
Troubling Innovation: Craft and Computing Across Boundaries

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ABSTRACT

Craft practices such as needlework, ceramics, and woodworking have long informed and broadened the scope of HCI research. Whether through sewable microcontrollers or programs of small-scale production, they have helped widen the range of people and work recognised as technological and innovative. However, despite this promise, few organisational resources have successfully drawn together the disparate threads of scholarship and practice attending to HCI craft. In this workshop, we propose to gather a globally distributed group of craft contributors whose work reflects crucial but under-valued HCI positions, practices, and pedagogies, Through historically and politically engaged

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Figure 1: Collection of crafting tools to support integrated electronic textile making [18].



Figure 2: Making Core Memory [25] a design inquiry into the invisible work that went into assembling core memory, an early form of computer information storage initially woven by hand.

work, we seek to build community across boundaries and meaningfully broaden what constitutes innovation in HCI to date.

CCS CONCEPTS

• **General and reference** → *Design*; • **Human-centered computing** → *Interactive systems and tools*; *Collaborative and social computing theory, concepts and paradigms*;

KEYWORDS

Craft; Computational Craft; eCraft; Hybrid Craft; Digital Craft; Crafts Inquiry; D.I.Y.; Humanistic HCI; Research Through Design; Practice;

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BACKGROUND

Craft is on the move. HCI scholars take up craft tools and procedures to broaden the range of people involved in technology development [7, 12, 16–18]. Historians of technology seek out craft metaphors as a means of countering dominant engineering histories [9, 30]. Digital humanists enlist craft practices to elevate bodily engagement with computational analysis (e.g., [11, 21, 23]). Whether through sewable microcontrollers or programs of small-scale production, ceramics or woodworking, an attention to craft practices has helped widen the range of people and work recognised as technological and innovative.

However, despite the growing promise of scholarship at the nexus of craft and computation, the conversation has remained disparate and diffuse, consisting of a broad and largely disconnected array of activities, programs, and pedagogies. The work occupies categories as broad as electronic-textiles, critical craft studies, and digital fabrication, and appears in conferences across the humanities and design (recent symposium: [1]). Just as the terms of innovation have undergone recent and widespread revision within a range of craft scholarship [10, 26, 30], a material turn within the humanities and social sciences has pointed the important role of embodied, material practice in the work of human-computer interaction [3, 25]. Now it is the moment to bring these conversations together.

To gather and extend recent debates at the interface of craft and computation, we propose a one-day CHI workshop that addresses emerging contexts, materials, and methods. Whether through the study of maintenance, needlecraft, or computer-aided design, we examine craft as a crucial site for reworking the artefacts, tools, and settings through which longstanding legacies of e.g. coloniality and



Figure 3: Hybrid carpentry, featuring a 3D printed nylon12 joint for stool's wooden legs [13].

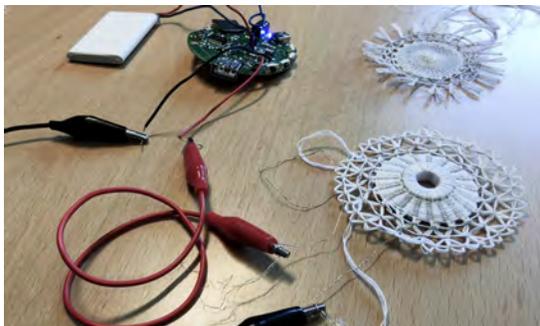


Figure 4: Sonic Lace prototype: Textile speakers crafted by using traditional Tenerife Lace technique.

industrialization unfold. By turning to craft, we seek to not only recognise crucial but under-recognised forms of cognitive and manual labour but also intervene in the wider social, political, and historical structures that bind them. This workshop builds on a substantial body of HCI scholarship examining the form and nature of craft practice. From the early work of Blauvelt, Wrensch and Eisenberg investigating computational tools to support physical making [5], to initial calls for considering craft practices as sites for exploring technological appropriation [24], we build on the growing integration of craft and computational practice. This work has included the introduction of a diverse palette of craft materials for interactive explorations [17], the development of innovative hybrid solutions, such the integration of traditional hardware components into textiles [4, 19, 20], the use of digital tools to support procedural fabrication [8, 15], potentials for repair, unique and preciousness [27, 28, 31] and the prototyping of their relationships in diverse contexts such as the classroom [6, 14]. Underlying these computational innovations sits a body of HCI scholarship attending to craft competencies and environments as sites that hold lessons for interaction design (e.g. [22, 29]).

