2023 Minerva Informatics Equality Award

Women in CS@TUM: Female Students Support, Encouragement and Retention Initiatives

Name of university: Technical University of Munich (TUM)

Department: TUM School of Computation, Information and Technology (CIT)

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Abstract

Despite many global efforts to increase representation of women in technology, we still remain minority in our study programs in the universities and later on in the workforce. Gender discrimination, unconscious biases, stereotypes, feelings of not belonging, and the lack of female role models are a couple of factors that negatively affect the success, the prosperity, and even the mental health of female students in Informatics. Women in CS@TUM is a group of members from the department of Informatics at TUM, working towards equal participation and the support of women and of other underrepresented groups in the department. It is a community that is mainly driven and shaped by female students who are dedicated to improving the conditions *for all the female students* in the department.

Note: This submission can be considered as a runner-up (if it does not win the award) and be included as an exemplar of best practices in future Informatics Europe publications.

Description of the Initiative

Although for the last decade, the number of students in computer science in Germany has steadily been growing, the ratio of female students remains almost constant, with 18%, 19%, and 18% of female students enrolling in winter semester 2021/22, 2019/20 and 2016/17, respectively [1]. Additionally, women who enter the tech workforce are more likely to quit their jobs, with a staggering number of 50% of them quitting before the age of 35, and 56% are likely to quit by mid-career [2]. Fostering gender equality in computer science and technology, in general, encourages social progress, allowing the voice of women to be heard and influence society and industry. Diverse teams have higher productivity, more creativity, and follow budgets and manage time better. Most importantly, they are able to create products that fulfill the needs of diverse groups of people. In a university, this translates to teaching, research, and administration being conducted with a wider range of perspectives and ideas.

Women in CS@TUM (short WiCS and formerly known as IFF-Informatik Forum Frauen) is a group of members from the TUM School of Computation, Information and Technology who are working towards equal participation of women and other under-represented groups at the department of Informatics. It is an initiative driven mainly by female students who are passionate about the topic of inclusion, equality, and equity. The team is additionally supported by scientific staff and professors who are involved in the topics of diversity in our departments.

Team growth over semesters

WiCS was founded by Prof. Dr. Anne Brüggemann-Klein in 2015, and it has been growing ever since, particularly in the last two years, as shown in the figure. Currently, in the summer semester of 2022, we have **46 active members** participating in 5 different teams (Event, Community, Social media, Public Relations, and Finance). The details of the structure of the team can be found in [3].
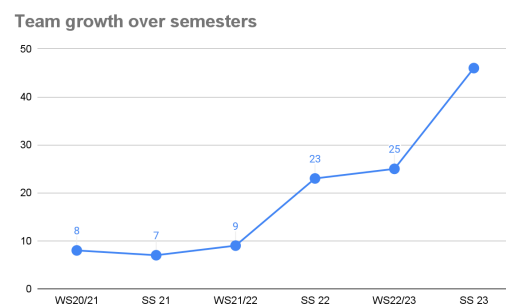
Our goal is to create an inclusive and supportive community that works together to foster gender equality and to support all female students in the department to actively develop and strive in the field of computer science and STEM in general. The group's ongoing activities focus on topics related to self-development, career planning, work-life balance, and leadership. The group also provides a platform to meet and collaborate with other ambitious and like-minded women by becoming part of the team and enables everyone on the team to have a real impact on various diversity and inclusion activities at TUM. In the following, we cover some of the core efforts of our team.

Events. Organizing events (workshops, invited talks, community-building activities etc.) is one of the main efforts of our team. We consider the events a great opportunity to give all our female students a chance to come together and be inspired, motivated, and empowered. It is scientifically shown that being a minority in any group (e.g., women in CS or technology, non-binary in a workforce, among others) triggers various emotional patterns, where people struggle with feelings of (not) belonging, various unconscious biases, stereotype threats, and imposter syndrome [8,9]. Our main objective with the events is to 1) better support our students during their study programs so they can strive and be as successful and as comfortable in their environment and 2) to prepare them as future young female professionals entering the workforce, which is still male-dominated.

