



Gender gap in electrical engineering at the University of Belgrade (1923-2010): Analysis of graduates' structure using R

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Background

- We met at the first PSSOH conference
 - Stanković, Biljana. (2018). Programirati kao devojčica: rodne razlike u računarstvu (Version paper & presentation) (pp. 24–27). Belgrade, Serbia: University of Belgrade - School of Electrical Engineering and Academic Mind. <http://doi.org/10.5281/zenodo.1476518>
- We discussed the lack of precise data
 - Data on the local situation is either imprecise or collected from small samples
 - This is rather simple data, but still not as available as it should be!
 - Information on the historical trends when it comes to gender disparity in electrical engineering and computer science is virtually lacking
- Then, we decided to change it for the Second PSSOH conference!
Today!
 - The results presented here are part of our study and joint efforts to change the current situation.



Photo taken by Assist. Prof. Miodrag Tasić, University of Belgrade – School of Electrical Engineering @PSSOH2018

Our aims

- To explore gender structure of graduates in electrical engineering at the University of Belgrade (UB) from 1923 to 2010
 - To analyze graduates' gender, graduation age, and module preferences
 - To offer recommendations for future research and policy intervention
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DISCLAIMER & ACKNOWLEDGEMENT:

- This analysis is based on the graduates' data. For more comprehensive analysis stay tuned for our future research and results.
- The work on this paper was partly supported by the Ministry of education, science, and technological development, Republic of Serbia Grants TR-33020 (N. M.) and 179018 (B. S.).

DATA PREPARATION

Some historical facts, first!

Building of Technical faculties, Belgrade, 1931., source: Historical archives of Belgrade, signature IAB-1165-A-4-0053.



Some historical facts, first!

- **1905** – Technical faculty was founded at the UB with three modules:
 - civil engineering
 - architecture
 - mechanical engineering – ME (with electrical engineering – EE)
- **1922** – University regulation that students could apply for diploma in EE and ME

- **1923** – first students graduating in EE
- **1946** – EE and ME were separated
- **1948** – ETF was formed

Note that modules varied through history of ETF.

