A Large-Scale Mixed-Methods Analysis of Blind and Low-vision Research in ACM and IEEE

Yong-Joon Thoo[1], Maximiliano Jeanneret Medina[1, 2],
Jon E. Froehlich[3], Nicolas Ruffieux[1] and Denis Lalanne[1]

[1]Human-IST Institute, University of Fribourg
[2]HEG Arc, HES-SO // University of Applied Sciences Western Switzerland
[3]University of Washington

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Context

Field-, technology-, method-agnostic review

	All abilities (e.g., visual, hearing, motor, cognitive)	**Blind and/or Low-vision (BLV) People**
General	Concept[1] (e.g., accessibility)	
Focused	*Not identified*	Goal/Task; Methods[2]; Technology or Device[3]

[1]Mack et al. CHI'21; Sarsenbayeva et al. *International Journal of Human-Computer Studies* 2023
[2]Brulé et al. CHI'20
[3]Bhowmick and Hazarika *Journal on Multimodal User Interfaces* 2017

Context

Field-, technology-, method-agnostic review

RQ1

Research areas

RQ2

Communities of focus

RQ3

Technological trends*

RQ4

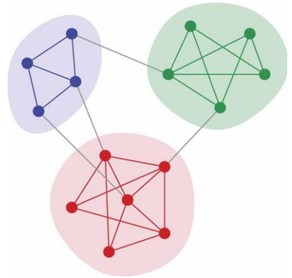
Interaction modalities

*Not part of the presentation

Methodology
Bibliometric Workflow

1. Research design
2. Compilation of bibliographic data
3. Analysis
4. Visualization
5. Interpretation

Science map:



Zupic and Čater *Organizational Research Methods* 2015

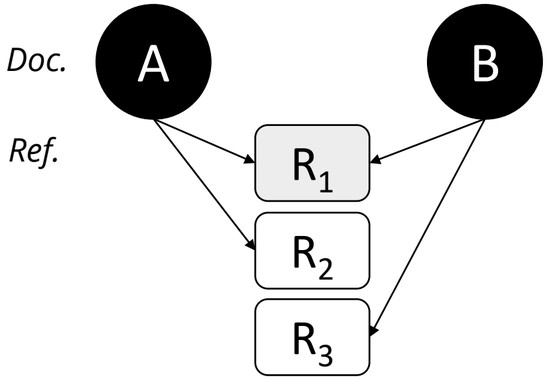
Methodology
Research design (1)

Quantitative

Qualitative

Bibliometric

Documents Bibliographic Coupling Analysis (DBCA)



Programmatic

Frequency counting of terms

BLV:

Conceptual framework

Deductive and inductive

Facet	Category
Research Context	Issue addressed Contribution type
Delineating the Field of Research (RQ1)	Research area
Communities of Focus (RQ2)	Community of focus Age category
Technological Trends (RQ3)	Interactable computer system Technology Device
Interaction Modalities (RQ4)	Vision use strategy Input modality / Output modality

Methodology
Compilation of bibliographic data (2)

Search Terms*	Venue / Document Type	Period

`blind | low-vision | deaf-blind | with visual impairments | blindness | partially sighted | partial vision | visually impaired | …`
`&`
`people | person | user`
	ACM OR IEEE
	
	Conference proceedings OR journal articles
		2010-2022 (inclusive)

3,378 papers with bibliographic references and # citations (incoming)
→ N=3,193 (after screening)

*Adapted primarily from Brulé et al. CHI'20; Mack et al. CHI'21; and inspired by Sharif et al. ASSETS'22. Simplified for clarity. Retrieved the 7th of April 2023.

Methodology
Analysis (3) & Visualization (4)

Input

N=3,193
with bibliographic references
and # citations (incoming)

N=880
with Title, Abstract and
Author Keywords (TAK)

Processing*

Bibliometric processing:
1. Filtering (norm. citation)
2. DBCA
3. Clustering

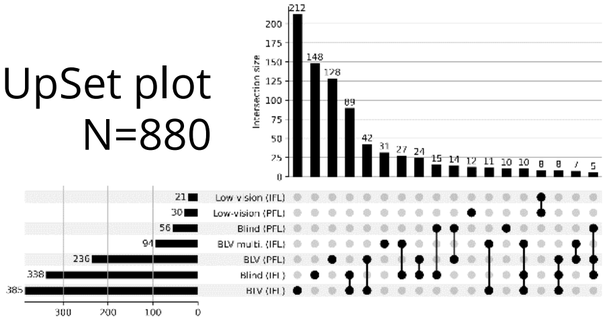
Programmatic processing:
1. Counting terms in TAK
2. Consolidation (manual)
3. Counting terms in TAK

Visualization

Science map (VOS)
N=880

Rank	Cluster	Paper
1	1	Antol et al. *ICCV* 2015
1	2	Bigham et al. *UIST* 2010
		...

