Report from Dagstuhl Seminar 19291

Values in Computing

Edited by

Christoph Becker[1], Gregor Engels[2], Andrew Feenberg[3], Maria Angela Ferrario[4], and Geraldine Fitzpatrick[5]

1 **University of Toronto, CA,** christoph.becker@utoronto.ca
2 **Universität Paderborn, DE,** engels@uni-paderborn.de
3 **Simon Fraser University – Burnaby, CA,** feenberg@sfu.ca
4 **Lancaster University, GB,** m.a.ferrario@lancaster.ac.uk
5 **TU Wien, AT,** geraldine.fitzpatrick@tuwien.ac.at

Abstract

Values are deeply held principles guiding decisions of individuals, groups and organizations. Computing technologies are inevitably affected by values: through their design, values become embodied and enacted. However, some values are easier to quantify and articulate than others; for example, the financial value of a software product is easier to measure than its 'fairness'. As a result, less measurable values are often dismissed in decision making processes as lacking evidence.

This is particularly problematic since research shows that less measurable values tend to be more strongly associated with sustainable practices than easier to quantify ones; it also indicates that the systems we design are likely to be inadequate for tackling long-term complex societal problems such as environmental change and health-related challenges that so often computing technologies are asked to address.

This seminar aims to examine the complex relations between values, computing technologies and society. It does so by bringing together practitioners and researchers from several areas within and beyond computer science, including human computer interaction, software engineering, computer ethics, moral philosophy, philosophy of technology, data science and critical data studies. The outcomes include concrete cases examined through diverse disciplinary perspectives and guidelines for values in computing research, development and education, which are expressed in this report.

Seminar July 14–19, 2019 – http://www.dagstuhl.de/19291
2012 ACM Subject Classification Human-centered computing → Collaborative and social computing, Social and professional topics → Computing / technology policy, Applied computing → Law, social and behavioral sciences, Social and professional topics → Computing education, Social and professional topics → Computing profession, Software and its engineering → Software creation and management, Human-centered computing
Keywords and phrases computing in society, responsible innovation, sustainability informatics computer ethics, philosophy of technology and moral philosophy
Digital Object Identifier 10.4230/DagRep.9.7.40
Edited in cooperation with Klementina Josifovska

1 Executive Summary

Maria Angela Ferrario (Lancaster University, GB)
Christoph Becker (University of Toronto, CA)
Gregor Engels (Universität Paderborn, DE)
Andrew Feenberg (Simon Fraser University – Burnaby, CA)
Geraldine Fitzpatrick (TU Wien, AT)

The purpose of Dagstuhl Seminar 1929 'Values in Computing' was to bring together practitioners and researchers with expertise stretching beyond computer science, to include sociology, ethics, and philosophy to examine the complex relations between human values, computing technologies and society. In so doing, the seminar invited an inter-disciplinary community to share their challenges, illustrate their approaches through concrete case studies, and distil lessons learned into actionable guidelines for research and education with tangible implications for policies and industry.

The seminar was motivated by the growing urgency for computing research and industry to answer questions about the role that digital technology plays in society. The greater the scale and reach of digital technology systems, the greater their impact, both intended and unintended. Mainstream media, popular science, and the general public have only started grappling with the scale of these consequences. Many are calling institutions, professionals, and scientists to act [3]. Recent years have seen an increasing number of high-profile software scandals and malpractices in which individual privacy and democracy have been undermined (Cambridge Analytica's use of Facebook data), the environmental impact of air pollutants disregarded (the Volkswagen's diesel emission scandal), and human lives lost (the Boeing 737 Max anti-stall software disasters).

These events are the constant reminders that human values are indeed "the facts of the future" [1], as Feenberg argues. Values are not the opposite of facts, they become facts: the more weight we give to certain values (e.g. wealth, political influence, power), the bigger the 'blind spots' of the existing values become (e.g. environmental sustainability, equality and social justice). There is a pressing need then to understand how human values operate and to build on this understanding to consider how research and education might contribute to a more socially responsible computing industry.

To this end, the seminar brought together disciplines with a long tradition of critical thinking and human-centred approaches to computing with those that, such as Software Engineering, have been traditionally considered, albeit increasingly controversially, as 'values neutral'. The breadth and depth of the interdisciplinary debate, one of the key distinguishing features and strengths of this five-day seminar, was also, and intentionally so, one of its main challenges. This was particularly evident when the need to unpack the multifaceted and often abstract notion of human values was met by the demand for the discussion to be of concrete relevance to computing education and practice. Within this context, one of the key objectives of the seminar was to facilitate both the exploration of broad themes and the identification of specific topics that would require meaningful cross-disciplinary effort. To this end, a two-pronged approach was designed to encourage both divergence and converge of viewpoints.

Thematic divergence was encouraged through six short *Seed Talks*, ten open-floor *Lightning Talks*, and a *Soap Box* session were participants would pitch high-level challenges to provoke discussion. Convergence was facilitated by *World Café* style group discussions around six emergent themes. Over the last two days, these themes were then distilled into four topics with one working group assigned to each (*Action*, *Education*, *Research*, and *Response*). Seed Talks were invited 20-minute talks designed to be informative and provocative. Thematically, they were structured around the original seminar proposal scoping areas: theory and methodologies (Feenberg and Mainzer), professional practice (Spiekermann and Whittle); and educational pathways (Nathan and Patitsas). Participants offered Lightning Talks on a variety of topics of their own choosing. For instance, Easterbrook focused on the environmental crisis and called for urgent action; Walker, McCord and Lievrouw shared their experiences of socially responsible digital activism; Frauenberger provided concrete examples on how different ways of thinking informatics in education [2]; Winter outlined the tools and techniques used to study values in software production [4]; and Jensen-Ferreira shared her approach to software industry research. Finally, four teams worked on a specific *Values in Computing* topic, each identifying a possible course of action:

1. *Action* – This group worked under the premise that the professional knowledge and critical insight of computer and social scientists should be mobilized as an active force in public education and policy-making concerning the design, implementation and regulation of information technology. With a view to these three lines of action, the group proposed the penning and wide distribution of a document, tentatively entitled *"The Dagstuhl Declaration"* here included.
2. *Research* – The Research group pursued a threefold-goal: understand the state-of-the-art of the research and highlight under-explored research areas; discuss methods and tools that have been or can be used, and identify future research directions.
3. *Education* – The Education group discussed the implications for undergraduate and graduate computing education by conducting a brief but focused exploration of existing university-level courses, methods and tools and their mapping of curriculum cross-cutting learning objectives.
4. *Response* – This group worked on the intersection between climate emergency and the future of computing and centred its activity on gathering resources about this intersection and writing an opinion piece to address it.

References

1 Andrew Feenberg. Ten paradoxes of technology. Techné: Research in Philosophy and Technology, 14(1):3–15, 2010.

2 Christopher Frauenberger and Peter Purgathofer. 2019. Ways of thinking in informatics. Commun. ACM 62, 7 (June 2019), 58-64.

3 Leon J. Osterweil. Be prepared. SIGSOFT Softw. Eng. Notes, 41(5):4–5, November 2016.

4 Emily Winter, Stephen Forshaw, Lucy Hunt, and Maria Angela Ferrario. 2019. Towards a systematic study of values in SE: tools for industry and education. In Proceedings of the 41st International Conference on Software Engineering: ICSE-NIER '19. IEEE Press, Piscataway, NJ, USA, 61-64.

2 Table of Contents

3 Seed Talks

3.1 Values are the Facts of the Future

Andrew Feenberg (Simon Fraser University – Burnaby, CA)

Technology is always technical and cultural. In introducing key ideas from critical constructivism [1], Prof. Andrew Feenberg placed two questions center stage: Why is technology clearly rational but simultaneously value-laden, and how can values and technical rationality co-exist? Critical theory does not reject rationality, but it rejects the idea of technical neutrality. In a famous article by Langdon Winner, he used Robert Moses' bridges in New York to articulate how "artifacts have politics" [2] – in other words, they embody and enact political and social values. In critical constructivism, the concept of underdetermination highlights that technological choices are always more than technical, taken relative to a context responding to a social world. The adaptation of technology to its environment introduces bias from society. Critical constructivism distinguishes substantive bias from formal bias – the latter is not incompatible with rationality but simply a particular form of rationality. The technical and cultural aspects of technology manifest in affordances – physical or perceived properties of an object that determine or indicate how that object can be used within the experienced, meaningful and socially shared universe of concepts, objects and actions.

In critical constructivism, technical elements are the words of the language of technology, and the technical code is the grammar that governs how larger sentences and arguments can be formed out of these elements. Through technical codes, cultural values are embodied in technical artifacts, but culture and its values appear so obvious to the actors in that process that their influence often remains overlooked. As a result, values in computing in its current capitalist context often express excluded needs of marginalized stakeholders. The public resistance to aspects of technology we encounter today highlights the possibilities of alternate futures in which those values that are now marginalized could become facts.

References

1 Feenberg, A. (2017). Technosystem: The social life of reason. Cambridge, Massachusetts: Harvard University Press.
2 Winner, L. (1980). Do Artifacts Have Politics? Daedalus, 109(1), 121–136.

3.2 Towards Value-Based Computing Challenges in Software Engineering and AI

Klaus Mainzer (TU München, DE)

Main reference Klaus Mainzer: "Künstliche Intelligenz – Wann übernehmen die Maschinen?", Springer, Berlin, 2nd edition 2019.
URL https://doi.org/10.1007/978-3-662-58046-2

In the world of computing and software engineering, machine learning with learning algorithms becomes more and more powerful with exponentially growing computing capacity. Machine learning algorithms are not only applied in science and technology, but dominate business

strategies and the industrial Internet. They control the processes of a networked world in the Internet of Things. But, the state of the art in machine learning is mainly based on statistical learning and reasoning with an exploding number of parameters. These „black boxes“ need more explainability and accountability w.r.t. safety-critical systems and societal infrastructures. Obviously, with increasing complexity, the challenges of security and responsibility come to the fore. Safety-critical software demonstrates that values in computing must not be restricted to ethical values only. In practice, we must also consider the costs of testing which depend on value-based decisions. Rigorous proofs of complex software with mathematical accuracy need an immense amount of time and man-power. On the other side, it is risky to rely only in ad-hoc testing and empirical testing in the case of safety-critical systems. For certification of AI-programs, we must aim at increasing accuracy, security, and trust in software in spite of increasing complexity of civil and industrial applications, but with respect to the costs of testing (e.g., utility functions for trade-off time of delivery vs. market value, cost/effectiveness ratio of availability). There is no free lunch for the demands of safety and security. Responsible AI must find fair and sustainable degrees of certification. The author is engaged in the steering board for AI-cerfification (DIN/ISO) of the German government. Behind this is the fundamental insight that computing technology does not work independently of societal and civil values. At that point, humanities and social sciences come in. Without considering societal structures and processes, hardly any innovation in software engineering and AI can be successful. But, vice versa, without better understanding and explainability of computing technology, societies cannot be governed. The Internet of Things should be transformed into an Internet of Values. Therefore, questions of humanities and social sciences must be addressed right from the start in the design of computing and software technology and not only in a subsequent “add-on” that comes into play when the technology has already created facts. This talk is a plea for “Technikgestaltung” which means more than “shaping” and “governance” of technology. In short, we aim at a value-based roadmap which is no innovation killer, but the breakthrough to a responsible and sustainable, and therefore, better technology.

