Accessibility-Related Publication Distribution in HCI Based on a Meta-Analysis

Mark Colley
mark.colley@uni-ulm.de
Institute of Media Informatics, Ulm University
Ulm, Germany

Taras Kränzle
taras.kraenzle@alumni.uni-ulm.de
Institute of Media Informatics, Ulm University
Ulm, Germany

Enrico Rukzio
enrico.rukzio@uni-ulm.de
Institute of Media Informatics, Ulm University
Ulm, Germany

ABSTRACT

Accessibility research aims to aid humans that experience minor or major disabilities and conditions. However, researchers might have limited exposure to certain disabilities, therefore, focus on those prevalent in their own lives. This work presents a script-based meta-analysis on addressed populations in accessibility research published on top Human-Computer Interaction (HCI) venues (3617 full papers). We categorize the publications regarding the involved people and their disabilities. We found that work on *vision disability* makes up for almost one third (27.85%) of the work published in general HCI. In light of these findings, we present possible conference- and funding-related explanatory approaches and argue that disability research could more reflect the prevalence of disabilities in the world.

CCS CONCEPTS

• **General and reference → Surveys and overviews**.

KEYWORDS

Accessibility; overview; survey.

ACM Reference Format:
Mark Colley, Taras Kränzle, and Enrico Rukzio. 2022. Accessibility-Related Publication Distribution in HCI Based on a Meta-Analysis. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 Extended Abstracts), April 29-May 5, 2022, New Orleans, LA, USA.* ACM, New York, NY, USA, 28 pages. https://doi.org/10.1145/3491101.3519701

1 INTRODUCTION

According to *The International Classification of Functioning, Disability and Health* (ICF) [316], there are multiple categories of impairments that can be broadly sub-categorized into four types [129]: Mobility and Physical Impairments, Vision, Hearing, and Cognitive or Learning Disabilities. For example, there are around 1.3 billion people with some, 217 million people with a severe vision impairment, and 36 million people are blind [42, 247]; 466 million people have disabling hearing loss [248], and 50 million people have some form of dementia [249]. The distribution of disability in the USA in 2015, as an example, is 3.6% for hearing, 2.3% for vision, and 4.8% for cognitive impairments [176]. Accessibility plays an important role in various conferences today both for attendance as well as a research topic [1]. The *International ACM SIGACCESS Conference on Computers and Accessibility* (ASSETS) [90] specifically addresses research on people with disabilities. Additionally, there are special subcommittees at CHI for mental health, learning and accessibility & ageing [245]. However, a quantitative approach to how strongly each disability is addressed in the field of Human-Computer Interaction (HCI) is missing. HCI refers to a "multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers" [98]. This is important to shape future research. Complex problems require formulating the challenges first [134]. Knowing the distribution of papers on disabilities can facilitate discussions about potential underrepresentation, especially important research topics, and distribution of research funds. Thus, the first important step is to report relevant data as, for example, done by Microsoft [185].

This work first provides an overview of the addressed population from 2009 — 2019 that were published at ASSETS to define relevant fields and terminology. Based on this overview, a script-based categorization approach was defined. For this, we first categorized the papers of ASSETS manually and then compared this to the script-based paper categorization approach. Such a script-based approach enabled us to categorize many more publications than would be possible manually. After an iterative improvement process, we used this script to search further venues in the accessibility community (W4A [6], TACCESS [243]) and the broader HCI domain (CHI [244], UIST [293], AutoUI [149], and MUM [216]) in the time frame of 2016 – 2019 were included in the quantitative categorization process. We found that conferences vary greatly in the addressed populations such as visual disabilities for ASSETS, TACCESS, and W4A or cognitive and learning disabilities at CHI. Visual impairments were studied and addressed the most (27.85%).

Contribution statement: This work contributes to the body of accessibility-related knowledge by providing a meta-analysis on addressed disabilities in the field of HCI. For this, an R script-based approach was defined, compared to a manual classification of the ASSETS papers from 2009 — 2019 and then applied to other relevant venues. This work shows different focus points of the conferences and reveals the misalignment of the work on disabilities with the prevalence of disabilities in the general population.

2 METHOD

In this paper, we provide a meta-analysis on the addressed disabilities at major HCI venues. First, we describe our manual and script-based process. We reviewed the main proceedings of ASSETS

CHI '22 Extended Abstracts, April 29-May 5, 2022, New Orleans, LA, USA

ACM ISBN 978-1-4503-9156-6/22/04.
https://doi.org/10.1145/3491101.3519701

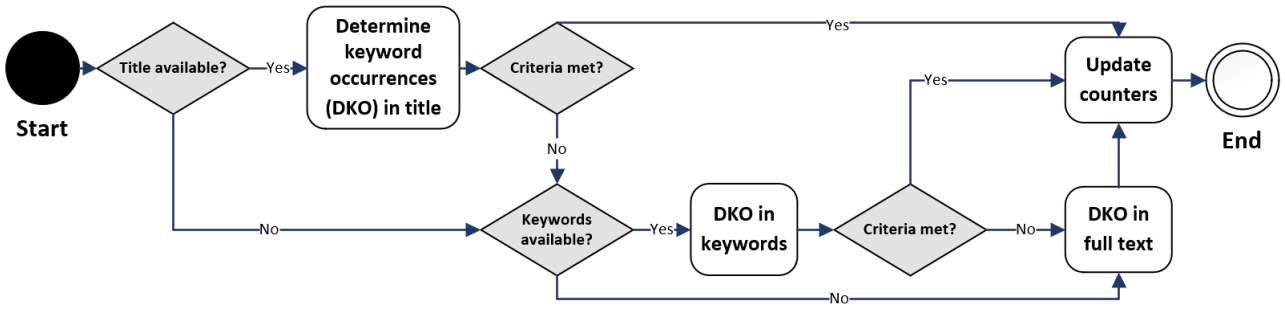


Figure 1: Classification procedure in the R script.

from 2009 — 2019 (**316** publications). We collected all 316 ASSETS papers and formalized our process to classify and review the papers. We chose ASSETS as a premier venue for accessibility-related publications and the time frame to gather a large enough sample.

2.1 Manual Categorization

All ASSETS papers were categorized manually by two authors. For this, the two authors first read the title, the abstract, and the keywords. If a categorization was not possible based on these sections, the entire full paper was read. Both authors categorized all papers. Disagreements were resolved via discussions. One author already has knowledge about and worked with people with vision impairments. Additionally, a medical physician was available for queries regarding nomenclature and disabilities. First, we categorized publications into four types [129]: Mobility and Physical Impairments, Vision, Hearing, and Cognitive or Learning Disabilities. We found that some papers could not be categorized as more than one disability or older adults were addressed. Therefore, we added the categories *General Accessibility* and *Elderly*. We explicitly do not see being of older age to be a disability. Additionally, we divided psychological disorders from cognitive disabilities as these seem to become more prevalent [246]. This is also in line with the distinction of the UN Convention on the Rights of Persons with Disabilities (UNCRPD) between mental and intellectual disabilities [121]. As we will discuss in section 5, there is an inevitable conceptual overlap between these disabilities [208], however, not in our sub-category terminology. The results can be seen in Table 1.

2.2 Script-based Categorization

After the manual categorization, the publications were analyzed via a R script using the *pdfsearch* [187] (see Appendix C; available under https://github.com/M-Colley/accessibility-distribution-meta). We defined relevant terms of the addressed disability (e.g., "visual impairment"). Additionally, we asked a medical physician for related keywords. As authors tend to use different vocabulary, we used the first ten synonyms with a rating greater than 200 (highest possible, crowd-sourced) from https://www.powerthesaurus.org as an "excellent resource of English words and their synonyms" [281, p. 4] for the search.

With preliminary criteria, we first analyzed the 316 publications of ASSETS. In an iterative process, we added relevant keywords. When no match was found, the paper was again analyzed independently by two authors and relevant search terms were added to the script. Therefore, the search term lists vary in length. Disagreements were resolved through discussions. In the case of unclear affiliations to one of the categories, the authors also asked a medical physician as these are examined in detecting and working with people with disabilities.

For ASSETS, the classification based on the R script for ASSETS was then compared to our manual categorization. Our script categorized 306/316 ($\approx$ 96.84%) ASSETS paper. We found that 59/77 table cells (one cell per year and addressed disability; e.g., *Vision Disability* for 2009 had 9 references in Table 1) were populated the same. As a distance function measuring the deviation from the manual categorization, we defined the absolute difference for each cell. This showed that there is a difference of 22 (max 2 per cell, see Appendix B Table 3) publications (e.g., the automatically generated table has 7 references for *Vision Disability* for 2009, thus the difference is 2). Ten of these can be attributed to the non-classified publications and five can be attributed to non-searchable publications. Nevertheless, we were able to correctly classify 93% of all publications at ASSETS. This leads us to conclude that our approach, while not perfect, provides a reliable picture of accessibility-related publications at HCI venues. The relevant search terms can be found in Appendix A.

Afterward, we repeated this with the additional publications. For this, we followed the PRISMA [217] process. PRISMA refers to the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses*. The papers had to be published within the time frame of 2016 – 2019. We chose this different time frame because (1) we found no changes over the distribution at ASSETS over the 11 years and (2) CHI allows bulk downloads for this time frame (as of January 2021). They also had to be published in a journal or on a conference with an HCI focus: W4A, TACCESS, CHI, UIST, AutoUI, and MUM. We downloaded all papers from the ACM DL.

First, we repeated the procedure with the papers of W4A and TACCESS, as it is clear that all publications address accessibility. Again, relevant search terms from titles were added manually. After another iteration, with our script, of the **494** publication in ASSETS, W4A, and TACCESS, we could **not** categorize 15 or 3.23% of the publications. Of these, 5 were deemed *maybe-accessibility-related* and 10 *accessibility-unrelated* (see criteria below).

For these 494 publications, on average, the category with the most occurrences had *M*=88.41 (*SD*=69.07) occurrences (e.g., terms from one category occurred ≈ 88 times). The first quartile was 41. The category with the second most occurrences had *M*=14.02 (*SD*=17.00). The first quartile was 4. Overall, publications had *M*=112.99 (*SD*=79.53) accessibility-related keywords, the first quartile being 59. Based on these numbers, we considered a publication as assigned to a category when a search term was found in the title or the keywords or otherwise if (1) more than 23 references (0.1 quantile of most common keyword category) to one category were found and (2) either the ratio to the second most common keywords was above 2.0 or no more than 14 references (mean of second most common keywords) to another category were found in the entire full paper. *References* refers to the number of appearances of one specific term (e.g., *dyslexia*) in the **entire** full paper. As all works include some reference to accessibility, we defined that if at least **20** references (0.05-quantile of the overall keyword occurrences for the accessibility-related venues) to search terms are found, this paper was categorized as *maybe accessibility-related*. With this threshold, only 10/494 ≈ 2.02% publications of the accessibility-related venues ASSETS, TACCESS, and W4A were wrongly categorized as *accessibility-unrelated*. 271 were categorized by title, 46 by keywords. This approach also guards against "accessibility-as-icing", as singular sentences indicating a potential relevance to people with disabilities will not be categorized as relevant.

As we aimed to gain a broader picture of the HCI community, we included the full papers of the conferences CHI, UIST, AutoUI, and MUM in the R-based analysis. We chose CHI and UIST as large top tier HCI venues and AutoUI and MuM as surrogates for smaller, more focused conferences. With the updated criteria, we checked **all** full papers. Taken together, we categorized **3617** full papers. For every conference, a data table was automatically generated (see supplementary material). Following the PRISMA method [217], we only included the papers outlined above, excluded no records, and performed no qualitative synthesis

Usage of *pdfsearch* [187] in full text: `keyword_search(pdf_file, keyword=keywords, path=TRUE, remove_hyphen=TRUE, surround_lines=1, ignore_case=TRUE, split_pdf=TRUE)` where: *keywords* are the search terms per disability, *remove_hyphen* is set to TRUE to combine hyphenated words, *ignore_case* is TRUE to disregard capitalization, and *split_pdf* is TRUE as this is "most useful with multicolumn pdf files" [187, p. 6].

3 FINDINGS

We report descriptive statistics for all papers and conference-related findings. We found that **1062** of the 3617 (29.36%) full papers to address a disability. Additionally, we found that 400 full papers were *potentially accessibility-related*. 577 of 1062 (54.33%) were classified by either the title (445 or 41.90%) or the keywords (132 or 12.43%).

ASSETS: We predominantly found vision-related papers (128/316 or 40.51%; see Figure 2a). While we approve of this effort and do not want this to cease, we are worried that other disabilities are not included sufficiently. Hearing and cognitive disabilities were addressed the second most. All other disabilities each represent ≈ 10% or less of the papers.

AutoUI: AutoUI did not address disabilities to a great extent. With our script, we found that one publication addressed cognitive disability and two addressed older adults (2.2% of the 136 analyzed papers).

CHI: 515/2514 (20.49%) papers addressed disability. These works mainly focused on older adults (128, 5.09%), psychological (94, 3.74%), or cognitive (86, 3.42%) disabilities (see Figure 2b). This accounts for the more frequent occurrence of mental health problems [246]. Visual disabilities were the fourth most common disability addressed (84). Other disabilities were only addressed to a minor degree; hearing disability, as the fifth most common, was only addressed in 4.47% of all the accessibility-related papers.

MUM: We found that two papers addressed vision, four congitive, one psychological, five mobility disability and five addressed older adults (in total, 11.49% of the 148 analyzed papers).

TACCESS: We categorized 70/70 papers. Vision-related papers were most dominant (31/70, 44.29%). Older adults, the second most common addressed population, were only addressed in 10/70 (14.29%) of the categorized papers.

UIST: 49/325 (15.08%) addressed disability. Mobility (21, 6.46%) and visual (15, 4.62%) were most dominantly addressed.

W4A: 102/108 (94.44%) papers were categorized. W4A, with addressing website accessibility, focuses mainly on general accessibility (43, 39.81%; this includes accessibility evaluations) and visual impairments (33, 30.56%).

In Table 2, the occurrences per disability addressed are summed up. Most work focuses on vision impairments while the other disabilities are addressed to an equal degree. Hearing-impairment related work is scarcer. When the distribution of disabilities is taken into account, we argue that this distribution could look different and, therefore, while these findings are not worrisome, action should be taken to better address underrepresented disabilities.

4 EXPLANATORY APPROACHES, IMPLICATIONS, AND RECOMMENDATIONS

Almost a third of the publications were focused on vision impairment and another third on the combination of cognitive and psychological disabilities. In this section, we propose explanations for the analysis' findings.

4.1 Possible Conference-Related Explanations

Driving is a highly visual and often demanding task which is difficult for people with impairments [250]. This could be one reason for the lack of accessibility-related work on AutoUI. However, there are approaches, e.g., to aid people with vision impairments to steer [300]. We also believe that with the advance of autonomous driving, the target group of vehicle-related research will change towards work-related and accessibility-related research (e.g., see [77]).

ASSETS, TACCESS, and UIST seem to focus highly on visual impairments. One interpretation of the dominance of visual-impairment related papers might be that a lot of visual feedback is apparent in today's society, e.g., billboards, television, and the worldwide web. We predominantly perceive information through a display in 2020, for example via smartwatch, smartphone, tablet, laptop, PC, or screen walls. Therefore, researchers could attribute a high relevance to these topics. With an increased amount of visual

Table 1: Distribution of publications based on the addressed population at ASSETS from 2009 — 2019.

Year	Vision Disability	Hearing Disability	Brain, Cognitive or Learning Disabilities	Psychological Disorders	Mobility and Physical Impairments	General Accessibility	Elderly	Overall Papers
2009	**9**[5, 13, 17, 97, 119, 164, 278, 319, 324]	**3**[70, 196, 211]	**4**[27, 71, 142, 194]	**3**[125, 198, 235]	**1**[200]	**5**[33, 49, 107, 303, 340]	**1**[323]	26
2010	**9**[72, 132, 172, 190, 223, 228, 257, 277, 311]	**4**[144, 180, 308, 326]	**6**[11, 136, 189, 226, 254, 335]	**3**[120, 230, 236]	**0**	**5**[34, 50, 91, 177, 202]	**1**[138]	28
2011	**8**[86, 93, 155, 171, 204, 242, 299, 338]	**5**[135, 145, 170, 309, 325]	**2**[186, 320]	**4**[38, 41, 106, 124]	**1**[255]	**4**[2, 35, 215, 334]	**3**[76, 148, 279]	27
2012	**10**[21, 60, 94, 110, 141, 150, 182, 273, 318, 342]	**4**[181, 183, 197, 220]	**1**[315]	**2**[163, 165]	**0**	**3**[218, 260, 269]	**5**[88, 232, 237, 313, 333]	25
2013	**12**[20, 26, 69, 166, 184, 231, 240, 262, 305, 330, 339, 346]	**4**[158, 174, 310, 321]	**3**[137, 253, 265]	**1**[213]	**3**[89, 99, 314]	**2**[112, 256]	**3**[83, 109, 292]	28
2014	**14**[23, 24, 59, 62, 63, 92, 116, 151, 207, 214, 221, 239, 300, 329]	**2**[179, 307]	**1**[267]	**2**[87, 209]	**4**[66, 133, 219, 229]	**2**[45, 105]	**4**[22, 64, 81, 84]	29
2015	**14**[8, 40, 53, 104, 108, 117, 130, 233, 263, 272, 296, 317, 345, 349]	**4**[143, 159, 178, 288]	**5**[58, 74, 103, 156, 266]	**3**[210, 225, 337]	**1**[65]	**4**[79, 82, 102, 312]	**1**[80]	32
2016	**12**[3, 7, 14, 95, 114, 160, 199, 264, 294, 302, 306, 332]	**4**[46, 51, 167, 259]	**4**[173, 222, 284, 347]	**2** [271, 328]	**0**	**2**[205, 286]	**0**	24
2017	**14**[12, 36, 37, 52, 56, 115, 140, 191, 227, 241, 280, 285, 301, 348]	**3**[30, 146, 161]	**3**[75, 201, 268]	**5**[44, 127, 131, 206, 331]	**2**[67, 224]	**1**[274]	**0**	28
2018	**13**[4, 9, 39, 55, 57, 123, 169, 261, 287, 297, 298, 343, 344]	**5**[10, 48, 96, 153, 282]	**3**[18, 19, 25]	**1**[283]	**1**[68]	**3**[29, 128, 275]	**2**[192, 193]	28
2019	**20**[31, 54, 73, 111, 118, 122, 139, 154, 188, 203, 234, 252, 258, 276, 291, 295, 304, 322, 336, 341]	**7**[15, 47, 61, 152, 157, 162, 175]	**3**[28, 195, 290]	**1**[270]	**3**[16, 251, 289]	**1**[168]	**6**[32, 85, 100, 101, 147, 327]	41
Total	**135 (42.72%)**	**45 (14.24%)**	**35 (11.08%)**	**27 (8.54%)**	**16 (5.06%)**	**32 (10.13%)**	**26 (8.23%)**	**316**

Table 2: Distribution of overall papers based on addressed population.

