**Names and addresses of the applicant or applicants**

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**Indication of whether the submission is on behalf of an individual or a group**

Submission is for the FemTech.dk research program at the Department of Computer Science, University of Copenhagen

The submission is a group submission:

- Professor Pernille Bjørn, University of Copenhagen, the founder of FemTech.dk research program
- Assistant Professor Maria Menendez-Blanco, Free University of Bozen-Bolzano, Italy, former postdoctoral fellow in the FemTech.dk research program
- PhD Fellow Valeria Borsotti, University of Copenhagen, PhD researchers in the FemTech.dk research program

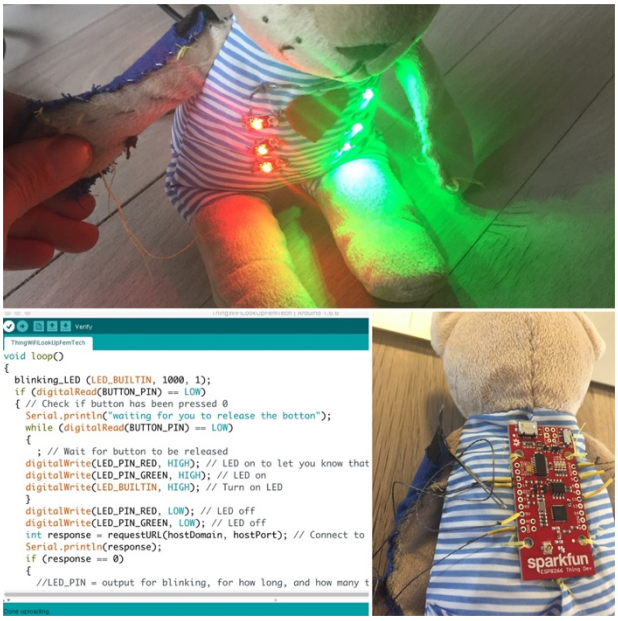
**A brief summary or abstract (100 words or less) which can be made public**

In 2016 only 8% of the students in the Computer Science (CS) program were women. FemTech.dk was established in 2017, and since then, 20% women are accepted each year into the CS program, and we increased the number of women in the faculty as well as women graduating with a PhD degree. The FemTech program was created by the first woman to be full professor in the department. Now there are five. FemTech combines organizational initiatives (e.g., CS4All) with analogue-digital design artefacts which produce alternative narratives about CS (e.g., AtariWomen) opening CS for people with diverse backgrounds to become successful.

**Description of the initiative (max 2 pages)**

The FemTech.dk action research program was initiated in 2016 at the University of Copenhagen to increase gender diversity and equity within the Department of Computer Science for both students and faculty. FemTech consists of multiple research projects, which have spurred organizational initiatives transforming the department towards equity. FemTech is fundamentally about combining research and interventions with a focus on making long-term change. FemTech follows two main interlinked paths: (1) unpacking and understanding the challenges related to unbalanced gender representation in computer science, and (2) intervening and extending the field of computer science to allow for multiple, diverse agendas.

***FemTech opens the agenda about Computer Science to a broader audience outside of the university.*** The FemTech workshops began as an educational initiative with the aim of creating opportunities for young women to explore their interests in developing digital technologies. They were organized as interventionist activities, meaning that our intention was to intervene through an activity, and then learn about our phenomenon of interest. The center of the workshops is the FemTech artefacts: e.g., Cyberbear. Cyberbear is a hacked IKEA bear transformed into an IoT artefact by adding a WiFi-enabled micro-controller. The interactive opportunities of Cyberbear connect the FemTech artefact with participants' everyday lives by linking the artefact to a technology they use every day – their high school online schedule. Concretely, this IoT artefact allows participants to 'hack' their own personal high school schedule online and retrieve information about whether the first module on that day was canceled or not. When we created Cyberbear, we wanted to make an artefact that, through its very physical expression, would challenge fundamental stereotypical understandings and narratives of computer science. The design decision to make Cyberbear in soft materials using e-textiles was meant to shift the idea of computer science as 'something hard' towards computer science as 'something soft'. Thus, by connecting digital and analog materials to the Cyberbear artefact, we manifested the sociomaterial relational connections between what is digital and what is material and produced an alternative narrative depicting computer science as reaching beyond the computer screen – as being more than what occurs in the digital world by including the physical world. The material choice challenged the taken-for-granted assumptions about the boundaries of what is relevant for computer science. By bringing in IoT technology through a Wi-Fi-enabled micro-controller design, we demonstrate how programming and creating technology is not limited to keyboard and touchscreen interaction but includes physical, material interactions.



