

**WE SHOULD ALL BE
FEMINISTS**

Software Engineering Feminism

Letizia Jaccheri – 7th May 2024



Norwegian University of
Science and Technology



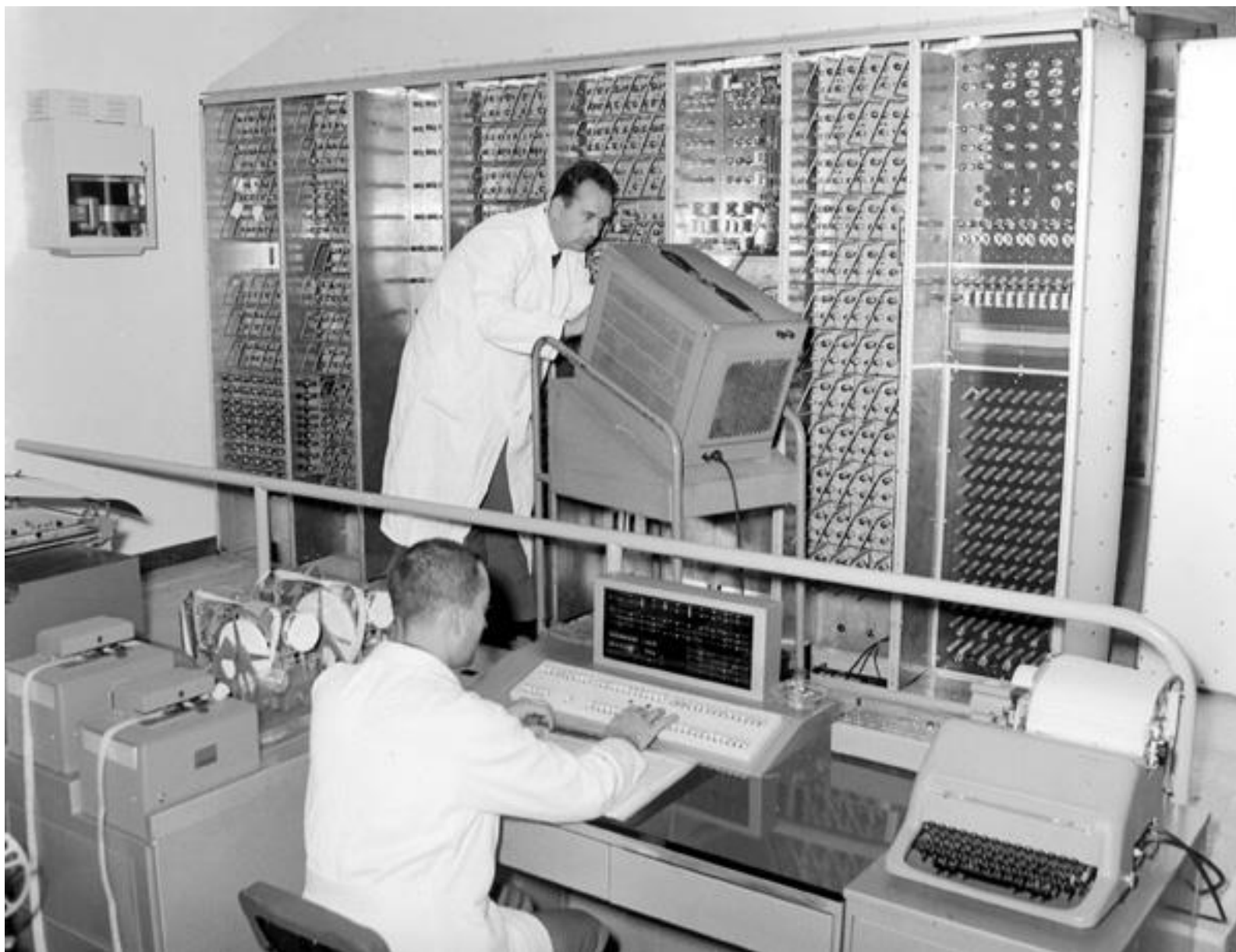


Politecnico
di Torino



NTNU

Norwegian University of
Science and Technology





Letizia Jaccheri www.letiziaccheri.org is a computer scientist. Letizia is born in Pisa. She has been professor at NTNU since 2002 and since 2013 she acts as department head for NTNU's Department of Computer and Information Science.

