Utrecht University

Graduate School of Natural Sciences
Applied Data Science (MSc)

THE ROLE OF SOCIAL NETWORKS AND PERSONAL CHARACTERISTICS IN SHAPING FERTILITY INTENTIONS: A MULTI-METHOD MACHINE LEARNING PERSPECTIVE

Ezgi GÜNBATAR

Supervisor: Dr. Javier Garcia Bernardo

The preferences and actions of others shape people's desires about having children. Individuals do not act in isolation but are embedded in a network of social relations. This study offers a quantitative approach to defining the effects of individual and social network characteristics on fertility decisions. The aim to find an answer to the **"Do the individual characteristics and the social network attributes affect women's desire to have children?"** question. For this purpose, individual and network characteristics are used for predicting the having children intentions. The previous study, Stulp et al. (2023), also focused on fertility preferences with LASSO regression. This study found individual characteristics are the strongest predictors and individual and network variables explained 40% of the variation together, but network variables alone had no explanatory effect. With this information, the focus was placed on whether there is an impact of network variables.

DATA

- Dataset: LISS Panel (Longitudinal Internet Studies for the Social Sciences)
  Social Networks and Fertility Research Survey.
- 738 Dutch women aged 18 to 40.
- Each have 25 alter in total 18.ooo relationship
- **Ego variables:** Individual characteristics, information about the respondent herself. (age, origin, number of children, partner...)
- **Network variables:** Structural variables generated from the attributes of alters in the network. (density, number of people with children...)
- **Outcome variable:** "childwish" with 4 classes:
  "Do you think you will have (more) children in the future?"

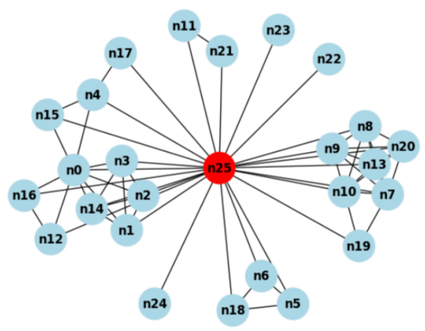


Figure 1: Node-edge representation of a network for one respondant

METHODS

- Graph Neural Networks
- Histogram-Based Gradient Boosting Decision Tree
- Support Vector Machine
- Random Forest

	Ego Model	Network Model	Full Model
HGBT	0.56	0.46	0.53
GNN	-	0.35	-
Random Forest	0.54	0.45	0.51
SVM	0.50	0.45	0.53

Table 1: Accuracy metrics for all methods.

HISTOGRAM-BASED GRADIENT BOOSTING DECISION TREE

RESULTS

Childwish	Precision	Recall	F1 Score	#
1- Absolutely not	0.52	0.55	0.54	89
2- Probably not	0.48	0.33	0.39	98
4- Probably so	0.56	0.75	0.64	227
5- Absolutely so	0.61	0.45	0.52	190

Table 2: Performance metrics for the ego model (HGBT)

Childwish	Precision	Recall	F1 score	#
1- Absolutely not	0.40	0.34	0.37	89
2- Probably not	0.33	0.24	0.28	98
4- Probably so	0.48	0.56	0.52	227
5- Absolutely so	0.49	0.50	0.49	190

Table 3: Performance metrics for the network model (HGBT)

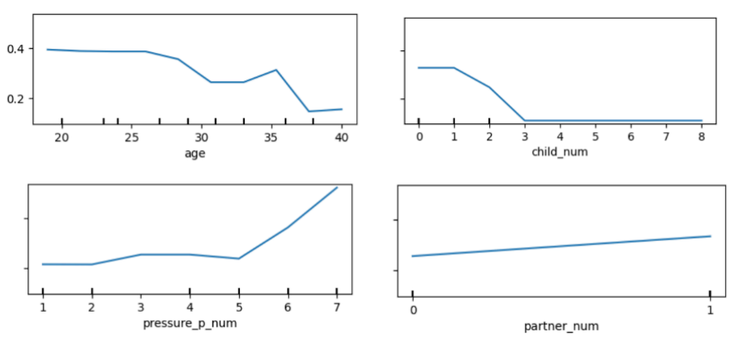


Figure 2: Partial dependency graphs ("absolutely so") for important ego variables

When the age gets older and, the number of children increases the probability of saying "absolutely so" decreases. Women with partners are more likely to have a positive attitude towards having children compared to those without partners.