Data



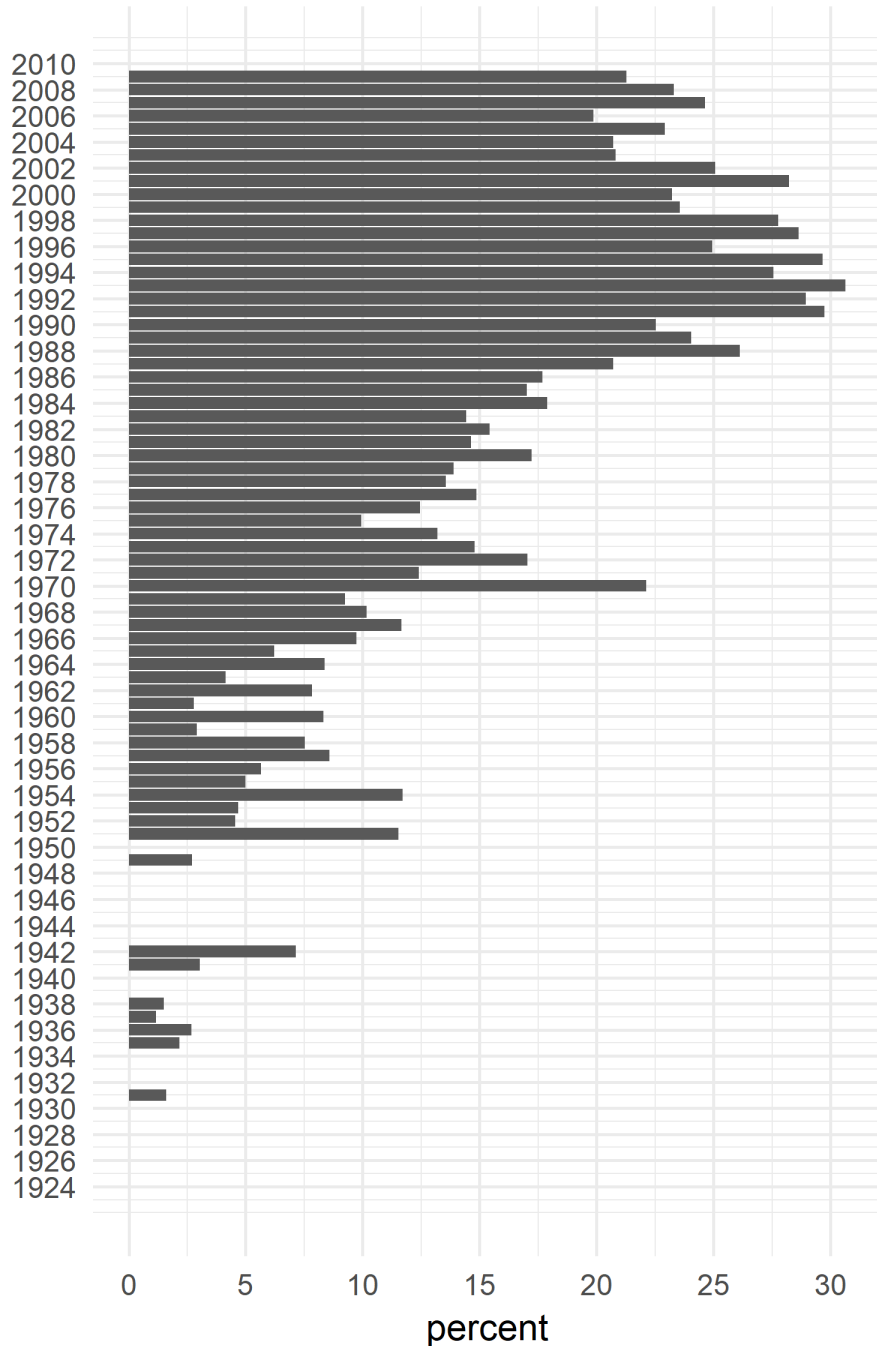
- In order to answer our research questions:
 - How did gender gap change over 87 years at UB?
 - Are there gender differences in age at the time of graduation?
 - Are there “masculine” and “feminine” modules?
- We used following dataset:
 - Address book of graduates in electrical engineering at the University of Belgrade 1923-2010" (original title in Serbian "Imenik inženjera elektrotehnike koji su diplomirali na Univerzitetu u Beogradu 1923-2010")
 - This book contains graduation year, name, abbreviated middle name, surname, module, and year, place and state of birth for 19596 graduates – so no data on gender!
- By manual manipulation data were extracted and transformed in machine-readable form and gender was added.

Assessing gender (or sex?)

- The gender was determined for 98.8% of graduates.
 - N. M. was responsible for filling in the gender column in the dataset, based on the graduates' names, and B. S. performed an additional inspection.
 - Inconclusive cases were either unisex or foreign names, such as: Saša, Sava, Vanja, Dobrica, Vladica, and other.
- We refer here to gender as a common term for both gender and sex (in Serbian: “rod” and “pol”)
 - Person's biological characteristics vs. person's internal awareness
 - For more information check: Ann Oakley, "Sex, gender and society", Routledge, 2016.

