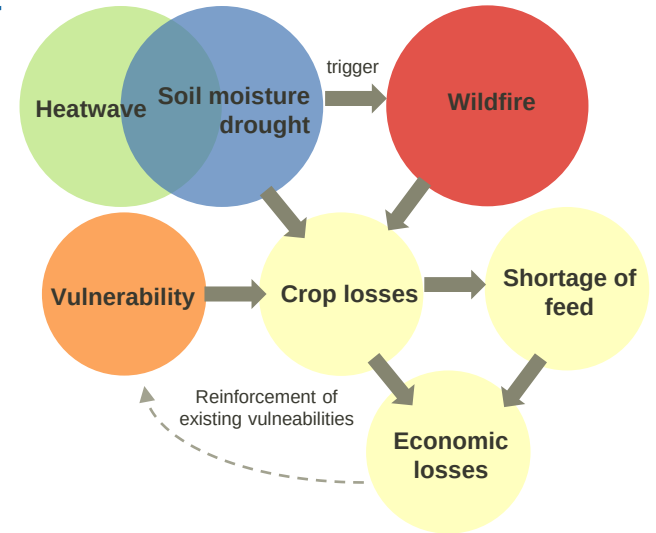


Compound and cascading drought impacts do not happen by chance: a proposal to quantify their relationships

Dr. Mariana M. de Brito

Prof. Dr. Christian Kuhlicke



Our goals

New methods are needed for quantifying cascading and compound impacts.

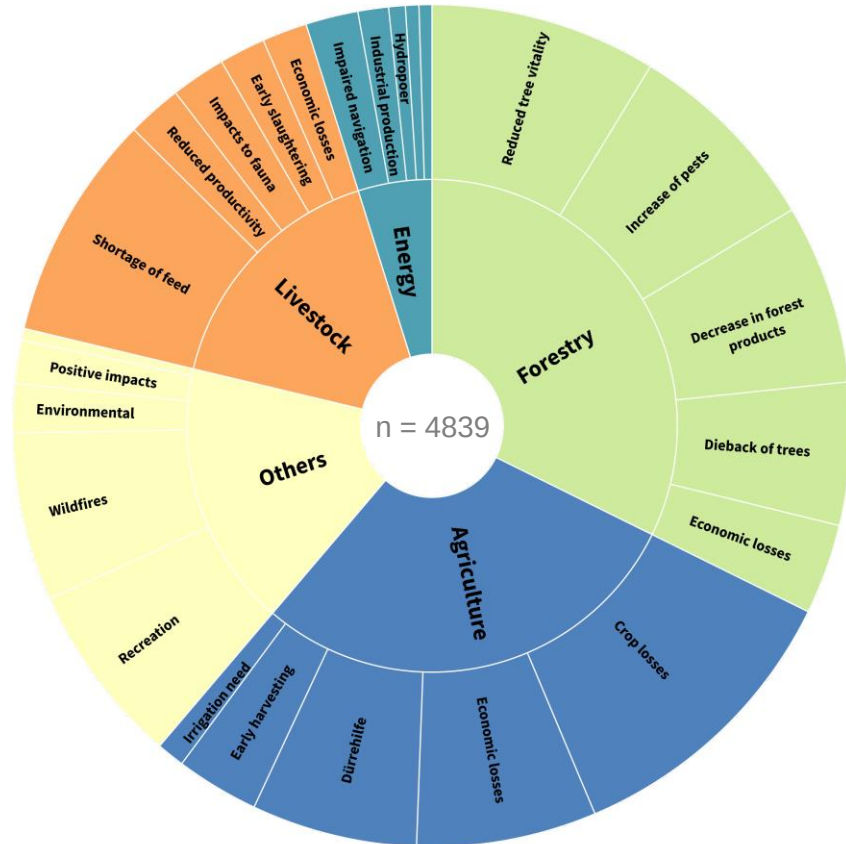
Here we aimed at:

- visualize co-occurrence and cascading drought impact patterns
- investigate if they occur by chance or follow a pattern