Vision Disability	Hearing Disability	Brain, Cognitive or Learning Disabilities	Psychological Disorders	Mobility and Physical Impairments	General Accessibility	Elderly	Combined
291 (27.85%)	81 (7.75%)	145 (13.88%)	131 (12.54%)	121 (11.58%)	103 (9.86%)	173 (16.56%)	1045

displays, there is the possibility that people with visual disabilities are not able to fully make use of the possibilities.

Another possible interpretation is that visual impairments are potentially more "tangible" to seeing people than, for example, learning disabilities. It is rather easy to simulate vision loss either by closing one's eyes or using simulations [113]. Simulations for physical impairments also seem possible with some more effort. This is, however, difficult for learning disabilities. Visual tasks also allow for relatively easy assessment and evaluation. Designing valid studies that can show effects on learning outcomes are subject to numerous confounding variables: Experts agreed that "further research involving technically adequate measures to determine cognitive, neuropsychological, and academic response-to-intervention interrelationships was necessary" [126, p. 231]. Additionally, "SLD [specific learning disabilities] need individualized interventions based on specific learning needs" [126, p. 223].

For CHI, we found that mostly older adults and cognitive and psychological disabilities were addressed. This seems to be in contrast to the given explanation for ASSETS and TACCESS. Visual impairments ranked only fourth. However, CHI is the leading venue in the HCI community, according to the Google scholar ranking and, therefore, attracts cutting edge research. Additionally, there are numerous subcommittees including *Learning, Education, and Families*, *Health*, and *Accessibility and Ageing* [245]. This could be a reason for the higher submissions of cognitive- and psychological-addressing research. W4A addresses web accessibility and its evaluation. As numerous websites are highly visual, this is a problem for people with vision impairments. Therefore, the focus on this population is explainable.

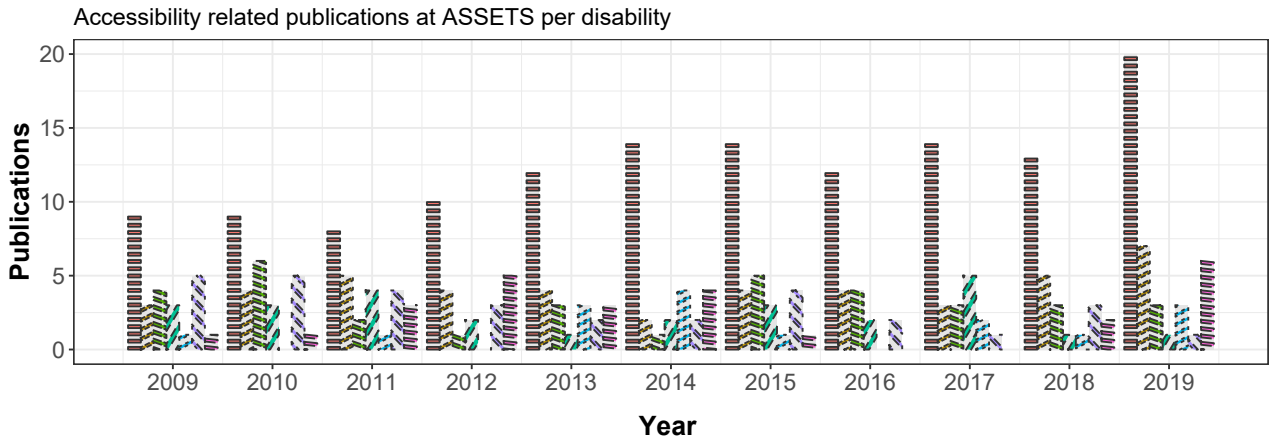
Finally, there are also difficulties regarding recruiting participants of certain disabilities and running usability testing, focus groups and interviews with younger/child populations.

4.2 Bias in Funding Agencies

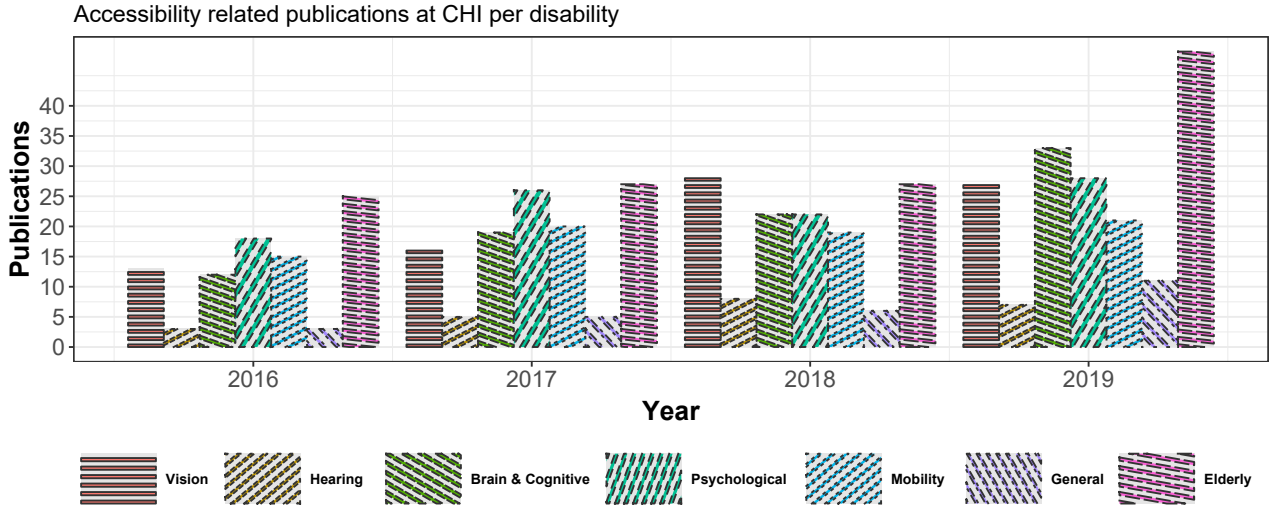
Funding of research projects is a potential source for the disproportionate distribution of papers. Currently, there are 25 EU-funded research projects on technologies for accessibility [78]. Three address visual impairments, two hearing impairments, one deaf-blindness, five motor impairments, nine cognitive impairments, and five general accessible communication technology. In Canada, currently announced projects are made of seven projects addressing motor impairment, eight projects addressing general disabilities, three visual, and two cognitive disabilities [238]. Microsoft's *AI for Accessibility* program [212] has no special focus an a disability. In their featured examples, all categories of disabilities are addressed. While this is not a full view of funding agencies around the world, it seems that the bias towards visual and cognitive and psychological disabilities is, at least today, not induced by funding agencies.

4.3 Publication

Based on our script-based approach and the difficulties we experienced, we propose some enhancements for the publication process such as including the target group and the used methodology in the



(a) Publications on ASSETS per disability from 2009 — 2019.



(b) Publications on CHI per disability from 2016 — 2019.

Figure 2: Publications on CHI and ASSETS per disability as a stacked bar chart.

Keywords. This could also be done automatically, as done by other venues such as *IEEE Xplore Digital Library*. Additionally, we recommend a more rigorous approach to the enforcement of metadata validity. This is relevant for several tasks such as (our) script-based approaches but also, for example, bibliometrics. We also stress the need to provide papers in an accessible and searchable format. This is also necessary to ensure that screen readers can function properly.

5 THOUGHTS ON AND LIMITATIONS OF OUR APPROACH & FUTURE WORK

Categorization is shaped by culture and worldview and, itself shapes these [43]. It can also "suggest bias or reflect negative, disparaging, or patronizing attitudes toward individuals or groups of individuals" [129, p. 62]. With our suggested approach, potentially harmful considered terms (e.g., elderly, see [129]) were used for classification. Additionally, including a medical physician could have included a biased view on the topic of disability. Hanson et al. [129] state that language alters and we strongly support this change towards unharmful terminology, however, for our purpose, these search terms were necessary. Also, some overlap between the categorization is inevitable. We assured that most search terms can only be put into one category, however, for example, vision disability is often addressed for older adults, resulting in an overlap. The creation of the search terms, in general, was difficult and demanded an extensive use of reading at least titles and keywords of the paper. Still, it cannot be eliminated that some keywords were overlooked.

Our R-based categorization of work potentially could have miscategorized some works due to unaccounted or overlapping search terms, not accounting for abbreviations etc. Additionally, the difference in length for search terms per disability could have biased the results. While the categorization via title or keywords, performed well, it had difficulties when general terms were used in the keywords alongside more specific ones. For example, keywords that **first** have *assistive technology* and **then** *autism* would be categorized under *General Accessibility* while, if the keywords would be reversed it would be categorized under *Psychological Disorder*. This became clear when the script-based approach was compared to the manual categorization for ASSETS papers.

Classification solely based on the title, abstract, and keywords was difficult. While our script searched the entire paper, adding such relevant information in these parts would significantly ease the reading process. Also, we found that numerous files have incorrect metadata. This limited script-based process. For example, the TACCESS papers' title is TACCESS*VolumeIssue-Number of Article*, e.g. *TACCESS1201-03*. Keywords are also missing in the TACCESS publications' metadata. Additionally, numerous PDF files were not text-searchable. For ASSETS, these were five publications. While this resembles only 1.6%, this could still have biased our results.

6 CONCLUSION

In conclusion, we have shown that people with disabilities are addressed in numerous conferences in HCI. Some of the venues seem to address specific disabilities disproportionately. ASSETS and TACCESS, for example, seem to mainly address visual impairments. To uncover this finding, we employed a script-based methodology. We proposed some explanations such that *visual disabilities* are more graspable for researchers and practitioners. Our work is, to the best of our knowledge, the first approach to quantitatively reveal the addressed populations with disabilities in HCI.

ACKNOWLEDGMENTS

This work was conducted within the project 'SituWare' funded by the Federal Ministry for Economic Affairs and Energy (BMWi).
Mark Colley was supported by the Startup Funding B of Ulm University.

REFERENCES

[1] CHI 2019. 2019. Accessibility. https://chi2019.acm.org/for-attendees/accessibility/. [Online; accessed: 06-NOVEMBER-2019].
[2] Julio Abascal, Amaia Aizpurua, Idoia Cearreta, Borja Gamecho, Nestor Garay-Vitoria, and Raúl Miñón. 2011. Automatically generating tailored accessible user interfaces for ubiquitous services. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 187–194.
[3] Ali Abdolrahmani and Ravi Kuber. 2016. Should i trust it when i cannot see it?: Credibility assessment for blind web users. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 191–199.
[4] Ali Abdolrahmani, Ravi Kuber, and Stacy M Branham. 2018. Siri Talks at You: An Empirical Investigation of Voice-Activated Personal Assistant (VAPA) Usage by Individuals Who Are Blind. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 249–258.
[5] Iyad Abu Doush, Enrico Pontelli, Dominic Simon, Tran Cao Son, and Ou Ma. 2009. Making Microsoft Excel™: multimodal presentation of charts. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 147–154.
[6] W4A: Web Accessibility. 2020. W4A: Web Accessibility. https://dl.acm.org/conference/w4a. [Online; accessed 12-JUNE-2020].
[7] Dustin Adams, Sri Kurniawan, Cynthia Herrera, Veronica Kang, and Natalie Friedman. 2016. Blind photographers and VizSnap: A long-term study. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 201–208.
[8] Dragan Ahmetovic, Roberto Manduchi, James M Coughlan, and Sergio Mascetti. 2015. Zebra crossing spotter: Automatic population of spatial databases for increased safety of blind travelers. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 251–258.
[9] Dragan Ahmetovic, Uran Oh, Sergio Mascetti, and Chieko Asakawa. 2018. Turn right: Analysis of rotation errors in turn-by-turn navigation for individuals with visual impairments. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 333–339.
[10] Sedeeq Al-khazraji, Larwan Berke, Sushant Kafle, Peter Yeung, and Matt Huenerfauth. 2018. Modeling the speed and timing of American Sign Language to generate realistic animations. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 259–270.
[11] Gazihan Alankus, Rachel Proffitt, Caitlin Kelleher, and Jack Engsberg. 2011. Stroke therapy through motion-based games: a case study. *ACM Transactions on Accessible Computing (TACCESS)* 4, 1 (2011), 3.
[12] Khaled Albusays, Stephanie Ludi, and Matt Huenerfauth. 2017. Interviews and Observation of Blind Software Developers at Work to Understand Code Navigation Challenges. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 91–100.
[13] Troy Allman, Rupinder K Dhillon, Molly AE Landau, and Sri H Kurniawan. 2009. Rock Vibe: Rock Band® computer games for people with no or limited vision. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 51–58.
[14] Maraim Alnfiai and Srinivas Sampalli. 2016. An evaluation of SingleTapBraille keyboard: a text entry method that utilizes braille patterns on touchscreen devices. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 161–169.
[15] Oliver Alonzo, Abraham Glasser, and Matt Huenerfauth. 2019. Effect of Automatic Sign Recognition Performance on the Usability of Video-Based Search Interfaces for Sign Language Dictionaries. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 56–67.
[16] Ahmad Alsaleem, Ross Imburgia, Mateo Godinez, Andrew Merryweather, Roger Altizer, Tamara Denning, Jeffery Rosenbluth, Stephen Trapp, and Jason Wiese. 2019. Leveraging Shared Control to Empower People with Tetraplegia to Participate in Extreme Sports. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 470–481.
[17] Tomohiro Amemiya and Hisashi Sugiyama. 2009. Haptic handheld wayfinder with pseudo-attraction force for pedestrians with visual impairments. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 107–114.
[18] Boyd Anderson, Shenggao Zhu, Ke Yang, Jian Wang, Hugh Anderson, Chao Xu Tay, Vincent YF Tan, and Ye Wang. 2018. MANA: Designing and Validating a User-Centered Mobility Analysis System. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 321–332.
[19] Beatrice Aruanno, Franca Garzotto, Emanuele Torelli, and Francesco Vona. 2018. HoloLearn: Wearable Mixed Reality for People with Neurodevelopmental Disorders (NDD). In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 40–51.
[20] Shiri Azenkot and Nicole B Lee. 2013. Exploring the use of speech input by blind people on mobile devices. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 11.
[21] Shiri Azenkot, Kyle Rector, Richard Ladner, and Jacob Wobbrock. 2012. PassChords: secure multi-touch authentication for blind people. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 159–166.
[22] Ron Baecker, Kate Sellen, Sarah Crosskey, Veronique Boscart, and Barbara Barbosa Neves. 2014. Technology to reduce social isolation and loneliness. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 27–34.
[23] Catherine M Baker, Lauren R Milne, Jeffrey Scofield, Cynthia L Bennett, and Richard E Ladner. 2014. Tactile graphics with a voice: using QR codes to access text in tactile graphics. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 75–82.

[24] Suzanne P Balik, Sean P Mealin, Matthias F Stallmann, Robert D Rodman, Michelle L Glatz, and Veronica J Sigler. 2014. Including blind people in computing through access to graphs. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 91–98.

[25] Fabio Ballati, Fulvio Corno, and Luigi De Russis. 2018. Assessing Virtual Assistant Capabilities with Italian Dysarthric Speech. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 93–101.

[26] Nikola Banovic, Rachel L Franz, Khai N Truong, Jennifer Mankoff, and Anind K Dey. 2013. Uncovering information needs for independent spatial learning for users who are visually impaired. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 24.

[27] Jérémy Bauchet, Hélène Pigot, Sylvain Giroux, Dany Lussier-Desrochers, Yves Lachapelle, and Mounir Mokhtari. 2009. Designing judicious interactions for cognitive assistance: the acts of assistance approach. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 11–18.

[28] Andrew A Bayor, Laurianne Sitbon, Bernd Ploderer, Filip Bircanin, Stewart Koplick, and Margot Brereton. 2019. Leveraging Participation: Supporting Skills Development of Young Adults with Intellectual Disability Using Social Media. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 143–155.

[29] Cynthia L Bennett, Erin Brady, and Stacy M Branham. 2018. Interdependence as a frame for assistive technology research and design. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 161–173.

[30] Larwan Berke, Christopher Caulfield, and Matt Huenerfauth. 2017. Deaf and hard-of-hearing perspectives on imperfect automatic speech recognition for captioning one-on-one meetings. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 155–164.

[31] Cristian Bernareggi, Dragan Ahmetovic, and Sergio Mascetti. 2019. μGraph: Haptic Exploration and Editing of 3D Chemical Diagrams. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 312–317.

[32] Tapomayukh Bhattacharjee, Maria E Cabrera, Anat Caspi, Maya Cakmak, and Siddhartha S Srinivasa. 2019. A Community-Centered Design Framework for Robot-Assisted Feeding Systems. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 482–494.

[33] Margit Biemans, Betsy van Dijk, Pavan Dadlani, and Aart van Halteren. 2009. Let's stay in touch: sharing photos for restoring social connectedness between rehabilitants, friends and family. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 179–186.

[34] Jeffrey P Bigham, Jeremy T Brudvik, and Bernie Zhang. 2010. Accessibility by demonstration: enabling end users to guide developers to web accessibility solutions. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 35–42.

[35] Jeffrey P Bigham, Richard E Ladner, and Yevgen Borodin. 2011. The design of human-powered access technology. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 3–10.

