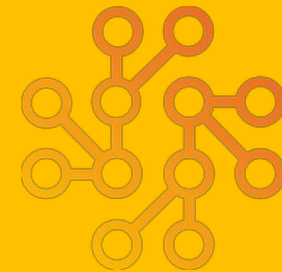


Challenges and Opportunities of Gender Inclusion Worldwide in Open-Source Software

Informatics Europe webinar on Gender Equality



INFORMATICS
EUROPE

by Ayushi Rastogi, Assistant Professor in Software Engineering



university of
 groningen



Ayushi Rastogi

Assistant Professor, University of Groningen

Solving problems relevant to *Software Industry and Society*

Software data for signals

Member of IPN and Informatics Europe's Equity, Diversity, and Inclusion working group

Gender diversity in Open Source Software

Marginal rise in gender diversity

Eastern Asia and North America leads in gender diversity

How to build inclusive communities?

Insights for research and stakeholders including software industry and government

To make better software and
society,

MAKE BETTER SOFTWARE TEAMS

Software



97% of applications and 90% of companies use open-source code.



Background

Women earning computing degrees rose since mid-1990s,
yet they comprise a quarter of computing professions.

-- NCWIT, US

“Women are concentrated at lower career levels and there are
fewer women in top positions in IT companies in India”

NASSCOM, India --

Gender gap garners attention worldwide

If more women enter the digital job market, it could create
an annual EUR 16 billion GDP boost for Europe.

-- European Commission

<https://ncwit.org/resource/scorecard/>

<https://www.nasscom.in/knowledge-center/publications/women-and-it-scorecard-india>

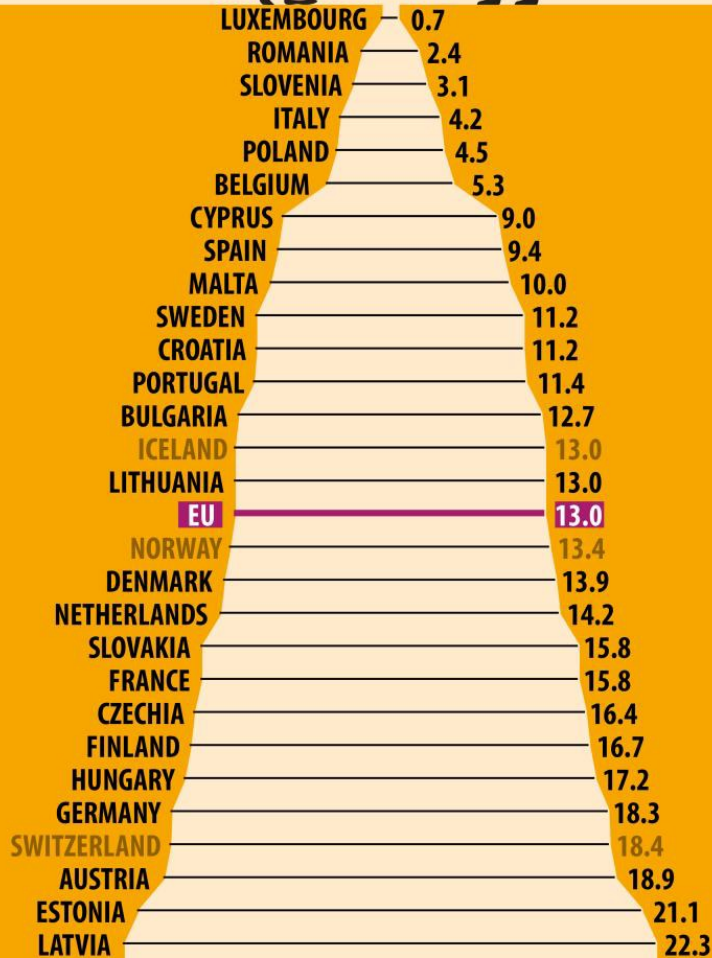
<https://www.eesc.europa.eu/en/news-media/eesc-info/112018/articles/64518>

Gender pay gap:

How much less do women earn than men?



Difference between average gross hourly earnings of male and female employees as % of male gross earnings, 2020



For all countries except Czechia and Iceland: data for enterprises employing 10 or more employees. Czechia and Iceland: data for enterprises employing 1 or more employees.

