Title
Hack4Her: Hackathon for Female Students in the Netherlands
https://hack4her.github.io/

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The submission is on behalf of the Computer Science department at the Vrije Universiteit Amsterdam (VUA), where Katja Tuma is the budget holder for organising the event in collaboration with student volunteers.

Abstract
Hack4Her is the only continuous ***female-focused*** student hackathon in the Netherlands in the past six years. Since 2022, this ***community building*** event has involved ***110+ students*** (around ***70 women***). Thanks to overwhelmingly positive experiences, it is now an annual event. Hack4Her aims to (i) ***retain female students*** in technical careers, (ii) provide a ***safe space*** for women to showcase their problem-solving skills, (iii) boost women's engagement in their disciplines with ***reward and recognition***, and (iv) provide an ***inclusive program*** open to any gender-identity. This year Hack4Her became national and ***is also hosting 20 visiting students.***

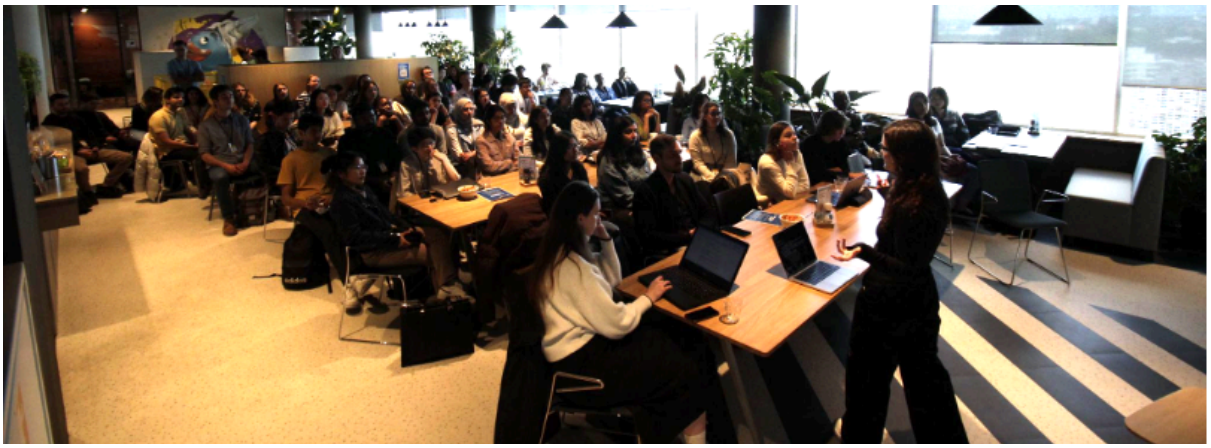

Figure 1: Plenary session (hackathon participants only) at the 2023 event

Description of the initiative

Too many ***female students drop out of computer science*** disciplines early-on which has a propagating negative effect on the proportion of women in academic positions and modern paths to wealth such pursuing high-tech careers in computer science (which started with a poor ratio [1] and had not improved [2] - see Dutch technical universities in [3]). The ***lack of women academics*** creates a ***negative feedback loop*** as it has been empirically shown that role models can push more women into the discipline [4-6]. The root of this problem may lie with parenting, education system, teachers and peers which might contribute to ***gender stereotyped beliefs*** about high-tech professions [7] thus hampering girls' and women's later decisions about pursuing (and remaining) in high-tech careers. A mentality shift is a challenging long-term societal goal, requiring structural investments and policies, but certainly worth investing in.

Höhne and Zander [8] found empirical evidence of female students experiencing ***greater uncertainty about their belonging*** within the domain of computer science than male students. In addition, Höhne and Zander [8] found that ***belonging uncertainty significantly predicted students' dropout*** intentions above and beyond the pertinent predictors academic self-efficacy, expectancy of success, perceived future utility value of the subject, and previous academic performance. Therefore, short-term ***goals with immediate actions*** to improve this situation should urgently be taken by educational institutions (such as Universities) where a systematic gender gap exists.