[36] Jeffrey P Bigham, Irene Lin, and Saiph Savage. 2017. The Effects of Not Knowing What You Don't Know on Web Accessibility for Blind Web Users. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 101–109.

[37] Syed Masum Billah, Vikas Ashok, Donald E Porter, and IV Ramakrishnan. 2017. Speed-Dial: a surrogate mouse for non-visual web browsing. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 110–119.

[38] Rolf Black, Annalu Waller, Nava Tintarev, Ehud Reiter, and Joseph Reddington. 2011. A mobile phone based personal narrative system. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 171–178.

[39] Mayara Bonani, Raquel Oliveira, Filipa Correia, André Rodrigues, Tiago Guerreiro, and Ana Paiva. 2018. What My Eyes Can't See, A Robot Can Show Me: Exploring the Collaboration Between Blind People and Robots. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 15–27.

[40] Jens Bornschein, Denise Prescher, and Gerhard Weber. 2015. Collaborative creation of digital tactile graphics. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 117–126.

[41] Fatima A Boujarwah, Hwajung Hong, Gregory D Abowd, Rosa I Arriaga, et al. 2011. Towards a framework to situate assistive technology design in the context of culture. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 19–26.

[42] Rupert RA Bourne, Seth R Flaxman, Tasanee Braithwaite, Maria V Cicinelli, Aditi Das, Jost B Jonas, Jill Keeffe, John H Kempen, Janet Leasher, Hans Limburg, et al. 2017. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *The Lancet Global Health* 5, 9 (2017), e888–e897.

[43] Geoffrey C Bowker and Susan Leigh Star. 2000. *Sorting things out: Classification and its consequences*. MIT press, Cambridge, MA, USA.

[44] LouAnne E Boyd, Kathryn E Ringland, Heather Faucett, Alexis Hiniker, Kimberley Klein, Kanika Patel, and Gillian R Hayes. 2017. Evaluating an iPad Game to Address Overselectivity in Preliterate AAC Users with Minimal Verbal Behavior. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 240–249.

[45] Erin Brady and Jeffrey P Bigham. 2014. How companies engage customers around accessibility on social media. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 51–58.

[46] Danielle Bragg, Nicholas Huynh, and Richard E Ladner. 2016. A personalizable mobile sound detector app design for deaf and hard-of-hearing users. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 3–13.

[47] Danielle Bragg, Oscar Koller, Mary Bellard, Larwan Berke, Patrick Boudreault, Annelies Braffort, Naomi Caselli, Matt Huenerfauth, Hernisa Kacorri, Tessa Verhoef, et al. 2019. Sign Language Recognition, Generation, and Translation: An Interdisciplinary Perspective. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 16–31.

[48] Danielle Bragg, Raja Kushalnagar, and Richard Ladner. 2018. Designing an Animated Character System for American Sign Language. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 282–294.

[49] Giorgio Brajnik. 2009. Validity and reliability of web accessibility guidelines. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 131–138.

[50] Giorgio Brajnik, Yeliz Yesilada, and Simon Harper. 2010. Testability and validity of WCAG 2.0: the expertise effect. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 43–50.

[51] Alessandra Brandão, Hugo Nicolau, Shreya Tadas, and Vicki L Hanson. 2016. SlidePacer: A presentation delivery tool for instructors of deaf and hard of hearing students. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 25–32.

[52] Stacy M Branham, Ali Abdolrahmani, William Easley, Morgan Scheuerman, Erick Ronquillo, and Amy Hurst. 2017. Is Someone There? Do They Have a Gun: How Visual Information about Others Can Improve Personal Safety Management for Blind Individuals. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 260–269.

[53] Stacy M Branham and Shaun K Kane. 2015. The invisible work of accessibility: how blind employees manage accessibility in mixed-ability workplaces. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 163–171.

[54] Stacy M Branham and Antony Rishin Mukkath Roy. 2019. Reading Between the Guidelines: How Commercial Voice Assistant Guidelines Hinder Accessibility for Blind Users. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 446–458.

[55] Robin N Brewer and Vaishnav Kameswaran. 2018. Understanding the power of control in autonomous vehicles for people with vision impairment. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 185–197.

[56] Julian Brinkley, Brianna Posadas, Julia Woodward, and Juan E Gilbert. 2017. Opinions and preferences of blind and low vision consumers regarding self-driving vehicles: Results of focus group discussions. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 290–299.

[57] Daniella Briotto Faustino and Audrey Girouard. 2018. Understanding authentication method use on mobile devices by people with vision impairment. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 217–228.

[58] Erin Buehler, William Easley, Samantha McDonald, Niara Comrie, and Amy Hurst. 2015. Inclusion and education: 3D printing for integrated classrooms. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 281–290.

[59] Erin Buehler, Shaun K Kane, and Amy Hurst. 2014. ABC and 3D: opportunities and obstacles to 3D printing in special education environments. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 107–114.

[60] Michele A Burton, Erin Brady, Robin Brewer, Callie Neylan, Jeffrey P Bigham, and Amy Hurst. 2012. Crowdsourcing subjective fashion advice using VizWiz: challenges and opportunities. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 135–142.

[61] Janine Butler, Brian Trager, and Byron Behm. 2019. Exploration of Automatic Speech Recognition for Deaf and Hard of Hearing Students in Higher Education Classes. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 32–42.

[62] Maria Claudia Buzzi, Marina Buzzi, Barbara Leporini, and Amaury Trujillo. 2014. Designing a text entry multimodal keypad for blind users of touchscreen mobile phones. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 131–136.

[63] Megan Campbell, Cynthia Bennett, Caitlin Bonnar, and Alan Borning. 2014. Where's my bus stop?: supporting independence of blind transit riders with StopInfo. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 11–18.

[64] Loïc Caroux, Charles Consel, Lucile Dupuy, and Hélène Sauzéon. 2014. Verification of daily activities of older adults: a simple, non-intrusive, low-cost approach. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 43–50.

[65] Patrick Carrington, Kevin Chang, Helena Mentis, and Amy Hurst. 2015. But, I don't take steps: Examining the Inaccessibility of Fitness Trackers for Wheelchair Athletes. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 193–201.

[66] Patrick Carrington, Amy Hurst, and Shaun K Kane. 2014. The gest-rest: a pressure-sensitive chairable input pad for power wheelchair armrests. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 201–208.

[67] Patrick Carrington, Denzel Ketter, and Amy Hurst. 2017. Understanding Fatigue and Stamina Management Opportunities and Challenges in Wheelchair Basketball. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 130–139.

[68] Patrick Carrington, Gierad Laput, and Jeffrey P Bigham. 2018. Exploring the Data Tracking and Sharing Preferences of Wheelchair Athletes. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 242–248.

[69] Brendan Cassidy, Gilbert Cockton, and Lynne Coventry. 2013. A haptic ATM interface to assist visually impaired users. In *Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*. ACM, ACM, New York, NY, USA, 1.

[70] Anna C Cavender, Jeffrey P Bigham, and Richard E Ladner. 2009. ClassInFocus: enabling improved visual attention strategies for deaf and hard of hearing students. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 67–74.

[71] Yao-Jen Chang, Wan Chih Chang, and Tsen-Yung Wang. 2009. Context-aware prompting to transition autonomously through vocational tasks for individuals with cognitive impairments. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 19–26.

[72] Claude Chapdelaine. 2010. In-situ study of blind individuals listening to audio-visual contents. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 59–66.

[73] Bindita Chaudhuri, Leah Perlmutter, Justin Petelka, Philip Garrison, James Fogarty, Jacob O Wobbrock, and Richard E Ladner. 2019. GestureCalc: An Eyes-Free Calculator for Touch Screens. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 112–123.

[74] Jinghui Cheng, Cynthia Putnam, and Doris C Rusch. 2015. Towards efficacy-centered game design patterns for brain injury rehabilitation: A data-driven approach. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 291–299.

[75] Gabriel J Cler and Cara E Stepp. 2017. Development and Theoretical Evaluation of Optimized Phonemic Interfaces. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 230–239.

[76] José Coelho, Carlos Duarte, Pradipta Biswas, and Patrick Langdon. 2011. Developing accessible TV applications. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 131–138.

[77] Mark Colley, Marcel Walch, Jan Gugenheimer, and Enrico Rukzio. 2019. Including People with Impairments from the Start: External Communication of Autonomous Vehicles. In *Proceedings of the 11th International Conference on Automotive User Interfaces and Interactive Vehicular Applications: Adjunct Proceedings* (Utrecht, Netherlands) *(AutomotiveUI '19)*. Association for Computing Machinery, New York, NY, USA, 307–314. https://doi.org/10.1145/3349263.3351521

[78] European Commission. 2019. EU-funded research projects into technologies for accessibility. https://ec.europa.eu/digital-single-market/en/eu-funded-research-projects-technologies-accessibility. [Online; accessed 24-AUGUST-2020].

[79] Paulo A Condado and Fernando G Lobo. 2015. A system for controlling assisted living environments using mobile devices. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 33–38.

[80] Charles Consel, Lucile Dupuy, and Hélène Sauzéon. 2015. A unifying notification system to scale up assistive services. In *Proceedings of the 17th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 77–87.

[81] Michael Crabb and Vicki L Hanson. 2014. Age, technology usage, and cognitive characteristics in relation to perceived disorientation and reported website ease of use. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 193–200.

[82] Michael Crabb, Rhianne Jones, Mike Armstrong, and Chris J Hughes. 2015. Online news videos: the UX of subtitle position. In *Proceedings of the 17th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 215–222.

[83] Jennifer L Davidson and Carlos Jensen. 2013. What health topics older adults want to track: a participatory design study. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 26.

[84] Marianne Dee and Vicki L Hanson. 2014. A large user pool for accessibility research with representative users. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 35–42.

[85] Ine D'Haeseleer, Kathrin Gerling, Dominique Schreurs, Bart Vanrumste, and Vero Vanden Abeele. 2019. Ageing is Not a Disease: Pitfalls for the Acceptance of Self-Management Health Systems Supporting Healthy Ageing. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 286–298.

[86] Benoît Encelle, Magali Ollagnier-Beldame, Stéphanie Pouchot, and Yannick Prié. 2011. Annotation-based video enrichment for blind people: A pilot study on the use of earcons and speech synthesis. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 123–130.

[87] Charles Fage, Léonard Pommereau, Charles Consel, Emilie Balland, and Hélène Sauzéon. 2014. Tablet-based activity schedule for children with autism in mainstream environment. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 145–152.

[88] Chloe Fan, Jodi Forlizzi, and Anind Dey. 2012. Considerations for technology that support physical activity by older adults. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 33–40.

[89] Torsten Felzer and Stephan Rinderknecht. 2013. How someone with a neuromuscular disease experiences operating a PC (and how to successfully counteract that). In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 29.

[90] The International ACM SIGACCESS Con ference on Computers and Accessibility. 2019. ASSETS 2019. https://assets19.sigaccess.org/. [Online; accessed: 05-NOVEMBER-2019].

[91] Leo Ferres, Gitte Lindgaard, and Livia Sumegi. 2010. Evaluating a Tool for Improving Accessibility to Charts and Graphs. In *Proceedings of the 12th International ACM SIGACCESS Conference on Computers and Accessibility* (Orlando, Florida, USA) *(ASSETS '10)*. ACM, New York, NY, USA, 83–90. https://doi.org/10.1145/1878803.1878820

[92] Alexander Fiannaca, Ilias Apostolopoulous, and Eelke Folmer. 2014. Headlock: a wearable navigation aid that helps blind cane users traverse large open spaces. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 19–26.

[93] David R Flatla and Carl Gutwin. 2011. Improving calibration time and accuracy for situation-specific models of color differentiation. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 195–202.

[94] David R Flatla and Carl Gutwin. 2012. So that's what you see: building understanding with personalized simulations of colour vision deficiency. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 167–174.

[95] Germán H. Flores and Roberto Manduchi. 2018. WeAllWalk: An Annotated Dataset of Inertial Sensor Time Series from Blind Walkers. *ACM Trans. Access. Comput.* 11, 1, Article 4 (March 2018), 28 pages. https://doi.org/10.1145/3161711

[96] Raymond Fok, Harmanpreet Kaur, Skanda Palani, Martez E Mott, and Walter S Lasecki. 2018. Towards More Robust Speech Interactions for Deaf and Hard of Hearing Users. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 57–67.

[97] Eelke Folmer, Bei Yuan, Dave Carr, and Manjari Sapre. 2009. TextSL: a command-based virtual world interface for the visually impaired. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 59–66.

[98] Interaction Design Foundation. 2020. Human-Computer Interaction (HCI). https://www.interaction-design.org/literature/topics/human-computer-interaction. [Online; accessed 12-JANUARY-2020].

[99] Andrew Fowler, Brian Roark, Umut Orhan, Deniz Erdogmus, and Melanie Fried-Oken. 2013. Improved inference and autotyping in EEG-based BCI typing systems. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 15.

[100] Rachel L Franz, Leah Findlater, Barbara Barbosa Neves, and Jacob O Wobbrock. 2019. Gender and Help Seeking by Older Adults When Learning New Technologies. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 136–142.

[101] Rachel L Franz, Jacob O Wobbrock, Yi Cheng, and Leah Findlater. 2019. Perception and Adoption of Mobile Accessibility Features by Older Adults Experiencing Ability Changes. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 267–278.

[102] Christopher Frauenberger. 2015. Disability and technology: A critical realist perspective. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 89–96.

[103] Markus Funk, Sven Mayer, and Albrecht Schmidt. 2015. Using in-situ projection to support cognitively impaired workers at the workplace. In *Proceedings of the 17th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 185–192.

[104] Giovanni Fusco and Valerie S Morash. 2015. The tactile graphics helper: providing audio clarification for tactile graphics using machine vision. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 97–106.

[105] Prathik Gadde and Davide Bolchini. 2014. From screen reading to aural glancing: towards instant access to key page sections. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 67–74.

[106] Julia Galliers, Stephanie Wilson, Sam Muscroft, Jane Marshall, Abi Roper, Naomi Cocks, and Tim Pring. 2011. Accessibility of 3D game environments for people with aphasia: An exploratory study. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 139–146.

[107] Ed Gellenbeck and Andreas Stefik. 2009. Evaluating prosodic cues as a means to disambiguate algebraic expressions: an empirical study. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 139–146.

[108] Andrea Gerino, Lorenzo Picinali, Cristian Bernareggi, Nicolò Alabastro, and Sergio Mascetti. 2015. Towards large scale evaluation of novel sonification techniques for non visual shape exploration. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 13–21.

[109] Kathrin M Gerling, Regan L Mandryk, and Michael R Kalyn. 2013. Wheelchair-based game design for older adults. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 27.

[110] Nicholas A Giudice, Hari Prasath Palani, Eric Brenner, and Kevin M Kramer. 2012. Learning non-visual graphical information using a touch-based vibro-audio interface. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 103–110.

[111] Cole Gleason, Amy Pavel, Xingyu Liu, Patrick Carrington, Lydia B Chilton, and Jeffrey P Bigham. 2019. Making Memes Accessible. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 367–376.

[112] Jorge Goncalves, Vassilis Kostakos, Simo Hosio, Evangelos Karapanos, and Olga Lyra. 2013. IncluCity: using contextual cues to raise awareness on environmental accessibility. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 17.

[113] Joy Goodman-Deane, Sam Waller, Alice-Catherine Collins, and John Clarkson. 2013. Simulating vision loss: what levels of impairment are actually represented?. In *Contemporary Ergonomics and Human Factors 2013: Proceedings of the international conference on Ergonomics & Human Factors 2013, Cambridge, UK, 15-18 April 2013*. CRC Press, CRC Press, Boca Raton, FL, USA, 347.

[114] Timo Götzelmann. 2016. LucentMaps: 3D printed audiovisual tactile maps for blind and visually impaired people. In *Proceedings of the 18th international ACM Sigaccess conference on computers and accessibility*. ACM, ACM, New York, NY, USA, 81–90.

[115] João Guerreiro, Dragan Ahmetovic, Kris M Kitani, and Chieko Asakawa. 2017. Virtual navigation for blind people: Building sequential representations of the real-world. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 280–289.

[116] João Guerreiro and Daniel Gonçalves. 2014. Text-to-speeches: evaluating the perception of concurrent speech by blind people. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 169–176.

[117] João Guerreiro and Daniel Gonçalves. 2015. Faster Text-to-Speeches: Enhancing Blind People's Information Scanning with Faster Concurrent Speech. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 3–11.

[118] João Guerreiro, Daisuke Sato, Saki Asakawa, Huixu Dong, Kris M Kitani, and Chieko Asakawa. 2019. CaBot: Designing and Evaluating an Autonomous Navigation Robot for Blind People. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 68–82.

[119] Tiago Guerreiro, Hugo Nicolau, Joaquim Jorge, and Daniel Gonçalves. 2009. NavTap: a long term study with excluded blind users. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 99–106.

[120] Tiago Guerreiro, Hugo Nicolau, Joaquim Jorge, and Daniel Gonçalves. 2010. Towards accessible touch interfaces. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 19–26.

[121] Training Guide. 2010. The convention on the rights of persons with disabilities.

[122] Darren Guinness, Annika Muehlbradt, Daniel Szafir, and Shaun K Kane. 2019. RoboGraphics: Using Mobile Robots to Create Dynamic Tactile Graphics. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 673–675.

[123] Anhong Guo, Saige McVea, Xu Wang, Patrick Clary, Ken Goldman, Yang Li, Yu Zhong, and Jeffrey P Bigham. 2018. Investigating Cursor-based Interactions to Support Non-Visual Exploration in the Real World. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 3–14.

[124] Joshua Hailpern, Marina Danilevsky, and Karrie Karahalios. 2011. ACES: aphasia emulation, realism, and the Turing test. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 83–90.

[125] Joshua Hailpern, Karrie Karahalios, Laura DeThorne, and James Halle. 2009. Talking points: the differential impact of real-time computer generated audio/visual feedback on speech-like & non-speech-like vocalizations in low functioning children with ASD. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 187–194.

