CHI 1994-2013: Mapping Two Decades of Intellectual Progress through Co-word Analysis

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Based on a true story...

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A newcomer's questions

- Does HCI have any overarching theory?
- Does HCI have any mainstream research methodology?
- Does HCI have accumulated knowledge?



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Previous work

- Harrison et al. (2007): 3 overlapping paradigms
 - human-factors
 - classical cognitivism/information processing based
 - phenomenologically-situated
- Bartneck and Hu (2008): co-citation analysis
 - Popular authors, countries



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Sample collection

- CHI Proceedings: 1994-2013
 - 3152 articles
 - 16035 keywords





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Keywords

1994-2003

# Popular Topic (Frequency)	Core Topic (Coreness value)	Backbone Topic (Structural holes)	#	Popular Topic (Frequency)	Core Topic (Coreness value)	Backbone Topic (Structural holes)
CSCW (50) world wide web (35) ubicomp (28) visualization (27) input devices (27) user interface (26) virtual reality (26) Fitts' law (24) infoviz (23) augmented reality (22) interaction design (22) interaction techniques (21) information retrieval (20) tangible user interface (20) CMC(20) children (20) multimedia (20) user studies (18) user interface design (18) cognitive modeling (18)	CSCW (0.375) two-handed interaction (0.355) ubicomp (0.226) world wide web (0.222) CMC (0.191) information retrieval (0.186) infoviz (0.171) awareness (0.161) tangible user interface (0.160) virtual reality (0.160) user interface (0.159) augmented reality (0.149) children (0.148) user studies (0.146) multimedia (0.145) interaction techniques (0.142) visualization (0.142) interaction design (0.137) hypertext (0.133) ethnography (0.113)	CWCW (42) world wide web (31) interaction design (31) user interface (30) visualization (29) input devices (27) interaction techniques (27) CMC (26) ubicomp (25) information retrieval (24) multimedia (24) infoviz (23) children (23) virtual reality (22) Fitts' law (22) Interface design (22) mobile computing (20) empirical study (20) augmented reality (19) agents (19)	1 2 3 4 5 6 7 8 9 10 1 11 11 11 11 11 12 2 2 2 2 2 2 2 2	mobile phone (67) ubicomp (65) visualization (62) handheld devices (60) CMC (59) gestures (59) user studies (58) collaboration (57) privacy (54) 0 CSCW (52) 1 design (49) 2 children (48) 3 sustainability (45) 4 ethnography (45) 5 evaluation (43) 6 infoviz (43) 7 mobile (42) 8 TUI (38) 9 games (38) 0 Fitts' Law (37) 1 online communities (36) 2 HCI4D/ICTD (35) 3 interaction design (35) 4 augmented reality (34)	handheld devices (0.229) gestures (0.229) collaboration (0.226) mobile phone (0.224) CMC (0.211) ubicomp (0.210) CSCW (0.208) touch (0.207) children (0.203) evaluation (0.195) privacy (0.161) user studies (0.158) design (0.153) education (0.152) learning (0.146) visualization (0.146) TUI (0.142) touch screens (0.134) mobile (0.134) tabletop (0.123) augmented reality (0.117) communication (0.116) infoviz (0.115)	ubicomp (44) collaboration (43) evaluation (43) mobile phone (41) children (39) visualization (38) design (38) gestures (34) user studies (34) CSCW (34) CMC (33) mobile (32) handheld devices (31) games (29) ethnography (28) augmented reality (28) social computing (28) privacy (27) social networks (26) mobile computing (25) sustainability (24) infoviz (24) education (24) learning (24)
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26 social networks (33)

28 crowdsourcing (32)

27 usability (33)



TUI (23)

awareness (23)

participatory design (22)

2004-2013

awareness (0.112)

SNS (0.109)

wikis (0.106)

Cohesiveness vs. Paradigm Change

- CHI has become more cohesive over time
- But:
- Due to the connections of new and emerging keywords
- Not by establishing new links between existing keywords
 - -Only 42 of 94 keywords (44.7%) between 1994-2003 are found again as top keywords between 2004-2013