3.3 Value-based System Engineering for Ethics by Design

Sarah Spiekermann-Hoff (Wirtschaftsuniversität Wien, AT)

In this talk I will first give an overview of what ethics is and what roles values play for ethics by design. I will explain what values are according to 100 years of research in material value ethics (phenomenology) and how they can be identified with the help of classical ethical theories (like utilitarianism, virtue ethics and duty ethics). Against this background my talk will include a cautious note on why “lists” of values or value principles (transparency, bias, accountability, et.) are nice to have, but incomplete to create a sustainable system design in practice. I will then outline how ethics by design can be achieved through value-based engineering. I show how innovation teams can identify relevant values for a system’s design and then ensure that value dispositions effectively end up in the technical and organizational concepts. The methods described are largely corresponding to the current work status of the IEEE P7000 group, which I co-chair and co-initiated. IEEE P7000 is planned to become IEEE’s standard for a model process for ethical system engineering[1].

[1] https://standards.ieee.org/project/7000.html

3.4 Values in the Software Industry

Jon Whittle (Monash University – Clayton, AU)

Joint work of Waqar Hussain, Davoud Mougoui, Rifat Shams, Harsha Perrera, Arif Nurwidyantoro, Gillian Oliver
Main reference https://www.slideshare.net/jonwhittle9/values-in-the-software-industry

This talk reported on how the software industry thinks about and implements human values such as integrity, diversity, inclusion and social responsibility. The history of software engineering is a focus on developing software with particular functionality at affordable cost and that is safe, secure and reliable. This talk argues for a shift to consider also broader human values. Results were presented on two case studies with industry as to how they translate corporate values into software products. The main findings are that companies care about human values but currently have limited methods and tools for ensuring that software respects the values they care about. For more information, see http://www.ovislab.net.

3.5 Holding onto Disruption

Lisa P. Nathan (University of British Columbia – Vancouver, CA)

I was asked by the organizers of this seminar to address the topic "disruption". I was encouraged to "be bold". The boldness of this talk is not because I introduce an innovative values-in-computing design theory, methodology, or framework. Rather, the boldness is in extending an invitation. I invite you—computer scientists and academics whose research and teaching are entwined with computing technologies—to join me in facing our climate crisis. Frankly, a more appropriate term for what we face is ecocide, the destruction of our environment.

Across the globe environmental conditions are deteriorating faster than anticipated, causing suffering across species and ecosystems [3]. To gather at this prestigious scientific venue and continue to ignore the myriad connections between computing and our climate would be a stunning act of denial. I am not suggesting that this dire situation can be solved by 'values in computing', the topic of our seminar. Rather, in this talk I discuss how the norms of academia, computing in particular, are implicated by climate change. The accepted ways we go about research and teaching—our approach to computer science research, computer science education, applying for grants, reviewing papers, and traveling to conferences—are entangled with the shifting state of our world. Each of these activities is wrapped up with our climate. As professionals caught up in the rhetoric of digital technologies, each day we perpetuate and benefit from the forces that have led to this crisis. I say this not to assign blame, certainly not to suggest that we are individually responsible for the state of things, but to point to the incredible difficulties of extricating ourselves from the norms and expectations of our professional lives.

Scientists are unequivocal that each year will set heat records, larger and more violent storms, and rising, acidifying seas [7, 4]. Countless communities are experiencing the effects of climate disruptions, flooding, food crops failing, devastating fires, mass human migrations, etc. We are learning that early climate forecasts suffered from overstated optimism and understated threat levels [6], yet there continues to be a reluctance to appear alarmist in the

face of this disaster. Scientists' fears, my fear, of professional and public censure are part of why the issue slips from the mind [1, 2, 5]. In professional conversations I am wary of talking about it, because it makes people so uncomfortable. The topic is disruptive. Yet, the alternative is to ignore the research of climate scientists and others, which calls into question the purpose of the academic enterprise. Why is it deemed acceptable to ignore findings we find distressing?

This seed presentation is an attempt to make space within our discussions to consider the climate crisis and how it influences our work. I ask whether we can step away from discussions grounded by computing logics that privilege values of efficiency, speed, utilitarianism, control, and unlimited growth? Even if we are able to sustain our attention, should we address this emergency through the same ways of thinking, the same normative structures and systems, tropes and stories that created them? Changing dominant stories is hard, but we have models... many found in stories. I draw upon such unsettling stories in this talk. I encourage us to consider ways to face climate disruption together as the complicated, brilliant, flawed, arrogant, and creative professionals, academics, and human beings that we are. The forces that have caused this trouble, are a part of us, just as we are a part of the natural world. I argue to hold onto this knowledge of ourselves as we strive to change our ways of being in the world.

Or will we carry on as "normal", letting the research and our climate emergency slide out of our minds once again?

References

1 Keynyn Brysse, Naomi Oreskes, Jessica O'Reilly, and Michael Oppenheimer. 2013. Climate change prediction: Erring on the side of least drama? Global Environmental Change 23, 1 (February 2013), 327–337. DOI:https://doi.org/10.1016/j.gloenvcha.2012.10.008

2 J. E. Hansen. 2007. Scientific reticence and sea level rise. Environ. Res. Lett. 2, 2 (April 2007), 024002. DOI:https://doi.org/10.1088/1748-9326/2/2/024002

3 IPCC, 2018: Global Warming of $1.5°C$. An IPCC Special Report on the impacts of global warming of $1.5°C$ above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

4 David Malmquist. 2018. Researchers issue first-annual sea-level report cards. Phys.org/news. Retrieved June 19, 2019 from https://phys.org/news/2018-03-issue-first-annual-sea-level-cards.html

5 George Marshall. 2015. Don't even think about it: why our brains are wired to ignore climate change (Paperback edition ed.). Bloomsbury, London Oxford New York New Delhi Sydney.

6 Reuters. 2019. Scientists shocked by Arctic permafrost thawing 70 years sooner than predicted. The Guardian. Retrieved June 18, 2019 from https://www.theguardian.com/environment/2019/jun/18/arctic-permafrost-canada-science-climate-crisis

7 M.M. Vogel, J. Zscheischler, R. Wartenburger, D. Dee, and S.I. Seneviratne. 2019. Concurrent 2018 hot extremes across Northern Hemispher due to human-induced climate change. Earth's Future (June 2019), 2019EF001189. DOI:https://doi.org/10.1029/2019EF001189

3.6 Education and Values in Computing

Elizabeth Patitsas (McGill University – Montreal, CA)

Education is an important means through which values in computing are spread, communicated, and encoded. In this seed talk I will be sharing and discussing two key concepts from the sociology of education: the hidden curriculum and Freire's banking model of education. I will also be discussing Sam Breslin's ethnography of CS education and how it teaches students to "render the world technical" , and what this means for values in computing. Finally I will encourage some critical reflection on our own values here in this Dagstuhl and the structures herein.

4 Lightning Talks

4.1 Technology and Neighbourhood Values

Ann Light (University of Sussex – Brighton, GB)

I contrasted the sustainability of managing idle capacity through sharing economy tools with the merits of collective local agency bred by caring-based sharing in a locality. I described how 'relational assets' form and build up over time in a neighbourhood to act as local socio-technical infrastructure to sustain alternative economies and different models of trust. I proposed digital networks of support for local solidarity and resourcefulness and suggested how technologies can be pro- or anti-futures in their characteristics.

4.2 In Search for PANDORA

Peter Reichl (Universität Wien, AT)

Recently, the necessity of an ethical consideration of the digital change has become evident also within the community of computer scientists as the responsible driving force, especially in the context of the ongoing discussion about autonomous vehicles and the ethical dilemmata they may be facing. In this way, however, only one of Kant's notorious three questions is addressed, i.e.: What can I know? What ought I to do? What may I hope? Similarly, it seems not enough to only consider "the good", but also other transcendentalia like "the true" and "the beautiful". Hence, I wonder whether ethics is indeed the appropriate philosophical field to deal with the issue of values in computing. Instead I believe that, eventually, this is a question of philosophical anthropology. This is in line with Günter Anders and his concept of the Promethean slope, i.e. the ever increasing gap between technological advances and human imperfection. The resulting search for PANDORA – a Philosophical Anthropology between Next-generation internet, Digito-Ontological Revolution

and Anticopernican turn (see www.homodigitalis.at) finally aims at answering also Kant's fourth and final question: what is the human being? What is the human being with respect to digital change, and what is the world we are currently building for him and her?

4.3 The Immorality of Artificial Emotions

Blay R. Whitby (University of Sussex – Brighton, GB)

Research into the simulation of human emotions is a major research theme in robotics, artificial intelligence, and cognitive science. Unfortunately, there is a very high probability that this research will be used – and indeed already is sometimes being used – in ways that are clearly unethical and dangerous. Artificial emotions (AE) research will facilitate the development of technology that can obviously be used to manipulate, exploit, and abuse humans. It is also an area in which there currently exist almost no legal or ethical restrictions. At present, work, on A.E. is at the level of crude simulation of emotions BUT it has been shown to be very effective at producing emotional responses in humans even when they know that it is merely a trick. This has been demonstrated empirically for example by Cynthia Breazeal (Breazeal, C., and Brooks, R. 2005) and Briggs and Scheutz (Briggs, G and Scheutz, M. ,2102). The opportunities for exploitation and manipulation are so great that there ought to be controls, if not a complete ban, on this technology. On balance therefore, it is time to scrutinize this area of work on moral grounds and abandon the assumption that it is always beneficial.

4.4 Ways of Thinking in Informatics

Christopher Frauenberger (TU Wien, AT)

Main reference Christopher Frauenberger, Peter Purgathofer: "Ways of thinking in informatics", Commun. ACM, Vol. 62(7), pp. 58–64, 2019.
URL https://doi.org/10.1145/3329674

In this short talk, I provide an overview of a University course "Ways of Thinking in Informatics". It is a 6 ECTS university course that is mandatory for all first-year students of Informatics bachelor studies at TU Wien. It was conceptualised by Chris Frauenberger and Peter Purgathofer in 2015, and is part of the degree programs since winter semester 2017. It was inspired by "The first five computer science principles pilots", re-interpreted through the lens of European scientific traditions. Chapters include scientific thinking, computational thinking, design thinking, critical thinking, economical thinking and responsible thinking. The aim of the course is to equip students with a range of perspectives that allows them to think about computing in different ways, enabling them to critically reflect on their education, research and practice.