Ireland, Greece: data not available

Gender pay gap ranges from less than 5% to more than 18%

Digital and online engagement *can* shift across geographic regions in addition to gender

https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/equal-pay/gender-pay-gap-situation-eu_en#facts-and-figures

Software Engineering

Gender

No difference in work practices

Contributions from women less likely accepted

Vertical and horizontal segregation

Work Practices and Perceptions from Women Core Developers in OSS Communities

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Gender differences and bias in open source: pull request acceptance of women versus men

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Geography

Relationship between Geographical Location and Evaluation of Developer Contributions in GitHub

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On the Relationship Between the Developer's Perceptible Race and Ethnicity and the Evaluation of Contributions in OSS

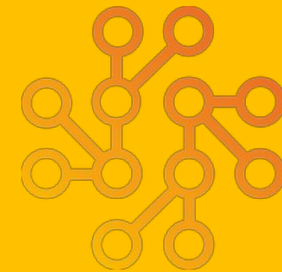
Reza Nadri^{id}, Gema Rodríguez-Pérez^{id}, *Member, IEEE*, and Meiyappan Nagappan^{id}, *Member, IEEE*

Disparity in code evaluation regionally

White developers have higher chances of code acceptance than non-white developers

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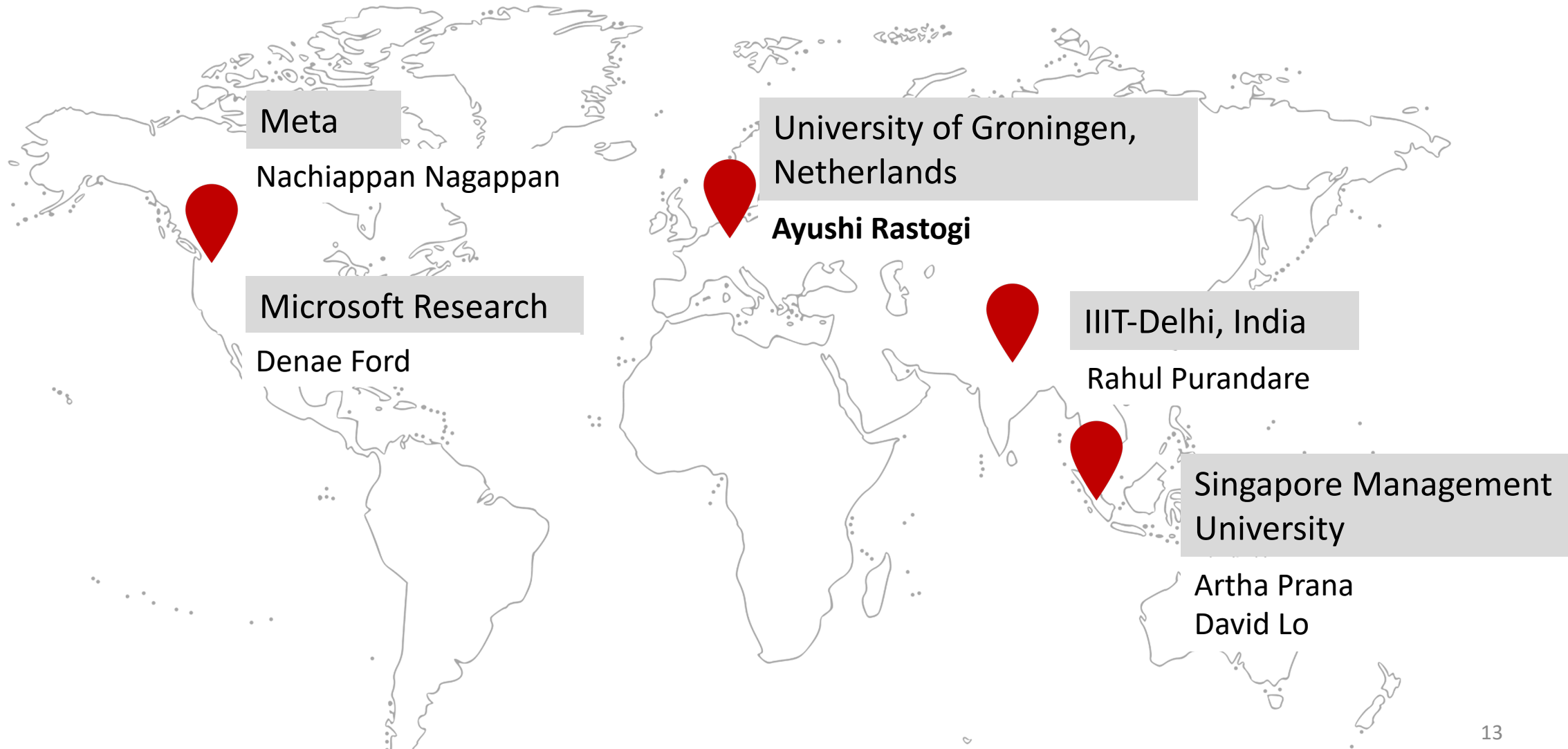
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State-of-practice