The Little Doormaid

TAPPETINA



Letizia Jaccheri



letiziaccheri.org



40000 students at NTNU







Q: About you

- Which class?
- Department?
- University? How many students?





[Home](#) > [Welcome](#)

womENCourage™ 2024
Responsible Computing for Gender Equality
ACM Celebration of Women in Computing
Madrid, Spain, June 26-28, 2024

Last Chance! [Open Call for Last-minute Posters](#) until May 10th.

Welcome to the **11th ACM Celebration of Women in Computing: womENCourage™ 2024**, hosted at Escuela Politécnica Superior of Universidad Carlos III de Madrid. Open to all genders, this event is aimed at celebrating **the role and impact of women in computing** and supporting participants at different stages in their STEM careers by offering an international, multisectoral, and multidisciplinary forum to **share experience and knowledge**, get **constructive feedback**, and promote **meaningful networking**.

This year's theme, **Responsible Computing for Gender Equality**, highlights the gender gap in computing and puts the stress on the utilitarian nature of **computing, as a tool to augment human capabilities and contribute to the progress of society**.

A responsible perspective of computing has to permeate different areas such as artificial intelligence, software engineering, cybersecurity, and human-computer interaction. These technologies are

Important Dates

Poster, Workshop & Tutorial submission **February 22nd**
(deadline extended)

Scholarship application deadline
April 1st

Registration opens **April 2nd** Early ends **May 31st**

Conference **June 26-28 2024**

Our supporters (See all)

Diamond



Thale Kuvås Solberg (Q-Free)
ACM womENcourage 2023



TDT4290

Customer Driven Project

- <https://tinyurl.com/2x5y5mnk>
- Customer defines the project – The teaching team, the students learn together with the customer
- 2023
 - Artificial Intelligence
 - Sustainability
 - Gender and Diversity

SE

Analysis and Design | Empirical software engineering | Software quality | Architecture | Processes | AI and SE | Human factors in SE



Gender

Gender and sex | Non-binary | LGBT+ rights | #metoo 2017 | Same-sex marriage 2001 | Intersectionality – triply

Q: The Agile manifesto

- Who?
- When?
- Values?