4.5 Tackling Digital Resignation

Irina Shklovski (IT University of Copenhagen, DK)

The goal of this workshop is to consider the issues of values in computing and how to not only speak about these but also to intervene into the infrastructures and practices that need to be become more reflexive and aware if we are to have a better digital future than the relatively apocalyptic one that seems to be on the horizon. Yet the problems that we are tackling are so big, so looming, so distressing and so all-encompassing that at times it becomes too devastating to grasp it all. The other day one of my students asked: *How do you avoid getting really depressed when working on this?* Indeed, that is a good question. So along with considering the 'big' issues of values in design I want to raise a smaller concern that I believe is foundational as well. How do we teach about values in computing and the necessity of these considerations in ways that are not paralyzing? In efforts to intervene, education is one such intervention and I want to call for attention to approaches to teaching that can introduce critical issues in more pragmatic and practical terms that can promote more effective action from our students when they go on into the world.

4.6 Mobilization and Solidarity

Curtis McCord (University of Toronto, CA) and Dawn Walker (University of Toronto, CA)

During the first days of Dagvic, several participants expressed an interest in the history of activism both within the computer science profession (notably that of Computing Professionals for Social Responsibility) and around activism around computational technologies more generally. Given that many at Dagvic were keen to take more action in advocating for social and environmental justice causes, we wanted to make the case that working in solidarity with existing causes and groups outside of academic computer science can be effective, as well as theoretically rich. Our lightning talk showcased three key areas of value-driven technology development and activism, and to provide some examples.

A lot of important work is being done to develop Community and Mesh Networks, with the intention of creating equitable, empowering, and resilient telecommunications infrastructures. Examples of work in this area include:

- LibreRouter [2] and AlterMundi [3]
- Telecomunicaciones Indígenas Comunitarias (TIC AC) [4] and Rhizomatica [5] as well as other community networking organizations.

Owing to the proliferation of ICT-mediated employment, movements advocating for digital labour rights are emerging and exploring new ways of using computational systems to organize. Examples include:

[2] https://librerouter.org/
[3] https://www.altermundi.net/
[4] https://www.tic-ac.org/
[5] https://www.rhizomatica.org/

- Platform Cooperatives [6]
- justice4couriers [7] and justice4foodora [8]
- The Tech Workers Coalition [9] and the technwontbuildit campaign.

Work continues to be done to involve communities as active and credible participants in software and systems development work, to build local capacity, and to create information commons. Examples include:

- The Bristol Approach [10] to technology development and intervention, now being employed across Europe
- Digital Democracy [11], which uses digital technologies, such as mapping systems, to help marginalize communities advocate for their rights.

4.7 Deconstructing Values in Computing

Doris Allhutter (OEAW – Wien, AT)

Main reference Doris Allhutter: "Mind Scripting: A Method for Deconstructive Design", Science, Technology, & Human Values, Vol. 37, pp. 684–707, 2012.
URL http://dx.doi.org/10.2307/23474485

This talk asked what we can gain from connecting the research on values in computing with research on the normativity of computational methods and concepts. In computing, we encounter different kinds of values: epistemic values and social values, stated values or reflected values, explicit and implicit values, but often there are implicit or invisible implications of either of these values. Values are inscribed to and at the same time enacted by computational methods, concepts, and ways of thinking in multi-layered ways. They are entangled with norms and mundane beliefs and the social power relations that are coproduced through practices of computing.

This raises the question of what different methodologies we need to deal with different sorts of values and their complex entanglement with computing. I suggest that DECONSTRUCTION opens up perspectives that go beyond reflecting on values and on how to translate them to systems. It contributes to understanding the implicit entanglements of values and to reflecting and redefining concepts and methods applied in computing.

For example, recently research on bias and discrimination in machine learning and AI has emphasized the need for multi- or interdisciplinary approaches to get a grip on the complex intertwining of social power relations and technical norms and practices. Clearly, this multi- and interdisciplinary research includes different normative frameworks and ways of thinking that need to be negotiated. This is complicated by the fact that these frameworks are not fully transparent and ready for reflection. We need to ask: how do we (computer scientists, developers, inter- and transdisciplinary teams) mobilize values, norms and implicit assumptions in our practices (research and development practices)?

[6] https://platform.coop/
[7] https://www.justice4couriers.fi/
[8] https://www.foodstersunited.ca/
[9] https://techworkerscoalition.org/
[10] https://www.bristolapproach.org/
[11] https://www.digital-democracy.org/

In my research, I use deconstruction to trace the implicit normativity of computing practices. I am currently organizing a number of workshops using a method called 'mind scripting', a deconstruction method based in theories of discourse, ideology, memory and affect that uncovers and negotiates the implicit assumptions in practices of computing and how they are entangled with values, norms and mundane beliefs [1, 2, 3]. In these workshops a group of six to ten participants starts either 1) from a computational problem to explore its normativity, or 2) from a value question. It also works great in teaching. If you are interested, please get in touch: dallhutt@oeaw.ac.at

References

1 Allhutter, D., Berendt, B., et al. forthcoming. Deconstructing Practices of 'Debiasing in Machine Learning', in preparation.
2 Allhutter, D. 2012. Mind Scripting: A Method for Deconstructive Design. In Science, Technology & Human Values 37(6), 684-707.
3 Allhutter D. & Hofmann, R. 2010. Deconstructive Design as an Approach to Opening Trading Zones. In J. Vallverdú (Ed.), Thinking Machines and the Philosophy of Computer Science: Concepts and Principles, Hershey/New York: IGI Global, 175-192.

4.8 Theoretical and Methodological Approach to Studying the Role of Human Values

Emily Winter (Lancaster University, GB)

This talk presented a theoretical and methodological approach to studying the role of human values in software production. Values are too often dismissed as something 'fuzzy'. We wanted to explore how to study values in a way that could speak effectively to the software engineering community. To do this, we turned to psychological values theory (particularly the work of Schwartz and Maio) and the Q-Sort, an established card-ranking method that produces both qualitative and quantitative data. The Q-Sort exercise – as a systematic task – was appealing for industry-based software engineers, and the data allowed us to analyse the role of values at the three levels identified by Maio: the system level (how values relate to each other); the personal level (how individuals interpret values); and the instantiation level (how values are manifested through behaviours).

4.9 People Involvement in the AI System Development Life-Cycle

Juliana Soares Jansen Ferreira (IBM Brazil Research Laboratory – Rio de Janeiro, BR)

Joint work of Juliana Soares Jansen Ferreira, Clarisse Sickenius de Souza
Main reference Rafael Brandão, Joel Carbonera, Clarisse S. de Souza, Juliana Jansen Ferreira, Bernardo Gonçalves, Carla Faria Leitão: "Mediation Challenges and Socio-Technical Gaps for Explainable Deep Learning Applications", CoRR, Vol. abs/1907.07178, 2019.
URL https://arxiv.org/abs/1907.07178

In my lighting talk, I briefly talk about my current research topic, which is related to investigate different people involved in the AI system development life-cycle. I am particular interested in professionals that have a lot of experience on designing and developing systems

that now need to adapt, create or even "forget" practices, tools, models they are used to adopt to develop system in the AI paradigm. Some research findings related to this research are found in the paper "Mediation Challenges and Socio-Technical Gaps for Explainable Deep Learning Applications" [12]. I was also the author of a book that presents the SigniFYI Suite, which is a resourceful tool for the research I am doing. The SigniFYI Suite consists of a set of conceptual, methodological, and technical tools that aim to support the study of meaning-making and meaning-taking processes in software design, development and use. See details at the book "Software Developers as Users: Semiotic Investigations in Human-Centered Software Development"[13].

References

1 Brandão, R., Carbonera, J., de Souza, C., Ferreira, J., Gonçalves, B., & Leitão, C. (2019). Mediation Challenges and Socio-Technical Gaps for Explainable Deep Learning Applications. arXiv preprint arXiv:1907.07178.

2 De Souza, C. S., Cerqueira, R. D. G., Afonso, L. M., Brandão, R. D. M., & Ferreira, J. S. J. (2016). Software Developers as Users. Cham: Springer International Publishing.

4.10 The Discontinuous Future

Steve Easterbrook (University of Toronto, CA)

We speak of research agendas, curriculum change, working with practitioners, etc, as if the future world (over the next decade or so) will be like the present world. It won't be.

The next decade will be marked by a struggle for rapid transformational change throughout society, and the outcome of that struggle will determine the future of human civilization. Yet everything we've mapped out speaks of incremental change. It's a gradualist agenda that talks about working with existing companies, existing curricula, existing research labs, nudging them to take human values a little more seriously in their work.

But if you take seriously the confluence of (at least) three serious and urgent crises, it's clear we don't have time for an incrementalist approach:

1) The climate crisis, in which digital technology is deeply implicated. The carbon footprint of computing is growing dramatically, because we're putting the internet in everything, and it's amplifying all the worst trends of our disposable, consumerist society. Silicon valley's model of innovation ("move fast, break things, and leave others to clear up the mess") has focussed for so long on finding new ways to monetize our data that we've forgotten what innovation really looks like. A reminder: over the next decade or so, we need to completely transform our energy infrastructure to reach net zero global emissions. We can't do this while silicon valley continues to hoover up all the available investment capital.

2) Automation and AI, which threatens to destroy any notion of a stable job for vast sectors of society, and which replaces human empathy for the cold, impenetrable injustice of algorithmic regulation (How do we just say "no" as a society to such technologies?).

[12] https://arxiv.org/abs/1907.07178
[13] https://www.springer.com/gp/book/9783319428291

3) The dismantling of democracy, through the use of ubiquitous digital surveillance by autocrats and corporatists, and the exploitation of (addictive) social media as a vector for extremist propaganda designed to pit us against one another.

So we should be striving for a much more radical agenda that envisages the wholesale end to the technological solutionism of Silicon valley, turning it into a humble enterprise that places human dignity first. We need to dismantle the stranglehold of the big five tech corporations, break the relationship between digital technology and consumerism, and give ourselves the power to ban some technologies completely. We should not put activism in a box. As academics, activism should infuse all of our teaching, all our research, all our community engagement. If we're not working for transformational change, we're reinforcing the status quo.

Put simply, we need to recognize the unique historical moment we find ourselves in, and the role computing has played in our current existential crises.