Gender diversity in Open Source Software

Mined archived software data on GitHub*

21,456 software projects

non-toy projects

infer location and gender

Interpreting Blau index

Region	Gender diversity (Blau index)
Africa	0.08
Europe	0.08
Oceania	0.10
Americas	0.14
Asia	0.15

Blau Index: 0 ; 4 men, 1 unknown

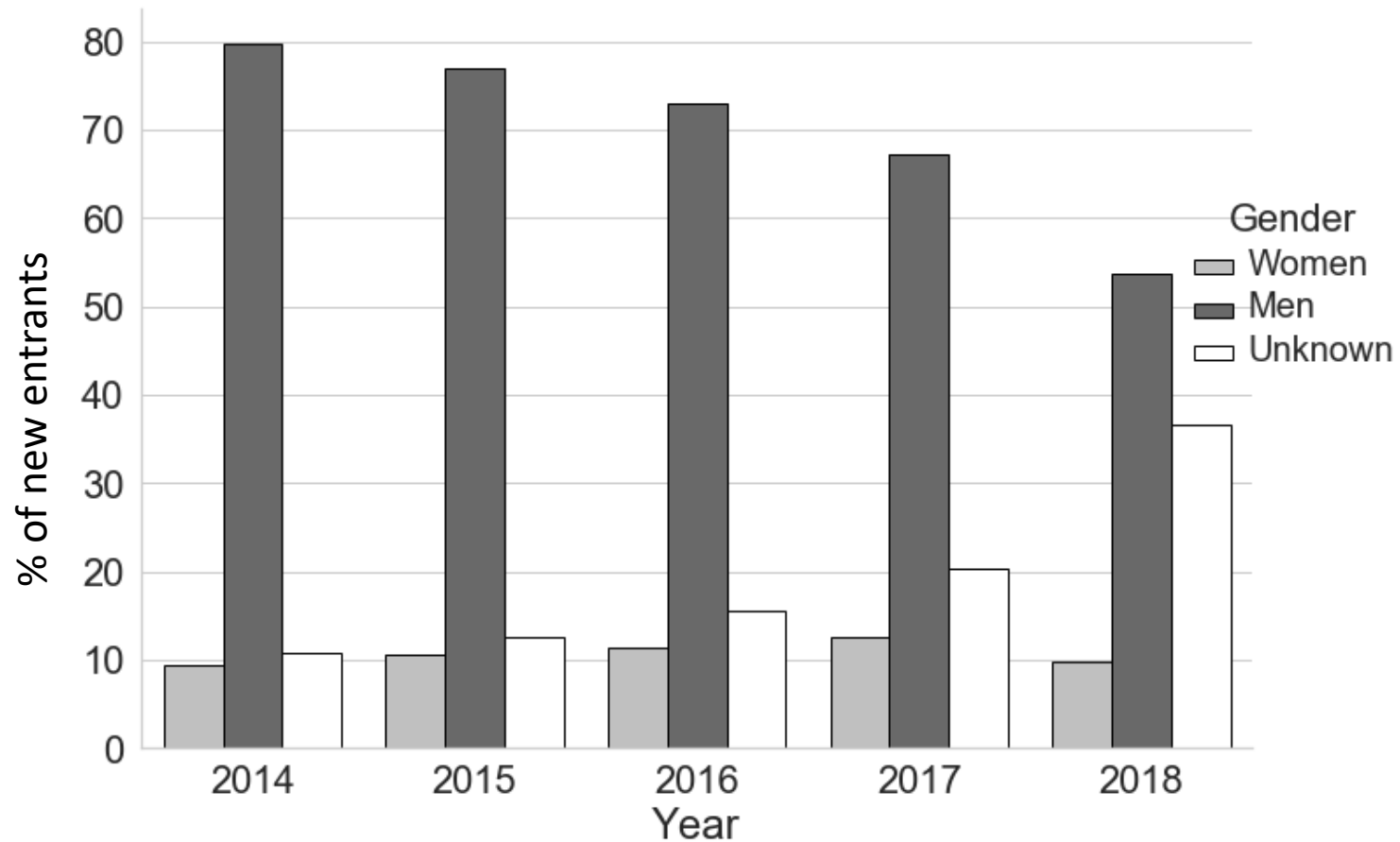
Blau index: 0.5 ; 2 men, 2 women, 1 unknown