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan



Kent Beck
Software Engineer



Mike Beedle
Computer Scientist



Arie Van Bennekum
Product Manager



Alistair Cockburn
Software Scientist



Ward Cunningham
Software Developer



Jon Kern
Program Manager



Martin Fowler
Software Developer



James Grenning
Software Engineer



Jim Highsmith
Software Developer



Andy Hunt
Software Developer



Ron Jeffries
Software Developer



Brian Marick
Computer Scientist



Bob Martin
Software Engineer



Stephen J. Mellor
Computer Scientist



Jeff Sutherland
Software Developer



Ken Schwaber
Software Developer



Dave Thomas
Computer Programmer

17 MEN CREATED THE AGILE MANIFESTO

**EVERY COMPANY IS NOW A
SOFTWARE COMPANY**

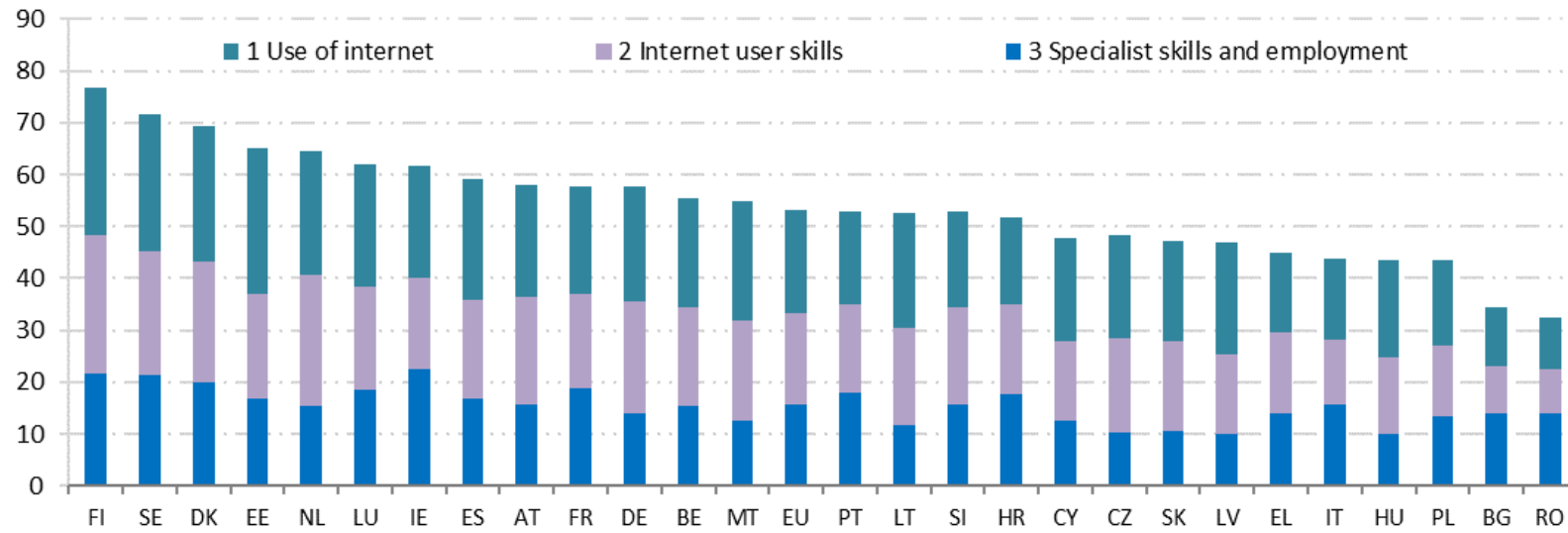
2012: 17%

2021: 19,1%



**The European Commission
report Women active in the ICT
sector concludes that including
more women in the digital
economy could create
an annual GDP boost in the
EU of **EUR 9** billion.**

https://www.itu.int/en/ITU-D/Digital-Inclusion/Women-and-Girls/Girls-in-ICT-Portal/Documents/women_active_in_ict.pdf



Spain

	Spain		EU	
	Women value	Men rank	Women value	Men value
1 Use of internet				
1.1 Internet users	91%	7	91%	85%
% individuals, 2020				87%
1.2 People who have never used the internet	6%	9	6%	10%
% individuals, 2020				8%
1.3 Online banking	65%	17	69%	65%
% internet users, 2020				67%
1.4 Doing an online course	29%	2	28%	15%
% internet users, 2020				15%
1.5 Online consultations or voting	12%	11	12%	11%
% internet users, 2019				12%
1.6 e-Government users	65%	17	69%	64%
% internet users submitting forms, 2020				64%
1 Use of internet	70	7	60	
Score (0-100)				
2 Internet user skills				
2.1 At least basic digital skills	56%	14	59%	54%
% individuals, 2019				58%
2.2 Above basic digital skills	35%	9	37%	29%
% individuals, 2019				33%
2.3 At least basic software skills	58%	13	61%	56%
% individuals, 2019				60%
2 Internet user skills	57	10	53	
Score (0-100)				
3 Specialist skills and employment				
3.1 STEM graduates	12	18	29.7	14
Per 1000 individuals aged 20-29, 2019				28
3.2 ICT specialists	1.6%	16	5.6%	1.7%
% total employment, 2020				6.5%
3.3 Unadjusted gender pay gap	12%	3		19%
% difference in pay, 2019				
3 Specialist skills and employment	50	9	47	
Score (0-100)				
Women in Digital Index				
Score (0-100)	59.1	8	53.2	

Q: Why?

2021: 19,1% ICT Specialists are women

Why?