5 World Café's

5.1 World Café Report: Understanding Values in Computing

Austen W. Rainer (Queen's University of Belfast, GB)

The group discussions comprised five different groups discussing the prompt statement, "Understanding of Values in Computing". Each group talked for about 20 minutes. To encourage divergence, each group made notes on a separate sheet of paper, and did so without seeing the sheets completed by other groups. There were different dynamics for each group, though all groups were constructive and thought-provoking. There were a variety of contrasting ideas raised by each group. There were wide ranging discussions, consistent with a divergent approach.

Potential themes emerging from the discussions were:

1. The definition of values: What are values? How are values distinct from norms, principles etc.? (This has already been explored in a paper published by Ferrario and her colleagues [1]. Does it make sense even to try to define values precisely?
2. Values-in-relation: How do values relate to other values, to emotions, to motivation, to promises, even to identity? How do values relate to actions, decision-making, outcomes and impact?
3. Negotiation of values: How can we negotiate, compare, align, contrast, balance values?
4. Technology (broadly defined): How can we develop new tools, methods etc (or reuse existing tools, methods etc.) to work with values, e.g., to discover them, compare them, prioritise them?
5. Example: using privacy as an example, is privacy a value? To whom is privacy a value?
6. One potential next step is to converge the divergent ideas, so that they coherently relate to computing, as per the theme of the week, Values in Computing.

Content of individual discussions:

Group 1

1. What interests us – the Dagstuhl attendees – about values?
2. Why are values valuable to us?
3. How do we distinguish values from x, where x is from the set ethics, norms, principles, ...?
4. How do values relate to Ways of Thinking?
5. What research questions might emerge from these discussions?
6. How do assumptions and perspectives of different roles relate to values? For example, an engineer is motivated to 'solve' a 'problem' whilst a scientist is motivated to understand the world: does this suggest different values?
7. How do personal values relate to professional values? What clashes or conflicts arise between personal and professional values? What internal conflicts arise from balancing multiple personal values, or from balancing multiple professional values? Does this give rise to ambivalence toward values?
8. How do we negotiate values?
9. As an example, what values arise with regards to marriage vs values with regards to a civil partnership?
10. What tools and methods are there, or do we need, to help us work with values e.g. to discover values?
11. Other comments (as bullet points): Explicit values, Context, Relational, Political, Norms, World knowledge, Reflected values, Revealing value / discovering values.

Group 2

1. How do we understand the phrase, "Understanding of values (in computing)"? What does the phrase mean?
2. How do we align values between communities, e.g., between software developers and end users? What contrasts are there between awareness of values, negotiation of values, and alignment of values?
3. Can we – should we – talk about a universality of values? Or a plurality of values? What about a dialect of values?
4. How can we 'stand' in tension with values? Assuming that it is not possible to arrive at a consensus of values, how do we live with tension (conflict) between values (e.g., from different stake-holders)?
5. Unresolved tension (conflict) may itself be valuable in the sense that it is fruitful for encouraging thinking, reflection etc. In other words, tension can be positive. We can use value tension as some kind of resource or catalyst.
6. In contrast to resolving tensions, or optimising values, it may be helpful to think in terms of satisfying values.
7. Do we want to define value? Defining value risks 'freezing' the concept. As a contrasting example, laws sometimes do not define a word/concept (e.g., "reasonable") leaving it to 'practitioners' (and lawyers) to define it in practice.
8. Assuming we cannot – or should not – define the concept of value, can we pin down the 'corners' of the concept enough that we can have a conversation?
9. To what degree are values embodied? We talk about understanding values but they are understood by someone... specific situated lifeworld.
10. To what degree are values situated, and contextual?
11. Who is the "us" that has a value?
12. Would it be more insightful to think in terms of valuing rather than value?
13. What is the relationship between values and promises?

Group 3

1. How do we make a general discussion about values more specific to computing, i.e., values in computing? Values can be defined simply as: what is important, when, for whom, and under what conditions.
2. Is "values" the appropriate word (concept) to use? What about values in business, or values in systems?
3. Why are we talking about values in computing?
4. Why are we motivated to be an engineer, or a scientist, or an artists? Does this motivation convey something about our values?
5. What is "values"?
6. Whose values?
7. Does the situation affect whether a person even thinks about values? Everyday situations may not require, or trigger, values. How do values relate to actions and to decision-making?
8. How do values relate to decision theory?
9. Evidence Based Software Engineering (EBSE) talks about integrating best evidence from research with practical experience and human values: is there the opportunity to connect Values in Computing with EBSE?

Group 4

1. What does the phrase "Understanding of values" mean?
2. How do values relate to requirements? A possible model might be something like: (knowledge, context, experience) → values → decision → action → outcome → impact.
3. What is the relationship of emotions to values?
4. What are the barriers or facilitators of decisions? How do these relate to, or affect, values?
5. Values are relational, with the well-known Schwarz model of values.
6. Are values multidimensional, e.g., individual – team, company – industry, society, users.
7. Is there a temporality of values?
8. What perspective 'frames' a value?
9. Can we develop tools that allow us to map the values of stakeholders as software progresses through the lifecycle? For example, what are the values of the project managers during the requirements phase? How do the values of developers compare with those of end-users during the acceptance testing phase? Do the values change over the course of the project to develop the software?
10. What about the decommissioning of software: what values are 'active' at that point? The software industry has the well-known 'iron triangle' of: cost, time (schedule) and quality. This iron triangle conveys three values. Another example is: information, energy, time (citation: Daniel Spreng)
11. Are values goals that are important, valid, legitimate?
12. Is there an ordering to products and values e.g., values first then products, or products first then values?
13. Is there a hierarchy of values?
14. In a conflict of values, what value/s get sacrificed?

Group 5

1. Understanding is not measurable.
2. Values are not universal (in the sense of not being static)
3. Are values what drive you to do something? In other words, values motivate?

4. Values may drive (motivate) an individual or a group.
5. Can culture be understood as values?
6. Values are not inherently positive or negative, but may lead to positive or negative outcomes or consequences.
7. Perhaps we should think in terms of valuing rather than values.
8. Given privacy as an example, then: Is privacy a value? This may depend on whether privacy is something that is important to someone. Different cultures place more or less importance on privacy (e.g., USA vs former USSR-bloc countries) suggesting that privacy is a value for some cultures and not (much of) a value for other cultures. Different contexts might also entail different relations to privacy. There are multiple conceptions of privacy. Rather than a value, privacy may be understood as a state.
9. How does privacy contrast to secrecy?
10. How does individual privacy contrast with community / collectivism?
11. There may be levels of abstraction, for example: I have an awareness of something, e.g., privacy I then decide on whether that something is valuble Technology has supported the 'deployment' of a set of values into other cultures, e.g., the values of corporate America are 'deployed' into other countries through user agreements, GDPR (do the degree that GDPR represents or contains values) has implications for non-EU countrieser cultures, e.g., the values of corporate America are 'deployed' into other countries through user agreements, GDPR (do the degree that GDPR represents or contains values) has implications for non-EU countries.
12. Would it be more helpful to think in terms of value systems rather than values?
13. What is the relationship of values to (personal, community) identity?
14. What is the relationship of values to emotions?

References

1 Winter, E., Forshaw, S., Hunt, L., & Ferrario, M. A. (2019). Towards a systematic study of values in SE: tools for industry and education. In Proceedings of the 41st International Conference on Software Engineering: New Ideas and Emerging Results (pp. 61-64). IEEE Press.

5.2 World Café Report: Research Challenges

Christoph Becker (University of Toronto, CA)

Joint work of All participants of the seminar

5.2.1 Overview

The five rounds of discussions on research challenges were intense and broad-sweeping. Most rounds centered around one particular cluster of themes. That also means there is much unexplored territory.

A few key themes stood out.

1. **Empirical approaches** to eliciting, representing, reasoning about values from multiple angles
2. **Interdisciplinarity:** Challenges, specific modes of thinking about it, and research designs
3. **Education** research
4. The importance of **framing**, perspective, and historical understandings.

5.2.2 Empirical approaches

Given a project (recent, current, or commencing)… how can we identify, uncover, make visible, represent the explicit and the implicit values that 'really' drive (guide, shape, constrain) the project? (Q1)

We used Q1 to explore how different research designs would approach this question; what disciplinary and inter-disciplinary perspectives they would center; what questions of research design would surface; what we could learn; and what research challenges are waiting there. An interesting set of rough designs emerged quickly, covering action research, design-oriented research, project-focused case study research, mixed-methods analyses of specific phenomena, and designs focused on psychology/sociology tools for elicitation; as well as retrospection and post-mortem analysis of a project as part of reflective practice. We then used Q1 to explore what methods and research tools this type of research would require. An example (by Maria Bakardjieva) is the inscription of subject positions in platforms supporting democratic processes. One method may see technology as text to be critically deconstructed. A complementary method would perform empirical studies of projects.

5.2.3 Challenges of interdisciplinarity

We aimed to steer the discussions clear of exhaustive elaboration of all the challenges, including the barriers built into current academic disciplinary systems, but to focus instead on some aspects that seemed productive.

Ways of understanding technology-people relationships *across* disciplinary perspectives were discussed. We observe the spectrum of disciplines. Traditionally, scholars on each end of a spectrum from computing/natural science to social construction and science and technology studies have struggled to see the other end. Interestingly, new generations of scholars are more comfortable in bridging – (e.g. people using Machine Learning in Critical Data Studies; using ethnography in HCI, etc). How can this be supported? What are practical ways of bridging and of supporting the bridging?

This requires a better and more systematic understanding of the nature of interdisciplinary work: What kinds of interdisciplinary 'regimes', as Clarisse de Souza calls them, are more or less effective in the space of *Values in Computing*? Interdisciplinary regimes are configurations of ontology/epistemology/methodology/axiology relations. Typical patterns include the application of one discipline's framework to address a question in another discipline's domain; the transfer of one method to another domain; but there are many others. 'Patterns of regimes' for *Values in Computing* will be a very valuable resource, providing reusable research design knowledge and contextual reasoning around how what is effective.

What skills are needed to engage in this type of research? Two are identified here: (1) the ability to transcend one's own worldview and understand the role of worldviews across disciplines; (2) the ability to navigate variations in scale of time/space of interest to disciplines.

What are the values embedded in the research methods we use and the research we do?

5.2.4 Educational research questions

An expected learning outcome we agree on is for students to become aware of the normative implications of computing.

Since there is a field 'public understanding of science', there should also be a field 'public understanding of technology'. Professionalization and relates to the issues of hyper-specialization and exceeding divisions of labor, which have often brought up as a factor in the lack of understanding of computing and other technological work as political – since everyone only sees only a tiny piece of the overall systemic work, the politics of the whole remain invisible.

We would like to see solid empirical research exploring longitudinally the effectiveness of pedagogical methods and practices of getting CS students to relate their values to their technical work. This could involve comparisons across institutional settings, countries, disciplines or cultural aspects.