Our events focus on various topics: technical events like hackathons, coding sessions, and different technical workshops, events on how to prepare your resume and interview tips, mentoring events, and different panel and speaker sessions where we invite successful female role models from industry and academia that can share their journey with our students. In the last few years, we have also introduced soft-skill workshops and events focusing on mental and physical well-being, e.g., events on boosting confidence, a self-defense course, and recently a yoga event. Lastly, we try to find a balance between organizing events with speakers from the industry and, at the same time, organizing events that cover and explore different opportunities for our students to become successful researchers and academics.

WiCS Scholarships and Travel Grants Program. Besides the events that we organize for our students, the second aspect that we put a special focus on is giving opportunities to our female students to attend the world's most prominent conferences that bring the career interests and the prospects of women in computing to the forefront. With our program, we have covered not only the conference registrations but the travel expenses and the costs from the overall stay of our recipients. We choose our scholarship recipients following a rigorous selection process designed and conducted by a specialized scholarships committee within our team.

Kinderzimmer project. Establishing Nursery rooms and childcare as part of the FMI (Faculty for Mathematics and Informatics) building in the TUM Garching campus is the first project our team realized.

As part of this project, within the FMI building, we have equipped two rooms with everything necessary for child care for a short, limited period. This service is open to students, professors, research associates, and guests not only from the Informatics department but the whole university. The intention of the initiative was not to replace the regular childcare services (e.g., kindergartens) but to offer an alternative service to parents when regular childcare is not available. The kinderzimmer is completely free for everyone to use, with the exception of when a babysitter is booked for the services. Our aim with this project was to contribute towards improving the work-life balance of the people working and studying at the TUM, as well as guest lecturers or researchers. Please note that WiCS set up and maintained this project for the first five years. The project is currently maintained by the Math Department, and WiCS does not contribute to the current organization.

Unconscious Bias Training and Mining the Unconscious Bias at TUM are two additional projects led by Prof. Anne Brüggemann-Klein and developed by members of our team.

The *unconscious bias training* is a workshop that was initially created to be integrated into the tutors' training at the department. The overarching goal of this training was to increase awareness of unconscious biases through real-life experiments and examples in order to avoid reinforcing stereotype threats that can undermine students' academic performance, feelings of belonging, competence, and aspiration, especially our female students. We considered that it is of extreme importance to educate and train the tutors and the teaching assistants in our department on this matter so they are more conscious while working with their students, especially their female students as a minority that is most affected by these biases. Due to its success, we were invited to conduct the training for Ph.D. students in other departments.

The bias awareness training set the foundation for a follow-up project: *Mining the unconscious bias at TUM* in which we further investigated these problems and tried to measure them as part of our Informatics department. We did this through the creation of explicit and implicit questionnaires and online surveying tools that supported the collection and analysis of data from 457 students.

Evidence of Impact

Events

Over the course of the last seven years, **our team has organized more than 80 events that have been attended by more than 2000 students**. Our events are not only attended by Informatics students, but also we have attendees from other programs and departments within TUM. A complete list of our events can be found here [4]. In [5], we provide sample feedback and some statistics from a post-event survey. Additionally, various companies that promote diversity (e.g., Google, Bloomberg, Microsoft, etc.) show interest in collaborating on workshops and events with our team, which also demonstrates our impact.