Stereotypes

Insufficient
Knowledge of jobs

Social
expectations

Job adv oriented
towards men

Intervention



Female students in 2021

20%



29%



Interventions

INFORMATION

NETWORK

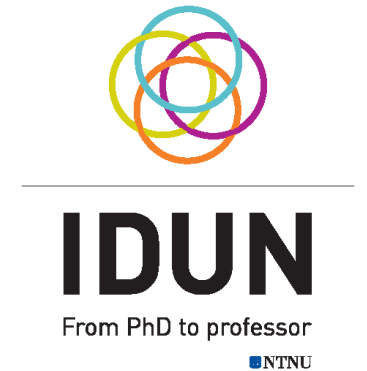
MENTORING

ANTI BIAS TRAINING

Quota

Norwegian and European best Practices

- [ADA](#)
- [IDUN](#)
- [EUGAIN](#)
- [Horizon CRAFT](#)
- [Erasmus + Women Stem Up](#)
- [ACM WomENcourage](#)
- [Abelia Tech Kvinner](#)



IDUN – from PhD to Professor

1 Mio. Euro 2019 – 2022

Background:

581 employees in scientific positions – 22% female

125 professors – 13,8% female

Challenge:

- Too few women at master level
- Dropout from phd to professor



Idun Reiten

IDUN Scientific Mentor program

9 International professors as IDUN mentors



Nirmalie Wiratunga
(IDI team)
<http://www.rgu.ac.uk/dms/taff/wiratunga-nirmalie/>



Anne Håkansson (ITK team)
https://en.uit.no/ansatte/person?p_document_id=584195



Jana Jagerska (IES team)
https://en.uit.no/ansatte/person?p_document_id=407454

Co-mentor

Professor Astrid Aksnes
UiT - The Arctic University of Norway



Radboud University



Martha Larson
(IDI team)
<https://www.ru.nl/english/people/larson-m/>



TrønderEnergi

Gro Klæboe (IEL team)
<https://no.linkedin.com/in/gro-kl%C3%A6boe-7b87741a>



Sibylle Schroll (IMF team)
University of Cologne
<https://sites.google.com/site/sibylleschroll/>