[126] J. Hale, V. Alfonso, V. Berninger, B. Bracken, C. Christo, E. Clark, M. Cohen, A. Davis, S. Decker, M. Denckla, R. Dumont, C. Elliott, S. Feifer, C. Fiorello, D. Flanagan, E. Fletcher-Janzen, D. Geary, M. Gerber, M. Gerner, S. Goldstein, N. Gregg, R. Hagin, L. Jaffe, A. Kaufman, N. Kaufman, T. Keith, F. Kline, C. Kochhar-Bryant, J. Lerner, G. Marshall, J. Mascolo, N. Mather, M. Mazzocco, G. McCloskey, K. McGrew, D. Miller, J. Miller, M. Mostert, J. Naglieri, S. Ortiz, L. Phelps, B. Podhajski, L. Reddy, C. Reynolds, C. Riccio, F. Schrank, E. Schultz, M. Semrud-Clikeman, S. Shaywitz, J. Simon, L. Silver, L. Swanson, A. Urso, T. Wasserman, J. Willis, D. Wodrich, P. Wright, and J. Yalof. 2010. Critical Issues in Response-To-Intervention, Comprehensive Evaluation, and Specific Learning Disabilities Identification and Intervention: An Expert White Paper Consensus. *Learning Disability Quarterly* 33, 3 (2010), 223–236. https://doi.org/10.1177/073194871003300310 arXiv:https://doi.org/10.1177/073194871003300310

[127] Foad Hamidi, Melanie Baljko, and Isabel Gómez. 2017. Using Participatory Design with Proxies with Children with Limited Communication. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 250–259.

[128] Foad Hamidi, Kellie Poneres, Aaron Massey, and Amy Hurst. 2018. Who Should Have Access to my Pointing Data?: Privacy Tradeoffs of Adaptive Assistive Technologies. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 203–216.

[129] Vicki L. Hanson, Anna Cavender, and Shari Trewin. 2015. Writing about Accessibility. *Interactions* 22, 6 (Oct. 2015), 62–65. https://doi.org/10.1145/2828432

[130] Kotaro Hara, Shiri Azenkot, Megan Campbell, Cynthia L Bennett, Vicki Le, Sean Pannella, Robert Moore, Kelly Minckler, Rochelle H Ng, and Jon E Froehlich. 2015. Improving public transit accessibility for blind riders by crowdsourcing bus stop landmark locations with google street view: An extended analysis. *ACM Transactions on Accessible Computing (TACCESS)* 6, 2 (2015), 5.

[131] Kotaro Hara and Jeffrey P Bigham. 2017. Introducing people with ASD to crowd work. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 42–51.

[132] David S Hayden, Liqing Zhou, Michael J Astrauskas, and John A Black Jr. 2010. Note-taker 2.0: the next step toward enabling students who are legally blind

to take notes in class. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 131–138.

[133] Hamilton A Hernandez, Mallory Ketcheson, Adrian Schneider, Zi Ye, Darcy Fehlings, Lauren Switzer, Virginia Wright, Shelly K Bursick, Chad Richards, and TC Graham. 2014. Design and evaluation of a networked game to supportsocial connection of youth with cerebral palsy. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 161–168.

[134] Francis Heylighen. 1988. Formulating the problem of problem-formulation. *Cybernetics and Systems* 88 (1988), 949–957.

[135] Ellen S Hibbard and Deb I Fels. 2011. The vlogging phenomena: a deaf perspective. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 59–66.

[136] Jesse Hoey, Krists Zutis, Valerie Leuty, and Alex Mihailidis. 2010. A tool to promote prolonged engagement in art therapy: design and development from arts therapist requirements. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 211–218.

[137] Kristine Holbø, Silje Bøthun, and Yngve Dahl. 2013. Safe walking technology for people with dementia: what do they want?. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 21.

[138] Nic Hollinworth and Faustina Hwang. 2010. Relating computer tasks to existing knowledge to improve accessibility for older adults. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 147–154.

[139] Leona Holloway, Kim Marriott, Matthew Butler, and Samuel Reinders. 2019. 3D Printed Maps and Icons for Inclusion: Testing in the Wild by People who are Blind or have Low Vision. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 183–195.

[140] Jonggi Hong, Alisha Pradhan, Jon E Froehlich, and Leah Findlater. 2017. Evaluating Wrist-Based Haptic Feedback for Non-Visual Target Finding and Path Tracing on a 2D Surface. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 210–219.

[141] Jian Huang, Armando Barreto, and Malek Adjouadi. 2012. Evaluation of dynamic image pre-compensation forcomputer users with severe refractive error. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 175–182.

[142] Matt Huenerfauth, Lijun Feng, and Noémie Elhadad. 2009. Comparing evaluation techniques for text readability software for adults with intellectual disabilities. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 3–10.

[143] Matt Huenerfauth, Elaine Gale, Brian Penly, Mackenzie Willard, and Dhananjai Hariharan. 2015. Comparing methods of displaying language feedback for student videos of american sign language. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 139–146.

[144] Matt Huenerfauth and Pengfei Lu. 2010. Modeling and synthesizing spatially inflected verbs for American sign language animations. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 99–106.

[145] Matt Huenerfauth, Pengfei Lu, and Andrew Rosenberg. 2011. Evaluating importance of facial expression in american sign language and pidgin signed english animations. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 99–106.

[146] Matt Huenerfauth, Kasmira Patel, and Larwan Berke. 2017. Design and psychometric evaluation of an American Sign Language translation of the system usability scale. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 175–184.

[147] Earl W Huff Jr, Natalie DellaMaria, Brianna Posadas, and Julian Brinkley. 2019. Am I Too Old to Drive?: Opinions of Older Adults on Self-Driving Vehicles. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 500–509.

[148] Amy Hurst and Jasmine Tobias. 2011. Empowering individuals with do-it-yourself assistive technology. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 11–18.

[149] AutomotiveUI: Automotive User Interfaces and Interactive Vehicular Applications. 2020. AutomotiveUI: Automotive User Interfaces and Interactive Vehicular Applications. https://dl.acm.org/conference/automotiveui. [Online; accessed 12-JUNE-2020].

[150] Muhammad Asiful Islam, Faisal Ahmed, Yevgen Borodin, and IV Ramakrishnan. 2012. Thematic organization of web content for distraction-free text-to-speech narration. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 17–24.

[151] Dhruv Jain. 2014. Path-guided indoor navigation for the visually impaired using minimal building retrofitting. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 225–232.

[152] Dhruv Jain, Audrey Desjardins, Leah Findlater, and Jon E Froehlich. 2019. Autoethnography of a Hard of Hearing Traveler. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 236–248.

[153] Dhruv Jain, Rachel Franz, Leah Findlater, Jackson Cannon, Raja Kushalnagar, and Jon Froehlich. 2018. Towards Accessible Conversations in a Mobile Context for People who are Deaf and Hard of Hearing. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 81–92.

[154] Mohit Jain, Rohun Tripathi, Ishita Bhansali, and Pratyush Kumar. 2019. Automatic Generation and Evaluation of Usable and Secure Audio reCAPTCHA. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 355–366.

[155] Chandrika Jayant, Hanjie Ji, Samuel White, and Jeffrey P Bigham. 2011. Supporting blind photography. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 203–210.

[156] Stefan Johansson, Jan Gulliksen, and Ann Lantz. 2015. User participation when users have mental and cognitive disabilities. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 69–76.

[157] Michael D Jones and M Jeannette Lawler. 2019. Delivering Sign Language in a Live Planetarium Show Using Head-Mounted Displays and Infrared Light. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 396–401.

[158] Hernisa Kacorri, Allen Harper, and Matt Huenerfauth. 2013. Comparing native signers' perception of American Sign Language animations and videos via eye tracking. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 9.

[159] Hernisa Kacorri, Matt Huenerfauth, Sarah Ebling, Kasmira Patel, and Mackenzie Willard. 2015. Demographic and experiential factors influencing acceptance of sign language animation by deaf users. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 147–154.

[160] Hernisa Kacorri, Sergio Mascetti, Andrea Gerino, Dragan Ahmetovic, Hironobu Takagi, and Chieko Asakawa. 2016. Supporting orientation of people with visual impairment: Analysis of large scale usage data. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 151–159.

[161] Sushant Kafle and Matt Huenerfauth. 2017. Evaluating the usability of automatically generated captions for people who are deaf or hard of hearing. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 165–174.

[162] Sushant Kafle, Peter Yeung, and Matt Huenerfauth. 2019. Evaluating the Benefit of Highlighting Key Words in Captions for People who are Deaf or Hard of Hearing. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 43–55.

[163] Yoram M Kalman, Kathleen Geraghty, Cynthia K Thompson, and Darren Gergle. 2012. Detecting linguistic HCI markers in an online aphasia support group. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 65–70.

[164] Shaun K Kane, Chandrika Jayant, Jacob O Wobbrock, and Richard E Ladner. 2009. Freedom to roam: a study of mobile device adoption and accessibility for people with visual and motor disabilities. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 115–122.

[165] Shaun K Kane, Barbara Linam-Church, Kyle Althoff, and Denise McCall. 2012. What we talk about: designing a context-aware communication tool for people with aphasia. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 49–56.

[166] Shaun K Kane, Meredith Ringel Morris, and Jacob O Wobbrock. 2013. Touchplates: low-cost tactile overlays for visually impaired touch screen users. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 22.

[167] Saba Kawas, George Karalis, Tzu Wen, and Richard E Ladner. 2016. Improving real-time captioning experiences for deaf and hard of hearing students. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 15–23.

[168] Claire Kearney-Volpe, Devorah Kletenik, Kate Sonka, Deborah Sturm, and Amy Hurst. 2019. Evaluating Instructor Strategy and Student Learning Through Digital Accessibility Course Enhancements. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 377–388.

[169] Edward Kim and Kathleen F McCoy. 2018. Multimodal Deep Learning using Images and Text for Information Graphic Classification. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 143–148.

[170] Michael Kipp, Quan Nguyen, Alexis Heloir, and Silke Matthes. 2011. Assessing the deaf user perspective on sign language avatars. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 107–114.

[171] Eunjeong Ko, Jin Sun Ju, and Eun Yi Kim. 2011. Situation-based indoor wayfinding system for the visually impaired. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 35–42.

[172] Masatomo Kobayashi, Trisha O'Connell, Bryan Gould, Hironobu Takagi, and Chieko Asakawa. 2010. Are synthesized video descriptions acceptable?. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 163–170.

[173] Thomas Kosch, Romina Kettner, Markus Funk, and Albrecht Schmidt. 2016. Comparing tactile, auditory, and visual assembly error-feedback for workers with cognitive impairments. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 53–60.

[174] Linda Kozma-Spytek, Paula Tucker, and Christian Vogler. 2013. Audio-visual speech understanding in simulated telephony applications by individuals with hearing loss. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 6.

[175] Linda Kozma-Spytek, Paula Tucker, and Christian Vogler. 2019. Voice Telephony for Individuals with Hearing Loss: The Effects of Audio Bandwidth, Bit Rate and Packet Loss. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 3–15.

[176] Lewis Kraus. 2016. 2015 Disability Statistics Annual Report. A Publication of the Rehabilitation Research and Training Center on Disability Statistics and Demographics.

[177] Sri H Kurniawan, Sonia Arteaga, and Roberto Manduchi. 2010. A general education course on universal access, disability, technology and society. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 11–18.

[178] Raja S Kushalnagar, Gary W Behm, Aaron W Kelstone, and Shareef Ali. 2015. Tracked Speech-To-Text Display: Enhancing Accessibility and Readability of Real-Time Speech-To-Text. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 223–230.

[179] Raja S Kushalnagar, Gary W Behm, Joseph S Stanislow, and Vasu Gupta. 2014. Enhancing caption accessibility through simultaneous multimodal information: visual-tactile captions. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 185–192.

[180] Raja S Kushalnagar, Anna C Cavender, and Jehan-François Pâris. 2010. Multiple view perspectives: improving inclusiveness and video compression in mainstream classroom recordings. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 123–130.

[181] Raja S Kushalnagar, Walter S Lasecki, and Jeffrey P Bigham. 2012. A readability evaluation of real-time crowd captions in the classroom. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 71–78.

[182] Oren Laadan, Andrew Shu, and Jason Nieh. 2012. Capture: A desktop display-centric text recorder. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 9–16.

[183] Walter S Lasecki and Jeffrey P Bigham. 2012. Online quality control for real-time crowd captioning. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 143–150.

[184] Walter S Lasecki, Phyo Thiha, Yu Zhong, Erin Brady, and Jeffrey P Bigham. 2013. Answering visual questions with conversational crowd assistants. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 18.

[185] Jenny Lay-Flurrie. 2020. A first look at our disability representation stats. https://blogs.microsoft.com/on-the-issues/2020/10/21/disability-representation-statistics-diversity-inclusion/. [Online; accessed 10-JANUARY-2020].

[186] Jonathan Lazar, Libby Kumin, and Jinjuan Heidi Feng. 2011. Understanding the computer skills of adult expert users with down syndrome: an exploratory study. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 51–58.

[187] Brandon LeBeau. 2019. Package 'pdfsearch'. https://cran.r-project.org/web/packages/pdfsearch/pdfsearch.pdf

[188] Kyungjun Lee, Jonggi Hong, Simone Pimento, Ebrima Jarjue, and Hernisa Kacorri. 2019. Revisiting Blind Photography in the Context of Teachable Object Recognizers. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 83–95.

[189] Preston Lewis, Steve Noble, and Neil Soiffer. 2010. Using accessible math textbooks with students who have learning disabilities. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 139–146.

[190] Frank Chun Yat Li, David Dearman, and Khai N Truong. 2010. Leveraging proprioception to make mobile phones more accessible to users with visual impairments. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 187–194.

[191] Mingzhe Li, Mingming Fan, and Khai N Truong. 2017. BrailleSketch: A Gesture-based Text Input Method for People with Visual Impairments. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 12–21.

[192] Qisheng Li, Krzysztof Z Gajos, and Katharina Reinecke. 2018. Volunteer-Based Online Studies With Older Adults and People with Disabilities. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 229–241.

[193] Yu-Hao Lin, Suwen Zhu, Yu-Jung Ko, Wenzhe Cui, and Xiaojun Bi. 2018. Why Is Gesture Typing Promising for Older Adults?: Comparing Gesture and Tap Typing Behavior of Older with Young Adults. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 271–281.

[194] Alan L Liu, Harlan Hile, Gaetano Borriello, Pat A Brown, Mark Harniss, Henry Kautz, and Kurt Johnson. 2009. Customizing directions in an automated wayfinding system for individuals with cognitive impairment. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 27–34.

[195] Joana Lobo, Soichiro Matsuda, Izumi Futamata, Ryoichi Sakuta, and Kenji Suzuki. 2019. CHIMELIGHT: Augmenting Instruments in Interactive Music Therapy for Children with Neurodevelopmental Disorders. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 124–135.

[196] Pengfei Lu and Matt Huenerfauth. 2009. Accessible motion-capture glove calibration protocol for recording sign language data from deaf subjects. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 83–90.

[197] Pengfei Lu and Hernisa Kacorri. 2012. Effect of presenting video as a baseline during an american sign language animation user study. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 183–190.

[198] Xiaojuan Ma, Jordan Boyd-Graber, Sonya Nikolova, and Perry R Cook. 2009. Speaking through pictures: Images vs. icons. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 163–170.

[199] Rhouri MacAlpine and David R Flatla. 2016. Real-Time Mobile Personalized Simulations of Impaired Colour Vision. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 181–189.

[200] I Scott MacKenzie. 2009. The one-key challenge: searching for a fast one-key text entry method. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 91–98.

[201] Galina Madjaroff and Helena Mentis. 2017. Narratives of older adults with mild cognitive impairment and their caregivers. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 140–149.

[202] Jennifer Mankoff, Gillian R Hayes, and Devva Kasnitz. 2010. Disability studies as a source of critical inquiry for the field of assistive technology. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 3–10.

[203] Reeti Mathur, Aishwarya Sheth, Parimal Vyas, and Davide Bolchini. 2019. Typing Slowly but Screen-Free: Exploring Navigation over Entirely Auditory Keyboards. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 427–439.

[204] Grace Mbipom and Simon Harper. 2011. The interplay between web aesthetics and accessibility. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 147–154.

[205] Samantha McDonald, Niara Comrie, Erin Buehler, Nicholas Carter, Braxton Dubin, Karen Gordes, Sandy McCombe-Waller, and Amy Hurst. 2016. Uncovering challenges and opportunities for 3D printing assistive technology with physical therapists. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 131–139.

[206] John McGowan, Grégory Leplâtre, and Iain McGregor. 2017. CymaSense: A novel audio-visual therapeutic tool for people on the autism spectrum. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 62–71.

[207] Lesley J McIntyre and Vicki L Hanson. 2014. Buildings and users with visual impairment: uncovering factors for accessibility using BIT-Kit. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 59–66.

[208] Alice Medalia and Rosa Lim. 2004. Treatment of cognitive dysfunction in psychiatric disorders. *Journal of Psychiatric Practice®* 10, 1 (2004), 17–25.

[209] Chao Mei, Lee Mason, and John Quarles. 2014. Usability issues with 3D user interfaces for adolescents with high functioning autism. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 99–106.

[210] Chao Mei, Lee Mason, and John Quarles. 2015. How 3D Virtual Humans Built by Adolescents with ASD Affect Their 3D Interactions. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility* (Lisbon, Portugal) *(ASSETS '15)*. Association for Computing Machinery, New York, NY, USA, 155–162. https://doi.org/10.1145/2700648.2809863

[211] Nicholas Michael, Dimitris Metaxas, and Carol Neidle. 2009. Spatial and temporal pyramids for grammatical expression recognition of American Sign Language. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 75–82.

[212] Microsoft. 2020. Featured AI for Accessibility projects. https://www.microsoft.com/en-us/ai/ai-for-accessibility-projects. [Online; accessed 24-AUGUST-2020].

[213] Hannah Miller, Heather Buhr, Chris Johnson, and Jerry Hoepner. 2013. AphasiaWeb: A social network for individuals with aphasia. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 4.

[214] Lauren R Milne, Cynthia L Bennett, Richard E Ladner, and Shiri Azenkot. 2014. BraillePlay: educational smartphone games for blind children. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 137–144.