WiCS Scholarships and Travel Grants

Sum of Scholarship recipients per Year

Legend: GHC, EWT, FemTec, vGHC, Elizabeth Skinner Workshop online, ACM womENcourage, ALF
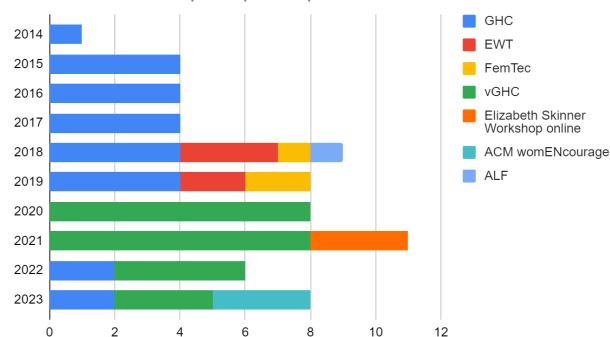
As part of our scholarships and the travel grants program, **since 2015, we have given <u>65 scholarships</u>** to venues like Grace Hopper Conference (GHC), European Women in Technology (EWT), ACM WomenENcourage, FemTec, among others, in which we have covered not only the conference registrations but the travel expenses and the overall stay of our recipients. For instance, in 2023, we awarded 10 scholarships with a total cost of approximately 10.000 Euros.

In the figure, you can see the sum of scholarship recipients per year for different venues. In [6], you can also find some of the reports that our recipients have written after the conferences. In these reports, our recipients explain in detail the overall process starting from the application to the conference attendance, their learnings, and how this experience inspired them and helped them in shaping and navigating their studies and future career directions. The reports also contain more details on how we organize the scholarship program and how dedicated our WomenInCS@TUM team is to supporting and giving the best experience to our students in this process.

Mining the unconscious bias at TUM

We published the results from this project in a conference paper at the European Conference of Software Architecture (ECSA 2020), Gender Diversity in SA track. A link to our publication can be found here [7].

Outreach and social media presence

To keep active and continuous contact with the students in the department, we are present on various social media platforms and maintain an active faculty presence. For example, to advertise our upcoming

events and scholarship deadlines, we are present on **Facebook (with 1031 followers)**, **Instagram (with 1230 followers)**, **LinkedIn (with 491 followers)**, and **Discord (with 177 members)**. We use Discord primarily for internal team communication, but there are designated channels on the server that are open to the public. We are very conscious of adding motivating, meaningful, and constructive content on our social media that our followers will benefit from. Also, all social media platforms allow female students from the department to have direct contact with our team regardless of their concrete subject of interest. This enables us to do direct mentoring, and we also serve as an advisory board for more personal issues of our students that, if necessary, are propagated to more formal channels, including other faculty members including the dean.

This brings us to the second point: the team's faculty presence. WiCS is present at different faculty events, for example, SET, Unileben, Virtual orientation, CDTM Responsible Leadership, Sommerfest, Absolventen Fest, TUM Open Day, and the faculty retreat. Additionally, some members of our team serve as Gender Equality Officers Deputies at the CIT.

And finally, over the years, we have been contacted by similar women's groups and initiatives from various other German universities, and even from the University of Cape Town, to mentor them and share our experience on how to build a strong and long-lasting community as ours.

Testimonies from WiCS alumni

"In October 2016, I enrolled in the Informatics bachelor program at TUM and, only three months later, joined WiCS, formerly known as IFF (the faculty's women in computer science group). At the time, the group consisted of only a handful of members. **Yet, it was incredible not only to experience the fantastic support from within the group itself personally but also to contribute to building a more inclusive, safe, and empowering space for female faculty members and students who were not directly affiliated with the group.** *We did this by organizing on-campus events and launching various initiatives. As my studies continued, through this successful presence, we were able to recruit more and more active members, allowing us to continuously expand the offered programs and types of events and sessions.*

On a personal level, members of the group helped me navigate and persist through challenging times throughout my studies by always offering guidance and support. *Furthermore, the people I met both within the group and through our events and programs have inspired me over and over to be daring, to believe in myself, and to follow my path. Being part of WiCS gave me the confidence to speak up in a professional context, currently as a solution engineer at VMware, and to always ask for a seat at the table. It also showed me how much impact one's words and actions can have on other people: one of the things that I am most proud of is when a member of the group reached out to let me know that because of my encouragement, they had applied to and were selected for a scholarship program."*