UpSet plot
N=880



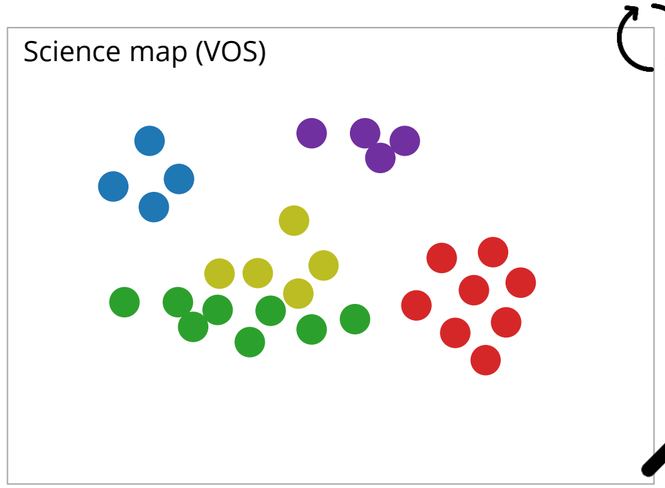
*Data cleaning details and tools are described in the paper

Methodology

Interpretation (5) – a two-level iterative analysis

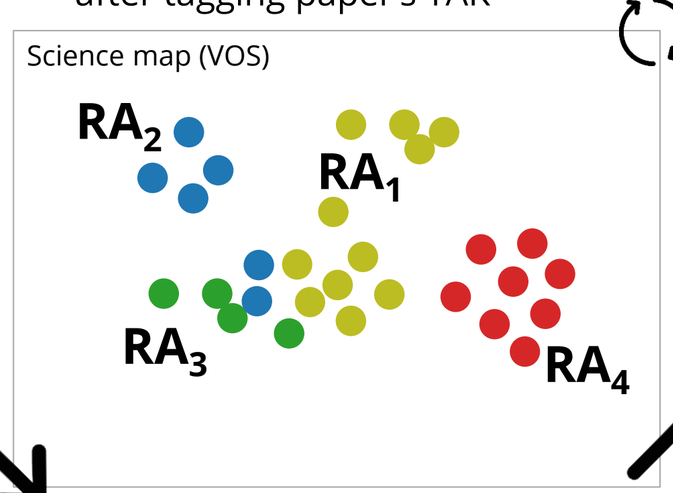
1) First-level Analysis (N=880)

a) **Five clusters** obtained after DBCA



Cluster	N=880 (%)
C_A	95 (10.8)
C_B	166 (22.4)
C_C	176 (20)
C_D	403 (45.6)
C_E	40 (4.5)

b) **Four research areas** obtained after tagging paper's TAK



Research Area	N=880 (%)
RA_1	280 (31.8)
RA_2	195 (22.2)
RA_3	54 (6.1)
RA_4	331 (37.6)
RA_{Other}	20 (2.3)

2) Second-level Analysis (N=100)