Less prevalent within these domains has been an attention to longer legacies of colonialism, industrialisation, and geopolitical change entangled with craft practice. Such processes actively shape the contemporary landscape of computational labour and manufacturing that craft interventions grow within (see, for example [16, 30]). It is with these broader historical, political, and economic forces in mind that we turn to our thematic discussions. With this backdrop, we consider what HCI might learn from crossing boundaries in and around craft practice.

Workshop Themes and Addressed Issues

In the sections that follow, we describe the organisation of our workshop across three central themes: artefacts, tools, and environments. The themes serve to focus our workshop discussion across different scales of craft and computing entanglements. At each stage, we attend to the roles that craft plays alongside the wider transnational flows, colonial heritages, and forms of industrialisation on which they rely. We use the phrase "HCI craft" as a shorthand to refer to the spectrum of computing projects (tools, systems, infrastructures) that explicitly engage, extend, or rework craft techniques.

Artefacts: The Objects of HCI Craft. With this first set of questions, we examine the material, cultural, and geopolitical status of the HCI craft object. Such artefacts render a host of historical commitments, lived values, and future imaginings visible or invisible[2]. Attending to both their material form and their surrounding social worlds, we explore their capacity to inform and disrupt existing bodies of knowledge. For example, we ask:

- **What form does the computational take** in and around HCI craft objects?
- **What characterises the material flows** producing and produced by HCI craft objects?
- **Whose legacies gets silenced / recovered** through the circulation of HCI craft objects?

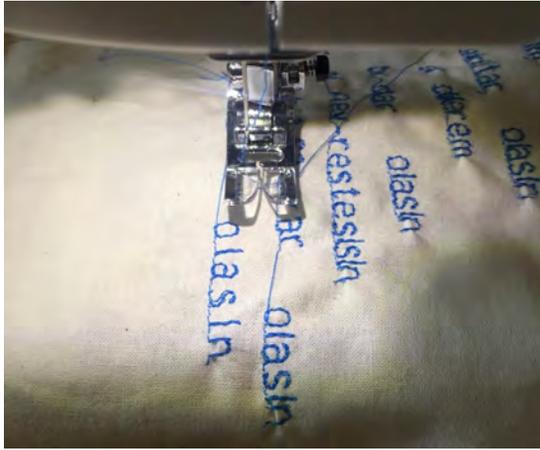


Figure 5: Re-interpretation of copy: Sewing of "Gazelles" written by the ottoman poet Mihri Hatun (16th century).

Workshop Organisers

Irene Posch is a professor at the University of Art and Design Linz, Austria. She has a background in media and computer science. Her research and practice explore the integration of technological development into the fields of art and craft, and vice versa, and social, cultural, technical and aesthetic implications thereof.

Özge Subasi is an Assistant Professor in Media and Visual Arts, Istanbul. With a background in the arts, design and anthropology, her recent research is in contextualisation of the new crafts, especially craftwork with aging communities.

Tools: The Implements, Devices, and Machines of HCI Craft. With this second set of questions, we consider the particular configurations of technique, collaboration, and imagination enabled by new computational apparatuses around craft. In this work, we explore not only what types of technological work is made possible but also how craft tools shape the gendered, classed, and racialized dimensions of computational labor [18, 25].

For example, we ask:

- **What specific tools** enable and facilitate HCI craft?
- **How do the tools reinforce** stereotypes about who is considered innovative / noninnovative?
- **How do the tools challenge** or rework those stereotypes?