At the Vrije Universiteit Amsterdam, we have heard from our own female students about symptoms of "not belonging", such as stories about the uncomfortable stereotypes that are imposed in some student circles ("it's better she writes the report, and he does the coding" and similar). This has motivated us to work together with a group of student volunteers and organise a female-focused student hackathon with the aim to ***valorize and retain the female students*** that are already studying at our Universities.

Research shows that activities such as STEM-based social groups, cliques, extramural clubs, or graduate programs foster a sense of belonging [9]. ***Hackathon*** is an event where people engage in rapid and collaborative engineering over a relatively short period of time such as 24 or 48 hours and is a great example of such an activity with ***strong community building effects***. Since female participation in mainstream hackathons is poor (11%-28% reported in [10]) we organised a female-focused hackathon, following best practices outlined by Kos [10].

To be more inclusive, we ***do not mandate*** the teams to deliver source code as a final product. In addition, together with a team of dedicated students we have also developed a ***code of conduct*** for the event that is presented on the first day which is important to ***ensure social safety*** and respect for ***intellectual property***. We also do not collect any final deliverables and the judges assess the teams based on their presentation. Finally, we foster ***different ways participants can engage*** with the event other than just a competition (such as workshops and lectures).

Hack4Her is a 3-day event (see Table 1) and makes the following key contributions:

- facilitates challenge-based learning and provides recognition and reward for female students,
- increases visibility of female students and provides networking opportunities,
- shares knowledge from advances in research with the participating industry and student communities,
- provides a platform for top female student talent and young academic researchers,

- raises awareness about diversity challenges in technical and business careers during the event,
- ensures social safety and respect for intellectual property with a dedicated Code of Conduct.

Day 1	Welcome	Diversity Workshop	Dinner	Keynote	Speed Dating
Day 2	Breakfast	Keynote & Workshop (optional), Hacking	Haching	Workshop (optional), Hacking	Hacking
Day 3	Hacking	Hacking	Hacking	Pitches, Awards	Celebration

Table 1: The structure of the yearly program.

Hack4Her 2022: The event was hosted at VUA premises and featured three exciting interdisciplinary challenges with an overarching theme of “social good for women”: 1) detecting discrimination on Twitter, 2) detecting breast cancer in a provided database, 3) building a SAT solver for Sudoku. The event also hosted two invited talks from VUA researchers from interdisciplinary fields (professor in AI ethics and senior researcher on data privacy).

Hack4Her 2023: The event was hosted at Booking.com offices in Amsterdam. It was sponsored by the Network Institute [15] and by funds from the research group [16] of the scientific lead and project coordinator. We had three exciting challenges to offer: 1) identifying optimal locations for new healthcare facilities to maximise women's access, 2) investigating how to empower women at the workplace, spread information or improve their positions in different Industries, 3) developing a solution that safeguards women's well-being in the digital realm.

Hack4Her 2024: This year’s event is just around the corner and will be hosted on VUA campus. Around 300 interested students signed up (240+ female) from more than 10 different Dutch universities. With the generous support of our sponsors and partner universities, we are also providing support for the travelling students (free accommodation near VUA campus) and are going to host 150+ students for two days of a challenge-packed program designed to boost young women's tech careers.

More about the event on our public web-page: https://hack4her.github.io/

Evidence of its impact

This is the ***first continued women-only student hackathon in the Netherlands***, and for the past six years, the only such event in the country. Radboud Women of Computing Science hosted a similar event called The Women Tech Storm in 2018 [11]. Other programming competitions (not female focused) are held at VUA campus as well as several national, european and international working groups organising various events to promote diversity and inclusion in academia (Radboud Women of Computing Science [11], EUGAIN [12], EDI IPN Working Group [13], to name a few). There are, of course, mainstream hackathons and conferences promoting female learnership organised by industries [14] in the Amsterdam area and beyond.