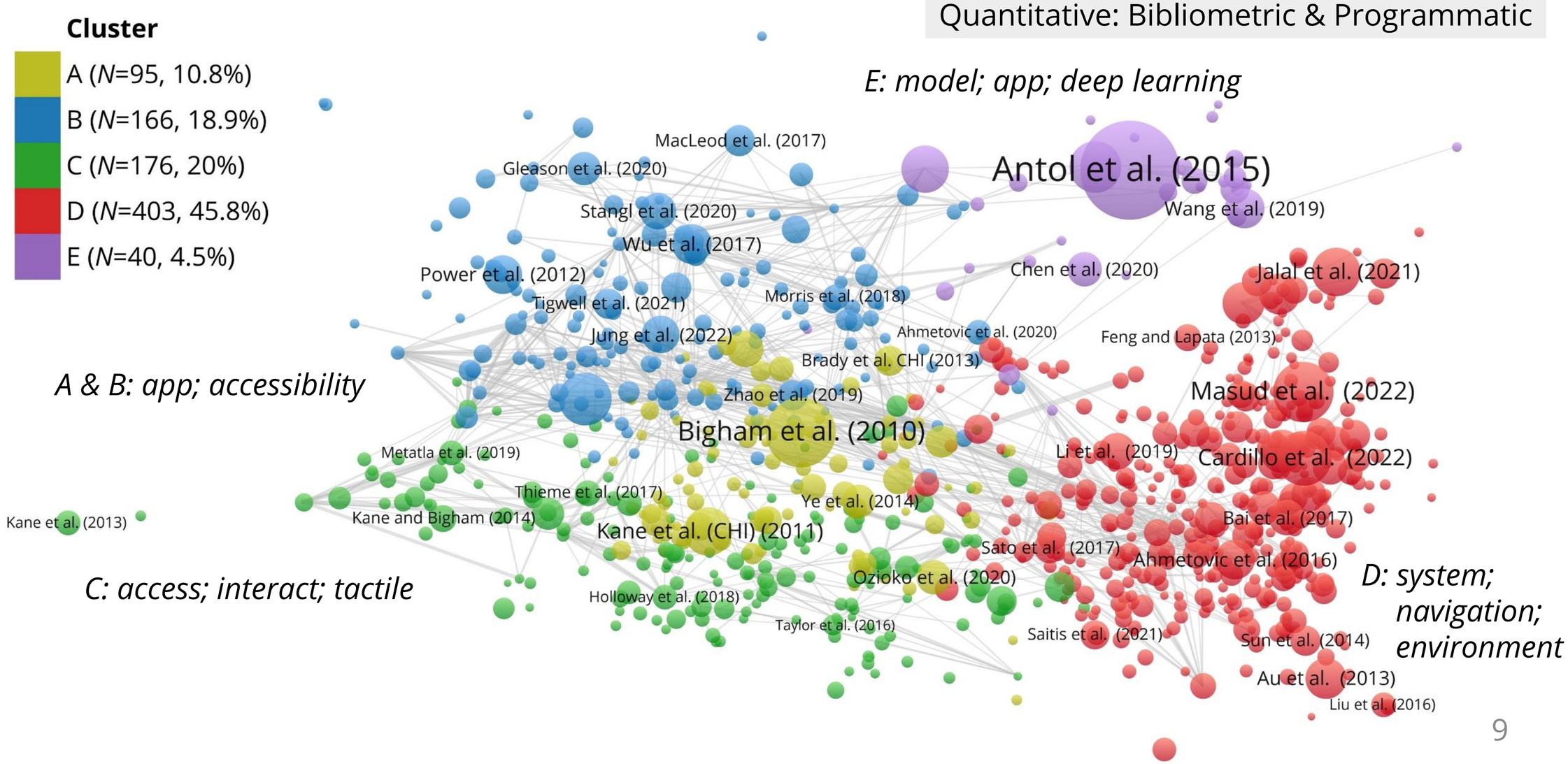
In-depth qualitative analysis based on our conceptual framework

Facet	Category	N=100
Research Context	Issue addressed Contribution type	
Delineating the Field of Research (RQ1)	Research area	32
Communities of Focus (RQ2)	Community of focus Age category	22
Technological Trends (RQ3)	Interactable computer system Technology Device	6
Interaction Modalities (RQ4)	Vision use strategy Input modality / Output modality	38 2