[215] Silvia Mirri, Ludovico Antonio Muratori, and Paola Salomoni. 2011. Monitoring accessibility: large scale evaluations at a geo political level. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 163–170.

[216] MUM: Mobile and Ubiquitous Multimedia. 2020. MUM: Mobile and Ubiquitous Multimedia. https://dl.acm.org/conference/mum. [Online; accessed 12-JUNE-2020].

[217] David Moher, Alessandro Liberati, Jennifer Tetzlaff, and Douglas G Altman. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine* 151, 4 (2009), 264–269.

[218] Kyle Montague, Vicki L Hanson, and Andy Cobley. 2012. Designing for individuals: usable touch-screen interaction through shared user models. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 151–158.

[219] Kyle Montague, Hugo Nicolau, and Vicki L Hanson. 2014. Motor-impaired touchscreen interactions in the wild. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 123–130.

[220] Caio DD Monteiro, Ricardo Gutierrez-Osuna, and Frank M Shipman. 2012. Design and evaluation of classifier for identifying sign language videos in video sharing sites. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 191–198.

[221] Priscilla Moraes, Gabriel Sina, Kathleen McCoy, and Sandra Carberry. 2014. Evaluating the accessibility of line graphs through textual summaries for visually impaired users. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 83–90.

[222] Lourdes M Morales-Villaverde, Karina Caro, Taylor Gotfrid, and Sri Kurniawan. 2016. Online learning system to help people with developmental disabilities reinforce basic skills. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 43–51.

[223] Tony Morelli, John Foley, and Eelke Folmer. 2010. Vi-bowling: a tactile spatial exergame for individuals with visual impairments. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 179–186.

[224] Dafne Zuleima Morgado Ramirez and Catherine Holloway. 2017. But, I Don't Want/Need a Power Wheelchair: Toward Accessible Power Assistance for Manual Wheelchairs. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 120–129.

[225] Meredith Ringel Morris, Andrew Begel, and Ben Wiedermann. 2015. Understanding the challenges faced by neurodiverse software engineering employees: Towards a more inclusive and productive technical workforce. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 173–184.

[226] Robert R Morris, Connor R Kirschbaum, and Rosalind W Picard. 2010. Broadening accessibility through special interests: a new approach for software customization. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 171–178.

[227] Cecily Morrison, Edward Cutrell, Anupama Dhareshwar, Kevin Doherty, Anja Thieme, and Alex Taylor. 2017. Imagining Artificial Intelligence Applications with People with Visual Disabilities using Tactile Ideation. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 81–90.

[228] Emma Murphy, Enda Bates, and Dónal Fitzpatrick. 2010. Designing auditory cues to enhance spoken mathematics for visually impaired users. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 75–82.

[229] Maia Naftali and Leah Findlater. 2014. Accessibility in context: understanding the truly mobile experience of smartphone users with motor impairments. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 209–216.

[230] Fnu Nazneen, Fatima A Boujarwah, Shone Sadler, Amha Mogus, Gregory D Abowd, and Rosa I Arriaga. 2010. Understanding the challenges and opportunities for richer descriptions of stereotypical behaviors of children with ASD: a concept exploration and validation. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 67–74.

[231] Hugo Nicolau, João Guerreiro, Tiago Guerreiro, and Luís Carriço. 2013. UbiBraille: designing and evaluating a vibrotactile Braille-reading device. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 23.

[232] Hugo Nicolau and Joaquim Jorge. 2012. Elderly text-entry performance on touchscreens. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 127–134.

[233] Hugo Nicolau, Kyle Montague, Tiago Guerreiro, André Rodrigues, and Vicki L Hanson. 2015. Typing performance of blind users: An analysis of touch behaviors, learning effect, and in-situ usage. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 273–280.

[234] Hugo Nicolau, André Rodrigues, André Santos, Tiago Guerreiro, Kyle Montague, and João Guerreiro. 2019. The Design Space of Nonvisual Word Completion. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 249–261.

[235] Sonya Nikolova, Jordan Boyd-Graber, Christiane Fellbaum, and Perry Cook. 2009. Better vocabularies for assistive communication aids: connecting terms using semantic networks and untrained annotators. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 171–178.

[236] Sonya Nikolova, Marilyn Tremaine, and Perry R Cook. 2010. Click on bake to get cookies: guiding word-finding with semantic associations. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 155–162.

[237] Francisco Nunes, Maureen Kerwin, and Paula Alexandra Silva. 2012. Design recommendations for tv user interfaces for older adults: findings from the eCAALYX project. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 41–48.

[238] Government of Canada. 2020. Announced Projects under the Accessible Technology Program. https://www.ic.gc.ca/eic/site/118.nsf/eng/00003.html. [Online; accessed 24-AUGUST-2020].

[239] Uran Oh and Leah Findlater. 2014. Design of and subjective response to on-body input for people with visual impairments. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 115–122.

[240] Uran Oh, Shaun K Kane, and Leah Findlater. 2013. Follow that sound: using sonification and corrective verbal feedback to teach touchscreen gestures. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 13.

[241] Uran Oh, Lee Stearns, Alisha Pradhan, Jon E Froehlich, and Leah Findlater. 2017. Investigating Microinteractions for People with Visual Impairments and the Potential Role of On-Body Interaction. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 22–31.

[242] João Oliveira, Tiago Guerreiro, Hugo Nicolau, Joaquim Jorge, and Daniel Gonçalves. 2011. Blind people and mobile touch-based text-entry: acknowledging the need for different flavors. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 179–186.

[243] ACM Transactions on Accessible Computing. 2020. ACM Transactions on Accessible Computing. https://dl.acm.org/journal/taccess. [Online; accessed 12-JUNE-2020].

[244] CHI: Conference on Human Factors in Computing Systems. 2020. CHI: Conference on Human Factors in Computing Systems. https://dl.acm.org/conference/chi. [Online; accessed 12-JUNE-2020].

[245] CHI: Conference on Human Factors in Computing Systems. 2020. Selecting a Subcommittee. https://chi2021.acm.org/for-authors/presenting/papers/selecting-a-subcommittee. [Online; accessed 12-AUGUST-2020].

[246] National Alliance on Mental Illness. 2019. Mental Health By The Numbers. https://www.nami.org/learn-more/mental-health-by-the-numbers. [Online; accessed: 05-NOVEMBER-2019].

[247] World Health Organization. 2018. Blindness and vision impairment. https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment. [Online; accessed: 07-JUNE-2019].

[248] World Health Organization. 2019. Deafness and hearing loss. https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss. [Online; accessed: 07-SEPTEMBER-2019].

[249] World Health Organization. 2019. Dementia. https://www.who.int/news-room/fact-sheets/detail/dementia. [Online; accessed: 08-OCTOBER-2019].

[250] Cynthia Owsley and Gerald McGwin Jr. 1999. Vision impairment and driving. *Survey of ophthalmology* 43, 6 (1999), 535–550.

[251] Shanmugam Muruga Palaniappan, Ting Zhang, and Bradley S Duerstock. 2019. Identifying Comfort Areas in 3D Space for Persons with Upper Extremity Mobility Impairments Using Virtual Reality. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 495–499.

[252] Sujeath Pareddy, Anhong Guo, and Jeffrey P Bigham. 2019. X-Ray: Screenshot Accessibility via Embedded Metadata. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 389–395.

[253] Avinash Parnandi, Virendra Karappa, Youngpyo Son, Mostafa Shahin, Jacqueline McKechnie, Kirrie Ballard, Beena Ahmed, and Ricardo Gutierrez-Osuna. 2013. Architecture of an automated therapy tool for childhood apraxia of speech. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 5.

[254] Anne Marie Piper, Nadir Weibel, and James D Hollan. 2010. Introducing multimodal paper-digital interfaces for speech-language therapy. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 203–210.

[255] Ondrej Polacek, Zdenek Mikovec, Adam J Sporka, and Pavel Slavik. 2011. Humsher: a predictive keyboard operated by humming. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 75–82.

[256] John R Porter and Julie A Kientz. 2013. An empirical study of issues and barriers to mainstream video game accessibility. In *Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*. ACM, ACM, New York, NY, USA, 3.

[257] Denise Prescher, Gerhard Weber, and Martin Spindler. 2010. A tactile windowing system for blind users. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 91–98.

[258] Giorgio Presti, Dragan Ahmetovic, Mattia Ducci, Cristian Bernareggi, Luca Ludovico, Adriano Baratè, Federico Avanzini, and Sergio Mascetti. 2019. WatchOut: Obstacle Sonification for People with Visual Impairment or Blindness. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 402–413.

[259] Halley P Profita, Abigale Stangl, Laura Matuszewska, Sigrunn Sky, and Shaun K Kane. 2016. Nothing to hide: aesthetic customization of hearing aids and cochlear implants in an online community. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 219–227.

[260] Cynthia Putnam, Kathryn Wozniak, Mary Jo Zefeldt, Jinghui Cheng, Morgan Caputo, and Carl Duffield. 2012. How do professionals who create computing technologies consider accessibility?. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 87–94.

[261] Kyle Rector, Rachel Bartlett, and Sean Mullan. 2018. Exploring Aural and Haptic Feedback for Visually Impaired People on a Track: A Wizard of Oz Study. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 295–306.

[262] Kyle Rector, Cynthia L Bennett, and Julie A Kientz. 2013. Eyes-free yoga: an exergame using depth cameras for blind & low vision exercise. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 12.

[263] Kyle Rector, Lauren Milne, Richard E Ladner, Batya Friedman, and Julie A Kientz. 2015. Exploring the opportunities and challenges with exercise technologies for people who are blind or low-vision. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 203–214.

[264] Andreas Reichinger, Anton Fuhrmann, Stefan Maierhofer, and Werner Purgathofer. 2016. Gesture-based interactive audio guide on tactile reliefs. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 91–100.

[265] Luz Rello and Ricardo Baeza-Yates. 2013. Good fonts for dyslexia. In *Proceedings of the 15th international ACM SIGACCESS conference on computers and accessibility*. ACM, ACM, New York, NY, USA, 14.

[266] Luz Rello, Miguel Ballesteros, and Jeffrey P Bigham. 2015. A spellchecker for dyslexia. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 39–47.

[267] Luz Rello, Clara Bayarri, Yolanda Otal, and Martin Pielot. 2014. A computer-based method to improve the spelling of children with dyslexia. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 153–160.

[268] Luz Rello and Jeffrey P Bigham. 2017. Good Background Colors for Readers: A Study of People with and without Dyslexia. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 72–80.

[269] John T Richards, Kyle Montague, and Vicki L Hanson. 2012. Web accessibility as a side effect. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 79–86.

[270] Kathryn E Ringland, Jennifer Nicholas, Rachel Kornfield, Emily G Lattie, David C Mohr, and Madhu Reddy. 2019. Understanding Mental Ill-health as Psychosocial Disability: Implications for Assistive Technology. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 156–170.

[271] Kathryn E Ringland, Christine T Wolf, LouAnne E Boyd, Mark S Baldwin, and Gillian R Hayes. 2016. Would you be mine: Appropriating minecraft as an assistive technology for youth with autism. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 33–41.

[272] André Rodrigues, Kyle Montague, Hugo Nicolau, and Tiago Guerreiro. 2015. Getting smartphones to TalkBack: understanding the smartphone adoption process of blind users. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 23–32.

[273] Romisa Rohani Ghahari, Mexhid Ferati, Tao Yang, and Davide Bolchini. 2012. Back navigation shortcuts for screen reader users. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 1–8.

[274] Anne Spencer Ross, Xiaoyi Zhang, James Fogarty, and Jacob O Wobbrock. 2017. Epidemiology as a framework for large-scale mobile application accessibility assessment. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 2–11.

[275] Anne Spencer Ross, Xiaoyi Zhang, James Fogarty, and Jacob O Wobbrock. 2018. Examining image-based button labeling for accessibility in Android apps through large-scale analysis. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 119–130.

[276] Manaswi Saha, Alexander J Fiannaca, Melanie Kneisel, Edward Cutrell, and Meredith Ringel Morris. 2019. Closing the Gap: Designing for the Last-Few-Meters Wayfinding Problem for People with Visual Impairments. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 222–235.

[277] Jaime Sánchez and Natalia de la Torre. 2010. Autonomous navigation through the city for the blind. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 195–202.

[278] Jaime Sánchez, Mauricio Saenz, and Jose Miguel Garrido. 2010. Usability of a Multimodal Video Game to Improve Navigation Skills for Blind Children. *ACM Trans. Access. Comput.* 3, 2, Article 7 (Nov. 2010), 29 pages. https://doi.org/10.1145/1857920.1857924

[279] Daisuke Sato, Masatomo Kobayashi, Hironobu Takagi, Chieko Asakawa, and Jiro Tanaka. 2011. How voice augmentation supports elderly web users. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 155–162.

[280] Daisuke Sato, Uran Oh, Kakuya Naito, Hironobu Takagi, Kris Kitani, and Chieko Asakawa. 2017. Navcog3: An evaluation of a smartphone-based blind indoor navigation assistant with semantic features in a large-scale environment. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 270–279.

[281] Dibyendu Seal, Uttam K. Roy, and Rohini Basak. 2020. Sentence-Level Emotion Detection from Text Based on Semantic Rules. In *Information and Communication Technology for Sustainable Development*, Milan Tuba, Shyam Akashe, and Amit Joshi (Eds.). Springer Singapore, Singapore, 423–430.

[282] Matthew Seita, Khaled Albusays, Sushant Kafle, Michael Stinson, and Matt Huenerfauth. 2018. Behavioral Changes in Speakers who are Automatically Captioned in Meetings with Deaf or Hard-of-Hearing Peers. In *Proceedings of the*

20th International ACM SIGACCESS Conference on Computers and Accessibility. ACM, ACM, New York, NY, USA, 68–80.

[283] Sumita Sharma, Krishnaveni Achary, Harmeet Kaur, Juhani Linna, Markku Turunen, Blessin Varkey, Jaakko Hakulinen, and Sanidhya Daeeyya. 2018. 'Wow! You're Wearing a Fitbit, You're a Young Boy Now!" Socio-Technical Aspirations for Children with Autism in India. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 174–184.

[284] Sumita Sharma, Saurabh Srivastava, Krishnaveni Achary, Blessin Varkey, Tomi Heimonen, Jaakko Hakulinen, Markku Turunen, and Nitendra Rajput. 2016. Gesture-based interaction for individuals with developmental disabilities in India. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 61–70.

[285] Lei Shi, Yuhang Zhao, and Shiri Azenkot. 2017. Designing interactions for 3D printed models with blind people. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 200–209.

[286] Kristen Shinohara, Cynthia L Bennett, and Jacob O Wobbrock. 2016. How designing for people with and without disabilities shapes student design thinking. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 229–237.

[287] Kristen Shinohara, Jacob O Wobbrock, and Wanda Pratt. 2018. Incorporating social factors in accessible design. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 149–160.

[288] Brent N Shiver and Rosalee J Wolfe. 2015. Evaluating alternatives for better Deaf accessibility to selected web-based multimedia. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 231–238.

[289] Corten Clemente Singer and Björn Hartmann. 2019. See-Thru: Towards Minimally Obstructive Eye-Controlled Wheelchair Interfaces. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 459–469.

[290] Laurianne Sitbon, Ross Brown, and Lauren Fell. 2019. Turning Heads: Designing Engaging Immersive Video Experiences to Support People with Intellectual Disability when Learning Everyday Living Skills. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 171–182.

[291] Alexa F Siu, Son Kim, Joshua A Miele, and Sean Follmer. 2019. shapeCAD: An Accessible 3D Modelling Workflow for the Blind and Visually-Impaired Via 2.5 D Shape Displays. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 342–354.

[292] Jan Smeddinck, Kathrin M Gerling, and Saranat Tiemkeo. 2013. Visual complexity, player experience, performance and physical exertion in motion-based games for older adults. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 25.

[293] UIST: User Interface Software and Technology. 2020. UIST: User Interface Software and Technology. https://dl.acm.org/conference/uist. [Online; accessed 12-JUNE-2020].

[294] Andrii Soviak, Anatoliy Borodin, Vikas Ashok, Yevgen Borodin, Yury Puzis, and IV Ramakrishnan. 2016. Tactile Accessibility: Does Anyone Need a Haptic Glove?. In *proceedings of the 18th international ACM SIGACCESS conference on computers and accessibility*. ACM, ACM, New York, NY, USA, 101–109.

[295] Abigale Stangl, Ann Cunningham, Lou Ann Blake, and Tom Yeh. 2019. Defining Problems of Practices to Advance Inclusive Tactile Media Consumption and Production. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 329–341.

[296] Abigale Stangl, Chia-Lo Hsu, and Tom Yeh. 2015. Transcribing across the senses: community efforts to create 3D printable accessible tactile pictures for young children with visual impairments. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 127–137.

[297] Abigale J Stangl, Esha Kothari, Suyog D Jain, Tom Yeh, Kristen Grauman, and Danna Gurari. 2018. BrowseWithMe: An Online Clothes Shopping Assistant for People with Visual Impairments. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 107–118.

[298] Lee Stearns, Leah Findlater, and Jon E Froehlich. 2018. Design of an Augmented Reality Magnification Aid for Low Vision Users. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 28–39.

[299] Amanda Stent, Ann Syrdal, and Taniya Mishra. 2011. On the intelligibility of fast synthesized speech for individuals with early-onset blindness. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 211–218.

[300] Burkay Sucu and Eelke Folmer. 2014. The blind driver challenge: steering using haptic cues. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 3–10.

[301] Ryo Suzuki, Abigale Stangl, Mark D Gross, and Tom Yeh. 2017. FluxMarker: Enhancing Tactile Graphics with Dynamic Tactile Markers. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 190–199.

[302] Sarit Felicia Anais Szpiro, Shafeka Hashash, Yuhang Zhao, and Shiri Azenkot. 2016. How people with low vision access computing devices: Understanding challenges and opportunities. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 171–180.

[303] Hironobu Takagi, Shinya Kawanaka, Masatomo Kobayashi, Daisuke Sato, and Chieko Asakawa. 2009. Collaborative web accessibility improvement: challenges and possibilities. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 195–202.