Environments: The Sites of Craft and Computation. With this set of questions, we examine the particular sites in and through which HCI craft unfolds. In mapping these sites, we aim to think within and beyond the studio, lab, or makerspace to the wider transnational and industrial relationships on which such spaces depend. For example, we ask:

- **What environments legitimate** craft practices within spaces of computation and innovation?
- **How do HCI craft environments configure labour** and what labour gets seen and valued?
- **How do different environments open or foreclose** opportunities for HCI craft?

Workshop Goals

This workshop is dedicated to gather and help define the field of scholarship and practice around craft and HCI. We aim to facilitate a wide-ranging discussion of emerging interests and concerns across the thematic categories of artefacts, tools, and environments. This work includes diverse approaches to the development of computational technologies around craft as well as deep empirical and theoretical investigations of craft legacies. The workshop connects an international and interdisciplinary group of researchers, craftspeople, artists, designers, and theorists from within and beyond academia. In particular, we aim to:

- Gather a community of scholars and practitioners examining the entanglement of craft and computation with the hope of scaffolding intellectual development and community.
- Create a road-map for future scholarship and practice.
- Produce an exhibition and online repository of our work for the CHI 2019 audience and beyond.

The output of the workshop will be a point of reference for new research endeavours connected to crafts and HCI. Its multidisciplinary foundation builds on a rich existing HCI tradition around electronic-textiles, making, and digital fabrication to impact a broad array of connected practices and disciplines.

Workshop Organisers (continued)

Daniela Rosner is an Assistant Professor in HCDE, University of Washington and co-director of the Tactile and Tactical Design Lab. Her research critically investigates the dimensions of d-methods, particularly within sites historically marginalized within engineering cultures such as weaving and needlecraft. She is the author of *Critical Fabulations: Reworking the Methods and Margins of Design* (MIT Press).

Raune Frankjaer is a PhD fellow at the Department of Digital Design and Information Studies at Aarhus University, Denmark. Her research centers on the emerging potentials of craft and digital technology in the areas of knowledge production, mediation, more-than-human communication

Amit Zoran is a senior lecturer at the Hebrew University of Jerusalem, with a background in engineering and media science. Amit explores the two divergent realms of computational technologies and classical hand-hewn skills, seeking a new way of thinking about these polarities.

Tania Pérez-Bustos is an Associate Professor at the School of Gender Studies at the National University of Colombia. Her research focuses on knowledge dialogues, critical knowledge making practices, such as technologies of knowing and caring, including ethnographic work on handcrafters in Colombia.

ORGANISERS

The workshop is organised by a group of researchers that are themselves active in the field, both through practice and theoretical work. They contribute diverse geographic and pedagogical perspectives to the intersection of crafts and computation, laying ground for the inclusive and holistic orientation of the workshop. See organiser details on the sidebar.

WEBSITE

The workshop website <https://craftcomputerinteraction.net> will accompany the workshop through all stages. In the pre-workshop phase, it will promote the workshop to a diverse community of interested researchers and practitioners as well as facilitate the submission of the position papers. During the workshop it will serve as a platform for information and exchange among workshop participants. After the workshop, the website will showcase workshop results to a wider online audience of researchers and practitioners interested in HCI craft. It will further be used for networking and community building around the workshop theme. The website will also host an extended list of references relevant to the workshop in order to guide future submissions and help contextualise the field.

PRE-WORKSHOP PLAN

This workshop intends to attract participants with a core interest in HCI craft. To create a sustainable community, we consider it important to include not only academics such as HCI researchers, but also craftspeople, industry representatives, and members of arts and design communities within and beyond HCI. All organisers are actively involved in HCI craft, collaborate with (or belong to) active crafts communities, and have significant experience organising related workshops and events (including numerous CHI workshops). The *Call for Participation* will be distributed through their networks spanning a wide geographic and thematic area and aiming at high quality and diverse position paper submissions. In addition, the call will be distributed to a selection of relevant mailing lists in the field (CHI, TEI, DIS) and hosted on the workshop website.