Results and Discussion

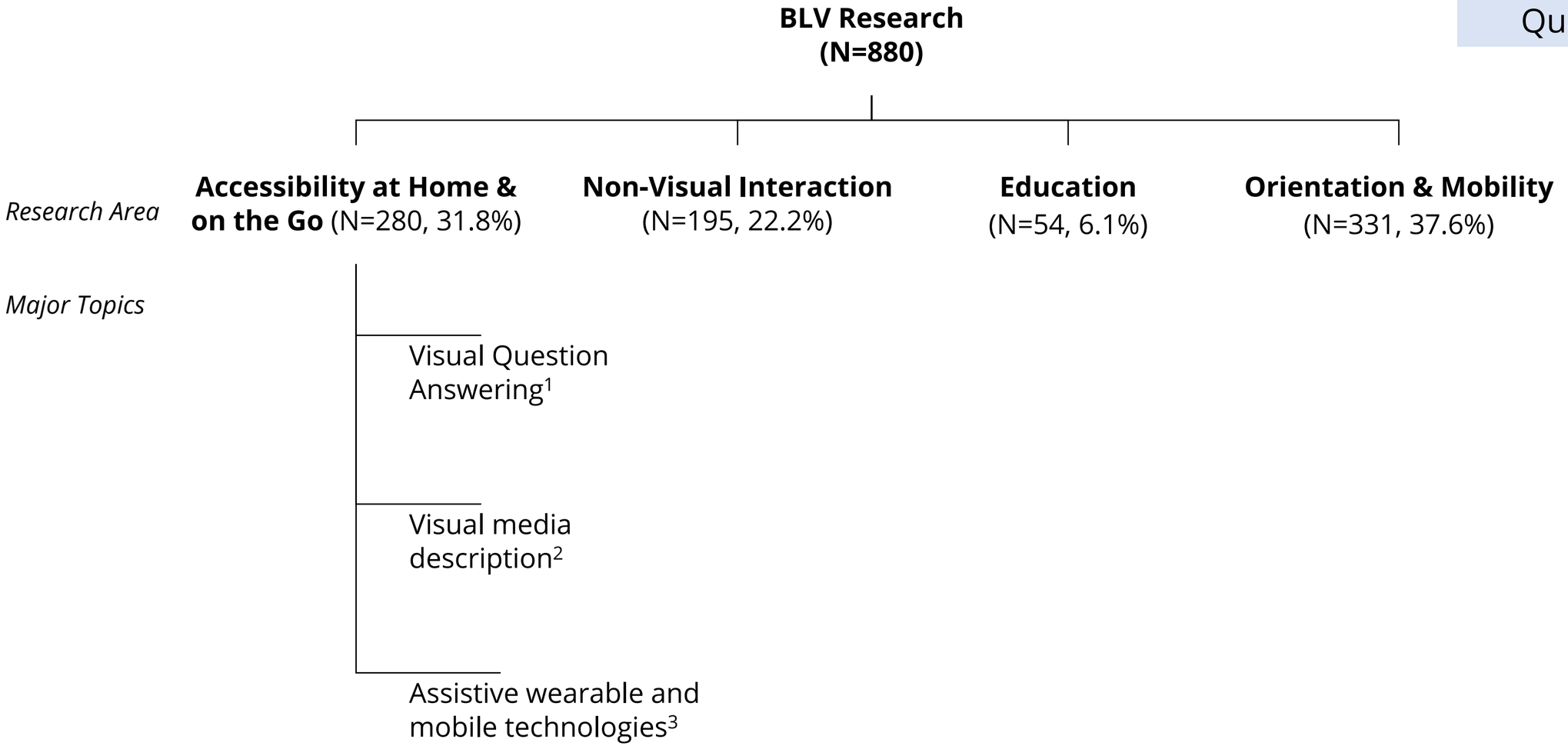
Delineating the Field of Research

Quantitative: Bibliometric & Programmatic



Results and Discussion
Delineating the Field of Research

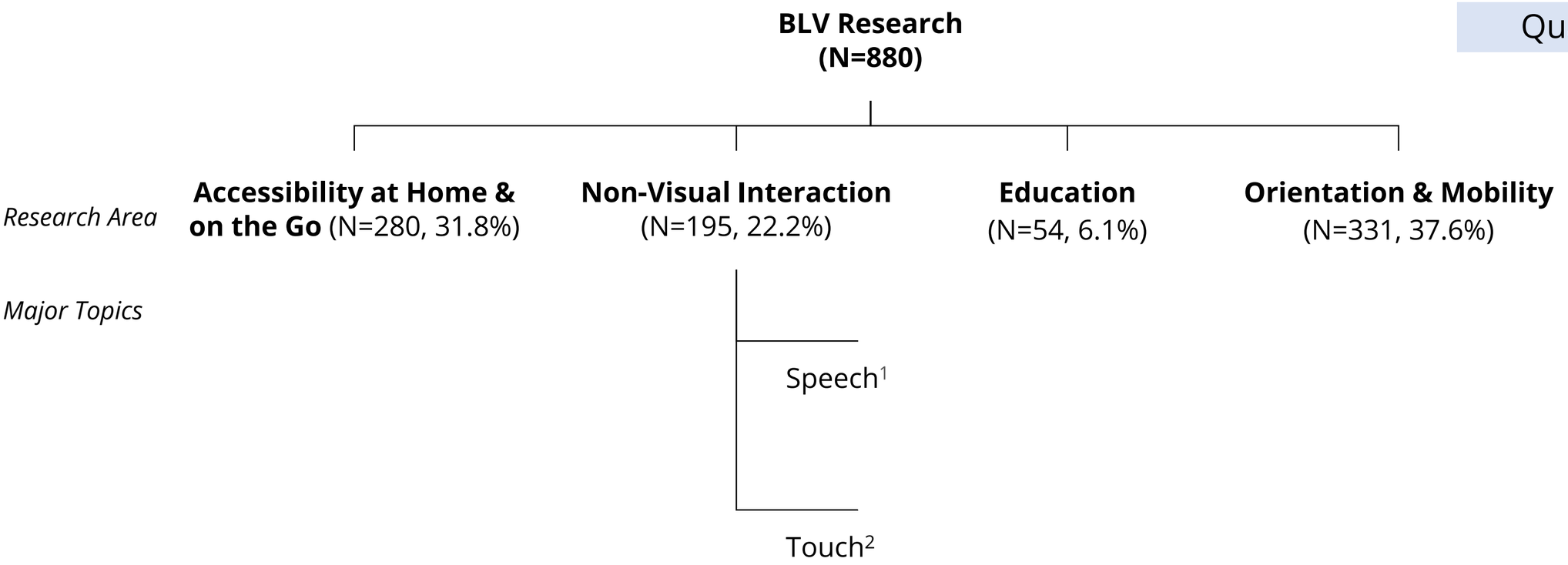
Qualitative



[1]Antol et al. ICCV'15; Bigham et al. UIST'10; Brady et al. CSCW'13; Gurari et al. CPVR'18
[2]Gleason et al. CHI'20; Morris et al. CHI'16; Wu et al. CSCW'17; Stangl et al. CHI'20