Gender diversity is low worldwide

Slight increase in gender diversity in last 5 years

Region Level 2	Diversity index: 2014	Diversity index: 2019	diff	#users 2014	#users 2019
Northern Africa	0.00	0.11	0.11	9	91
Sub-Saharan Africa	0.00	0.07	0.07	55	273
...					
Western Europe	0.05	0.08	0.03	2963	10637
Australia and New Zealand	0.08	0.10	0.02	573	1870

Percentage of women entering GitHub remains the same.



Gender diversity != Geographic diversity

Region and Gender diversity	Correlation	Statistical Significance
Level 1 (e.g., Africa)	-0.06	0.00*
Level 2 (e.g., sub-Saharan Africa)	-0.10	0.00*
Level 3 (e.g., Eastern Africa)	-0.10	0.00*
Location (e.g., Ethiopia)	-0.11	0.00*

Gathering perspectives

Challenges and opportunities

Understand local achievements

Identify unique problems

Reasons to join, participate, and leave project

Role of peer parity

Challenges and opportunities

Survey instrument

Stratified sampling balancing gender and geographic region
– 50 per gender per region

Responses linked to specific projects

118 survey responses

contacted 1500 developers (8% response rate)

1 response from woman for 4 responses from men

Women developers emphasize social aspects

Select a project with friends and colleagues than men

Women – 64% important; Men 25% important

Shared identity?

Women – 37% important; Men 1% important

Important for Americas (17%), Europe (11%), and Asia (4%)

Not important for Africa (0%)

Money as incentive

Gender matters

Women – 64% important; Men 35% important

Location matters

bigger motivation for Africa

Few developers from the region are being paid
Less common outside Europe and Americas

How to build inclusive
communities?

Build friendlier communities

“Promoting use of and enforcement of code of conduct”

Organization; policy makers

Enforce and incentivize Code of Conduct – currently used by less than 10% of projects

Social metrics for community self-evaluation - to assess quality and limit misuse of code of conduct (like Glassdoor)

Highlight role models

“More women reviewers. More women acting directly on the governance of large open source projects.”

Organization; policy makers

Proximity based mentorship – opportunity for cultural adaptations

Highlight role models from underrepresented- e.g., GitHub Explore and talks

Research with social considerations

Automated project recommender... which developer a user follows

Addition: number of current contributors known from a gender and region

Automated documentation improvements... barrier to entry

Addition: automated documentation localization

Automated developer assignment... focus on speed over diversity

Addition: distribute challenging tasks

Call for research

Quantify and set baseline... help assess change over time

Create awareness... take concrete observations to alleviate diversity issues

In-depth regional explorations... focus on region specific achievements and issues

Summary

State of practice

Low gender diversity across regions worldwide

Since 2014, *small improvement in gender diversity amongst contributors in North America and South-Eastern Asia*

How to build inclusive communities?

Develop friendlier communities – **community, organization**

Highlight role models - **organization**

Promote diversity with software engineering tools - **research**

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