How can education help future professionals in escaping/transcending operationalist conceptions of "values" in computing?

5.2.5 Framing

Different framings are brought up at different points:

1. **Value as a verb**. We speak about 'values' as nouns a lot. What about 'value' as a verb? *Valuing in Computing* brings the action of the subject to the foreground.
2. **An axiology of computing?** One way to frame our work is this: We want an axiology of computing (as in ontology, epistemology, methodology, axiology).
3. Values as the frame for other issues: We seem to begin many conversations looking for the values in something – whether computing in general, or systems, or groups, or organizations... Lisa Nathan reframes it: How do values help us to understand X? (a project, a system, an issue (such as privacy, cf. VSD work). In this framing, values provide a generative way of thinking with values. For example, Nissenbaum's work focuses on the context and situation.

5.3 World Café Report: Values in Computing in Education

David Hendry (University of Washington – Seattle, US)

Joint work of All participants of the seminar

Computer science holds potential for great benefit. And, harm too, for example: Fueling consumerism through psychological manipulation of individuals, including children; Undermining democracy; Unsustainable energy and resource demands. Hence, computer science can no long ignore such values as human dignity, human well-being, and environmental sustainability. Moving beyond engineering values – performance, scale, reliability, and correctness – computer science needs new criteria for judging the quality of systems and for holding engineers accountable.

Discerning the potential benefits and harms of the discoveries and inventions of computer science is not simply a technical matter. Nor is it a matter that is readily placed within the social sciences, law, or politics. Instead it is a matter that requires knowledge and skills for engineering, together with the social sciences and humanities.

The key question: How can students in engineering be positioned to be responsible engineers? One response is to draw on the agenda of Values in Computing to include new learning objectives that will enable students to account for human values in a principled and systematic manner throughout the design process.

Pointing the way are recent efforts by the IEEE and other professional organizations. See for example:

The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems (2019). Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems Actions, First Edition. IEEE. [14]

Like Ethically Aligned Design, Values in Computing is action- and process-oriented. By taking a design stance rather than solely an analytic, critical stance, Values in Computing goes well beyond "computer ethics" and "professional ethics."

The adoption of Values in Computing in higher education might be achieved by considering the following areas of change:

1. Culture: Cultural change within departments of computer science. The Values in Computing educational agenda will require commitment from departmental leadership and professional organizations toward a systemic cultural change.
2. Curricula: New learning objectives. New learning objectives that cut across the degree program will need to be developed. Not all courses will address all new learning objectives.
3. Pedagogy: New tools for learning. Individual instructors will need support in developing and appropriating new educational methods. Note: Teaching practices in computer science are currently being questioned and seem poised to undergo a major transformation in the next 5 years.

To address these three areas of change, one conceptual approach would be to develop a *model curriculum*. The model curriculum would offer an idealized target, including recommendations on culture (commitments to a future), curricula (what to learn), and pedagogy (methods that lead to successful learning). To assist departments in adopting the model curriculum, a set of *appropriation strategies* will be needed, acknowledging that different departments will have different capacities and interests for adopting the model curriculum. When considering the international context, appropriating strategies become particularly important.

Looking to the future, the following elements might be developed to fill in the areas of culture, curricula, and pedagogy. Activist student groups. Support the development of student groups that mobilize with activist agendas. (e.g., Environmental sustainability and engineering.)

Culture: Cultural change within departments of computer science. The Values in Computing agenda will require cultural change within the department, catalyzed by such commitments as (examples):

1. Diversity, Inclusion, and Equity. Engaging anti-oppression strategies related to student mental health, ethnicity, gender, family conditions, physical abilities, and so forth.
2. Responsible Innovation. Students will be responsible engineers and innovators.
3. Technology is Non-Neutral. Politics matter. A critical constructivism is necessary.

[14] https://standards.ieee.org/content/ieee-standards/en/industry-connections/ec/autonomous-systems.html

4. Beyond Engineering Values. Engineering must move beyond efficiency, scale, reliability, correctness and other engineering values to human values such as human well-being, human dignity, and environmental sustainability.

Employer needs: Employers will seek students with skills and knowledge for Values in Computing because such students will have distinctive knowledge and skills that will give a competitive advantage. Institutions. Different institutions will have different goals, needs, and aspirations.

Learning objectives (across the degree program). Examples:

1. Demonstrate that computer programs, algorithms, and data sets are non-neutral
2. Using a rubric of social elements, write a critical reflection on the possible upsides and downsides (benefits and harms) of a proposed technology
3. Conduct a threat analysis of a software system from the perspective of vulnerable stakeholders
4. Apply methods for addressing value tensions and develop value-based rationale for design choices
5. Design a participatory workshop and demonstrate skills for moderating a workshop
6. Describe and give brief definitions to 10 human values
7. Describe 10 technical features/mechanisms that support these values
8. Apply the precautionary principle to develop a rationale for stopping a project
9. Conduct a requirements analysis that identifies values analysis that identifies values
10. Develop implementation requirements for operationalizing a small set of human values.

Students – Different students at different levels will engage the cross-cutting learning objectives to different degrees and different levels of depth.

Professional Identity- Engineering and computer science students will develop a professional identities that includes engineering competency along with socially critical mindset. Reflective Practice provides an intellectual basis [1].

Questions:

1. In technical design and engineering, what do students need to know about social science, policy, law, and governance?
2. How do we teach students to recognize the limits of their expertise?
3. What kind of language must students learn in order to be able to identify the right domain expertise they need to engage as well as how to speak to these domain experts effectively?

References

1 Schön, D. A. (1938). The reflective practitioner. New York, 1083.

5.4 World Café Report: From Principles to Software Industry Practice

Jon Whittle (Monash University – Clayton, AU)

Joint work of All participants of the seminar

The group "Translation into Practice" considered how the great ideas/concepts/thoughts from the Dagstuhl seminar so far on "values in computing" could be moved into professional practice. That is, how can our community influence the software industry and other practitioner communities to take up the cause of values?

At a high level, we are aiming towards a translation from a conceptual space to an activity space: **Conceptual Space → Activity Space**

That is, how do we translate high level concepts around valuesto concrete activities that software practicioners can carry out? The answer depends on whether the values are externally imposed (e.g., by society, legislation) versus internally imposed (e.g., corporate values).

The groups came up with the following key considerations/themes.

1. **Study existing cases to identify "best" or "worst" practices**
   Values are embedded in all design decisions, so we have a lot of data on which to draw on! By undertaking case studies, we can elicit examples of how (good or bad) values have been implemented in products. For "values disasters" such as Cambridge Analytica, Molly Russell, VW emissions scandal, we can reverse engineer what went wrong and come up with mitigation strategies. For exemplars, we can derive best practice guidelines.

   In particular, it is important to study a range of cases from different communities: e. g., corporate versus not-for-profit versus activist developer versus open source communities. Each deal with values differently.
2. **Speak the language of the practitioner communities**
   We are ultimately reliant on software practitioners to implement any values-related ideas/concepts. To be successful, therefore, we need to speak their language. Simplicity is key. Academic language and terminology will not be understood or welcomed by practitioners. We need to find a way to distil complex, nuanced notions into simple language and provide supporting guidelines, methods and tools that are super lightweight and fit into existing practices: evolution of practice rather than revolution. One example that has proven to work well in the past is the notion of a "Roadmap" that outlines the future global directions and constraints for practitioner communities to respond/fit into (cf. Industry 4.0 roadmaps). Such roadmaps may be defined at state level or at sector level.
3. **Work within the realities of industry**
   Values are complex, infinite things. But different communities work within very real constraints that values work needs to consider:
   - budget realities (values relevant work is often the first to be cut in tough financial times)
   - timeline realities (industry cannot afford to take a long time over "properly" considering values)
   - simplicity realities (see point 2 above)
   - finitary nature realities (dealing properly with values is never-ending but industry must "finish" products)
4. **Influence key practices to include more reflection**
   We need to influence/change key practices in management, requirements and design, learning. A key concept is self or group reflection: how to change activities of these actors to instil natural reflection on values?
   - Management: values are actually very prevalent in management culture right now with lots of training provided to leaders on culture and values. How can our community improve or influence this?
   - Requirements and Design: how can we adapt software engineering practices and methods to include values?

- Learning: software professionals are continual learners (by necessity, since technology changes quickly); they take both formal and informal learning opportunities. We should provide easy-to-digest learning opportunities on values (e.g., microcredentials, MOOCs).

One approach is to build communities of practice that support these. Another is to influence political channels such as the Informatics Europe Board, ACM, IEEE, BCS or The Chartered Institute for IT.

5.5 World Café Report: On Politics

Christopher Frauenberger

Joint work of All participants of the seminar

The starting point for the theme at this group was: Creating technology is an inherently political activity. How do we get computer scientists, interaction designers and technologists to recognise and engage with their political role? Saying, "I just did the tech" will not be good enough.

In five rounds, all participants of the seminar spent around 20 minutes at this table. The work by previous groups was summarised for each new round, before initiating discussions by asking participants where and when they experience their work as being political? Where and when they bring their politics to work and if they experience any barriers to do so.

The following is a thematic summary of the discussions at this table:

Identifying Political Arenas and Their Power Dynamics:

- The market (the power of the consumer/unions etc)
- Policy making (through institutions, consultation, lobbying) – steering funding, future research agendas, policy around techonsultation, lobbying)
- Teaching – (hidden) curricula, what do future technologists need?
- Public outreach – making our opinions heard in the general public
- Academia itself is a political arena (policing disciplinary borders, distribution of resources...)
- The politics of code and platforms (open source, commercial lock in)
- Politics in the making of artefacts/services

Modes and Conditions for Participation in Politics:

- Who has a voice? Who is invited and who is marginalised, not heard? Who has access to making change?
- Power structures determine leverage
- Knowledge, a forum and a standing is necessary to participate
- Infrastructures empower/marginalise participation

As academics we are in a privileged position to speak up and that come with a responsibility to speak up? However not all academics are so previliged, there are academic and pragmatic pressures that limit the perceived agency to bring our own politics to the research we are doing (or to our teaching). Pragmatic choices need to be made in order to safeguard one's career/PhD. Often academics do not recognize the politics inherent in the kinds of research questions they ask or research methods they leverage and this is more common to junior scholars. This recognition is key to understanding how to position their work more effectively.

Examples in (project) work in which politics became visible: The notion of a *Moratorium*: When have we ever stopped doing a project because we thought it was a bad idea? How much personal politics can you bring to your work? It depends on the agency to speak up. A common dilemma is working with the military.

Example of challenges to bringing politics to work:

- Undermining legitimisation (you are not a scientist – but there are many other scientists that say something else, what has this to do with the science etc).
- Legal challenges when calling out unethical practices – are we protected as political actors?