[304] Xiang Zhi Tan, Elizabeth J Carter, Samantha Reig, and Aaron Steinfeld. 2019. Go That Way: Exploring Supplementary Physical Movements by a Stationary Robot When Providing Navigation Instructions. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 299–311.

[305] M Iftekhar Tanveer, ASM Anam, Mohammed Yeasin, and Majid Khan. 2013. Do you see what I see?: designing a sensory substitution device to access nonverbal modes of communication. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 10.

[306] Brandon Taylor, Anind Dey, Dan Siewiorek, and Asim Smailagic. 2016. Customizable 3D printed tactile maps as interactive overlays. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 71–79.

[307] Jessica J Tran, Ben Flowers, Eve A Risken, Richard J Ladner, and Jacob O Wobbrock. 2014. Analyzing the intelligibility of real-time mobile sign language video transmitted below recommended standards. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 177–184.

[308] Jessica J Tran, Tressa W Johnson, Joy Kim, Rafael Rodriguez, Sheri Yin, Eve A Riskin, Richard E Ladner, and Jacob O Wobbrock. 2010. A web-based user survey for evaluating power saving strategies for deaf users of mobileASL. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 115–122.

[309] Jessica J. Tran, Joy Kim, Jaehong Chon, Eve A. Riskin, Richard E. Ladner, and Jacob O. Wobbrock. 2011. Evaluating Quality and Comprehension of Real-time Sign Language Video on Mobile Phones. In *The Proceedings of the 13th International ACM SIGACCESS Conference on Computers and Accessibility* (Dundee, Scotland, UK) *(ASSETS '11)*. ACM, New York, NY, USA, 115–122. https://doi.org/10.1145/2049536.2049558

[310] Jessica J Tran, Rafael Rodriguez, Eve A Riskin, and Jacob O Wobbrock. 2013. A web-based intelligibility evaluation of sign language video transmitted at low frame rates and bitrates. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 2.

[311] Shari Trewin, Bonnie E John, John Richards, Cal Swart, Jonathan Brezin, Rachel Bellamy, and John Thomas. 2010. Towards a tool for keystroke level modeling of skilled screen reading. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 27–34.

[312] Shari Trewin, Diogo Marques, and Tiago Guerreiro. 2015. Usage of subjective scales in accessibility research. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 59–67.

[313] Shari Trewin, John T Richards, Vicki L Hanson, David Sloan, Bonnie E John, Cal Swart, and John C Thomas. 2012. Understanding the role of age and fluid intelligence in information search. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 119–126.

[314] Shari Trewin, Cal Swart, and Donna Pettick. 2013. Physical accessibility of touchscreen smartphones. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 19.

[315] Ha Trinh, Annalu Waller, Keith Vertanen, Per Ola Kristensson, and Vicki L Hanson. 2012. iSCAN: A phoneme-based predictive communication aid for nonspeaking individuals. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 57–64.

[316] T Bedirhan Üstün, Somnath Chatterji, Jerome Bickenbach, Nenad Kostanjsek, and Margie Schneider. 2003. The International Classification of Functioning, Disability and Health: a new tool for understanding disability and health. *Disability and rehabilitation* 25, 11-12 (2003), 565–571.

[317] Aditya Vashistha, Edward Cutrell, Nicola Dell, and Richard Anderson. 2015. Social media platforms for low-income blind people in india. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*.

ACM, ACM, New York, NY, USA, 259–272.
[318] Marynel Vázquez and Aaron Steinfeld. 2012. Helping visually impaired users properly aim a camera. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 95–102.
[319] Markel Vigo, Barbara Leporini, and Fabio Paternò. 2009. Enriching web information scent for blind users. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 123–130.
[320] Pooja Viswanathan, James J Little, Alan K Mackworth, and Alex Mihailidis. 2011. Navigation and obstacle avoidance help (NOAH) for older adults with cognitive impairment: a pilot study. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 43–50.
[321] Christian Vogler, Paula Tucker, and Norman Williams. 2013. Mixed local and remote participation in teleconferences from a deaf and hard of hearing perspective. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 30.
[322] Alexandra Vtyurina, Adam Fourney, Meredith Ringel Morris, Leah Findlater, and Ryen W White. 2019. VERSE: Bridging Screen Readers and Voice Assistants for Enhanced Eyes-Free Web Search. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 414–426.
[323] Annalu Waller, Vicki L Hanson, and David Sloan. 2009. Including accessibility within and beyond undergraduate computing courses. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 155–162.
[324] Zheshen Wang, Baoxin Li, Terri Hedgpeth, and Teresa Haven. 2009. Instant tactile-audio map: enabling access to digital maps for people with visual impairment. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 43–50.
[325] Kimberly A Weaver and Thad Starner. 2011. We need to communicate!: helping hearing parents of deaf children learn American Sign Language. In *The proceedings of the 13th international ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 91–98.
[326] Kimberly A Weaver, Thad Starner, and Harley Hamilton. 2010. An evaluation of video intelligibility for novice american sign language learners on a mobile device. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 107–114.
[327] Galen Weld, Esther Jang, Anthony Li, Aileen Zeng, Kurtis Heimerl, and Jon E Froehlich. 2019. Deep Learning for Automatically Detecting Sidewalk Accessibility Problems Using Streetscape Imagery. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 196–209.
[328] Kristin Williams, Karyn Moffatt, Jonggi Hong, Yasmeen Faroqi-Shah, and Leah Findlater. 2016. The cost of turning heads: A comparison of a head-worn display to a smartphone for supporting persons with aphasia in conversation. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 111–120.
[329] Michele A Williams, Caroline Galbraith, Shaun K Kane, and Amy Hurst. 2014. Just let the cane hit it: how the blind and sighted see navigation differently. In *Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility*. ACM, ACM, New York, NY, USA, 217–224.
[330] Michele A Williams, Amy Hurst, and Shaun K Kane. 2013. Pray before you step out: describing personal and situational blind navigation behaviors. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 28.
[331] Cara Wilson, Margot Brereton, Bernd Ploderer, Laurianne Sitbon, and Beth Saggers. 2017. Digital strategies for supporting strengths-and interests-based learning with children with autism. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 52–61.
[332] Graham Wilson and Stephen A Brewster. 2016. Using Dynamic Audio Feedback to Support Peripersonal Reaching in Young Visually Impaired People. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 209–218.
[333] Bernhard Wöckl, Ulcay Yildizoglu, Isabella Buber, Belinda Aparicio Diaz, Ernst Kruijff, and Manfred Tscheligi. 2012. Basic senior personas: a representative design tool covering the spectrum of European older adults. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 25–32.
[334] Maria K Wolters, Vicki L Hanson, and Johanna D Moore. 2011. Leveraging large data sets for user requirements analysis. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 67–74.
[335] Mike Wu, Ronald M Baecker, and Brian Richards. 2010. Field evaluation of a collaborative memory aid for persons with amnesia and their family members. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 51–58.
[336] Jian Xu, Syed Masum Billah, Roy Shilkrot, and Aruna Balasubramanian. 2019. DarkReader: Bridging the Gap Between Perception and Reality of Power Consumption in Smartphones for Blind Users. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 96–104.
[337] Victoria Yaneva, Irina Temnikova, and Ruslan Mitkov. 2015. Accessible texts for autism: An eye-tracking study. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 49–57.
[338] Rayoung Yang, Sangmi Park, Sonali R Mishra, Zhenan Hong, Clint Newsom, Hyeon Joo, Erik Hofer, and Mark W Newman. 2011. Supporting spatial awareness and independent wayfinding for pedestrians with visual impairments. In *The proceedings of the 13th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 27–34.
[339] Tao Yang, Prathik Gadde, Robert Morse, and Davide Bolchini. 2013. Bypassing lists: accelerating screen-reader fact-finding with guided tours. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 7.
[340] Yeliz Yesilada, Giorgio Brajnik, and Simon Harper. 2009. How much does expertise matter?: a barrier walkthrough study with experts and non-experts. In *Proceedings of the 11th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 203–210.
[341] Chris Yoon, Ryan Louie, Jeremy Ryan, MinhKhang Vu, Hyegi Bang, William Derksen, and Paul Ruvolo. 2019. Leveraging Augmented Reality to Create Apps for People with Visual Disabilities: A Case Study in Indoor Navigation. In *The 21st International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 210–221.
[342] Limin Zeng, Denise Prescher, and Gerhard Weber. 2012. Exploration and avoidance of surrounding obstacles for the visually impaired. In *Proceedings of the 14th international ACM SIGACCESS conference on Computers and accessibility*. ACM, ACM, New York, NY, USA, 111–118.
[343] Xiaoyi Zhang, Tracy Tran, Yuqian Sun, Ian Culhane, Shobhit Jain, James Fogarty, and Jennifer Mankoff. 2018. Interactiles: 3D printed tactile interfaces to enhance mobile touchscreen accessibility. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 131–142.
[344] Yuhang Zhao, Elizabeth Kupferstein, Doron Tal, and Shiri Azenkot. 2018. It Looks Beautiful but Scary: How Low Vision People Navigate Stairs and Other Surface Level Changes. In *Proceedings of the 20th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 307–320.
[345] Yuhang Zhao, Sarit Szpiro, and Shiri Azenkot. 2015. Foresee: A customizable head-mounted vision enhancement system for people with low vision. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 239–249.
[346] Yu Zhong, Pierre J Garrigues, and Jeffrey P Bigham. 2013. Real time object scanning using a mobile phone and cloud-based visual search engine. In *Proceedings of the 15th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 20.
[347] Wei Zhu, Boyd Anderson, Shenggao Zhu, and Ye Wang. 2016. A computer vision-based system for stride length estimation using a mobile phone camera. In *Proceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 121–130.
[348] Annuska Zolyomi, Anushree Shukla, and Jaime Snyder. 2017. Technology-Mediated Sight: A Case Study of Early Adopters of a Low Vision Assistive Technology. In *Proceedings of the 19th International ACM SIGACCESS Conference on Computers and Accessibility*. ACM, ACM, New York, NY, USA, 220–229.
[349] Hong Zou and Jutta Treviranus. 2015. Chartmaster: a tool for interacting with stock market charts using a screen reader. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM, ACM, New York, NY, USA, 107–116.

A SEARCH TERMS

Vision Disability: 'Braille-Reading', 'Impaired Colour Vision', 'Tactile Media', 'functional vision', 'blindness', 'Vision Disability', 'visually impaired', 'visual impairment', 'Visual Impairments', 'visually', 'impaired vision', 'braille', 'visually handicapped', 'low vision', 'low-vision', 'blind', 'visually-impaired', 'blind-folded', 'People with Vision Impairments', 'Accessible Image', 'accessible EPUB3', 'non-visual interaction', 'partially sighted', 'visual disability', 'visually

challenged', 'poor eyesight', 'near-blind', 'dim-sighted', 'visual-to-auditory', 'Visual Disabilities', 'cane', 'image text alternatives', 'Aural Navigation', 'image text alternative', 'visual handicap', 'short-sighted', 'Technology-Mediated Sight', 'VIP', 'tunnel vision simulation', 'Screen-Free', 'Screenless', 'Auditory Interaction', 'Synesthesia vision', 'Audio-Tactile Web Browsing', 'colour vision deficiency', 'Auditory Graphing Software', 'Color Differentiation', 'Color vision', 'screen-reader', 'Screen Reader', 'tactile graphics', 'haptic graphics', 'Mixed Visual Abilities', 'Visual Accessibility', 'Foresee', 'Tesseract OCR', 'Accessible Map Visualization', 'Tangram', 'Refractive error', 'ocular aberration'

Hearing Disability: 'Hard-of-Hearing', 'American Sign Language', 'Sign Language', 'subtitle', 'Mobile Sign Language', 'Hearing Disability', 'deaf', 'hearing loss', 'impaired hearing', 'hearing impaired', 'Hearing Disabilities', 'hearing-impaired', 'deafness', 'hard of hearing', 'impaired hearing', 'hearing disorder', 'hypoacusis', 'hearing difficulties', 'ASL', 'real-time captioning', 'hearing problem', 'loss of hearing', 'Lip-reading', 'Hearing Aid', 'Cochlear Implants', 'Speechreading', 'divergent hearing', 'transcription'

Brain, Cognitive or Learning Disability: 'Inclusive Education', 'Inclusion and Education', 'Speech-Language Therapy', 'intellectual disabilities', 'cognitive impairment', 'cognitively impaired', 'Developmental Disabilities', 'Developmental Disability', 'Brain Injury', 'Mental Ill-health', 'learning disabilities', 'learning disability', 'Developmental Disabilities', 'Mental Disabilities', 'Mental Disability', 'Cognitive Disabilities', 'Cognitive Disability', 'Cognitively Impaired', 'Cognitive or Learning Disabilities', 'dyslexia', 'cognitive disorder', 'cognitive impairment', 'learning difficulty', 'learning difficulties', 'learning-disabled', 'intellectual disability', 'intellectual', 'Cognitive Assistance', 'text simplification', 'dyslexic', 'learning disorder', 'down syndrome', 'speech impairment', 'non-speaking', 'non-speaking', 'speech-language therapy', 'Complex Communication Needs', 'Limited Communication', 'SimpleNLG', 'Italian Dysarthric Speech', 'Dysarthria', 'stroke', 'Apoplexy', 'Brain Disability', 'Brain Disabilities', 'brain', 'Acquired Brain Injury', 'Traumatic Brain Injury', 'brain disease', 'encaphalopathy', 'brain problem', 'brain condition', 'brain disorder', 'alzheimer', 'Parkinson', 'with PD', 'Amnesia', 'dementia', 'verbal dyspraxia', 'apraxia', 'childhood apraxia of speech'

Psychological Disability: 'Psychiatric test', 'Borderline', 'Dialectical Behavioral', 'Psychological Disorders', 'schizophrenia', 'individuals with SZ', 'neurotypical', 'personality', 'psychological problem', 'psychological distress', 'psychological disturbance', 'mental disorder', 'mental health', ' mental problems', 'mental illness', 'mental disturbance', 'folie', 'psychic disorder', 'neurosis', 'psychological condition', 'eating disorder', 'anxiety disorder', 'Invisible Disability', 'Invisible Disabilities', 'adhd', 'epilepsy', 'chronic pain', 'chronic fatigue', 'chronic dizziness', 'anxiety disorder', 'allergy', 'arachnoiditis', 'asperger', 'asthma', 'autism', 'with ASD', 'bipolar disorder', 'charcot-marie-tooth', 'circadian rhythm', 'coeliac', 'crohn', 'depression', 'diabetes', 'ehlers', 'endometreosis', 'fetal alchohol', 'Fibromyalgia', 'magraine', 'multiple sclerosis', 'narcolepsy', 'repetitive stress', 'scleroderma', 'aphasia', 'AAC', 'Autistic Spectrum Disorder', 'Childhood psychosis'

Mobility Impairment: 'Spinal Cord Disability', 'Poliomyelitis', 'Sidewalk Accessibility', 'gait', 'Mobility Analysis', 'motor impairment', 'motor disability', 'motor disabilities', 'wheelchair', 'wheelchair-based', 'hand tremor', 'tremor', 'Cerebral palsy', 'Muscular dystrophy', 'carpal tunnel', 'arthritis', 'Dexterity', 'Mobility and Physical Impairments', 'mobility impairment', 'physical handicap', 'physically disabled', 'physically handicapped', 'physical inability', 'Neuromuscular', 'hemiparesis', 'Variable Pointing Performance', 'gaze-control', 'Upper Limb Rehabilitation', 'Friedreich', 'ataxia', 'wearable', 'physical condition', 'tetraplegic', 'motor-impaired', 'motor impaired', 'limited motor abilities', 'physical impairment', 'physically disabled'

Elderly: 'Osteoporosis', 'older adult', 'Ageing', 'Aging', 'Elderly', 'care-giving environment', 'Elder', 'Senior-Friendly', 'senior persona', 'Elder Connectedness', 'older', 'mature', 'senior', 'elder', 'older person', 'alzheimer', 'seniors', 'social isolation', 'loneliness', 'retirement residence', 'Independent Living'

General: 'universal access', 'accessibility barriers', 'universally accessible', 'With Disabilities', 'with disability', 'Accessible Local Government', 'Web Design Guidelines', 'Teaching Accessibility', 'Accessible learning', 'Accessible Video Player', 'Accessible OzPlayer', 'Accessibility Guidelines', 'Disabled', 'Accessible Statistics', 'Inclusive Web', 'accessibility education', 'accessibility policies', 'website accessibility', 'web accessibility', 'website accessibility', 'Social Connectedness', 'digital accessibility', 'social accessibility', 'App Accessibility', 'Chronic Conditions', 'Diverse Needs', 'Cancer', 'Printing Assistive Technology', 'in Accessibility Research', 'Assistive Technology', 'Disability and Technology ', 'General Accessibility', 'Impairment Simulation', 'Environmental Accessibility', 'Special Education', 'special support needs', 'special needs', 'Assistive Services', 'Situational impairment', 'accessible PDF', 'STEM Accessibility', 'Web Content Modality', 'Capti ESL Assistant', 'disability studies', 'Assisted Living', 'Living', 'for the disabled', 'Accessible Interactive Simulations', 'Accessibility Evaluation', 'Accessibility Policies', 'Situational Impairment', 'Accessibility Feature'

Table 3: Distances between manual and automatic categorization for ASSETS.