- Nathalie Pett, WiCS alumna, part of the team from 2016 to 2019

"I was part of WiCS since the first semester of my master's degree, and stayed throughout the whole degree, thus around 2 years and a half. In my first semester, I was only a volunteer in the group, but from my second semester on, I was a student assistant. My main responsibilities were to organize the group's meetings and events, including creating the meetings' schedule, contacting external speakers for the events, and helping organize the space for the events. **Being part of WiCS was the best choice I did during this period of my life.** *During my degree, the group's participants and volunteers were incredibly helpful in challenging situations, for example, while applying for a job.* **The projects we were involved in also had a direct impact on my career, since, not only one of the projects ended up as a published paper, but helped me (and I believe many other colleges) to understand the environment the women are in while working in an tech field.** *Diversity still is a topic of value in my life, and I still continue to push toward it in many other ways."*

- Patricia Goldberg, WiCS alumna, part from the team from 2017 to 2020, former team student's assistant and a co-developer of Mining the Unconscious Bias at TUM project

Reference List

[1] Anna-Sofie Turulski, "Anzahl der Studierenden im Fach Informatik in Deutschland nach Geschlecht in den Wintersemestern von 1998/1999 bis 2021/2022", published: 05 May 2023, accessed: 01 July 2023, https://de.statista.com/statistik/daten/studie/732331/umfrage/studierende-im-fach-informatik-in-deutschland-nach-geschlecht/

[2] Laura Hood, "The retention problem: Women are going into tech but are also being driven out" published: 03 March 2023, accessed: 01 July 2023, https://theconversation.com/the-retention-problem-women-are-going-into-tech-but-are-also-being-driven-out-200625

[3] Link to the team structure:
https://docs.google.com/document/d/1g6NppNZ98s2VWASVGX9XPNiFNggbTgLJPGmUcLIh4Rc/edit?usp=sharing

[4] Full list of events
https://docs.google.com/spreadsheets/d/1jMMVv_yFBfLZaJbTfmNzQpg9X1FRE8bQ

[5] Answers from a post-event survey from our Ph.D. Stories event
https://docs.google.com/document/d/12IAHzDQoJtTaTumTbspQHCvYddcLexQny7sy1HEX78I/edit?usp=sharing

[6] Reports from our scholarship recipients:
- GHC17: https://drive.google.com/file/d/1Vlls_3xS7ZEyj77eA1QFe6gMD0mq8yw7/view?usp=sharing
- GHC19:
  https://drive.google.com/file/d/1T-F27l57STE9M8dYRlyAc7rz3eCvW0IU/view?usp=sharing
- GHC22:
  https://docs.google.com/presentation/d/19H-TaN3du7MBoPhdTH6nYwbSUEMZ-z4_/edit?usp=sharing&ouid=118282292196525840236&rtpof=true&sd=true

[7] Petrovska, Ana, et al. "Mining Gender Bias: A Preliminary Study on Implicit Biases and Gender Identity in the Department of Computer Science at the Technical University of Munich." *Software Architecture: 14th European Conference, ECSA 2020 Tracks and Workshops, L'Aquila, Italy, September 14–18, 2020, Proceedings 14*. Springer International Publishing, 2020. https://link.springer.com/chapter/10.1007/978-3-030-59155-7_11

[8] Banaji, Mahzarin R., and Anthony G. Greenwald. *Blindspot: Hidden biases of good people*. Bantam, 2016.

[9] Steele, Claude M. *Whistling Vivaldi: How stereotypes affect us and what we can do*. WW Norton & Company, 2011.

Social media presence

Link to our Facebook page: https://www.facebook.com/IFFTUM/
Link to our LinkedIn page: https://www.linkedin.com/company/women-in-computer-science-tum/
Link to Instagram: https://www.instagram.com/women.in.cs.at.tum/

Our WiCS team

Link to some pictures of our team and past events:
https://drive.google.com/drive/folders/1cYJi3BFMtDEEor2Z6HHok_EyQIcJP-h-?usp=sharing
Link to internal team-building reports:
https://drive.google.com/file/d/1-Buk3s5A6gAX9I-jD0vZ74h3yAo5Xqrz/view?usp=sharing
https://drive.google.com/file/d/1XckxTCqO8stswz4ZUScjoPk1QdjHIkKg/view?usp=sharing