Politics in Teaching: There is always a hidden curricula / agenda. Do political opinions belong into the classroom? Management often says no (which means, often political teachers seek to fly under the radar). On the other hand Universities are often places / spaces for resistance in oppressive regimes – do we feel we can/should revive this tradition?

Broadening Participation: ...both in the actual design and creation of technology and the big question of what we want (negotiating future alternatives)

A useful theoretical lens may be to think about Matters of Concern (Latour). The question may be a) what is a matter of concern and b) how do we configure people around matters of concern. Different levels of participation are possible (access to change from above and the Arnstein ladder of participation)

Politics and Expertise: In decision processes, often there is participation in a high-level political arena. However, then experts are taking over to finish the job – this is where a lot of politics happens, but it is hidden. Therefore, we need to thing about *Re-politicising the experts (and thus computing experts)*

Related narratives / arguments:
Slavoj Zizek points out that when Romano Prodi was installed as head of an expert government, it was sold as neutral technocrats to the people of Italy while Prodi was a Goldman Sachs manager.

Google programmers protested and have successfully moved the company to abandon their weapons program – it needs a few millions users to shift a company's position, but maybe only a few hundred engineers

Filling the Political Vacuum: Very fundamental decisions for our society are now being made very explicitly outside the political realm (Facebook, Google, Microsoft...) How can we get them to operate in the political arena?

5.6 World Café Report: Values Activism, Outreach, Mobilization, and Narratives – Learning from CPSR

Leah Lievrouw (University of California at Los Angeles, US)

In the first days of the Seminar, several conversations were sparked among participants who recalled the outreach efforts and effectiveness of the organization Computer Professionals for Social Responsibility (CPSR). Although CPSR was founded in the early 1980s and

officially disbanded in 2013, its influence in setting a value-driven agenda for computing practice, particularly in the U.S., was considerable. It was the launching point for spin-off advocacy organizations like the Electronic Privacy Information Center (EPIC) [15] and the Electronic Frontier Foundation (EFF) [16], both of which continue their work today as highly visible and effective public voices in computing-related social controversies. CPSR also launched the highly-regarded Participatory Design Conferences (PDC, now run under the aegis of the Design Research Society [17], which are still held biannually, and the Directions and Implications of Advanced Computing (DIAC) seminars, both of which have published proceedings. CPSR also sponsored the prestigious Norbert Wiener Award for Social and Professional Responsibility, whose recipients included Douglas Engelbart, Joseph Weizenbaum, Barbara Simons, and Mitch Kapor. The Dagstuhl participants wondered what, if any, aspects of CPSR might serve as a model, or whether new strategies, approaches, and techniques might be needed to launch a sustainable values-in-computing movement, encourage values activism, and influence professional practice in today's cultural and technical environment dominated by social media and new "leaderless" modes of movement organizing. Based on preliminary seminar discussions that identified values activism and the need for narratives to help communicate a values-in-computing agenda as a key theme for exploration, a world café exercise was conducted on the second afternoon of the seminar. Five different groups of participants (about 25 people in all) engaged in brainstorming sessions to articulate the essential aspects of values activism that might be incorporated into the Seminar's outcomes and products. Predictably, the discussions ranged widely, from the highly theoretical to on-the-ground pragmatism. However, three broad clusters of ideas/concerns emerged, which can be characterized as "the who," "the how," and "the what" of values activism.

Who plays a role or is a relevant stakeholder in values activism? A principal concern of the world café participants, perhaps unsurprising given the crossdisciplinary quality of the groups, was identifying potential key players in movement organizing and collective action around values in computing. The first question in this respect was whether computing professionals should be the primary constituents (or perhaps "vanguard," in the language of social movement studies), or whether a looser coalition structure among different groups with allied aims, for example data activism or civic hacking movements, would be more effective. CPSR was conceived and operated very much as a professional vanguard, setting agendas and raising visibility for values and ethical issues in computing, but arose in response to an academic and private-sector work environment dominated by defense funding and firms, and specifically U.S. President Ronald Reagan's Strategic Defense Initiative (SDI, popularly criticized as "Star Wars"). The situation today, with widespread public engagement with computing and the domination of a small number of highly concentrated commercial technology firms and platforms, may require a different approach.

1. Should any activist efforts be led by credentialed, "legitimate" or organized professionals only? e.g., ACM Computers & Society SIG; Partnership for AI; EUSSET.org; LCA, SLCA; relevant government or regulatory agencies; etc.
2. Or would it be more useful to form alliances or coalitions with grass-roots, "amateur" or volunteer activists, or solidarity with "worker" movements. For example, Tech Workers Coalition, right to repair movement, FemPower Tech or Extinction Rebellion. Furthermore, in relation to the public sectors – librarians, civil service, teachers and cultural workers.

[15] https://www.epic.org
[16] https://www.eff.org
[17] https://www.designresearchsociety.org/events/participatory-design-conference

Next, the gig workers, hackers & bug bounty hunters, makers, technology service workers, data activists and civic hackers, open source or FLOSS communities, Fridays for the Future can also be considered.
3. Enlistment of private-sector technology firms with strong commitments to corporate social responsibility (CSR) or maintaining public goodwill might also be useful – e.g., participants in "Partnership for AI" joining industry and advocacy organizations.
4. Movement/action repertoires may be generational; What worked for CPSR may no longer be sufficient to mobilize across stakeholder groups.

Participants also identified potential problems with the tension between a more centralized vanguard and broader coalition structures, namely problems with maintaining solidarity across groups with different aims, and the risk of diluting a clear values agenda, message or narrative.

How to launch, organize, and mobilize collective actors and action to maximize engagement with relevant stakeholders/publics? What possible action strategies & tactics or activist "repertoires" might be employed?

Another major theme of the world café exercise on values activism was what activist interventions, tactics and methods might achieve, which movement objectives. A range of possibilities were articulated, for example:

1. Direct engagement with and education of user publics (e.g., cryptoparties, teaching people how to stay safe or preserve their privacy online, how to understand user agreements or complex financial technologies, designing curriculum or teaching plans for schools, art practice/exhibitions, producing online media such as a YouTube channel or full-length documentaries like Terms and Conditions May Apply).
2. Building on the current public sense of outrage or powerlessness with respect to digital technologies, for example by participation in public meetings/town halls/demonstrations, lobbying campaigns to inform and influence politicians & regulators, creating media packages or writing op-ed pieces, etc.
3. Develop a values agenda and teaching tools for professional education in relevant disciplines (another major theme of the Seminar).
4. Organizing conferences, symposia, opportunities for sharing experiences and "what works".
5. Identifying funding sources for organizing: public, foundation, relevant industry sources

What in fact is the values agenda? What needs to be changed? What futures do we envision? The third and most difficult aspect of the values activism world café exercise turned out to be the articulation of the values-in-computing agenda itself, given that no specific values or perspectives had yet been formulated by the Seminar in plenary discussions. As one participant put it, "Aren't we supposed to be answering this in the Seminar this week?"

1. The spectrum from "What is to be done?" (Lenin) to the ironic "What is our one demand?" (Occupy) is wide: where does a "values in computing" movement lie on the spectrum?
2. Two major matters of concern in public discussion now are (1) Tech industry concentration and monopoly behavior, and consequences; (2) Pervasive capture and exploitation of personal data, especially to steer political power and outcomes.
3. What theories or values frameworks might be the basis on which to build a values agenda? Human rights? Care ethics? Social justice? Economic equity/political economy? Environmental justice? Place/groundedness?

4. Values perspective from the legacy of participatory design (PD), originally linked to unions and labor control over technical work: PD has diffused differently in different cultural, economic and national contexts but we might identify what values embedded in PD that were once "radical" have now become normative. Doug Shuler's leadership of the Computers & Society SIG may be instructive.
5. Possibilities include the right to repair; transparency; fairness/equity; "post-growth," cooperative action not competition; justice; voice; awareness of place or groundedness; sustainability; responsibility; the German Academy of Sciences focus on "responsibility," etc. Each may "mobilize different parts of the world".

6 Working Groups

6.1 Values in Computing – *Action*

Maria Bakardjieva (University of Calgary, CA), Doris Allhutter (OEAW – Wien, AT), Stefanie Betz (HFU – Furtwangen, DE), Gregor Engels (Universität Paderborn, DE), Andrew Feenberg (Simon Fraser University – Burnaby, CA), Peter Reichl (Universität Wien, AT), and Blay R. Whitby (University of Sussex – Brighton, GB)

Premise: This group worked under the premise that the professional knowledge and critical insight of computer and social scientists should be mobilized as an active force in public education and policy-making concerning the design, implementation and regulation of information technology. Professionals working in these fields are key players in the shaping of computer systems and applications. Therefore, their stance and their voices are able to make a decisive difference. In our view, there are several main avenues to achieve that outside of our professional activities as researchers, innovators and educators.

1. Public education: Active participation in public education including talks, media publications, events and collective organizing oriented toward critical assessment of the social effects of information technologies and the social practices arising around them.
2. Activist mobilization of professional communities: Taking a leading role in raising awareness and social accountability in the professional communities of information technology developers, analysts and practitioners with regard to the social consequences of new and existing technologies and systems.
3. Political pressure: Organizing and taking steps to exert collective pressure on political institutions and industry players in the direction of recognizing, counteracting and preventing the negative social effects of information technologies.

With a view to these three lines of action, the group proposed the penning and wide distribution of a document, tentatively entitled "The Dagstuhl Declaration." The purpose of the Declaration is to succinctly outline the key concerns shared by critically-minded computer and social scientists regarding the undesirable social impacts of current trends in information technology systems, practices and policies (diagnosis); to propose directions for change aligned with progressive social values such as human dignity, well-being, equity and sustainability (prognosis); to formulate compelling reasons why political institutions need to be pressured by the professional communities working in these areas and the public at

large (motivation); and to serve as an anchor for the emergence of collective identification and agency – a "we" – including the variety of actors who are willing and capable of exerting such pressure.

The overall structure of the Declaration and its main points were drafted by the group as follows:

DAGSTUHL DECLARATION: Content Outline

We, the participants in the Dagstuhl Seminar on Values in Computing representing researchers and professionals from disciplines such as computer science, system and software engineering, ethics, philosophy, education, science and technology studies, hereby state our deep concern with the present status of the information technology industry and its influence on society. Another digital future is possible!

There are numerous reasons to question whether information technology is a force for good in contemporary society. The structure and design of the most widely information technology systems, and the regime of their ownership and control, have proven to generate major social problems. Users and consumers are subjected to new modes of pervasive exploitation and surreptitious control. Vulnerable populations are being hurt. Inequalities of access and power are growing. The lack of accountability of major corporations is unprecedented. Governments and regulatory agencies are falling behind, unable to steer the course of technological systems and practices in the public interest. Data have emerged as a major source of economic and political power. Algorithms have demonstrated their capacity as powerful tools. When left unchecked, power of this sort corrupts absolutely. Unsurprisingly, we have seen numerous demonstrations of blatant abuse of data and algorithm power.