Darja Smite
(IDI team)
<https://darjasmite.net/>



Laura Giarre
(IIR Ålesund - IDI Gjøvik team)
<https://giarre.wordpress.com/>



Toktam Mahmoodi
(IIK team)
<https://www.kcl.ac.uk/people/toktam-mahmoodi>

15

12,55

16

12,07

17

13,31

18

13,82

19

14,22

20

14,27

21

16,49

EUGAIN Cost Action 19122

**WG1: FROM
SCHOOL TO
UNIVERSITY**

**WG2: FROM
BACHELOR/MASTER
STUDIES TO PH.D.**

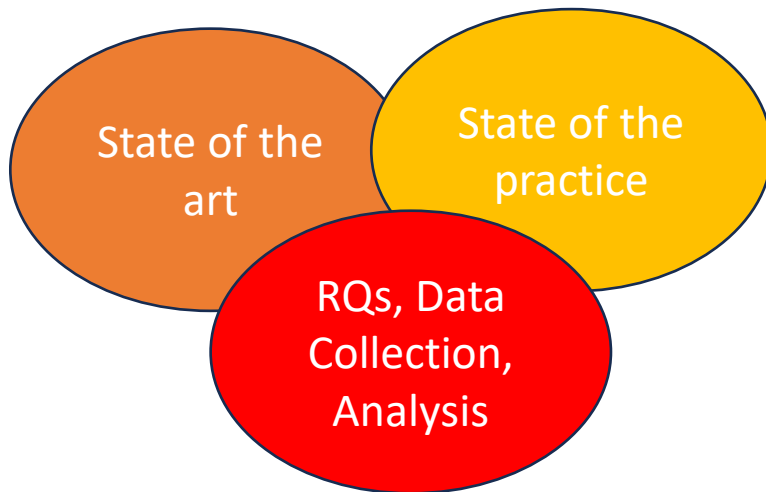
**WG3: FROM PH.D.
TO PROFESSOR**

**WG4:
COOPERATION
WITH INDUSTRY
AND SOCIETY**

**WG5: STRATEGY &
DISSEMINATION**

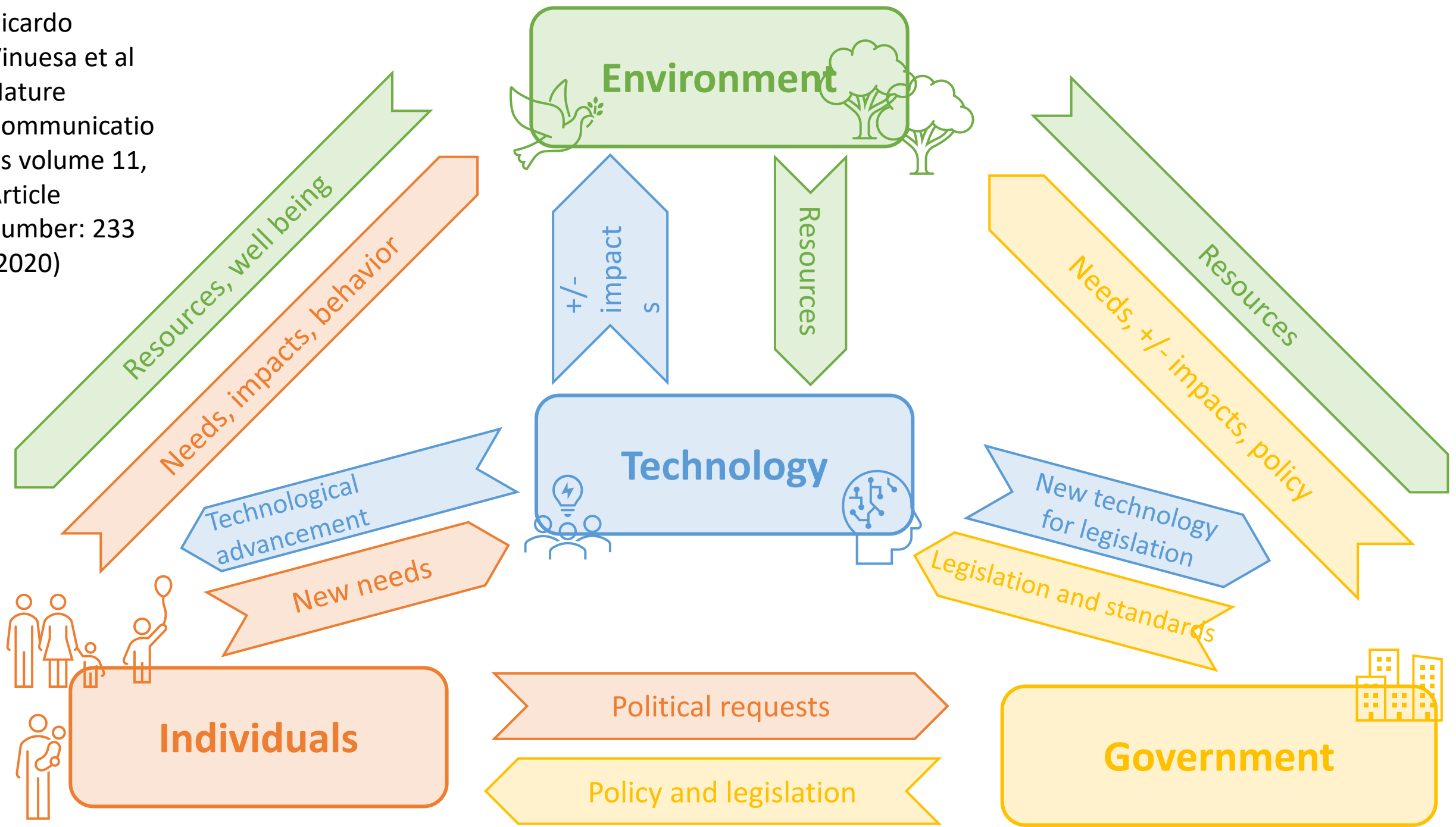
Research

- I have never tried that before so I think i should definitely be able to do that.
- *Swedish author Astrid Lindgren*