Year	Vision	Hearing	Brain, Cognitive, or Learning	Psychological	Mobility and Physical	General	Elderly
2009	2	0	0	0	0	0	0
2010	1	0	0	0	1	0	0
2011	1	0	0	1	1	1	0
2012	2	0	0	0	0	0	0
2013	0	0	0	0	0	0	1
2014	0	0	0	0	0	0	0
2015	2	0	1	0	1	0	1
2016	0	0	0	0	0	0	0
2017	1	0	0	0	0	1	0
2018	0	0	1	0	2	1	0
2019	0	0	0	0	0	0	0
Combined	9	0	2	1	5	3	2

B METHOD

C R SCRIPT

```r
library(pacman)

pacman::p_load(pastecs, readxl, xlsx, pdfsearch,
     tabulizer, formattable, htmltools, webshot, DT,
     Rfast, ggplot2, beepr)

# outsource all definitions for better overview
source("PATH_TO_DEFINITIONS.R", echo = FALSE)

number_of_problems <- 0
number_of_not_categorized <- 0

potentially_related_work <- 0
unrelated_work <- 0

categorized_by_title <- 0
categorized_by_keywords <- 0

df_occurrences <- data.frame(
  Conference = character(),
  Vision = integer(),
  Hearing = integer(),
  Cognitive = integer(),
  Psychological = integer(),
  Mobility = integer(),
  General = integer(),
  Elderly = integer(),
  stringsAsFactors = FALSE
)

df_occurrences_un_categorized <- data.frame(
  Conference = character(),
  Vision = integer(),
  Hearing = integer(),
  Cognitive = integer(),
  Psychological = integer(),
  Mobility = integer(),
  General = integer(),
  Elderly = integer(),
  stringsAsFactors = FALSE
)

```

```r
df_accessibility_related_keywords_found <- data.frame(
  Conference = character(),
  number = integer(),
  stringsAsFactors = FALSE
)



# Set directory to get all relevant pdfs, do this for all years
setwd("PATH_FOR_FILES_TOP_FOLDER")


# get all conference directories
conference_directories <- list.dirs(".", recursive = FALSE)

sink("output_pdf_search_newest.txt")
sink(stdout(), type = "message")

for (d in 1:length(conference_directories)) {

  # go into x'th conference
  setwd(conference_directories[d])

  df_conference <- data.frame(
    Year = character(),
    "Vision Disability" = integer(),
    "Hearing Disability" = integer(),
    "Cognitive Disability" = integer(),
    "Psychological Disability" = integer(),
    "Mobility Disability" = integer(),
    "General Disability" = integer(),
    "Elderly" = integer(),
    stringsAsFactors = FALSE
  )


  # get all years
  year_directories <- list.dirs(".", recursive = FALSE)


  for (y in 1:length(year_directories)) {
    vision_related_publications <- 0
    hearing_related_publications <- 0
    cognitive_related_publications <- 0
    psychological_related_publications <- 0
    mobility_related_publications <- 0
    general_related_publications <- 0
    elderly_related_publications <- 0

    # go into x'th year
    setwd(year_directories[y])

    year <- as.integer(substring(year_directories[y], 3))

    files <- list.files(pattern = "\\.pdf$")


    for (i in 1:length(files)) {

      # message all the names of the files
      # message(i, ":     ", substr(files[i], 1, nchar(files[i])-4))


      # pdf_file <- system.file('pdf', files[i], package = 'pdfsearch')
      # The pdftools function for extracting text is pdf_text.
      pdf_file <- files[i]

      result <- read_Metadata(pdf_file = pdf_file)
      title_available <- TRUE


      # Title was extracted
      # Attention: result if gone right is an array of relevant information including author, title
      # if gone wrong, then it is simply ""
      # Metadata can be available but title can still be NULL!
      # Use '||' to avoid error: "$ operator is invalid for atomic vectors"
      # see https://stat.ethz.ch/R-manual/R-devel/library/base/html/Logic.html
      if (length(result) == 1 || is.null(result$title)) {
        message("Title of PDF NOT AVAILABLE")
        title_available <- FALSE
      } else {
        message("Title of PDF is:", result$title)
      }


      # we search in the title and if any keyword was found, we assume that this is the disability studied
      # we once don't look at this to get information on the distribution!
      if (title_available) {
        # message("Looking in TITLE")

        pdf_title <- result$title