RESULTS WITH DISCUSSION

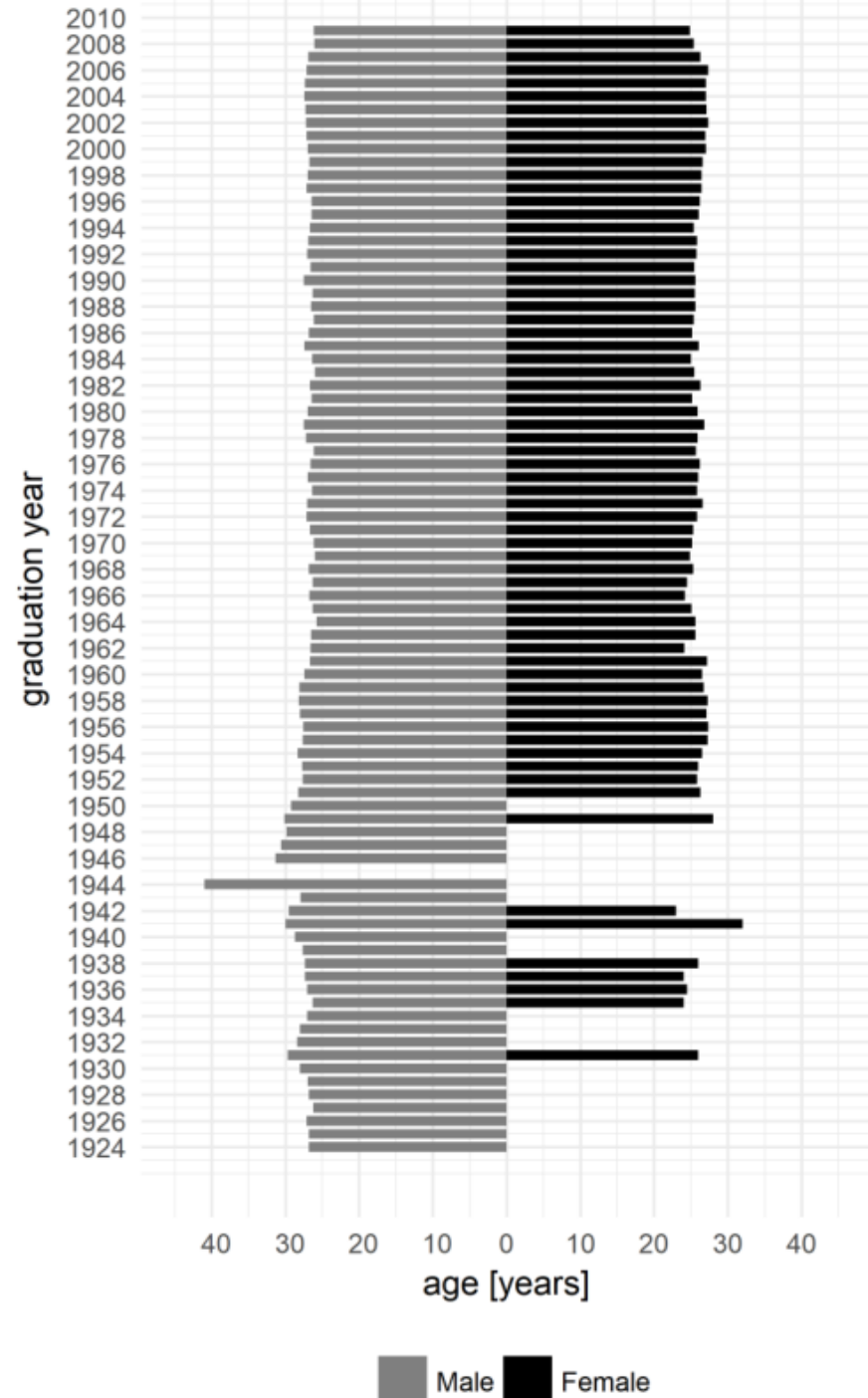
Percents of females per year



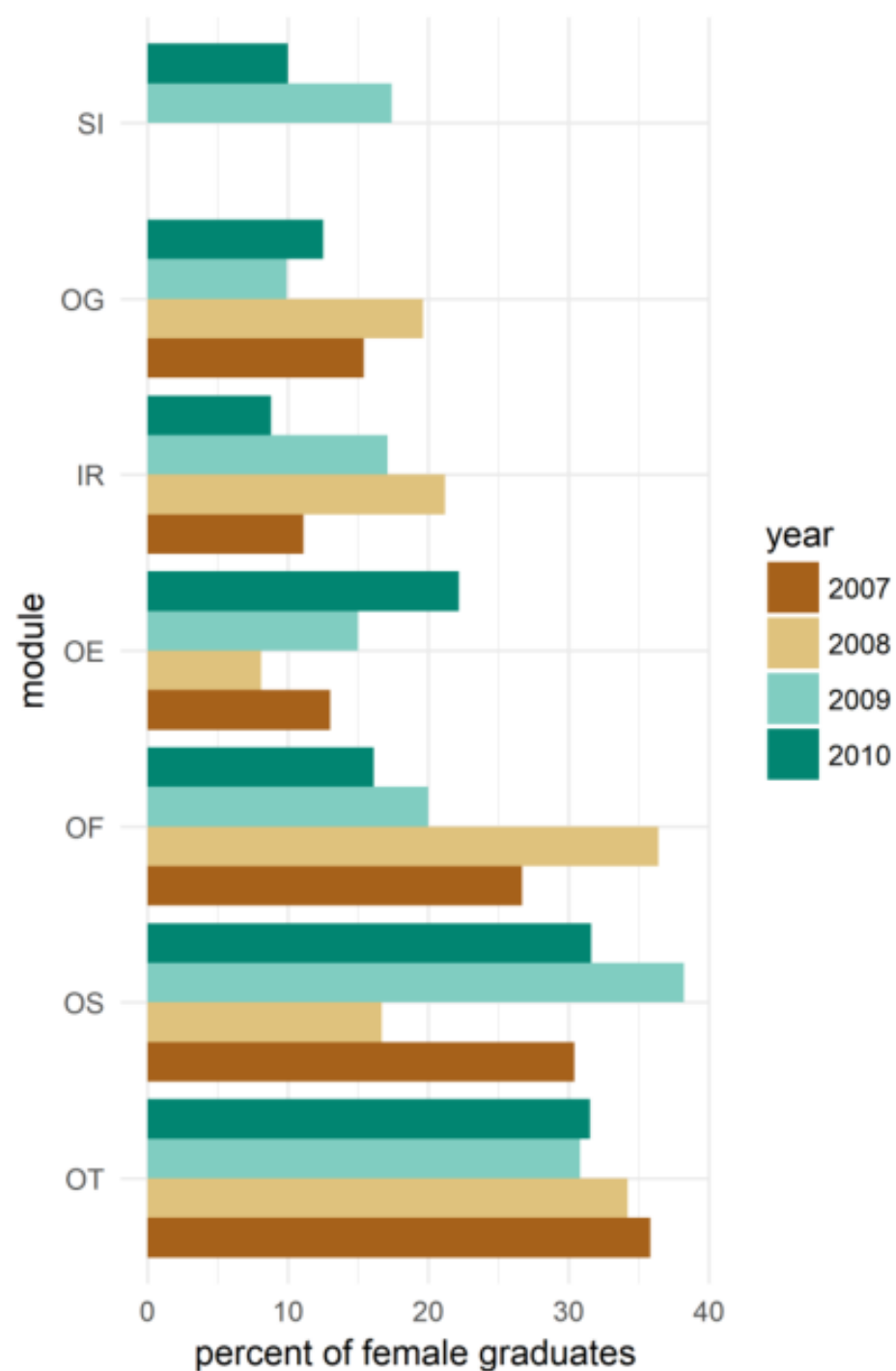
- The results are presented for 19588 graduates (1923-2010, except for 1945) with 18% of females.
- The first woman graduated in mechanical and electrical engineering at UB in 1931.
- The maximal percent of female graduates (30.6%) was in 1993
 - breakup war in Yugoslavia when large refugee migrations (including so-called brain drain migration) and military recruitment took place

The age at the graduation

- On average
 - Females were 25.98 ± 2.59 (20-48) years old
 - Males were 26.85 ± 3.48 (20-61) years old
- We found statistically significant difference with Welch two sample t-test
 - 1923-2010 ($p = 0.007$)
 - 1952-2010 ($p > 10^{-8}$)
- Reasons probably “gendered” in nature:
 - Bigger pressure for girls (“the clock is ticking”)
 - Compulsory military service for men (until 2011)



Module preferences



- Detailed analysis for modules introduced by Bologna reform (8.7% of entire dataset):
 - SI (Software Engineering): 11.7%
 - OG (Power Engineering): 13.9%
 - IR (Computer Engineering and Information Theory): 14.4%
 - OE (Electronics): 15.6%
 - OF (Physical Electronics): 26.9%
 - OS (Signals and Systems): 30.2%
 - OT (Telecommunications and Information Technology): 33.0%
- More analysis is needed, but there is a strong indication that “masculine” and “feminine” modules exist!
- And females are not bold as they should be!

INSTEAD OF A CONCLUSION

We need more work

- To include
 - period 2010-2019
 - enrolled students
 - career path after graduation
 - module preferences by periods
 - preferred courses (to study in detail e.g. biomedical engineering)
 - grades
- Investigate reasons behind gendered module preferences
- ...

Suggestions for decision makers?

- Make more woman visible in “masculine” modules (OE, IR, SI) and more man visible in “feminine” modules (OT, OS, Biomedical engineering)
- Get one man and one woman at the module presentation for sophomores at the ETF.
- Any ideas from the audience?



And I couldn't resist!

- There were 1.48% of females from Kruševac out of all females (1923-2010).
- There were 6 names “Nadica” from 1923 to 2010.



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