Ultimately, the concept behind the FemTech workshop is not simply a workshop to teach young women to code. The challenge that the FemTech workshop takes on concerns changing participants' perceptions of and narratives about computer science, through practical engagements and skills. The challenge of changing gender diversity within computer science is not about teaching women programming. It should not be a surprise that gender is not related to ability in learning how to program. Teaching women or other gender minorities to program is not the challenge. We had 24 participants in the first workshop, and in 2018 we had the Cryptosphere FemTech artefact, for a group of 26 participants. Since 2019 the FemTech workshops are part of the department's outreach activities. Since 2022 we have organized two workshops a year (Fall and Spring) with each 24 participants. In 2020 the workshop was held online due to the COVID-19 pandemic, and was accessible for 100 participants from Denmark, Greenland, and the Faroe Islands. Currently, over 250 people have participated in FemTech workshops.

***Re-writing the history of Computer Science by changing the history within computer science.*** Computer science was initially a women's occupation, but people are not aware of these women nor their achievements. To acknowledge them and make their achievements visible, we created AtariWomen. We identified women who made important contributions in the early days of computer games, and interviewed them, to tell their stories through artefacts. We identified 14 women and were allowed to tell 13 of their stories. We created FemTech artefacts to demonstrate their work including a re-mixed PACMAN game (where you can hear the voice of Dona Bailey talking about her first day working at Atari), a superhero cosplay costume which we presented at Emerald City Comic-Con, and a collection of vintages, signed Atari games with 3D printed frames made by women. The AtariWomen artefact has received a large amount of attention both within the gaming community (e.g., Seattle retro gaming event), in podcasts, news outlets, as well as been presented at museums (e.g., the Living Computer Museum and the Danish National Gallery). We estimate that more than 5000 people have learned about AtariWomen in the US and Europe due to keynotes, podcasts, events, etc. The AtariWomen story has also been introduced at the Department of Computer Science, thereby changing the narrative for the students and faculty.

***Reflecting upon the organizational and systemic barriers within computer science institutions***. Finally, we have made interventions focusing on the organizational and systemic barriers within our department. This includes in-depth ethnographic studies of the challenges and barriers for equity embedded in artefacts and rituals (e.g., songbook and introductory program) as well as jokes which are part of the culture (e.g., 'women can't code'). Through our ethnographic research we have identified the problems and presented them back to the organization which has ultimately led to change. In this work we have also created a new FemTech artefact – e.g., Doreen, which is a norm-critical, story-telling game of provocation, displaying women's invisible experiences in computing. Doreen has been instrumental for talking about the difficult challenges of problematic behavior in a way which does not judge individual people but facilitates a constructive dialogue. Based upon the insights from all of our interventions, several organizational initiatives have been created and implemented in the organization, including but not limited to: Bi-annual FemTech workshops; the annual Kick-starter course, Code of Conduct; CS4all initiative; Diversity Chair; Inclusive DIKU Initiative; Equity training of management; a re-design of introduction activities on the CS programs; and re-design of cultural artefacts and rituals.

**Evidence of its impact (max 2 pages)**

FemTech.dk increased the percentage of students who were women from 8% prior to 2016 to 20% each year since 2017. Further, in the history of the department there has been very few women in the faculty, and for most of the department history there has been 1 or no women in the faculty. Currently, in 2023, there are 11 women faculty (the majority of which were hired after 2017). The first woman to become a full professor at the department was hired in 2015 (Professor Pernille Bjørn, founder of FemTech), and by 2023 we have increased the number to five full professors in the department who are women.