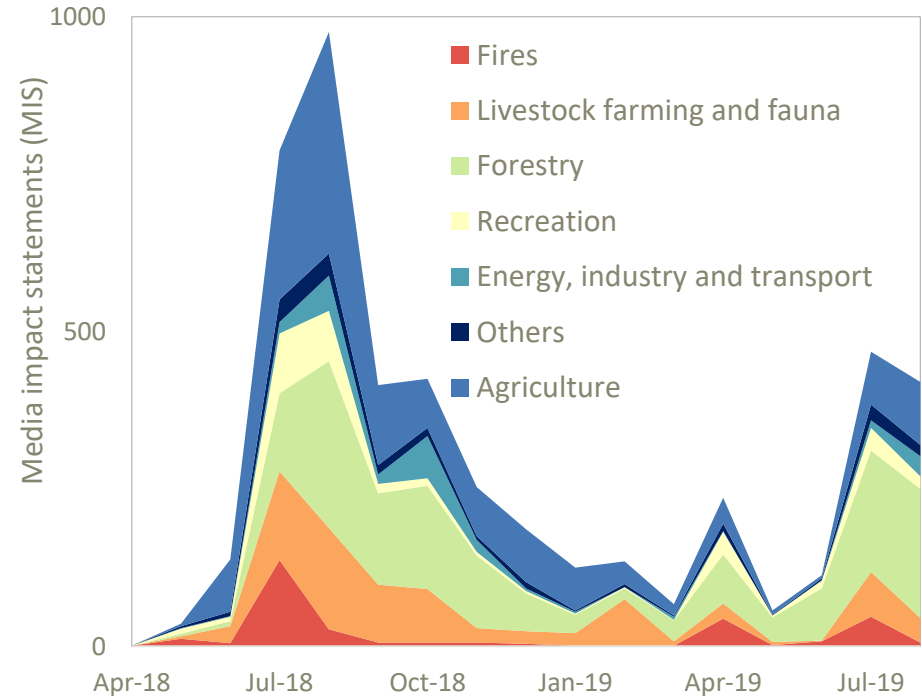
Case of the 2018/19 German drought



Impacts database



de Brito, M.M., Kuhlicke, C., Marx, A. (2020) Near-real-time drought impact assessment: A text mining approach on the 2018/19 drought in Germany. *Environmental Research Letters*. doi.org/10.1088/1748-9326/aba4ca



Methods: sequential pattern mining

Original media impact statements (MIS) database

City code	Day	N of MIS	MIS
1	96	1	44
1	149	2	44, 51
1	188	3	31, 33, 34
1	197	3	31, 33, 34

Total: 4839 MIS derived from newspaper articles

44: Impaired navigation
51: Recreation impacts

Co-occurring MIS

City code	Day	Co-occurring MIS
1	149	44 - 51
1	188	31 - 33
1	188	31 - 34
1	188	33 - 34
1	197	31 - 33
1	197	31 - 34
1	197	33 - 34

Total: 4608 co-occurring MIS

2-items cascading MIS within 30 days

City code	Sequence
1	31 → 31
1	31 → 33
1	31 → 34
1	33 → 31
1	33 → 33
1	33 → 34
1	34 → 31
1	34 → 33
1	34 → 34
1	34 → 34