[3]Ahmetovic et al. CHI'20; Neto et al. IEEE THMS 2017

Results and Discussion
Delineating the Field of Research

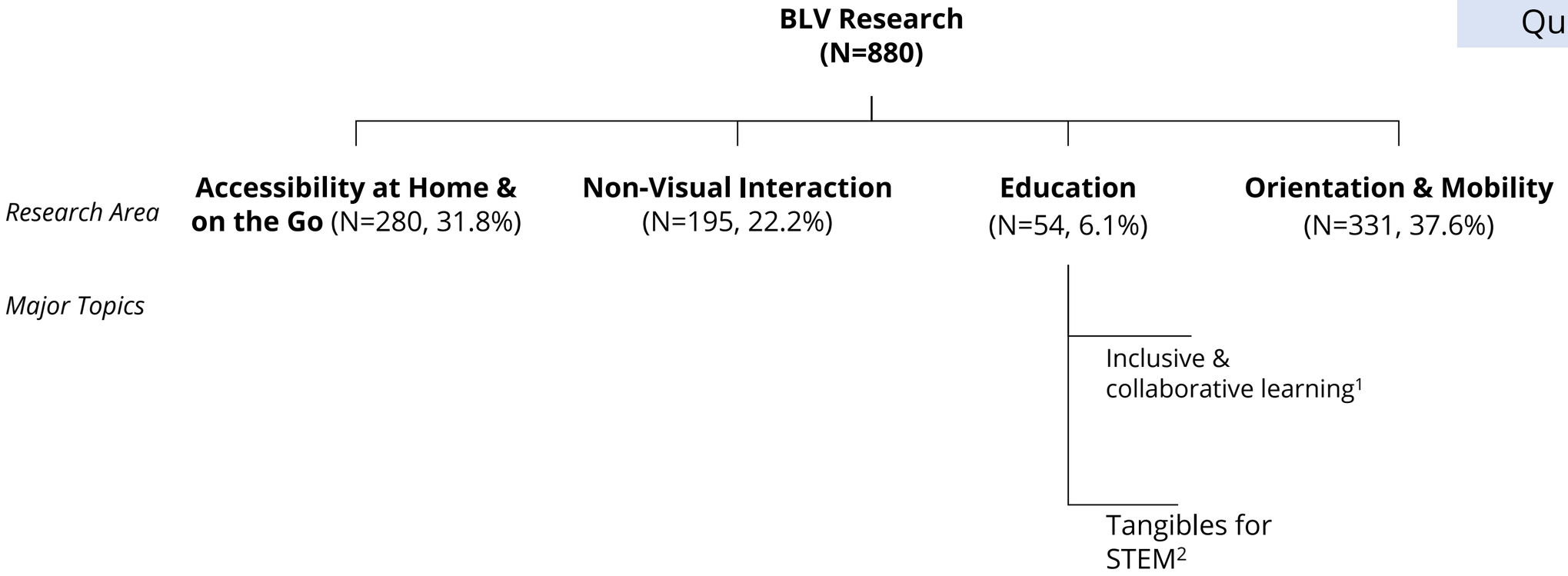
Qualitative



[1]Azenkot and Lee ASSETS'13; Branham and Roy ASSETS'19; Leporini et al. OzCHI'12; Pradhan et al. CHI'18
[2]Holloway et al. CHI'18; Kane et al. CHI'11; Oliveira et al. ASSETS'11; Ozioko et al. IEEE TNSRE 2020