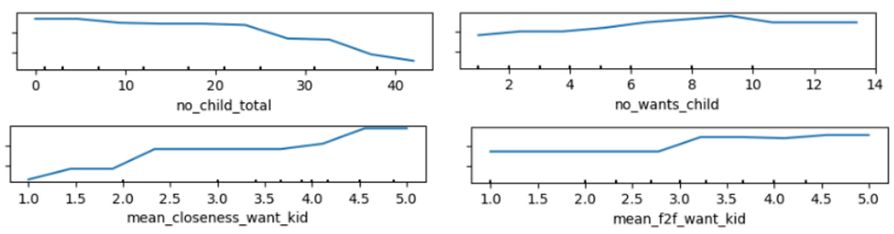
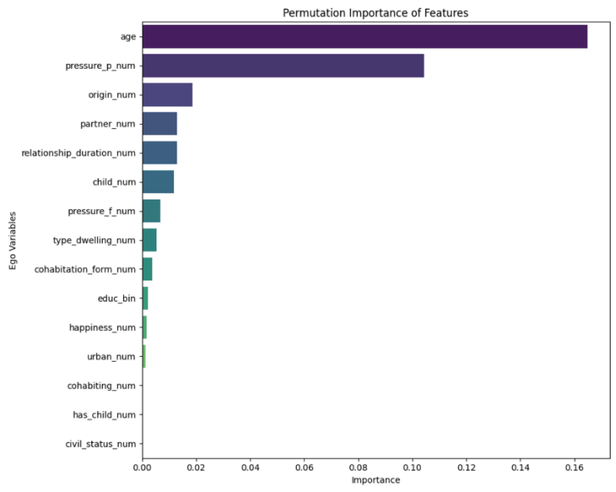
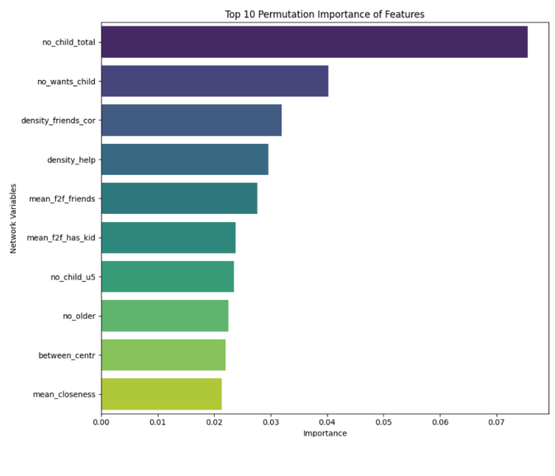


Figure 3: Partial dependency graphs ("absolutely so") for important network variables

As closeness to alters who expressing a desire for children increases, and as face-to-face meetings with these individuals become more frequent, the likelihood of saying "absolutely so" also rises.





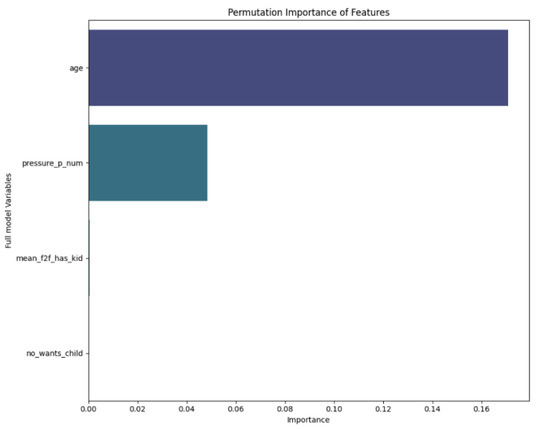
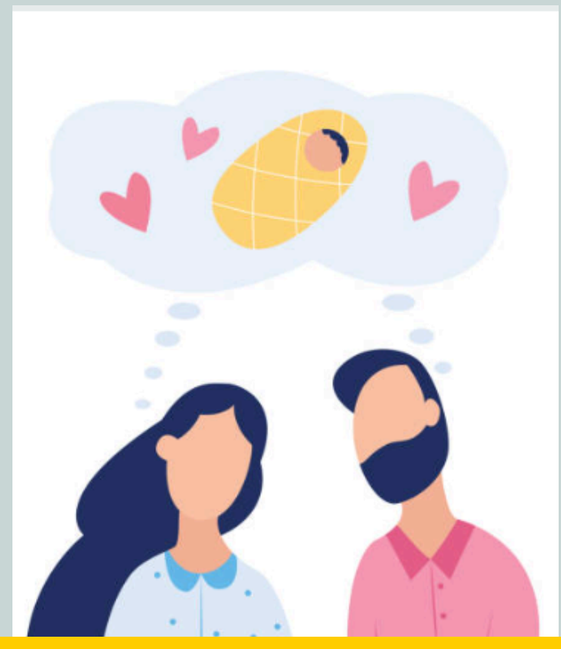


Figure 4: Permutation importance plots for ego, network and full model

CONCLUSION & DISCUSSION

- Individual characteristics, especially "age" and "family pressure" had a more significant impact compared to network variables. This finding is consistent with the study by Stulp et. al. (2023).
- But still, network variables had explanatory power for fertility intentions to a certain extent.
- What we refer to as "individual characteristics", it is not entirely possible to separate these traits from the influence of the network. It is expected that people form their networks based on their own character traits, and the reverse is also possible. Thus, it may be necessary to approach this subject from a causality perspective for the future research.



Ask for:
Ezgi Günbatar
e.gunbatar@students.uu.nl

REFERENCES:

- Stulp, G., Top, L., Xu, X., & Sivak, E. (2023). A data-driven approach shows that individuals' characteristics are more important than their networks in predicting fertility preferences. Royal Society Open Science, 10(12). https://doi.org/10.1098/rsos.230988.
- The Social Networks and Fertility Survey, downloaded from https://dataarchive.lissdata.nl