Social impact on the student population. In addition to the hackathon, Hack4Her offers a general program for students of any-gender identity. Last year, we had over ***100 participants (overall) attending parts of the program***. Every year, we increase ***the awareness and appreciation*** of the event, with ***300+ interested students signing up*** for this year. We believe that the event has potential for a ***long-term positive impact on the general student population*** as we kick-off the event with a diversity and inclusion workshop to raise awareness. This year, participants from different programs have signed up, albeit, VUA and UvA students are still in majority due to budget constraints (Table 2).

Hack4Her 2024 going national. In 2023 we set out to improve with the following milestones: 1) achieve participation from at least two other Dutch universities (hopefully more), 2) increase the number of participants (to 100 hackathon participants) and their background diversity, 3) improve the program offered to participants of any gender identity. We are very happy to have succeeded, as this year we will host 150+ participants, studying at programs all over the Netherlands (Table 2), and have exciting new workshop activity with industry experts and academic researchers planned for the general program.

Table 2: Demographics of the 2024 sign-up form. The majority of interested students are CS and AI students from VU and UvA.

	Hackathon	*General Track*	*Total*
Group size	206	104	310
Gender			
Woman	206	40	246
Man	0	57	57
Prefer Not to Say	0	5	5
Non-Binary	0	2	2
Study Level			
Msc	93	59	152
Bsc	102	44	146
Other	11	1	12
Program			
Computer Science	97	37	134
Artificial Intelligence	37	35	72
Computational Science	7	4	11
Bioinformatics	6	11	17
Other	59	17	76
University			
VUA	95	62	157
UvA	37	35	72
TU Delft	26	1	27
Uni Leiden	17	3	20
TU Eindhoven	8	0	8
Other	23	3	26

Added value for the participants. Students benefit from joining the event individually from several perspectives. First, they receive ***confirmation of belonging to the discipline***. Second, they have the opportunity to increase their ***visibility on the job*** market. Third, they gain ***knowledge and experience*** in solving technical challenges with value to the real world. Finally, they create a ***network of peers*** and might win a prize.

Added value for external stakeholders. **Local students** who do not (necessarily) attend the Hackathon may also benefit. First, as a consequence of motivating and increasing the retention of female students in existing programs, ***their female fellow students*** indirectly benefit from maintaining their existing support groups of peers, and a

discipline they can belong to, which increases their chances to stay on track with their studies. Second, the event provides ***increased visibility and reputation of our students*** (particularly female) to local industries as technical leaders and innovators. Third, diversity focused community building events have long-term positive impacts on the ***mentality of the general student population***. Finally, local students indirectly benefit from having the opportunity to join the yearly event and to broaden their knowledge as well as professional network.

National student population: Students attending programs at participating Universities are also external stakeholders, as ***hackathons are internationally recognized*** as beneficial for developing technical, entrepreneurship, and soft skills. The student population at large also benefits from more female fellows remaining in the disciplines.

Local and national academic staff: Academic staff doing research and teaching in the programs at the participating Universities benefit from teaching a more ***gender balanced population***. In addition, past events were received very positively by the attending ***junior female staff*** members. Providing them with a platform to ***share their research ideas and reach driven students*** could also benefit the retention of female staff members in academia (which has been notoriously low in computing sciences for decades). Finally, staff members of the participating Universities benefit from a more driven student population and a student population that is ***more attune to diversity issues***.

Local and national SMEs and NPOs: Companies that do not participate directly in the event but are looking for top talent (e.g., SMEs and non-profits, such as WomenCyber-NL[1]) indirectly benefit from gaining insight (e.g., on media posts and LinkedIn) into the young professionals that are driven for innovation, and have the opportunity to ***close the gender gap*** in their open positions.

Future plans for impact. The main goals for the future are to 1) make the event *truly national* and organise Hack4Her at a partner University outside Amsterdam, 2) increase the number of participants (to 200 hackathon participants) and their background diversity. To measure them, we collect interest with an online sign-up form, and collect participants', judges' and volunteers' feedback with a Likert scale survey questionnaire.