Results and Discussion
Delineating the Field of Research

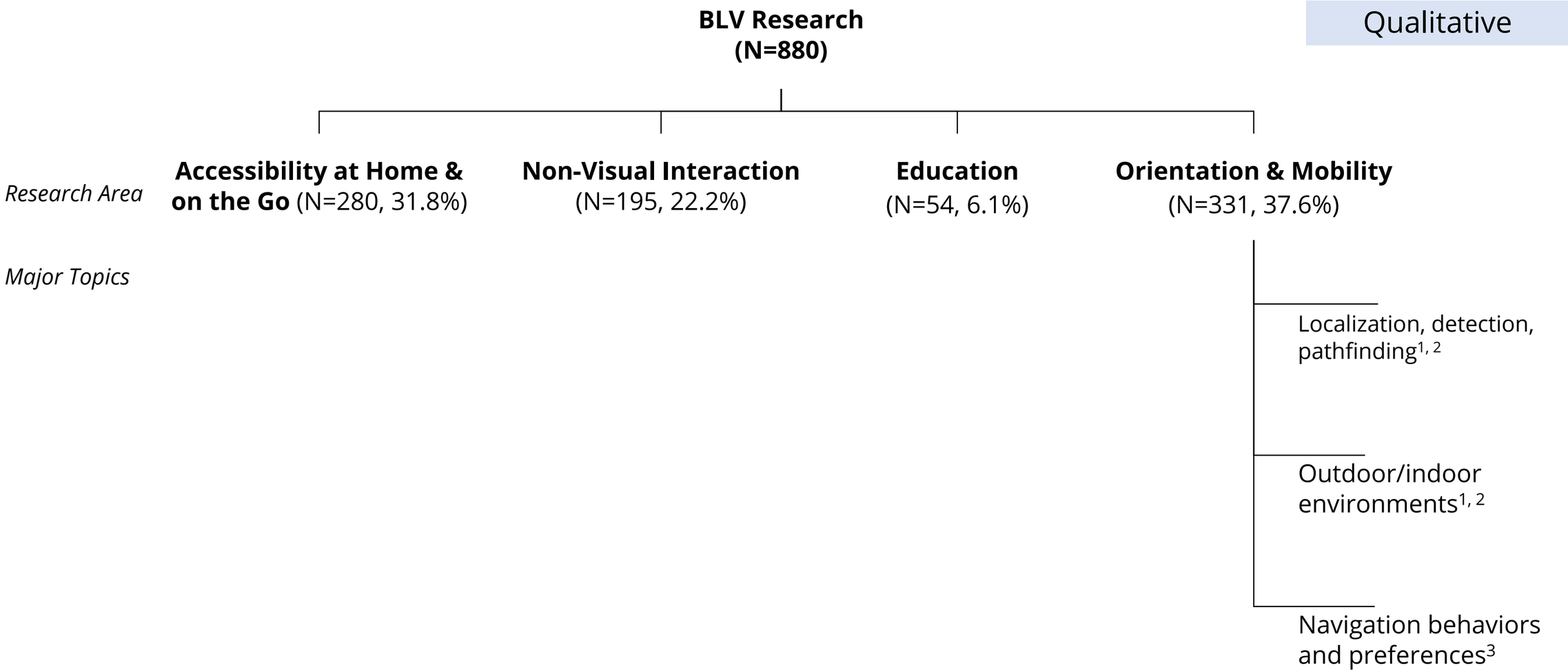
Qualitative



[1]Brulé et al. CHI'16; Metatla et al. CHI'19 & 20; Thieme et al. DIS'17
[2]Kane and Bigham SIGCSE'14; Koushik et al. CHI'19