Total: 465 patterns
16115 observations

Co-occurring impacts follow a pattern

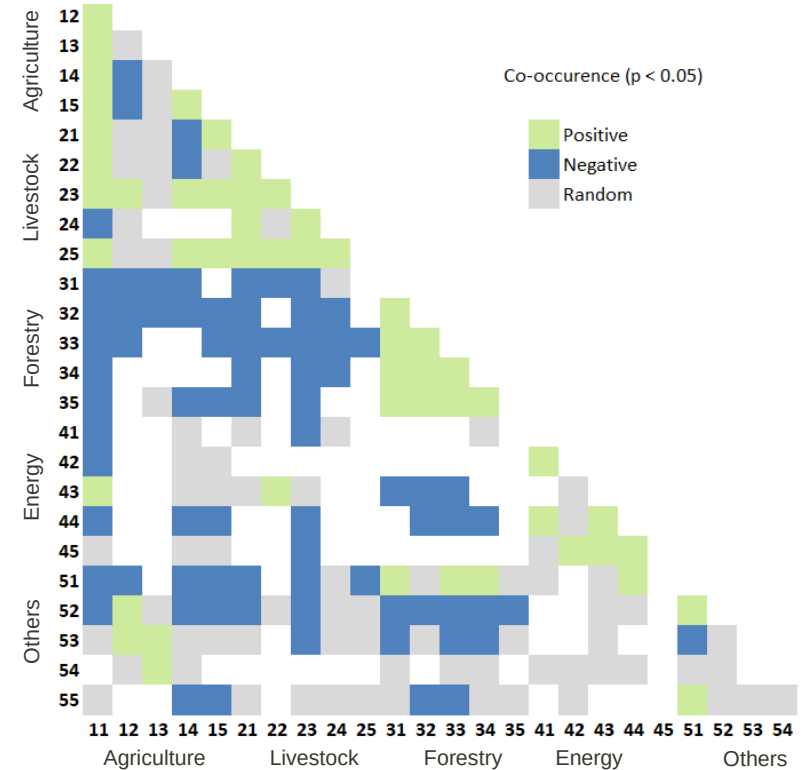
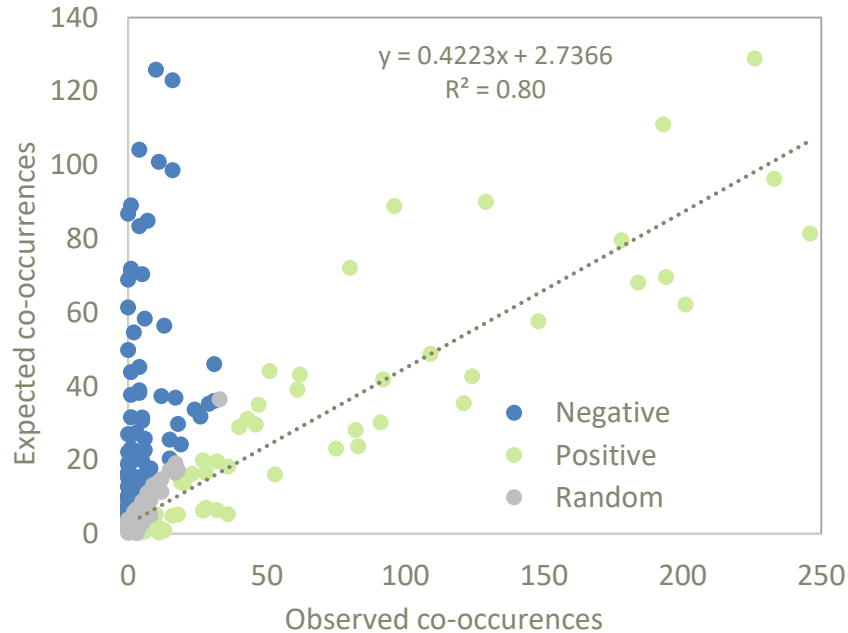
Probabilistic model proposed by Veech (2013)