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Themes

ID	Keywords	Size	F	CW-F	Cohesion	Centr.	Density
Al	computer supported cooperative work, interaction design, computer-mediated communication, awareness, media spaces, audio, social interfaces	7	18.42	34.14	0.767	0.981	2.048
A2	world wide web, empirical study, email. Internet	4	15.25	27	0.662	0.532	2.500
A3	ubiquitous computing, augmented reality, tangible user interface, ethnography, mobile computing, PDA, learning, GOMS, education, mobile/handheld devices, groupware	11	13.90	21.90	0.437	0.888	0.909
A4	visualization, user interface design, cognitive modeling, evaluation, navigation, direct manipulation, agents, user modeling, animation, graphical user interfaces, design rationale, two-handed interaction, metaphor, prototypes, trust, haptic, mobile phone, pen computing, design, two-handed input, intelligent systems, speech recognition, intelligent interfaces	23	10.34	13.78	0.353	1.160	0.174
A5	input devices, virtual reality, information visualization, interaction techniques, 3D user interfaces, motor control, virtual environments, human performance	8	16.62	30.12	0.734	0.655	2.179
A6	user interface, user studies, usability, methodology, Empirical Evaluation	5	15	24.2	0.468	0.570	1.600
A7	Fitts' law, information retrieval, hypertext, browsing	4	18	33.25	0.624	0.465	4.000
A8	children, educational applications, participatory design, design techniques	4	13.25	25	0.795	0.287	3.833
A9	multimedia, Interface design, collaboration, video, mouse, gestures, field study, e-commerce, hypermedia, privacy, social computing	11	8.81	16.09	0.876	1.069	0.473
A10	user-centered design, usability testing, usability engineering, design process, videoconferencing	5	9.6	15.4	0.715	0.368	1.400
A11	eye tracking, eye movements, multimodal interfaces, gaze	4	8	14.25	0.855	0.376	2.000
A12	annotation, digital libraries, documents, dynamic query	4	7.5	10.5	0.617	0.276	1.167
A13	programming by demonstration, end-user programming	2	8.5	12	0.609	0.195	4.000
A14	information foraging, information scent	2	8	16.5	1.001	0.184	6.000
ID	Keywords	Size	F	CW-F	Cohesion	Centr.	Density
B1	mobile phone, sustainability, ethnography, online communities, HCI4D/ICTD, health, persuasive technology, motivation, user-centered design, behavior change, community	11	30.09	30.27	0.358	0.899	1.036
B2	<i>ubiquitous computing, privacy, mobile, augmented reality, wearable computing, field study, mobile computing, context-aware, navigation, haptic, large displays, human-robot interaction, music, computer vision, GPS, feedback, mobile interaction</i>	17	26.94	28.58	0.416	1.064	4 0.654
B3	visualization, collaboration, user interface, wikis, social computing, tagging, annotation, personal information management	8	30.62	35.5	0.516	0.860	5 1.393
B4	mobile/handheld devices, gestures, Fitts' Law, touch screens, text entry, pointing, touch	7	36	43.71	0.470	0.631	3.619
B5	computer-mediated communication, computer supported cooperative work, eye tracking, communication, empirical study, trust, videoconferencing	7	30.71	36	0.496	0.722	2 2.048
B 6	user studies, interaction techniques, web search, input devices, personalization	5	26.4	28.2	0.442	0.642	2 1.500
B 7	design, games, usability, user experience, older adults, accessibility, memory	7	30.14	32.14	0.368	0.790	1.476
B8	children, tangible user interface, multi-touch, education, tabletop, learning	6	34	44.16	0.551	0.748	3.333
B 9	evaluation, information visualization, interaction design, participatory design, assistive	11	25.63	27	0.419	0.842	0.855
	technology, Methodology, design methods, creativity, prototypes, Security, end-user programming						
B10	social networks, SNS, social media, twitter, Facebook	5	25.6	34	0.705	0.453	3.700
B11	crowdsourcing, human computation	2	23	25.5	0.533	0.268	3 7.000
B12	awareness, video, families, coordination	4	19	23.5	0.690	0.449	2.167

1994-2003

2004-2013

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31

24.5

2

18

3 25.33

0.656

0.792

0.293

0.236

9.000

6.000

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B13 multitasking, attention, interruption

B14 emotion, affect





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Strategic diagrams of other fields





CHI

1994-2003



2004-2013













Discussion

• The only tradition at CHI (and HCI?) is that of having no tradition in terms of research topics.



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Discussion

- The accumulated knowledge in HCI is almost exclusively grounded on very specific technological contexts.
 - -instead of being universal like in the field of biology or physics.



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To answer the initial questions

- Does HCI have any overarching theory?
 –Not really, not even "competing" theories
- Does HCI have any mainstream research methodology?
 - -No, select the method that is appropriate to the context
- Does HCI have accumulated knowledge? -Contextual knowledge is available

The culprit: "Implications for design"

- Puts practitioners' needs above researchers'
 - Medicine also started as a practice and evolved into science
- Gives preference to contextual knowledge
 - Because design requires grounding
 - Forces compartmentalized thinking
- Often just a well-written argument
 - Not a tool, theory, or data
- Demotivates repeating studies
 - My research can help you design, not do more research
- Demotivates incremental research
 - Hard to argue for "improved" design implications



A way forward: establish motor themes

"Implications for research"

- Are the findings repeatable?
- Can they be re-used by other researchers in an experiment/study?
- Can they be improved?
- Am I giving a tool, theory, or data?

Grand challenges

- One way to get ahead of technology
- Allows technological advances to work for us, not against us
- ...but not too grand
 - Tangible, measurable

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Grand challenges using 2 words

- Cure cancer
- Human cloning
- Moon landing
- Increase bandwidth
- Increase range
- Increase capacity
- Reduce cost
- Detect faces
- Realistic rendering



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CHI

1994-2003



2004-2013













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Our papers are too novel, and they don't stack up





We need tangible & re-usable research: tools, data, theories







Thank you!

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Community Imaging Group

Studying communities through their use of technology

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