Results and Discussion
Delineating the Field of Research

Qualitative



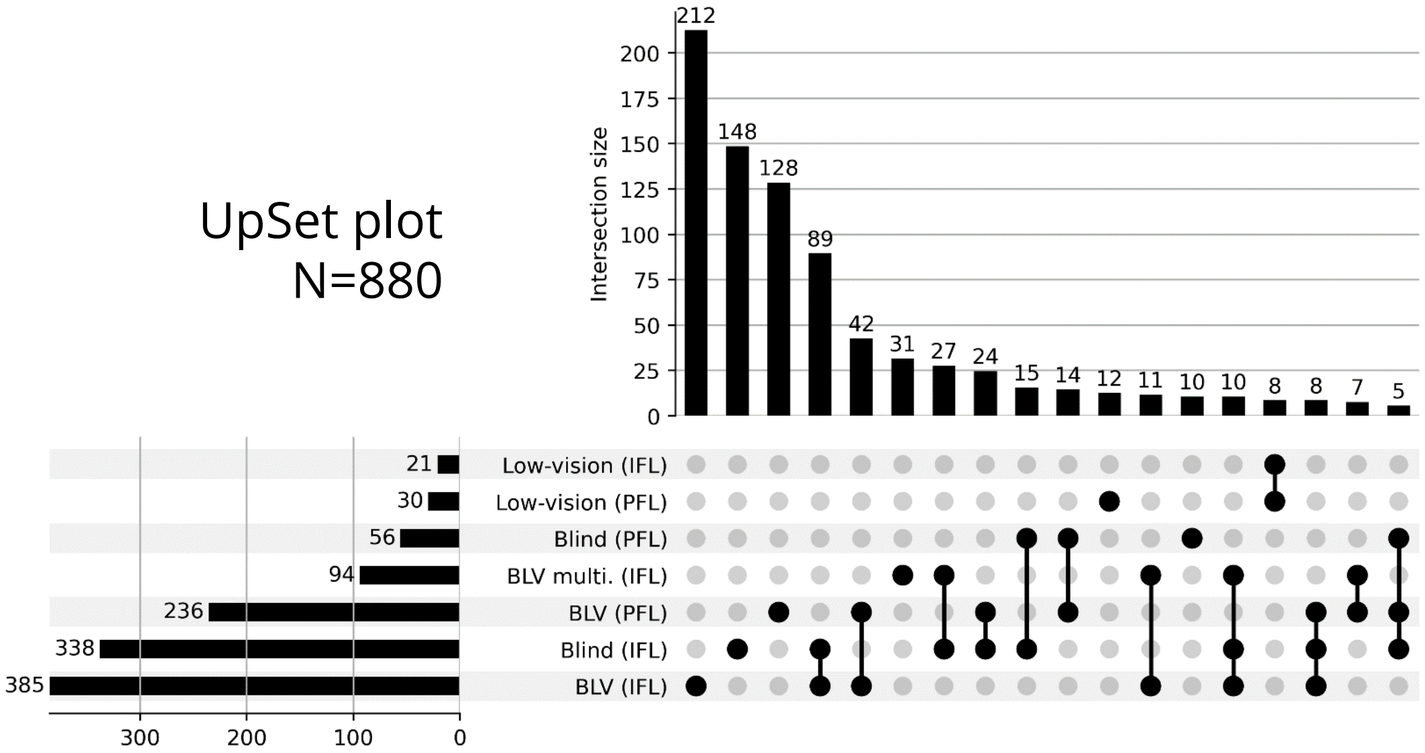
[1, 2]Ahmetovic et al. MobileHCI'16; Au et al. IEEE TMC 2013; Bai et al. IEEE TMC 2017; Sato et al. ASSETS'17
[3]Azenkot et al. CHI'11; Colley et al. CHI'20; Williams et al., ASSETS'13 & 14

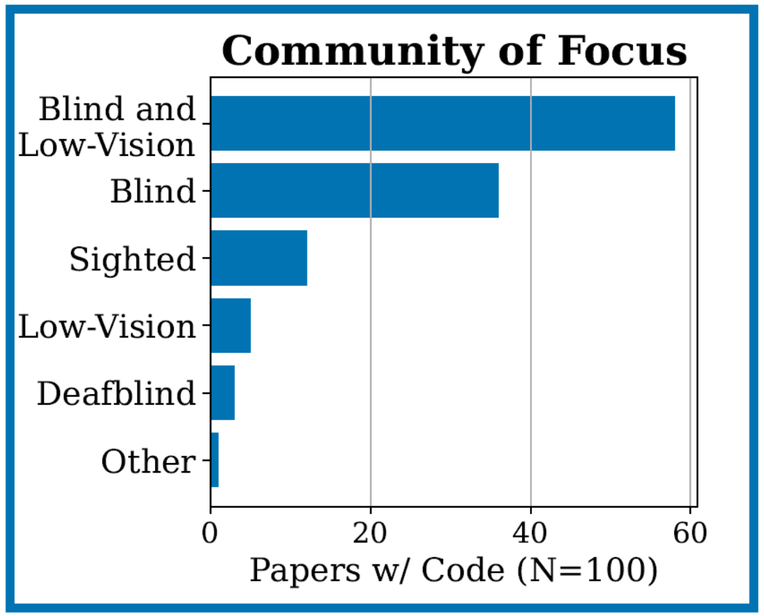
Results and Discussion
Communities of Focus