In order to achieve our goals, we have appointed a ***scientific committee*** and built strategic partnerships with ***other Dutch Universities*** (UvA, Eindhoven Uni of Technology, Uni Leiden, Radboud Uni, Tilburg Uni, Uni Twente). By doing so, we have both increased the number of female students that we can reach and also created a program with new topics for the workshops and lectures. Second, we plan to gather interest from ***tech-industry companies*** and other ***funding partners*** to form a ***sponsor committee*** for a more sustainable future of Hack4Her.

Many students wish to see the event happen every year, and have responded to the feedback survey that the ***main reason for their attendance*** was that the ***event was "female-focused"***, which is a clear indication of the need for this event. We hope that this initiative will receive the support and recognition that it needs to snow-ball as a common best practice in higher education.

[1] **Women4Cyber-NL:** is a non-profit European private foundation with a new Dutch chapter. They have expressed interest in attending and for supporting women that are interested in continuing their career in cybersecurity.

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[8] Höhne, E., & Zander, L. (2019). Belonging uncertainty as predictor of dropout intentions among first-semester students of the computer sciences. *Zeitschrift für Erziehungswissenschaft*, *22*(5), 1099-1119.
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[10] Kos, B. A. (2019, March). Understanding female-focused hackathon participants' collaboration styles and event goals. In *Proceedings of the International Conference on Game Jams, Hackathons and Game Creation Events 2019* (pp. 1-4).
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[12] EUGAIN. https://eugain.eu/
[13] EDI IPN Working Group. https://ict-research.nl/edi-working-group/
[14] High-Tech Heroes Conference. https://hightechcampus.com/events/female-tech-heroes/conference2023
[15] https://networkinstitute.org
[16]https://vu.nl/en/about-vu/faculties/faculty-of-science/more-about/foundational-and-experimental-security-computer-science

Letter of support

- Prof. dr. Patricia Lago (CS Dept. Management Team, Portfolio Research)

Press

Hack4Her Event - Vrije Universiteit Amsterdam
https://vu.nl/en/news/2024/2024-hack4her-event

Great Success for the Hack4Her Event - Network Institute
https://networkinstitute.org/2023/06/20/great-success-for-the-hack4her-event/

Assistant Professor Katja Tuma Receives AYA Recognition Rewards Award in Category Societal Impact - Vrije Universiteit Amsterdam
https://amsterdamyoungacademy.nl/aya-rr-awards-2023-education-quality-hack4her-and-inclusion/
https://vu.nl/en/news/2023/katja-tuma-receives-aya-recognition-rewards-award-category-societal-impact
https://www.uva.nl/shared-content/uva/en/news/news/2023/11/aya-r-r-awards.html
Jury Report VU Amsterdam Education Awards 2023-2024 Mylène Brown-Coleman co-project lead of Hack4Her
https://vu.nl/en/education/more-about/jury-report-vu-amsterdam-education-awards-2023-2024

Hack4Her an Official Event of the Network Institute
https://networkinstitute.org/category/event/

Isabella Venancia Gardner HAck4Her Project Lead Starts AI Master at UvA with Fellowship from the Amsterdam University Fund
https://www.uva.nl/content/nieuws/nieuwsberichten/2024/02/studenten-starten-ai-master-aan-de-uva-met-een-fellowship-van-het-amsterdams-universiteitsfonds.html

Hack4Her Shared as Best Practices for Inclusion of Women in Tech - Informatics Europe
https://www.informatics-europe.org/index.php?option=com_content&view=article&id=321:best-practices&catid=35:minerva-informatics-equality-award

LinkedIn posts:
https://www.linkedin.com/search/results/content/?keywords=hack4her&origin=CLUSTER_EXPANSION&sid=404

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If Hack4Her does not win the award, it can be considered as a runner up and be included as an exemplar of best practice in future Informatics Europe publications.