We, the signatories of this declaration, believe that urgent measures are needed for bringing data and algorithm power under public control. To avoid the further regress of our liberal-democratic societies, human and democratic values need to be infused into information technology design and application by way of policy, regulation and explicit codes of ethical conduct on the part of information technology creators and users. Ethics should be an essential dimension of computing practice and standard development. Computer professionals, corporations and researchers should be held accountable not only to their employers and investors for the profitability of their products, but to the public at large for the ethical, social and cultural repercussions of their work. Business models relying on the manipulation of users should be challenged and dismantled. In computing, business values should be balanced with the values of human dignity, social well-being, equity and sustainability. Human dignity means respect for persons as opposed to reducing them to manipulable things. Social well-being means increasing individual and collective capacities for freedom, recognition, happiness and fulfillment. Equity refers to ensuring equal access to choices and opportunities across social and cultural groups. Sustainability refers to cultivating modes of production and consumption compatible with the preservation of the natural environment and the happiness and prosperity of other human beings.

With a view to the plethora of examples of corporate irresponsibility, negligence and disregard for these values on the one hand, and the subservience and docility of public administrations and politicians, we believe that grassroots political mobilization is needed to defend and fight for securing their dominant position in information technology design and application worldwide. We are convinced that the communities of computer professionals and social scientists can play the role of the leading agent of such a mobilization. We can be that agent. It is our moral responsibility to speak up and act now.

The working group proposes the following key demands to be included in the Declaration:

- Make manipulative targeting of users illegal.
- Raise critical public awareness; engage civil society; mobilize resistance to misuse of computing power.
- Demand accountability & transparency from ICT & data processing companies: what affects the public should be open to public scrutiny.
- Legally institute data rights and tools for their enforcement.
- Break up the monopolies so as to favour competition and creativity.
- Provide resources for democratizing socially responsible and environmentally sustainable innovation;
- Encourage and fund alternative ICT projects;
- Institute oversight in technology applications to ensure social justice and equality and protect the vulnerable. The vulnerable R us.
- Institute forms of broad democratic participation in computer systems design and in policy-making related to information technology.
- Demand carbon neutral technologies and processes in the IT industry.

DAGSTUHL DECLARATION: Addressees

The finalized, approved and signed text of the Declaration should be formally submitted on behalf of all co-signatories to the following types of addressees demanding formal response:

- Professional organizations
- Government agencies
- Intergovernmental bodies
- Civil society organizations, groups, movements
- EU bodies
- Industrial bodies
- Corporations
- Labour organizations
- Student unions and other organizations

Organizations on the following list should be approached with priority:

- ACM
- IEEE
- Informatics Europe
- Acatech
- BCS
- CRA
- CEPIS
- IFIP
- Corporate leaders and employee organizations at Google, Facebook, Apple, Microsoft, Amazon, IBM, Huawei

DAGSTUHL DECLARATION: Circulation

The group recommends that individual participants personally present the Declaration to the professional and civic organizations they belong to as well as to governmental and administrative contacts they can access firsthand.

To achieve wide public circulation of the Declaration, the group recommends the following steps:

- Publish and comment it in the mass media
- Share it on existing social media sites dedicated to similar causes
- Create social media sites for this purpose
- Web site
- Facebook page;
- Twitter hashtag
- LinkedIn designation
- Create a video – YouTube
- Address the existing alternative social media platforms
- Address the profiles of individual politicians; parliaments
- Consider an online petition

Practical steps:

- Collectively write and edit a rhetorically compelling document.
- Share this brief with all participants in the seminar, invite input, invite suggestions to be entered in a collaborative document using track-changes
- Distribute it to the organizations we belong to, relate to, or know people in...
- Look for additional organizations that are potential allies
- Look for organizations that have ethics or ethical in their title in relation to information technology
- Mobilize our social & professional networks
- Crowdsource the work among the Dagstuhl participants

6.2 Values in Computing – *Education*

David Hendry (University of Washington – Seattle, US), Christoph Becker (University of Toronto, CA), Marta Cecchinato (University of Northumbria – Newcastle upon Tyne, GB), Teresa Cerratto-Pargman (Stockholm University, SE), Geraldine Fitzpatrick (TU Wien, AT), Leah Lievrouw (University of California at Los Angeles, US), Austen W. Rainer (Queen's University of Belfast, GB), Irina Shklovski (IT University of Copenhagen, DK), and Jon Whittle (Monash University – Clayton, AU)

The Values in Computing Education committee met for about 8 hours to discuss the implications of Values in Computing for undergraduate and graduate education. The committee members divided into four sub-committees. Each committee considered a different topic and wrote a report, presented below.

1. Brief Exploration of University-level Courses. Sub-report 1[18] presents a review of existing courses that address values in computing. One key finding is that many or most existing courses concern "ethics" rather than "human values." The report concludes with four questions intended to be used in a detail analysis of the courses that cover "ethics," "human values," and related topics. This works makes progress on a comprehensive review of how values are being engaged in computer science and technical education.

[18] https://pads.c3w.at/file/#/2/file/vo8vEOUK0V5JKwlgngH7nZy5/

2. Methods, Practices, and Tools. Sub-report 2[19] presents a list of over 30 pedagogical approaches for engaging ethics and values in education. The approaches are divided into three categories: (1) Awareness raising; (2) Understanding design and development through a values lens; and (3) Group work and reflective practitioners. For instructors looking for straightforward methods for engaging with values in their existing courses, the list of 30 approaches is an excellent starting point.
3. Framing Considerations for Learning Objectives. Sub-report 3[20] presents a list of 7 general pedagogical aims. Highlighting the need for a systemic shift in curriculum design and student support, these aims are intended to shape the development of specific learning objectives in a Bachelor's degree in data science that draws on the values in computing agenda. Examples include:
   - A main goal – Ensuring that students develop competencies in translations between societal concerns and information systems;
   - A universal focus – A focus on a small number of universal values;
   - Responsible innovation – Considering how the language of responsible innovation can be brought into teaching data science;
4. Curriculum Cross-cutting Learning Objectives. Sub-report 4[21] proposes 13 specific learning objectives, divided into six categories (Create, Evaluate, Analyze, Apply, Understand, Remember). Examples include: (1) Be able to redesign existing systems to better manifest social considerations (Create); (2) Be able to evaluate competing design decisions against social considerations (Evaluate); and (3) Understand that technology design choices inevitably influence how we live (Understand). This work demonstrates how a set of learning objectives can cut across a computer science curriculum.

6.3 Values in Computing – *Research*

Juliana Soares Jansen Ferreira (IBM Brazil Research Laboratory – Rio de Janeiro, BR), Clarisse Sieckenius de Souza (PUC – Rio de Janeiro, BR), Klementina Josifovska (Universität Paderborn, DE), Selma Lamprecht (Fraunhofer FOKUS – Berlin, DE), Daniel Pargman (KTH Royal Institute of Technology – Stockholm, SE), Barbara Russo (Free University of Bozen-Bolzano, IT), and Emily Winter (Lancaster University, GB)

Goal: The goal of the workshop is threefold: 1) to understand the state-of-the-art of the research and possibly highlight missing areas of exploration, 2) to discuss methods and tools that have been used or can be used by research in the area and 3) to suggest future directions for research in the area. Given the timeframe of the workshop, all workshop outcomes can only be considered to be starting points for future research. There is definitely more work to be done in the area; our proposals are to be seen as first steps. The working group was heterogeneous and consisted of senior and junior researchers in Human–Computer Interaction, Sustainability and Software Engineering as well as representatives from industry.

[19] https://pads.c3w.at/file/#/2/file/Hf2ZVPd0uTE7hIJZgiMZFahg/
[20] https://pads.c3w.at/file/#/2/file/2p3nQ6tvnUtwNk9D7NRnPXqH/
[21] https://pads.c3w.at/file/#/2/file/5zcaJeT3yWsCwypeqkY-++6S/

Work method: The work took as its starting point a formulation from the organisers' Dagstuhl application: "What tools and techniques (e.g. values maps, questionnaires, users' stories, and case studies) can support the representation, articulation, negotiation, and observation of values from the very early stages of requirements elicitation to the final appropriation of a technology?" After an initial round of presentations and brainstorming, the work was driven by two major research questions (see below). Then examples from research and industry drove the discussion these and associated questions that arose. The work was finally summarized (see below) by a set of outputs including emerging results/burning questions/areas of exploration.

Research questions:

RQ1. What are values in computing?

RQ2. What research frameworks and methods exist for doing research on values in general and in computing?

Discussing the research questions: RQ1.What are values in computing?

The members believe that this question can be answered in a pragmatic way. A few different proposals were discussed: values can originate in beliefs as well as in biases [6]; generic frameworks for analyzing values and values relations exist in literature and can be used as a starting point for discussions. Such frameworks can, if necessary, be adapted and customized to the computing field, or existing frameworks can be applied to scope and define values in computing. As such, further questions need to be addressed such as: are generic values appropriate for computing? Are known relations (still) valid when speaking about technology and technology adoption? Do values emerge or evolve with the evolution of the computing knowledge and technology? The working group suggests that future research develops a systematic literature review on values in computing.

RQ2. What research frameworks and methods exist for doing research on values in general and in computing?

Of general values frameworks, the group is aware of the Schwartz's values circumplex that has been relatively widely applied to computing [11, 12, 19, 18, 19], and Values Sensitive Design (VSD), developed specifically for computing [7, 8, 9]. The group concludes that there is a need to identify existing general frameworks and tools that have been adapted to computing (e.g., Schwartz's values circumplex), and frameworks and tools that have been specifically developed in/for computing (e.g. VSD).

The discussion then developed in two directions:

1. How to detect / identify values?
2. What are the major aspects the research must take into account?

How to detect/identify values? Research must explore different sources of information like documents (e.g. software requirements, design artifacts) developed with a technology as well as people's practices (e.g., code) to elicit implicit knowledge about values in computing. By comparing different sources of information at different stages of technology development and maintenance, research can surface gaps between attitude and practice. To identify values from different unstructured sources of information, research may apply tools like the economy of conventions [5]. What are the major aspects the research must take into account? The group engaged in lengthy discussion of this question. The interdisciplinarity and heterogeneity of the group favored a rich discussion needed to align different research culture and vocabulary. The group proposes five interrelated aspects that future research must consider: Process, People, Computing System, Context and Environment. The research must also be performed at different levels of people interactions: individual/community/ organization/society ... etc.