Quantitative: Programmatic

Qualitative

UpSet plot
N=880



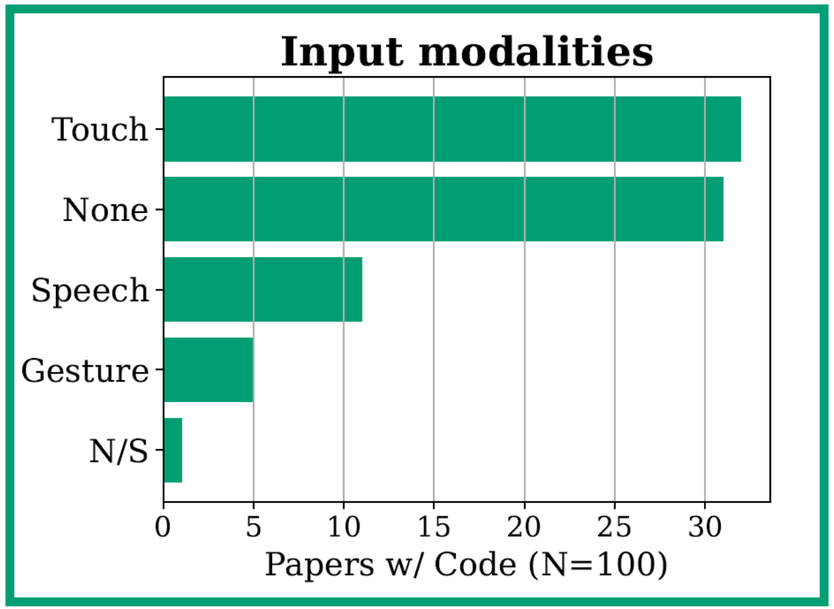


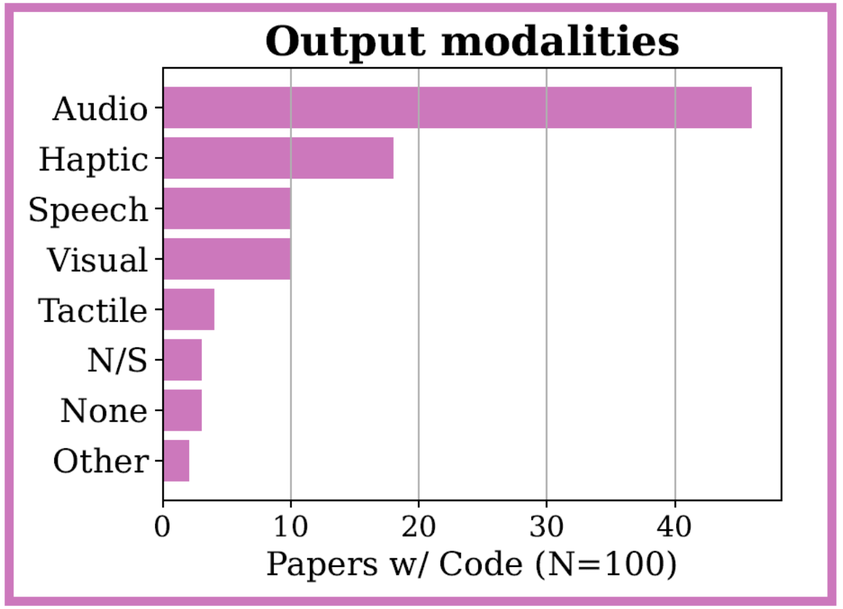
IFL: identity-first language
PFL: person-first language

→ Reporting participants' visual abilities

Results and Discussion
Interaction Modalities

Qualitative





→ Use of residual vision
→ Provide more control to users

Conclusion

- Delineation of the most prominent research areas related to BLV across ACM and IEEE
- An evidence-based discussion of current gaps and opportunities for future work
- Open-source programmatic analysis to support our two-level analysis

Thank you

https://github.com/human-ist/BLV-research-analysis

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heg - haute école de gestion
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PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

MAKEABILITY LAB

Yong-Joon Thoo

Maximiliano Jeanneret Medina

Jon E. Froehlich

Nicolas Ruffieux

Denis Lalanne