- K. K. Silveira and R. Prikladnicki, “A systematic mapping study of diversity in software engineering: A perspective from the agile methodologies,” in 2019 IEEE/ACM 12th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE), IEEE, 2019, pp. 7–10.
- A. Fisher, J. Margolis, and F. Miller, “Undergraduate women in computer science: Experience, motivation and culture,” ACM SIGCSE Bulletin, vol. 29, no. 1, pp. 106–110, 1997.
- D. Gurer and T. Camp, “An ACM-W Literature Review on Women in Computing,” SIGCSE Bull., vol. 34, no. 2, pp. 121–127, 2002.
- K. Albusays, P. Bjorn, L. Dabbish, D. Ford, E. Murphy-Hill, A. Serebrenik, and M.-A. Storey, “The diversity crisis in software development,” IEEE software 2021.
- G. Catolino, F. Palomba, D. A. Tamburri, A. Serebrenik, and F. Ferrucci, “Gender diversity and women in software teams: How do they affect community smells?” In 2019 IEEE/ACM 41st International Conference on Software Engineering: Software Engineering in Society (ICSE-SEIS), IEEE, 2019
- K. Blincoe, O. Springer, and M. R. Wrobel, “Perceptions of gender diversity’s impact on mood in software development teams,” IEEE software, vol. 36, no. 5, pp. 51–56, 2019.
- L. Jaccheri, C. Pereira, and S. Fast, “Gender issues in computer science: Lessons learnt and reflections for the future,” in 2020 22nd International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC), IEEE, 2020, pp. 9–16
- Tanjila Kanij, John Grundy, Jennifer McIntosh, Anita Sarma, and Gayatri Aniruddha. 2022. A new approach towards ensuring gender inclusive SE job advertisements. In Proceedings of the 2022 ACM/IEEE 44th International Conference on Software Engineering: Software Engineering in Society (ICSE-SEIS ‘22)
- Sharma, Kshitij, Juan C. Torrado, Javier Gómez, and Letizia Jaccheri. "Improving girls' perception of computer science as a viable career option through game playing and design: Lessons from a systematic literature review." *Entertainment Computing* 36 (2021): 100387.

Ricardo
Vinuesa et al
Nature
Communications volume 11,
Article
number: 233
(2020)



Margaret Burnet and Anita Sarma

- Gender Inclusiveness
- Magnifier <https://gendermag.org/>
- Product attribute



**Breaking Barriers in
Research Award 2021**

This award honors a member of the OSU community whose innovative research challenges and expands knowledge and/or advances gender equity.

The GenderMag Project

Dr. Margaret Burnett
Distinguished Professor, Computer Science

Dr. Anita Sarma
Associate Professor, Computer Science

 **Oregon State
University**

Alexander Serebrenick
ACM womENCourage 2023



Q: Draw a software engineer



Draw a Software Engineer Test - An Investigation into Children's Perception of Software Engineering Profession, Claudia Maria Cutrupi, Irene Zanardi, Letizia Jaccheri, Monica Landoni SEIS - Software Engineering in Society, 2023