Recommendations of Research Future Directions:

1. Perform a systematic literature review on values and values in computing to understand the state-of-the-art.
2. Explore roles and relations between "beliefs," "values," and "bias". In the process of understanding values in computing, one approach is to start from stakeholders' beliefs which can be collected with interviews, surveys or a literature review. We hope that by answering the question *how are values built*?, we can eventually understand what are values in computing. Research questions can motivate the research in this respect: Can values be grounded on beliefs? Can beliefs evolve into values? For example, one of the major beliefs of software developers is "developing software is a creative activity." Can this belief evolve into values related for instance to the freedom of developing software (e.g., Free / Libre Software and the Free Software Foundation)? What is the role of bias in relation with beliefs and values? In the above example, can creativity be biased by some sort of overestimation of the actual work of a software developer? Finally, if any relation between beliefs, bias and values exists, what is the gap (qualification) between beliefs / bias and the related values? Can this gap by any means be associated to the renowned "attitude – behavior gap" [13]? An example of attitude – behavior gap is when a user can have an attitude towards specific sustainable technologies, but they may purchase the ones that are more convenient or affordable. In general, this aspect is looking for other concepts connected with values. Apart from beliefs and ethics, this also includes the notion of social conventions. By analyzing justifications, the economy of conventions [2, 5] could offer an interesting framework to consider the construction and weighting of values in practices [4].
3. Perform research on five key dimensions: Process, People, Computing System, Context and Environment. The working group believes that these are the major aspects that need to be taken into account. A computing system is a system that is conceived, developed, orchestrated, operated and maintained by computing technologies in a modern environment and for which technology is the essential building block (i.e., without technology the system cannot perform any of the above mentioned activities). Process refers to the whole set of inter-related activities that lead to the production, deployment, operation and maintenance of a computing system. People refers to any person that has any interest in or may be impacted by the Computing System, that is system developers, users, stakeholders or even people that do not even acknowledge that the system exists. Context is the circumstances (e.g., purpose, use or behaviour) in which the computing systems operates and under which is observed (e.g., domain of application). A specific context also defined the meaning of the system itself (e.g., an ERP system can operate differently in different context of use). Environment is the ambient that interacts with the computing system. Both context and environment can evolve. For example, in the case of a low-energy website [22], the environment comprises all settings that enable the system to interact with the external components (e.g., connection to solar cells).
4. Study the evolution of values:
   - Values in computing evolve and emerge from practice. Technology triggers evolution of values and redefines values on the go. Research must acknowledge the dynamic aspect of values. Is it technology that motivates evolution or is it societal evolution that requires the evolution in computing? Case studies in both directions are needed. What are the effects of a technology on the society and its values? What is the role of practice in this relation? Values can emerge or adapt from conflicts and confrontations due to

[22] https://www.lowtechmagazine.com/2018/09/how-to-build-a-lowtech-website.html

daily practice [10, 1]. What are the circumstances in which conflicts and practice have any effect on values in computing? An example of values conflicts and confrontations can be identified once software developers realize that their "coding decisions" might have a real impact on other people's lives and that they are not used to consider the "big picture" of the software they produce [3].

- Technology can be used to other aims than the original ones. Research must consider that evolution, use, people, context and environment may change the original nature of a computing system. For example, the Open Source Software (OSS) initiative was born with the intention to offer a European economic strategy of technology production and distribution that can help differentiate the software market at the time dominated by the US production. To enforce such strategy the EU government has for long supported the OSS development [14]. Thus, the OSS initiative was born with a clear commercial intent. Today, instead, in many official speeches, OSS is presented as a technology that increases IT literacy and culture and frees users from legacy systems and vendors (lock-in effect) [15, 16].

The group found this change of the nature and value of a technology often happens in the so called "social discourse" where technology is presented for the rights and wrongs of society.

References

1 Berenbach B. & Broy M.. (2009) Professional and Ethical Dilemmas in Software Engineering, Computer, pp. 74-80
2 Boltanskz L. & Thevenot L. (1991) De la justification: Les economies de la grandeur (2006) On Justification: The Economies of Worth, NRF Essais, Gallimard
3 Brandão R., et al. Mediation Challenges and Socio-Technical Gaps for Explainable Deep Learning Applications: https://arxiv.org/abs/1907.07178
4 Cappel V. & Kappler K. E. (2019) Plurality of values in mHealth: Conventions and ethical dilemmas. in: The futures of EHealth – Social, Ethical and Legal Challenges, Ed.: Bächle/Wernick. Berlin: HIIG
5 Eymard-Duvernay, François, et al. (2005) Pluralist integration in the economic and social sciences: The economy of conventions." Post-autistic economics review 34.30, 22-40.
6 Friedman, B., & Nissenbaum, H. (1996). Bias in computer systems. ACM Transactions on Information Systems (TOIS), 14(3), 330-347
7 Friedman, B. (Ed.). (1997). Human values and the design of computer technology (No. 72). Cambridge University Press.
8 Friedman, B., Kahn, P. H., & Borning, A. (2008). Value sensitive design and information systems. The handbook of information and computer ethics, 69-101.
9 Friedman, B., & Hendry, D. G. (2019). Value sensitive design: Shaping technology with moral imagination. Mit Press.
10 Fleischmann K. & Wallace W.. (2010) Value Conflicts in Computational Modeling. Computer 43, 7, 57-63.
11 Knowles, B. (2013). Re-imagining persuasion: designing for self-transcendence. In CHI'13 Extended Abstracts on Human Factors in Computing Systems (pp. 2713-2718). ACM.
12 Knowles, B., Blair, L., Walker, S., Coulton, P., Thomas, L., & Mullagh, L. (2014, June). Patterns of persuasion for sustainability. In Proceedings of the 2014 conference on Designing interactive systems (pp. 1035-1044). ACM.
13 Rogers, E.M. (2003). Diffusion of Innovations (5th ed.). New York: Free Press.
14 Rossi B., Russo B., Succi G.. (2006) COSPA (consortium for studying, evaluating, and supporting the introduction of open source software and open data standards in the public administration), DG.O 2006: 153-154.

15 Rossi B., Russo B., Succi G.. (2007) Open Source Software and Open Data Standards as a form of Technology Adoption: a Case Study. OSS 2007: 325-330.

16 Rossi B., Russo B., Succi G.. (2012) Adoption of Free/Libre Open Source Software in Public Organizations: Factors of Impact. IT & People 25(2): 156-187.

17 Winter, E., Forshaw, S., & Ferrario, M. A. (2018). Measuring human values in software engineering. In Proceedings of the 12th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (p. 48). ACM.

18 Winter, E., Forshaw, S., Hunt, L., & Ferrario, M. A. (2019). Towards a systematic study of values in SE: tools for industry and education. In Proceedings of the 41st International Conference on Software Engineering: New Ideas and Emerging Results (pp. 61-64). IEEE Press.

19 Winter, E., Forshaw, S., Hunt, L., & Ferrario, M. A. (2019). Advancing the study of human values in software engineering. In Proceedings of the 12th International Workshop on Cooperative and Human Aspects of Software Engineering (pp. 19-26). IEEE Press.

6.4 Values in Computing – *Response*

Dawn Walker (University of Toronto, CA), Christoph Becker (University of Toronto, CA), Steve Easterbrook (University of Toronto, CA), Christopher Frauenberger (TU Wien, AT), Ann Light (University of Sussex – Brighton, GB), Curtis McCord (University of Toronto, CA), Lisa P. Nathan (University of British Columbia – Vancouver, CA), Elizabeth Patitsas (McGill University – Montreal, CA), and Irina Shklovski (IT University of Copenhagen, DK)

When the group forming round the theme of "Action" grew larger, a number of people peeled off to form a second action group to work on the intersection between climate emergency and the future of computing.

This intersection of themes is more significant than it might appear – two related challenges that put the stable futures and wellbeing of billions of people at risk. So, while the Dagstuhl group as a whole commented on the need for greater consideration of values in computing, this group, reflecting their deeply held concerns, addressed the intersection of two global challenges: a capitalist computer industry and rampant climate change. This group centred activity on gathering resources about this intersection and writing an opinion piece to address it. Our argument is, in a nutshell, that the computer industry is using up a significant part of the world's resources, creating a major carbon footprint and designing products and systems that actually reduce the capacity of societies to respond adequately to climate change, despite controlling tools that could lead to global collaborative action on this and other crises. Therefore, this group worked on an appeal for a coordinated joined-up response to the existential threat facing us. The resultant appeal:

1. Criticizes the abuse of eco-social capabilities that technology is amplifying – the manipulation of politics, individualisation of cultures and transactionalisation/quantification of relations;
2. Demonstrates how grassroot actions are already pointing the way towards an ecologically responsible green computing;
3. Calls for a computing industry that works to support social cohesion, curb growth for its own sake, promote fair work and adopt sustainable sources of production.

Participants

- Doris Allhutter
OEAW – Wien, AT
- Maria Bakardjieva
University of Calgary, CA
- Christoph Becker
University of Toronto, CA
- Stefanie Betz
HFU – Furtwangen, DE
- Marta Cecchinato
University of Northumbria – Newcastle upon Tyne, GB
- Teresa Cerratto-Pargman
Stockholm University, SE
- Clarisse Sieckenius de Souza
PUC – Rio de Janeiro, BR
- Steve Easterbrook
University of Toronto, CA
- Gregor Engels
Universität Paderborn, DE
- Andrew Feenberg
Simon Fraser University – Burnaby, CA
- Maria Angela Ferrario
Lancaster University, GB
- Geraldine Fitzpatrick
TU Wien, AT
- Christopher Frauenberger
TU Wien, AT
- David Hendry
University of Washington – Seattle, US
- Klementina Josifovska
Universität Paderborn, DE
- Selma Lamprecht
Fraunhofer FOKUS – Berlin, DE
- Leah Lievrouw
University of California at Los Angeles, US
- Ann Light
University of Sussex – Brighton, GB
- Klaus Mainzer
TU München, DE
- Curtis McCord
University of Toronto, CA
- Lisa P. Nathan
University of British Columbia – Vancouver, CA
- Daniel Pargman
KTH Royal Institute of Technology – Stockholm, SE
- Elizabeth Patitsas
McGill University – Montreal, CA
- Austen W. Rainer
Queen's University of Belfast, GB
- Peter Reichl
Universität Wien, AT
- Barbara Russo
Free University of Bozen-Bolzano, IT
- Irina Shklovski
IT University of Copenhagen, DK
- Juliana Soares Jansen Ferreira
IBM Brazil Research Laboratory – Rio de Janeiro, BR
- Sarah Spiekermann-Hoff
Wirtschaftsuniversität Wien, AT
- Dawn Walker
University of Toronto, CA
- Blay R. Whitby
University of Sussex – Brighton, GB
- Jon Whittle
Monash University – Clayton, AU
- Emily Winter
Lancaster University, GB