Edges: 4608

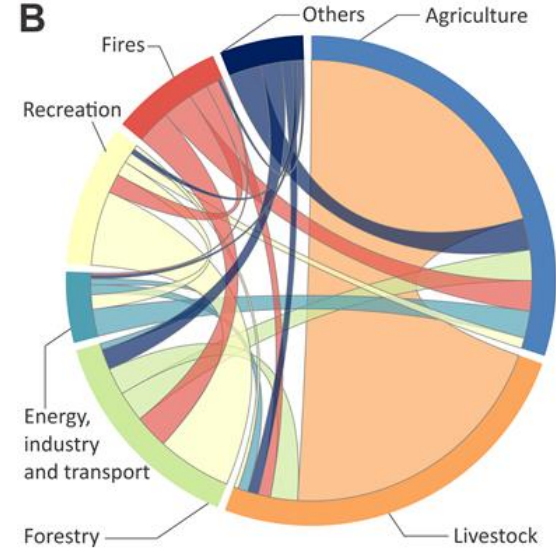
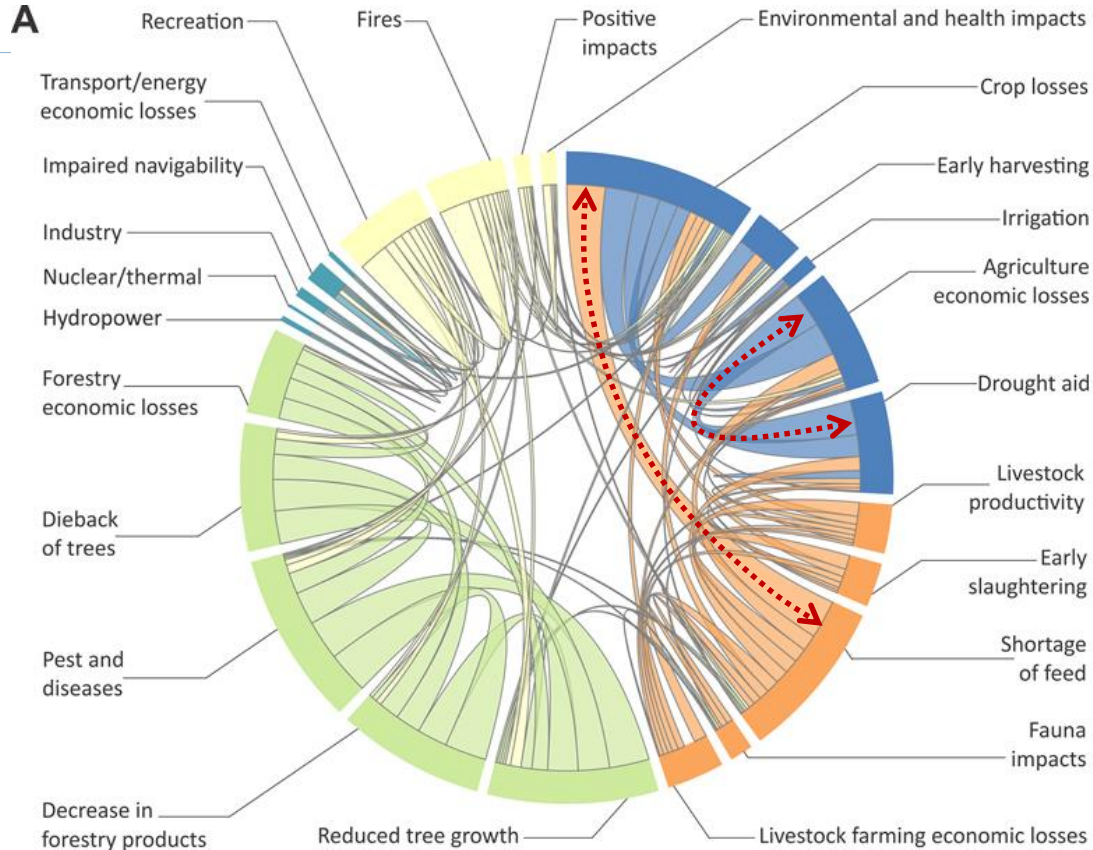
Positive: 80.3%