```

```
    result_disability_vision <- keyword_search(pdf_title,
      keyword = keyword_disability_vision,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_hearing <- keyword_search(pdf_title,
      keyword = keyword_disability_hearing,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_cognitive <- keyword_search(pdf_title,
      keyword = keyword_disability_cognitive,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_psychological <- keyword_search(pdf_title,
      keyword = keyword_disability_psychological,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_mobility <- keyword_search(pdf_title,
      keyword = keyword_disability_mobility,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )


    result_disability_older <- keyword_search(pdf_title,
      keyword = keyword_disability_older,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_general <- keyword_search(pdf_title,
      keyword = keyword_disability_general,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    # anyone with a keyword?

    if (dim(result_disability_vision)[1] > 0) {
      # a term was found!
      message("Vision disability term was found in TITLE. Number:", dim(result_disability_vision)[1])
      # message(head(result_disability_vision))
      vision_related_publications <- vision_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      # next to avoid double counting!
      # but only next when there really is one, otherwise we look in entire document
      next
    }

    if (dim(result_disability_hearing)[1] > 0) {
      # a term was found in TITLE!
      message("Hearing disability term was found in TITLE. Number:", dim(result_disability_hearing)[1])
      # message(head(result_disability_hearing))
      hearing_related_publications <- hearing_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }

    if (dim(result_disability_cognitive)[1] > 0) {
      # a term was found in TITLE!
      message("Cognitive disability term was found in TITLE. Number:", dim(result_disability_cognitive)[1])
      # message(head(result_disability_cognitive))
      cognitive_related_publications <- cognitive_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }

    if (dim(result_disability_psychological)[1] > 0) {
      # a term was found in TITLE!
      message("Psychological disability term was found in TITLE. Number:", dim(result_disability_psychological)[1])
      # message(head(result_disability_psychological))
      psychological_related_publications <- psychological_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }

    if (dim(result_disability_mobility)[1] > 0) {
      # a term was found in TITLE!
      message("Mobility disability term was found in TITLE. Number:", dim(result_disability_mobility)[1])
      # message(head(result_disability_mobility))
      mobility_related_publications <- mobility_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }


    if (dim(result_disability_older)[1] > 0) {
      # a term was found in TITLE!
      message("Elderly disability term was found in TITLE. Number:", dim(result_disability_older)[1])
      # message(head(result_disability_older))
      elderly_related_publications <- elderly_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }

    if (dim(result_disability_general)[1] > 0) {
      # a term was found in TITLE!
      message("General disability term was found in TITLE. Number:", dim(result_disability_general)[1])
      # message(head(result_disability_general))
      general_related_publications <- general_related_publications + 1
      categorized_by_title <- categorized_by_title + 1
      next
    }
  }


  keywords_available <- TRUE


  # keywords_available was extracted
  # Attention: result if gone right is an array of relevant information including author, title
  # if gone wrong, then it is simply ""
  # see https://stat.ethz.ch/R-manual/R-devel/library/base/html/Logic.html
```

```
  if (length(result) == 1 || is.null(result$keywords)) {
    message("Keywords of PDF NOT AVAILABLE")
    keywords_available <- FALSE
  } else {
    message("Keywords are:", result$keywords)
  }


  # we search in the keywords and if any keyword was found, we assume that this is the disability studied
  # we once don't look at this to get information on the distribution!
  if (keywords_available) {
    # message("Looking in KEYWORDS")

    pdf_keywords <- result$keywords

    result_disability_vision <- keyword_search(pdf_keywords,
      keyword = keyword_disability_vision,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_hearing <- keyword_search(pdf_keywords,
      keyword = keyword_disability_hearing,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_cognitive <- keyword_search(pdf_keywords,
      keyword = keyword_disability_cognitive,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_psychological <- keyword_search(pdf_keywords,
      keyword = keyword_disability_psychological,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_mobility <- keyword_search(pdf_keywords,
      keyword = keyword_disability_mobility,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )


    result_disability_older <- keyword_search(pdf_keywords,
      keyword = keyword_disability_older,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    result_disability_general <- keyword_search(pdf_keywords,
      keyword = keyword_disability_general,
      path = FALSE,
      ignore_case = TRUE, split_pdf = FALSE
    )

    # anyone with a keyword?

    if (dim(result_disability_vision)[1] > 0) {
      # a term was found!
      message("Vision disability term was found in KEYWORDS Number:", dim(result_disability_vision)[1])
      # message(head(result_disability_vision))
      vision_related_publications <- vision_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      # next to avoid double counting!
      # but only next when there really is one, otherwise we look in entire document
      next
    }

    if (dim(result_disability_hearing)[1] > 0) {
      message("Hearing disability term was found in KEYWORDS Number:", dim(result_disability_hearing)[1])
      # message(head(result_disability_hearing))
      hearing_related_publications <- hearing_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }

    if (dim(result_disability_cognitive)[1] > 0) {
      message("Cognitive disability term was found in KEYWORDS Number:", dim(result_disability_cognitive)[1])
      # message(head(result_disability_cognitive))
      cognitive_related_publications <- cognitive_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }

    if (dim(result_disability_psychological)[1] > 0) {
      message("Psychological disability term was found in KEYWORDS Number:", dim(result_disability_psychological)[1])
      # message(head(result_disability_psychological))
      psychological_related_publications <- psychological_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }

    if (dim(result_disability_mobility)[1] > 0) {
      message("Mobility disability term was found in KEYWORDS Number:", dim(result_disability_mobility)[1])
      # message(head(result_disability_mobility))
      mobility_related_publications <- mobility_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }


    if (dim(result_disability_older)[1] > 0) {
      message("Elderly disability term was found in KEYWORDS Number:", dim(result_disability_older)[1])
      # message(head(result_disability_older))
      elderly_related_publications <- elderly_related_publications + 1
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }

    if (dim(result_disability_general)[1] > 0) {
      message("General disability term was found in KEYWORDS Number:", dim(result_disability_general)[1])
      # message(head(result_disability_general))
      general_related_publications <- general_related_publications + 1
```

```
      categorized_by_keywords <- categorized_by_keywords + 1
      next
    }
  }


  # check for each keyword for the disability
  if (TRUE) {
    result_disability_vision <- keyword_search(pdf_file,
      keyword = keyword_disability_vision,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_hearing <- keyword_search(pdf_file,
      keyword = keyword_disability_hearing,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_cognitive <- keyword_search(pdf_file,
      keyword = keyword_disability_cognitive,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_psychological <- keyword_search(pdf_file,
      keyword = keyword_disability_psychological,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_mobility <- keyword_search(pdf_file,
      keyword = keyword_disability_mobility,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_older <- keyword_search(pdf_file,
      keyword = keyword_disability_older,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )

    result_disability_general <- keyword_search(pdf_file,
      keyword = keyword_disability_general,
      path = TRUE, remove_hyphen = TRUE, surround_lines = 1,
      ignore_case = TRUE, split_pdf = TRUE
    )
  }


  # CHECK for which criteria is met -- TRUE to always do it
  if (TRUE) {

    # create row for all found keywords
    df_one_year <- data.frame(
      Conference = substring(conference_directories[d], 3),
      Vision = dim(result_disability_vision)[1],
      Hearing = dim(result_disability_hearing)[1],
      Cognitive = dim(result_disability_cognitive)[1],
      Psychological = dim(result_disability_psychological)[1],
      Mobility = dim(result_disability_mobility)[1],
      General = dim(result_disability_general)[1],
      Elderly = dim(result_disability_older)[1],
      stringsAsFactors = FALSE
    )

    # string these together
    df_occurrences <- rbind(df_occurrences, df_one_year)


    # now get total number of found acc. related keywords
    accessibility_related_occurrences <- dim(result_disability_vision)[1] + dim(result_disability_hearing)[1] + dim(result_disability_cognitive)[1] + dim(result_disability_general)[1] + dim(result_disability_hearing)[1] + dim(result_disability_mobility)[1] + dim(result_disability_older)[1] + dim(result_disability_psychological)[1]
    message("Number of accesibility related occurrences: ", accessibility_related_occurrences)

    # look how many accessibility_related_occurrences are found in paper
    df_accessibility_found_one_year <- data.frame(
      Conference = substring(conference_directories[d], 3),
      number = accessibility_related_occurrences,
      stringsAsFactors = FALSE
    )

    # string these together
    df_accessibility_related_keywords_found <- rbind(df_accessibility_related_keywords_found, df_accessibility_found_one_year)



    if (dim(result_disability_vision)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {

      # compute all ratios
      # ratioVisionHearing <- dim(result_disability_vision)[1] / dim(result_disability_hearing)[1]
      # ratioVisionCognitive <- dim(result_disability_vision)[1] / dim(result_disability_cognitive)[1]
      # ratioVisionPsychological <- dim(result_disability_vision)[1] / dim(result_disability_psychological)[1]
      # ratioVisionMobility <- dim(result_disability_vision)[1] / dim(result_disability_mobility)[1]
      # ratioVisionOlder <- dim(result_disability_vision)[1] / dim(result_disability_older)[1]
      # ratioVisionGeneral <- dim(result_disability_vision)[1] / dim(result_disability_general)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_cognitive)[1], dim(result_disability_psychological)[1], dim(result_disability_mobility)[1], dim(result_disability_older)[1], dim(result_disability_general)[1])
      ratioVisionsecondHighest <- dim(result_disability_vision)[1] / secondHighest



      # if(ratioVisionHearing > MINIMUM_RATIO & ratioVisionCognitive > MINIMUM_RATIO & ratioVisionPsychological > MINIMUM_RATIO & ratioVisionMobility > MINIMUM_RATIO & ratioVisionOlder > MINIMUM_RATIO & ratioVisionGeneral > MINIMUM_RATIO){
```

```
      if (ratioVisionsecondHighest > MINIMUM_RATIO | ratioVisionsecondHighest == Inf) {
        vision_related_publications <- vision_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                    Error for paper, manual adjustment needed: ")
        message("                    ", files[i])
        # message("                      ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        vision_related_publications <- vision_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }
    } else if (dim(result_disability_hearing)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {


      # compute all ratios
      # ratioHearingVision <- dim(result_disability_hearing)[1] / dim(result_disability_vision)[1]
      # ratioHearingCognitive <- dim(result_disability_hearing)[1] / dim(result_disability_cognitive)[1]
      # ratioHearingPsychological <- dim(result_disability_hearing)[1] / dim(result_disability_psychological)[1]
      # ratioHearingMobility <- dim(result_disability_hearing)[1] / dim(result_disability_mobility)[1]
      # ratioHearingOlder <- dim(result_disability_hearing)[1] / dim(result_disability_older)[1]
      # ratioHearingGeneral <- dim(result_disability_hearing)[1] / dim(result_disability_general)[1]


      secondHighest <- order(dim(result_disability_vision)[1], dim(result_disability_cognitive)[1], dim(result_disability_psychological)[1], dim(result_disability_mobility)[1], dim(result_disability_older)[1], dim(result_disability_general)[1])
      ratioHearingsecondHighest <- dim(result_disability_hearing)[1] / secondHighest


      # if(ratioHearingVision > MINIMUM_RATIO & ratioHearingCognitive > MINIMUM_RATIO & ratioHearingPsychological > MINIMUM_RATIO & ratioHearingMobility > MINIMUM_RATIO & ratioHearingOlder > MINIMUM_RATIO & ratioHearingGeneral > MINIMUM_RATIO){
      if (ratioHearingsecondHighest > MINIMUM_RATIO | ratioHearingsecondHighest == Inf) {
        hearing_related_publications <- hearing_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                    Error for paper, manual adjustment needed: ")
        message("                    ", files[i])
        # message("                      ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        hearing_related_publications <- hearing_related_publications + 1
        next
      }
    } else if (dim(result_disability_cognitive)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {


      # compute all ratios
      # ratioCognitiveHearing <- dim(result_disability_cognitive)[1] / dim(result_disability_hearing)[1]
      # ratioCognitiveVision <- dim(result_disability_cognitive)[1] / dim(result_disability_vision)[1]
      # ratioCognitivePsychological <- dim(result_disability_cognitive)[1] / dim(result_disability_psychological)[1]
      # ratioCognitiveMobility <- dim(result_disability_cognitive)[1] / dim(result_disability_mobility)[1]
      # ratioCognitiveOlder <- dim(result_disability_cognitive)[1] / dim(result_disability_older)[1]
      # ratioCognitiveGeneral <- dim(result_disability_cognitive)[1] / dim(result_disability_general)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_vision)[1], dim(result_disability_psychological)[1], dim(result_disability_mobility)[1], dim(result_disability_older)[1], dim(result_disability_general)[1])
      ratioCognitivesecondHighest <- dim(result_disability_cognitive)[1] / secondHighest


      # if(ratioCognitiveHearing > MINIMUM_RATIO & ratioCognitiveVision > MINIMUM_RATIO & ratioCognitivePsychological > MINIMUM_RATIO & ratioCognitiveMobility > MINIMUM_RATIO & ratioCognitiveOlder > MINIMUM_RATIO & ratioCognitiveGeneral > MINIMUM_RATIO){
      if (ratioCognitivesecondHighest > MINIMUM_RATIO | ratioCognitivesecondHighest == Inf) {
        cognitive_related_publications <- cognitive_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
```

```
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                                Error for paper, manual adjustment needed: ")
        message("                                ", files[i])
        # message("                                  ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        cognitive_related_publications <- cognitive_related_publications + 1
        next
      }
    } else if (dim(result_disability_psychological)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {



      # compute all ratios
      # ratioPsychologicalHearing <- dim(result_disability_psychological)[1] / dim(result_disability_hearing)[1]
      # ratioPsychologicalCognitive <- dim(result_disability_psychological)[1] / dim(result_disability_cognitive)[1]
      # ratioPsychologicalVision <- dim(result_disability_psychological)[1] / dim(result_disability_vision)[1]
      # ratioPsychologicalMobility <- dim(result_disability_psychological)[1] / dim(result_disability_mobility)[1]
      # ratioPsychologicalOlder <- dim(result_disability_psychological)[1] / dim(result_disability_older)[1]
      # ratioPsychologicalGeneral <- dim(result_disability_psychological)[1] / dim(result_disability_general)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_cognitive)[1], dim(result_disability_vision)[1], dim(result_disability_mobility)[1], dim(result_disability_older)[1], dim(result_disability_general)[1])
      ratioPsychologicalsecondHighest <- dim(result_disability_psychological)[1] / secondHighest



      # now check that all others are below threshold
      # if(ratioPsychologicalHearing > MINIMUM_RATIO & ratioPsychologicalCognitive > MINIMUM_RATIO & ratioPsychologicalVision > MINIMUM_RATIO & ratioPsychologicalMobility > MINIMUM_RATIO & ratioPsychologicalOlder > MINIMUM_RATIO & ratioPsychologicalGeneral > MINIMUM_RATIO){
      if (ratioPsychologicalsecondHighest > MINIMUM_RATIO | ratioPsychologicalsecondHighest == Inf) {
        psychological_related_publications <- psychological_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                                Error for paper, manual adjustment needed: ")
        message("                                ", files[i])
        # message("                                  ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        psychological_related_publications <- psychological_related_publications + 1
        next
      }
    } else if (dim(result_disability_mobility)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {

      # compute all ratios
      # ratioMobilityHearing <- dim(result_disability_mobility)[1] / dim(result_disability_hearing)[1]
      # ratioMobilityCognitive <- dim(result_disability_mobility)[1] / dim(result_disability_cognitive)[1]
      # ratioMobilityPsychological <- dim(result_disability_mobility)[1] / dim(result_disability_psychological)[1]
      # ratioMobilityVision <- dim(result_disability_mobility)[1] / dim(result_disability_vision)[1]
      # ratioMobilityOlder <- dim(result_disability_mobility)[1] / dim(result_disability_older)[1]
      # ratioMobilityGeneral <- dim(result_disability_mobility)[1] / dim(result_disability_general)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_cognitive)[1], dim(result_disability_psychological)[1], dim(result_disability_vision)[1], dim(result_disability_older)[1], dim(result_disability_general)[1])
      ratioMobilitysecondHighest <- dim(result_disability_mobility)[1] / secondHighest



      # if(ratioMobilityHearing > MINIMUM_RATIO & ratioMobilityCognitive > MINIMUM_RATIO & ratioMobilityPsychological > MINIMUM_RATIO & ratioMobilityVision > MINIMUM_RATIO & ratioMobilityOlder > MINIMUM_RATIO & ratioMobilityGeneral > MINIMUM_RATIO){
      if (ratioMobilitysecondHighest > MINIMUM_RATIO | ratioMobilitysecondHighest == Inf) {
        mobility_related_publications <- mobility_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                                Error for paper, manual adjustment needed: ")
```

```
        message("                    ", files[i])
        # message("                      ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        mobility_related_publications <- mobility_related_publications + 1
        next
      }
    } else if (dim(result_disability_older)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {



      # compute all ratios
      # ratioOlderHearing <- dim(result_disability_older)[1] / dim(result_disability_hearing)[1]
      # ratioOlderCognitive <- dim(result_disability_older)[1] / dim(result_disability_cognitive)[1]
      # ratioOlderPsychological <- dim(result_disability_older)[1] / dim(result_disability_psychological)[1]
      # ratioOlderMobility <- dim(result_disability_older)[1] / dim(result_disability_mobility)[1]
      # ratioOlderVision <- dim(result_disability_older)[1] / dim(result_disability_vision)[1]
      # ratioOlderGeneral <- dim(result_disability_older)[1] / dim(result_disability_general)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_cognitive)[1], dim(result_disability_psychological)[1], dim(result_disability_mobility)[1], dim(result_disability_vision)[1], dim(result_disability_general)[1])
      ratioOlderecondHighest <- dim(result_disability_older)[1] / secondHighest



      # if(ratioOlderHearing > MINIMUM_RATIO & ratioOlderCognitive > MINIMUM_RATIO & ratioOlderPsychological > MINIMUM_RATIO & ratioOlderMobility > MINIMUM_RATIO & ratioOlderVision > MINIMUM_RATIO & ratioOlderGeneral > MINIMUM_RATIO){
      if (ratioOlderecondHighest > MINIMUM_RATIO | ratioOlderecondHighest == Inf) {
        elderly_related_publications <- elderly_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_general)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                    Error for paper, manual adjustment needed: ")
        message("                    ", files[i])
        # message("                      ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        elderly_related_publications <- elderly_related_publications + 1
        next
      }
    } else if (dim(result_disability_general)[1] > MINIMUM_OCCURRENCES_FOR_ACCEPTANCE) {



      # compute all ratios
      # ratioGeneralHearing <- dim(result_disability_general)[1] / dim(result_disability_hearing)[1]
      # ratioGeneralCognitive <- dim(result_disability_general)[1] / dim(result_disability_cognitive)[1]
      # ratioGeneralPsychological <- dim(result_disability_general)[1] / dim(result_disability_psychological)[1]
      # ratioGeneralMobility <- dim(result_disability_general)[1] / dim(result_disability_mobility)[1]
      # ratioGeneralOlder <- dim(result_disability_general)[1] / dim(result_disability_older)[1]
      # ratioGeneralVision <- dim(result_disability_general)[1] / dim(result_disability_vision)[1]

      secondHighest <- order(dim(result_disability_hearing)[1], dim(result_disability_cognitive)[1], dim(result_disability_psychological)[1], dim(result_disability_mobility)[1], dim(result_disability_older)[1], dim(result_disability_vision)[1])
      ratioGeneralsecondHighest <- dim(result_disability_general)[1] / secondHighest



      # if(ratioGeneralHearing > MINIMUM_RATIO & ratioGeneralCognitive > MINIMUM_RATIO & ratioGeneralPsychological > MINIMUM_RATIO & ratioGeneralMobility > MINIMUM_RATIO & ratioGeneralOlder > MINIMUM_RATIO & ratioGeneralVision > MINIMUM_RATIO){
      if (ratioGeneralsecondHighest > MINIMUM_RATIO | ratioGeneralsecondHighest == Inf) {
        general_related_publications <- general_related_publications + 1
        # here we go to next one as this is already categorized
        next
      }

      # now check that all others are below threshold
      else if ((dim(result_disability_vision)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_cognitive)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_psychological)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_mobility)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_hearing)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL) | (dim(result_disability_older)[1] > MAXIMUM_OCCURRENCES_FOR_MANUAL)) {
        message("                    Error for paper, manual adjustment needed: ")
        message("                    ", files[i])
        # message("                      ", metadata$title))
        number_of_problems <- number_of_problems + 1
      } else {
        # otherwise add one to the year and the correct column
        general_related_publications <- general_related_publications + 1
        next
      }
    }
  }

  # if we come to this line, then this paper could not be categorized!
  number_of_not_categorized <- number_of_not_categorized + 1
```

```
      message("Could not categorize: ", substr(files[i], 1, nchar(files[i]) - 4))

      # we want to know the number of keywords for every non-categorized work
      if (TRUE) {
        # No rows
        # This data frame has columns but no observations.

        # [1] = rows
        # [2] = columns
        if (dim(result_disability_vision)[1] > 0) {
          # a term was found!
          message("Vision disability term was found. Number:", dim(result_disability_vision)[1])
          # message(head(result_disability_vision))
        }

        if (dim(result_disability_hearing)[1] > 0) {
          # a term was found!
          message("Hearing disability term was found. Number:", dim(result_disability_hearing)[1])
          # message(head(result_disability_hearing))
        }

        if (dim(result_disability_cognitive)[1] > 0) {
          # a term was found!
          message("Cognitive disability term was found. Number:", dim(result_disability_cognitive)[1])
          # message(head(result_disability_cognitive))
        }

        if (dim(result_disability_psychological)[1] > 0) {
          # a term was found!
          message("Psychological disability term was found. Number:", dim(result_disability_psychological)[1])
          # message(head(result_disability_psychological))
        }

        if (dim(result_disability_mobility)[1] > 0) {
          # a term was found!
          message("Mobility disability term was found. Number:", dim(result_disability_mobility)[1])
          # message(head(result_disability_mobility))
        }


        if (dim(result_disability_older)[1] > 0) {
          # a term was found!
          message("Elderly disability term was found. Number:", dim(result_disability_older)[1])
          # message(head(result_disability_older))
        }

        if (dim(result_disability_general)[1] > 0) {
          # a term was found in TITLE!
          message("General disability term was found. Number:", dim(result_disability_general)[1])
          # message(head(result_disability_general))
        }
      }

      # create row for all found keywords
      df_one_year_uncategorized <- data.frame(
        Conference = substring(conference_directories[d], 3),
        Vision = dim(result_disability_vision)[1],
        Hearing = dim(result_disability_hearing)[1],
        Cognitive = dim(result_disability_cognitive)[1],
        Psychological = dim(result_disability_psychological)[1],
        Mobility = dim(result_disability_mobility)[1],
        General = dim(result_disability_general)[1],
        Elderly = dim(result_disability_older)[1],
        stringsAsFactors = FALSE
      )

      # string these together
      df_occurrences_un_categorized <- rbind(df_occurrences_un_categorized, df_one_year_uncategorized)


      #
      if (accessibility_related_occurrences < 20) {
        unrelated_work <- unrelated_work + 1
      } else {
        potentially_related_work <- potentially_related_work + 1
      }

      # message('--------------------------')
    }


    # now put all the variables in the right column
    # as we start in 2009
    row_for_df <- year - 2008

    message("Making row for year: ", year)

    # adjust YEAR as defined by the name of the folder
    # [row][column]
    df_conference[row_for_df, 1] <- as.character(year)
    df_conference[row_for_df, 2] <- as.integer(vision_related_publications)
    df_conference[row_for_df, 3] <- as.integer(hearing_related_publications)
    df_conference[row_for_df, 4] <- as.integer(cognitive_related_publications)
    df_conference[row_for_df, 5] <- as.integer(psychological_related_publications)
    df_conference[row_for_df, 6] <- as.integer(mobility_related_publications)
    df_conference[row_for_df, 7] <- as.integer(general_related_publications)
    df_conference[row_for_df, 8] <- as.integer(elderly_related_publications)

    # go up a directory to directory with the years
    setwd("..")
  }

  df_conference$Overall <- rowSums(df_conference[, c(2:8)])

  # column_sums
  df_conference[row_for_df + 1, 1] <- as.character("Combined")
  df_conference[row_for_df + 1, c(2:9)] <- colSums(df_conference[, c(2:9)], na.rm = TRUE)
  message("Making formattable table")

  # now make a nice coloured table from it
  format <- formattable(df_conference, list(area(col = 2:8) ~ color_tile("grey", "green")))
  export_formattable(format, paste0(substring(conference_directories[d], 3), "_table.png"))

  # package DT needed
  datatable_conference <- as.datatable(format)
  DT::saveWidget(datatable_conference, paste0(substring(conference_directories[d], 3), "_table.html"))

  # go up a directory
  setwd("..")
}

message("Analysis complete")
# 4 = "complete"
beep(sound = 4, expr = NULL)
```

```
message("In total, this many problems occurred: ", number_of_problems)
message("In total, this many papers could not be categorized: ", number_of_not_categorized)

message("In total, this many papers are probably unrelated: ", unrelated_work)
message("In total, this many papers are maybe related: ", potentially_related_work)

message("In total, this many papers were categorized by title: ", categorized_by_title)
message("In total, this many papers were categorized by keywords: ", categorized_by_keywords)


message(warnings())
sink()

df2 <- as.data.frame(df_occurrences)

df2$secondMax <- NULL
df2$thirdMax <- NULL
df2$fourthMax <- NULL
df2$fifthMax <- NULL
df2$sixthMax <- NULL

df2$max <- NULL
df2$min <- NULL

# now find the max and second most ... per paper
# this was used to assess the criteria for the categorization
# 1 indexes rows
df2$max <- apply(df2[, c(2:8)], 1, max)
df2$min <- apply(df2[, c(2:8)], 1, min)
df2$secondMax <- apply(df2[, c(2:8)], 1, function(x) x[maxn(2)(x)])
df2$thirdMax <- apply(df2[, c(2:8)], 1, function(x) x[maxn(3)(x)])
df2$fourthMax <- apply(df2[, c(2:8)], 1, function(x) x[maxn(4)(x)])
df2$fifthMax <- apply(df2[, c(2:8)], 1, function(x) x[maxn(5)(x)])
df2$sixthMax <- apply(df2[, c(2:8)], 1, function(x) x[maxn(6)(x)])

df2$Overall <- rowSums(df2[, c(2:8)])

df2$RatioMaxSecondMax <- df2$max / df2$secondMax

mean(df2$max)
sd(df2$max)
quantile(df2$max, 0.25)
quantile(df2$max, 0.1)


ggplot(df2, aes(x = max)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  scale_x_continuous(limits = c(00, 100))

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)



mean(df2$secondMax)
sd(df2$secondMax)
quantile(df2$secondMax, 0.25)
quantile(df2$secondMax, 0.75)

ggplot(df2, aes(x = secondMax)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(secondMax, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(secondMax, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(secondMax, 0.75)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  ggtitle("Second most common occurrences") +
  scale_x_continuous(limits = c(00, 30))

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)


mean(df2$thirdMax)
mean(df2$fourthMax)


mean(df2$Overall)
sd(df2$Overall)
quantile(df2$Overall, 0.25)
quantile(df2$Overall, 0.05)


ggplot(df2, aes(x = Overall)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(Overall, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(Overall, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(Overall, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(Overall, 0.05)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  ggtitle("Overall occurrences") +
  scale_x_continuous(limits = c(00, 150))

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)









### only look at accessibility-related venues:
```

```r
accessDf <- subset(df2, df2$Conference == "W4A" | df2$Conference == "ASSETS" | df2$Conference == "TACCESS")


mean(accessDf$max)
sd(accessDf$max)
quantile(accessDf$max, 0.25)
quantile(accessDf$max, 0.1)


mean(accessDf$secondMax)
sd(accessDf$secondMax)
quantile(accessDf$secondMax, 0.25)
quantile(accessDf$secondMax, 0.50)
quantile(accessDf$secondMax, 0.75)

mean(accessDf$Overall)
sd(accessDf$Overall)
quantile(accessDf$Overall, 0.25)
quantile(accessDf$Overall, 0.05)



ggplot(accessDf, aes(x = Overall)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  )

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)



ggplot(accessDf, aes(x = max)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  )

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)




ggplot(accessDf, aes(x = secondMax)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  )

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height = pdfheight + 2, device = cairo_pdf)




### only for those that are not categorizable



df_uncategorized <- as.data.frame(df_occurrences_uncategorized)

df_uncategorized$secondMax <- NULL
df_uncategorized$thirdMax <- NULL
df_uncategorized$fourthMax <- NULL
df_uncategorized$fifthMax <- NULL
df_uncategorized$sixthMax <- NULL

df_uncategorized$max <- NULL
df_uncategorized$min <- NULL

# now find the max and second most ... per paper
# this was used to assess the criteria for the categorization
# 1 indexes rows
df_uncategorized$max <- apply(df_uncategorized[, c(2:8)], 1, max)
df_uncategorized$min <- apply(df_uncategorized[, c(2:8)], 1, min)
df_uncategorized$secondMax <- apply(df_uncategorized[, c(2:8)], 1, function(x) x[maxn(2)(x)])
df_uncategorized$thirdMax <- apply(df_uncategorized[, c(2:8)], 1, function(x) x[maxn(3)(x)])
df_uncategorized$fourthMax <- apply(df_uncategorized[, c(2:8)], 1, function(x) x[maxn(4)(x)])
df_uncategorized$fifthMax <- apply(df_uncategorized[, c(2:8)], 1, function(x) x[maxn(5)(x)])
df_uncategorized$sixthMax <- apply(df_uncategorized[, c(2:8)], 1, function(x) x[maxn(6)(x)])

df_uncategorized$Overall <- rowSums(df_uncategorized[, c(2:8)])

df_uncategorized$RatioMaxSecondMax <- df_uncategorized$max / df_uncategorized$secondMax

# get number of uncategorized paper
nrow(df_uncategorized)

mean(df_uncategorized$max)
sd(df_uncategorized$max)
quantile(df_uncategorized$max, 0.25)
quantile(df_uncategorized$max, 0.1)


ggplot(df_uncategorized, aes(x = max)) +
  geom_histogram(aes(y = ..density..), # the histogram will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
```

```
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  )

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height =
    pdfheight + 2, device = cairo_pdf)



mean(df_uncategorized$secondMax)
sd(df_uncategorized$secondMax)
quantile(df_uncategorized$secondMax, 0.25)
quantile(df_uncategorized$secondMax, 0.75)

ggplot(df_uncategorized, aes(x = secondMax)) +
  geom_histogram(aes(y = ..density..), # the histogram
     will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(secondMax, na.rm = T))
    ,
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(secondMax, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(secondMax, 0.75)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  ggtitle("Second most common occurrences")

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height =
    pdfheight + 2, device = cairo_pdf)









ggplot(df_uncategorized, aes(x = Overall)) +
  geom_histogram(aes(y = ..density..), # the histogram
     will display "density" on its y-axis
    binwidth = .5, colour = "grey", fill = "white"
  ) +
  geom_density(alpha = .2, fill = "#FF6655") +
  geom_vline(aes(xintercept = mean(max, na.rm = T)),
    colour = "red", linetype = "longdash", size = .8
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.1)),
    colour = "blue", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.25)),
    colour = "green", linetype = "longdash", size = .5
  ) +
  geom_vline(aes(xintercept = quantile(max, 0.75)),
    colour = "green", linetype = "longdash", size = .5
  )

ggsave("PATH_TO_SAVE.pdf", width = pdfwidth, height =
    pdfheight + 2, device = cairo_pdf)
```

```
mean(subset(df_uncategorized$max, df_uncategorized$
    Conference == "W4A"))
sd(subset(df_uncategorized$max, df_uncategorized$
    Conference == "W4A"))

mean(subset(df_uncategorized$secondMax, df_uncategorized$
    Conference == "W4A"))
sd(subset(df_uncategorized$secondMax, df_uncategorized$
    Conference == "W4A"))

quantile(subset(df_uncategorized$max, df_uncategorized$
    Conference == "W4A"), 0.99)



w4a <- subset(df_uncategorized, df_uncategorized$
    Conference == "W4A")
nrow(w4a)

taccess <- subset(df_uncategorized, df_uncategorized$
    Conference == "TACCESS ")
nrow(taccess)


assets <- subset(df_uncategorized, df_uncategorized$
    Conference == "ASSETS ")
nrow(assets)


uist <- subset(df_uncategorized, df_uncategorized$
    Conference == "UIST ")
nrow(uist)


chi <- subset(df_uncategorized, df_uncategorized$
    Conference == "CHI ")
nrow(chi)

autoui <- subset(df_uncategorized, df_uncategorized$
    Conference == "AutoUI")
nrow(autoui)


potentially_related_work
```

paper_evaluation_anonymized.R