When computer science became an academic field in Denmark in 1970, it was during the student rebellion in which universities in Denmark underwent a change from being controlled by professors (the vast majority being men) to allow equal representation for student and staff on different committees. There were women when computer science was first created; however, only one woman, Edda Sveinsdottir, is mentioned by name in the written history (DIKU 2021). There are no gender statistics available from the University of Copenhagen until 1997; however, that year there were 18 women out of 241 students (7.47%). The years with the lowest number of incoming students that were women were 2004 (3.66%) and 2011 (3.9%), when their share was below 4%. These low percentages are surprising given Denmark's reputation for high rankings on equality; however, in recent years Denmark has dropped below the cut-off for the top 10 countries on the equality index, even as our Nordic neighbours Iceland, Norway, Finland, and Sweden occupy the top 4 positions.

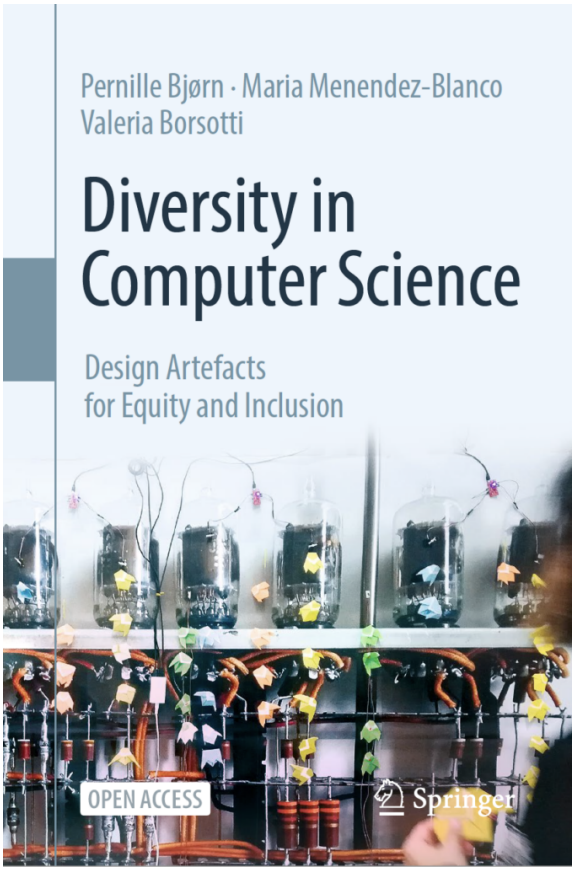
FemTech was created in 2016 to engage with research within gender and diversity and to explore the role of gender equity as part of digital technology design and development. FemTech considers how and why computer science as both a field and profession in Denmark has such a distinct and unbalanced gender representation in the 21st century. The focus was initially on the student base of the bachelor's program in computer science, which from the 1980s until 2016 was remarkably smaller than for other science programs at the University of Copenhagen. In terms of numbers, only 15 women students entered the bachelor's degree program in 2012 and 2013, and only 12 women students entered the program in 2014. In each of these three years, more than 160 students entered the program in total. Reviewing the 15-year period 2000-2014, the share of students who were women in the program was 7% to 9%, the lowest percentage of women in any study program across the University of Copenhagen. To compare, in 2016 the share of students who were women in the Math program was 30%, and in Physics it was 25%. Further, these percentages match those of other universities in Denmark.

Since FemTech was created more than 270 participants have been through the FemTech workshops, and approximately 5000 participants have learned about AtariWomen due to talks, podcasts, broadcasts, events, online, news outlets, etc.


Since 2017 approximately 50 women have started the CS bachelor program each year, and we have a thriving tenure-track program for junior faculty (all genders) which has allowed us to recruit excellent researchers who are now successful associate professors and one of which has been promoted to full professor. We have increased the number of women who are faculty as well as graduating with PhD degrees. We still have much to do, but the FemTech journey has created a path for continued growth and transformation of the department towards excellence in both research and education.

In 2022, we published the book: "Diversity in Computer Science" which documented the work we have done since 2016. The book is open access and has been downloaded 14.000 times since November 2022.