The organisers will review all submissions and select participants to the workshop with regard to: (1) relevance to the workshop themes, and (2) diverse representation within the field. Based on submissions, the organisers will prepare an overview of emerging categories for in-workshop discussions. Arrangements will be made with the conference organisers to ensure a possibility to exhibit the workshop results during the conference. See details on the sidebar.

WORKSHOP STRUCTURE

Connected to the theme of HCI craft, the organisers will approach the workshop goals in two ways. First, we intend to produce an exhibition with curated workshop submissions. The exhibition will be

Workshop Timetable

- 09:00 - 09:15 Welcome and introduction by the organisers into workshop theme and topics
- 09:15 - 10:30 Participants present their submission, 3 min each, and connect them to the categories they see fitting.
- 10:30 - 10:45 Coffee Break
- 10:45 - 11:15 Moderated group discussion on submissions and connected categories
- 11:15 - 12:30 Break out discussions on specific categories. Group forming based on participant topical interests
- 12:30 - 13:30 Lunch Break
- 13:30 - 15:00 Continued working in topic break-out groups, Creating a collage or curating of projects relevant to the category and contextually framing them
- 15:00 - 15:30 Coffee Break
- 15:30 - 16:30 Presentation and discussion of break out group results, preparing of the workshop exhibition
- 16:30 - 17:00 Closing discussion and wrap-up, identifying future work and steps
- 17:00 After workshop get-together, informal exchange and discussions

on display throughout the CHI conference, creating a tangible starting point for the establishment of a broader HCI crafts community. Second, the exhibit will include an accompanying booklet, which we will produce and distribute based on the workshop discussion. By holding the workshop for one day with 20 participants, the organisers will seek out a diversity of positions and make time for exchange among all participants. Participants are expected to make a contribution in 2-4 pages (open format) and bring a crafted artefact related to their proposal to the discussion. The conference will energise a growing repository of artefacts and approaches around HCI craft that will live on the website for wider visibility. See detailed timetable on the sidebar.

POST-WORKSHOP PLAN

After the workshop, organisers will update the website to relay the workshop outcomes and discussions, including documentation of the exhibition and the accompanying booklet. To communicate the outcomes and foster future collaboration, the organisers will establish an initial HCI craft community email list. The organisers also aim to organise a special issue of the ToCHI Journal dedicated to artistic research and crafts. Selected workshop contributions will be invited to submit full papers to this journal. Together the website, exhibition booklet, mailing list, and special journal issue will help expand workshop discussions well beyond the confines of the conference event.

CALL FOR PARTICIPATION

The one-day CHI 2019 workshop **Troubling Innovation: Craft and Computing Across Boundaries** aims to bring together practitioners and scholars working at the intersection of craft and computation. In this workshop, we gather a globally distributed group of craft contributors whose work reflects crucial but under-valued HCI positions, practices, and pedagogies. Whether through the study of maintenance, needlecraft, or computer-aided design, we examine craft as a crucial site for reworking the artefacts, tools, and settings through which long standing legacies of coloniality and industrialization unfold. Through historically and politically engaged craftwork, we seek to build community across boundaries and meaningfully broaden what constitutes innovation in HCI to date and possible futures of Craft and Computation.

We call for participants from diverse backgrounds including but not limited to creative activity, technical research, and critical scholarship in the social sciences interested in present, future and speculative perspectives on:

- Artefacts: The Objects of HCI Craft
- Tools: The Implements, Devices, and Machines of HCI Craft
- Environments: The Sites of Craft and Computation

Please read the full workshop abstract for details about workshop setting and goals. To apply, please submit a 2-4 page **position paper / annotated object / craft portfolio** in any format by **12 February 2019** through our website. Please also plan to bring a physical artefact (or documentation thereof) related to your submission to the workshop. At least one author of each accepted position paper must attend the workshop and register for at least one day of the conference. Please check <https://craftcomputerinteraction.net> for further information and to join our newsletter.