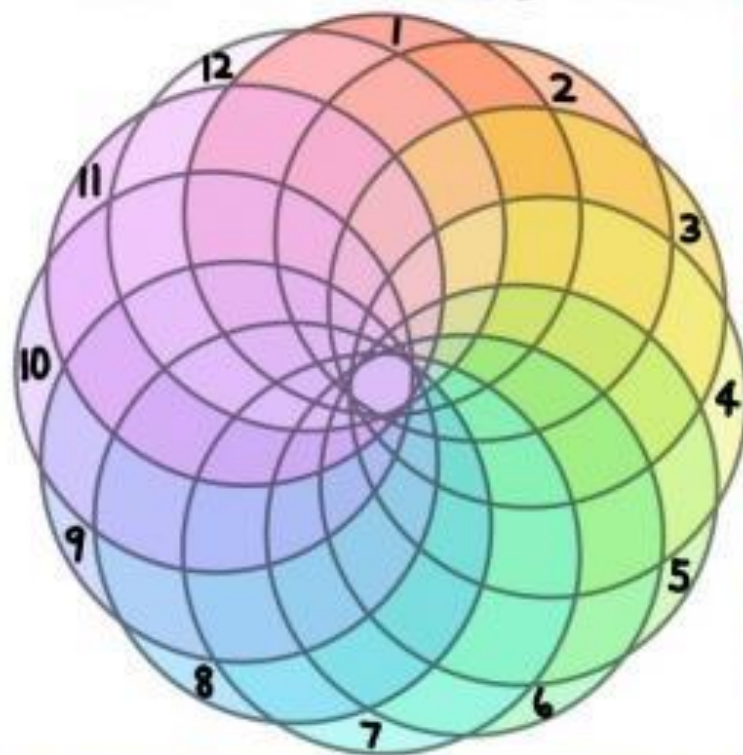
Q: Intersectionality

Discuss the concepts of

- Power
- Privilege
- Discrimination

And imagine examples of how the concepts intersect with technology/software development and use

INTERSECTIONALITY



- 1 Race
 - 2 Ethnicity
 - 3 Gender identity
 - 4 Class
 - 5 Language
 - 6 Religion
 - 7 Ability
 - 8 Sexuality
 - 9 Mental health
 - 10 Age
 - 11 Education
 - 12 Body size
- (...and many more...)

Intersectionality is a lens through which you can see where power comes and collides, where it locks and intersects. It is the acknowledgement that everyone has their own unique experiences of discrimination and privilege.

- Kimberlé Crenshaw -

@sylviaaduckworth

Q: What is a Bias?

- Pregiudizio (IT)
- Prejuicio / inclinacion (ES)
- Discuss one example of bias that intersect with SE

The Software Engineering (SE) concept was coined by a woman, Margaret Hamilton [4]. Born 1936, she is an American computer scientist who directed the development of the onboard flight software for NASA's Apollo program



I asked OpenArt to draw four software engineers and it made five white men (yes four in prompt but five were drawn).



Gender

- The software engineering (SE) community has focused on the gender gap that is indicative of broader societal biases but is only one dimension of the complex system of inequalities.

Statistics and trends

In 2023, only 5.17% of the global software developer community were women out of 27 million individuals.

Statista, *Worldwide developer gender*, 20223. [Online]. Available: <https://www.statista.com/statistics/1126823/worldwide-developer-gender/> (visited on 2023).

This statistic underscores a persistent issue: women in IT exit their roles at a significantly higher rate than men, with 50% leaving before the age of 35.

J. L. Glass, S. Sassler, Y. Levitte, and K. M. Michelmore, “What’s so special about STEM? A comparison of women’s retention in STEM and professional occupations,” *Social forces*, vol. 92, no. 2, pp. 723–756, 2013.

Gender biases

Gender biases in our culture influence individuals' decisions, self-perception, and career trajectories

- B. Trinkenreich, R. Britto, M. A. Gerosa, and I. Steinmacher, “An empirical investigation on the challenges faced by women in the software industry: A case study,” in *Proceedings of the 2022 ACM/IEEE 44th International Conference on Software Engineering: Software Engineering in Society*, 2022, pp. 24– 35.
- Recognizing the complex interplay between gender, biases, and societal norms is paramount to dismantling barriers in SE

According to [Ali2019], Facebook's job advertisement algorithm reached out to specific users based on their race, gender, and religion. Moreover, women were presented with stereotypical feminine jobs, such as secretaries or nurses. Such algorithms enhance sexism and racist attitudes in the labor environment.

[Ali2019] M. Ali, P. Sapiezynski, M. Bogen, A. Korolova, A. Mislove, and A. Rieke, "Discrimination through optimization: How facebook's ad delivery can lead to biased outcomes," Proceedings of the ACM on human-computer interaction, vol. 3, no. CSCW, pp. 1–30, 2019.