FemTech continues with new initiatives and current work includes: 1) Developing and implementing an Academic Search protocol for hiring research excellence considering equity, 2) Developing teaching modules for accessibility in the computer science curriculum, 3) Exploring ways to impact the gender categories embedded within the university administrative systems from binary towards more diverse classifications, and 4) Creating new design artefacts challenging the narrative about neurodiversity in computer science together with CS students




Summarizing the agenda for change in FemTech, it is about long-term cultural and organizational transformation of infrastructures, systems, practices, and rituals allowing for people with diverse backgrounds – gender, ethnicity, neurodiversity, etc. to see themselves becoming successful within the field of computer science. We see it in the numbers, yes – but more importantly, we see it in how all employees interact and bring their potential for the common good of the department, which then again supports individuals' careers.

**An optional reference list (which may include URLs of supporting materials)**


The FemTech.dk website https://www.femtech.dk

The AtariWomen website http://www.atariwomen.org

The Book reporting on the FemTech.dk research project and impact (Open Access)
Bjørn, P., M. Menendez-Blanco and V. Borsotti (2022). Diversity in Computer Science - Design and Artefacts for Equity and Inclusion, Springer.
https://link.springer.com/book/10.1007/978-3-031-13314-5

Academic papers reporting research done within the FemTech.dk research program:
Vej, J.-M., V. Borsotti, V. Savage, M. Engell-Nørregård and P. Bjørn (2022). DOREEN: A game of provocations creating new ambitions for equity in computing through intertextual design. NordiCHI. Århus, ACM.
http://www.femtech.dk/wp-content/uploads/2023/02/VejBorsottiSavageEngell-NorregardBjorn2022.pdf

Jensen, W., B. Craft, M. Löchtefeld and P. Bjørn (2022). "Learning through interactive artifacts: Personal fabrication using electrochromic displays to remember Atari women programmers." Entertainment Computing 40
http://www.femtech.dk/wp-content/uploads/2023/02/1-s2.0-S1875952121000616-main.pdf

Bjørn, P. and D. Rosner (2021). "Intertextual Design: The Hidden Stories of Atari Women." Human Computer Interaction.
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Jensen, J. K., T. Ammari and P. Bjørn (2019). "Into Scandinavia: When online fatherhood reflects societal infrastructures." ACM GROUP2020: PACM. http://www.femtech.dk/wp-content/uploads/2023/02/Intertextual-design-the-hidden-stories-of-Atari-women.pdf

Bjørn, P. and M. Menendez-Blanco (2019). "FemTech: Broadening participation to Digital technology development." ACM Multimedia.
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Menendez-Blanco, M. and P. Bjørn (2019). "Makerspaces on Social Media: Shaping access to Open Design." Human computer interaction
http://www.femtech.dk/wp-content/uploads/2023/02/BjornMenendezBlanco2019.pdf

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http://www.femtech.dk/wp-content/uploads/2023/02/TenorioBjorn2019.pdf

Menendez-Blanco, M., P. Bjørn, N. H. Møller, J. Bruun, H. Dybkjær and K. Lorentzen (2018). "GRACE: Broadening narratives of computing through history, craft and technology " Demo paper, ACM GROUP conference
http://www.femtech.dk/wp-content/uploads/2023/02/Menendez-BlancoBjornMollerBruunDybkjaerLorentzen2018.pdf

Tabel, O. L., J. Jensen, M. Dybdal and P. Bjørn (2017). "Programming as a social and tangible activity." Interactions Nov-Dec: 70-73.
http://www.femtech.dk/wp-content/uploads/2023/02/TabelJensenDybdahlBjorn.pdf

**Optionally, one or two letters of support. The letters of support may come, for example, from female faculty members who have benefited from the scheme, or from the Dean/Head of the organization of the applying Institution confirming impact**

Two letters of support are attached
1) Associate Professor Melanie Ganz, PhD.
2) Research assistant and former master student Jenny Margrethe Vej, MSc in Computer Science.

**An indication of whether the submission can be considered as a runner up (if it does not win the award) and be included as an exemplar of best practice in future Informatics Europe publications.**
Yes