REFERENCES

- [1] [n. d.]. Shared Ground Symposium. [http://cccdnow.org/\[objectObject\]](http://cccdnow.org/[objectObject])
- [2] Morehshin Allahyari and Rourke, Daniel. [n. d.]. *The 3D Additivist Cookbook*.
- [3] Jeffrey Bardzell and Shaowen Bardzell. 2016. Humanistic HCI. *Interactions* 23, 2 (Feb. 2016), 20–29. <https://doi.org/10.1145/2888576>
- [4] Joanna Berzowska. 2005. Electronic Textiles: Wearable Computers, Reactive Fashion, and Soft Computation. *Textile, The Journal of Cloth & Culture, Digital Dialogues 2: Textiles and Technology* 3, 1 (2005), 2–19.
- [5] Glenn Blauvelt, Tom Wensch, and Michael Eisenberg. 1999. Integrating Craft Materials and Computation. In *Proceedings of the 3rd Conference on Creativity & Cognition (C&C '99)*. ACM, New York, NY, USA, 50–56. <https://doi.org/10.1145/317561.317572>
- [6] Leah Buechley and Michael Eisenberg. 2009. Fabric PCBs, Electronic Sequins, and Socket Buttons: Techniques for e-Textile Craft. *Personal Ubiquitous Comput.* 13, 2 (Feb. 2009), 133–150. <https://doi.org/10.1007/s00779-007-0181-0>
- [7] Leah Buechley and Hannah Perner-Wilson. 2012. Crafting Technology: Reimagining the Processes, Materials, and Cultures of Electronics. *ACM Trans. Comput.-Hum. Interact.* 19, 3 (Oct. 2012), 21:1–21:21. <https://doi.org/10.1145/2362364.2362369>
- [8] Katie Bunnell. 2004. Craft and Digital Technology. Metsovo, Greece. <https://repository.falmouth.ac.uk/537/>
- [9] Tiffany Chan, Mara Mills, and Jentery Sayers. 2018. Optophonic Reading, Prototyping Optophones. *Amodern* 8 (2018).
- [10] Amy Cheatle and Steven J. Jackson. 2015. Digital Entanglements: Craft, Computation and Collaboration in Fine Art Furniture Production. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '15)*. ACM, New York, NY, USA, 958–968. <https://doi.org/10.1145/2675133.2675291>
- [11] Laura Devendorf and Daniela K. Rosner. 2015. Reimagining Digital Fabrication As Performance Art. In *Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '15)*. ACM, New York, NY, USA, 555–566. <https://doi.org/10.1145/2702613.2732507>
- [12] Michael Leitner and Özge Subasi. 2016. Arty Portfolios: Manifesting Artistic Work in Interaction Design Research. In *Proceedings of the 9th Nordic Conference on Human-Computer Interaction (NordCHI '16)*. ACM, New York, NY, USA, Article 65, 10 pages. <https://doi.org/10.1145/2971485.2971515>
- [13] Shiran Magrisso, Moran Mizrahi, and Amit Zoran. 2018. Digital Joinery For Hybrid Carpentry. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18)*. ACM, New York, NY, USA, 167:1–167:11. <https://doi.org/10.1145/3173574.3173741>
- [14] Michael Nitsche, Andrew Quitmeyer, Kate Farina, Samuel Zwaan, and Hye Yeon Nam. 2014. Teaching Digital Craft. In *CHI '14 Extended Abstracts on Human Factors in Computing Systems (CHI EA '14)*. ACM, New York, NY, USA, 719–730. <https://doi.org/10.1145/2559206.2578872>
- [15] Neri Oxman. 2007. Digital Craft Fabrication-Based Design in the Age of Digital Production.
- [16] Tania Pérez-Bustos and Manuel Franco-Avellaneda. 2014. Embroidering Self-knowledge: Systematization of Experiences and Participatory Design of Weaving As a Caring Practice in Cartago, Valle, Colombia. In *Proceedings of the 13th*

- Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium Papers, and Keynote Abstracts - Volume 2 (PDC '14)*. ACM, New York, NY, USA, 99–102. <https://doi.org/10.1145/2662155.2662173>
- [17] Hannah Perner-Wilson, Leah Buechley, and Mika Satomi. 2011. Handcrafting Textile Interfaces from a Kit-of-no-parts. In *Proceedings of the Fifth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '11)*. ACM, New York, NY, USA, 61–68. <https://doi.org/10.1145/1935701.1935715>
- [18] Irene Posch. 2017. Crafting Tools. *Interactions* 24, 2 (Feb. 2017), 78–81. <https://doi.org/10.1145/3038227>
- [19] Ernest Post and Margaret Orth. 1997. Smart fabric, or wearable clothing. In *International Symposium on Wearable Computers, Digest of Papers*. IEEE Comput. Soc, 167–168. <https://doi.org/10.1109/ISWC.1997.629937>
- [20] Bradley Quinn. 2013. *Textile visionaries: innovation and sustainability in textile design*. King, London. OCLC: 862800939.
- [21] Matt Ratto. 2011. Critical Making: Conceptual and Material Studies in Technology and Social Life. *The Information Society* 27, 4 (July 2011), 252–260. <https://doi.org/10.1080/01972243.2011.583819>
- [22] Daniela K. Rosner. 2012. The Material Practices of Collaboration. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work (CSCW '12)*. ACM, New York, NY, USA, 1155–1164. <https://doi.org/10.1145/2145204.2145375>
- [23] Daniela K Rosner. 2018. *Critical Fabulations: Reworking the Methods and Margins of Design*. MIT Press.
- [24] Daniela K. Rosner and Kimiko Ryokai. 2009. Reflections on Craft: Probing the Creative Process of Everyday Knitters. In *Proceedings of the Seventh ACM Conference on Creativity and Cognition (C&C '09)*. ACM, New York, NY, USA, 195–204. <https://doi.org/10.1145/1640233.1640264>
- [25] Daniela K. Rosner, Samantha Shorey, Brock R. Craft, and Helen Remick. 2018. Making Core Memory: Design Inquiry into Gendered Legacies of Engineering and Craftwork. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (CHI '18)*. ACM, New York, NY, USA, 531:1–531:13. <https://doi.org/10.1145/3173574.3174105>
- [26] Andrew Russell and Lee Vinsel. 2016. Hail the maintainers: Capitalism excels at innovation but is failing at maintenance, and for most lives it is maintenance that matters more. Aeon.
- [27] Vasiliki Tsaknaki and Ylva Fernaeus. 2016. Expanding on Wabi-Sabi As a Design Resource in HCI. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. ACM, New York, NY, USA, 5970–5983. <https://doi.org/10.1145/2858036.2858459>
- [28] Vasiliki Tsaknaki, Ylva Fernaeus, and Martin Jonsson. 2015. PRECIOUS MATERIALS OF INTERACTION – EXPLORING INTERACTIVE ACCESSORIES AS JEWELLERY ITEMS. *Design Ecologies* 6 (2015), 10.
- [29] Vasiliki Tsaknaki, Ylva Fernaeus, Emma Rapp, and Jordi Solsona Belenguer. 2017. Articulating Challenges of Hybrid Crafting for the Case of Interactive Silversmith Practice. In *Proceedings of the 2017 Conference on Designing Interactive Systems (DIS '17)*. ACM, New York, NY, USA, 1187–1200. <https://doi.org/10.1145/3064663.3064718>
- [30] Namita Gupta Wiggers. 2016. 15 We claim the bowl in the name of craft. *Contemporary Clay and Museum Culture* (2016), 154.
- [31] Amit Zoran and Leah Buechley. 2012. Hybrid Reassemblage: An Exploration of Craft, Digital Fabrication and Artifact Uniqueness. *Leonardo* 46, 1 (Oct. 2012), 4–10. https://doi.org/10.1162/LEON_a_00477