The same goes for Amazon, who created a recruitment tool that proved to be discriminating against women specifically [Dastin2022]

- J. Dastin, “Amazon scraps secret AI recruiting tool that showed bias against women,” in *Ethics of data and analytics*, Auerbach Publications, 2022, pp. 296–299.

A report by the research group AI Now about the diversity crisis in Artificial Intelligence (AI) notes that women comprise only 15 % of AI research staff at Facebook and 10% at Google [Wiggers2019].

- Kyle Wiggers, “How google treats meredith whittaker is important to potential ai whistleblowers,” 2019. [Online]. Available: "<https://venturebeat.com/ai/how-google-treatsmeredith-whittaker-is-important-to-potential-ai-whistleblowers/>".

Social scientist Kate Crawford has advanced the idea that the biggest threat from AI systems is not that they will become smarter than humans, but rather that they will hard-code sexism, racism, and other forms of discrimination into the digital infrastructure of our societies [Crawford2016].

- K. Crawford, M. Whittaker, M. C. Elish, S. Barocas, A. Plasek, and K. Ferryman, “The ai now report,” *The Social and Economic Implications of Artificial Intelligence Technologies in the Near-Term*, vol. 2, 2016.

Q: Do you know about any interventions for improving balance and eliminating biases?

Q: Do you know and/or can you imagine examples of careers in SE?

- Which are the obstacles?
- Do you know any story about somebody who has been exposed to an intervention?

RQ1 How can we apply intersectionality to software engineering to understand the diversity problem and propose holistic solutions?

S. Cho, K. W. Crenshaw, and L. McCall, "Toward a field of intersectionality studies: Theory, applications, and praxis," *Signs: Journal of women in culture and society*, vol. 38, no. 4, pp. 785–810, 2013.

RQ2 How do biases in the workforce impact biases in software?

- Implicit Association Test (IAT)
- Modern Sexism Scale (MSS)

- A. G. Greenwald, D. E. McGhee, and J. L. Schwartz, “Measuring individual differences in implicit cognition: The implicit association test.,” *Journal of personality and social psychology*, vol. 74, no. 6, p. 1464, 1998.
- Y. Wang and D. Redmiles, “Implicit gender biases in professional software development: An empirical study,” in *2019 IEEE/ACM 41st International Conference on Software Engineering: Software Engineering in Society (ICSE-SEIS)*, 2019, pp. 1–10.
- A. Hannak, G. Soeller, D. Lazer, A. Mislove, and C. Wilson, “Measuring price discrimination and steering on e-commerce web sites,” in *Proceedings of the 2014 conference on internet measurement conference*, 2014, pp. 305–318.

RQ3 What are the properties and the effects of inclusion Interventions?

- B. Trinkenreich, R. Britto, M. A. Gerosa, and I. Steinmacher, “An empirical investigation on the challenges faced by women in the software industry: A case study,” in Proceedings of the 2022 ACM/IEEE 44th International Conference on Software Engineering: Software Engineering in Society, 2022, pp. 24–35.

'I hope that feminists, and especially ecofeminists, are right that women carry a different type of values than those that prevail among leaders today. Caring as an attitude is essential, both when it comes to peace work, work against intolerable distress and suffering and ecological work. But it requires insightful women to stand up in gatherings and speak with strength and self-respect about life's issues' (Arne Næss, Norwegian philosopher).

Conclusions

- Women are underrepresented in software engineering and it is important to do something for social, economic, and environment reasons
- EUGAIN Eugain.eu
 - Training School Lugano 2024
- ACM Celebration of Women in Computing: womENcourage <https://womencourage.acm.org> June 2024 Madrid

Questions

Thanks to

NFR BALANSE - Programme on Gender Balance in Senior Positions and Research Management, EUGAIN COST Action 19122, Erasmus Plus Women Stem Up, ODA Network



IDUN
From PhD to professor
NTNU



INFORMATICS
EUROPE



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Computing Connecting Everyone
TRONDHEIM NORWAY 2023