Negative: 10.8%

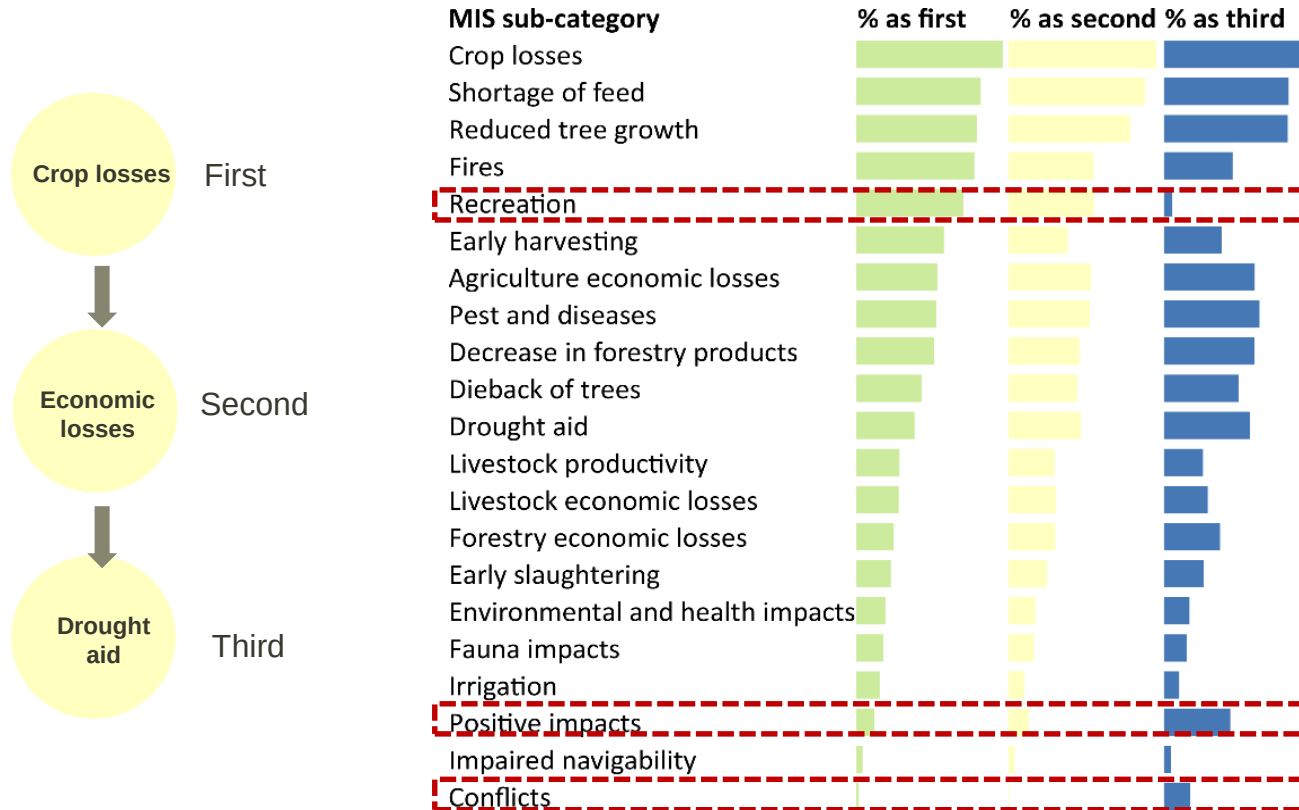
Random: 8.9%



Co-occurring MIS



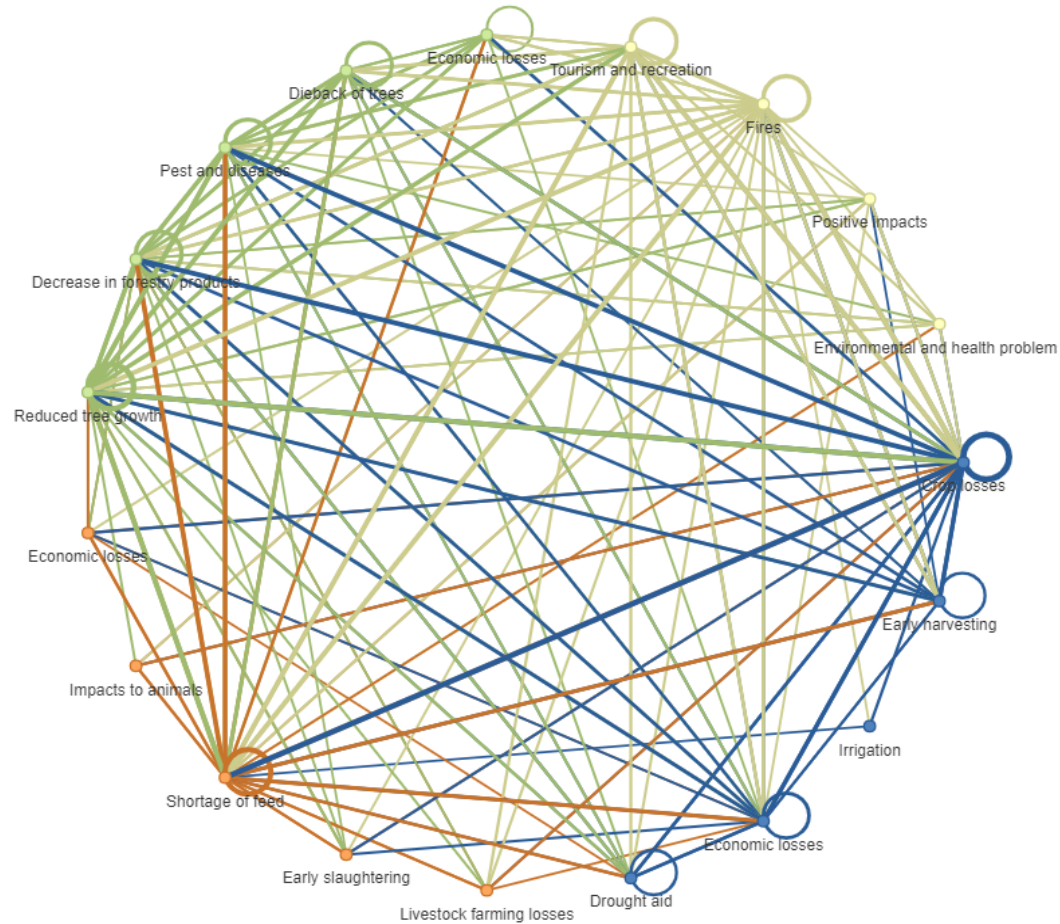
Some impacts tend to trigger other impacts



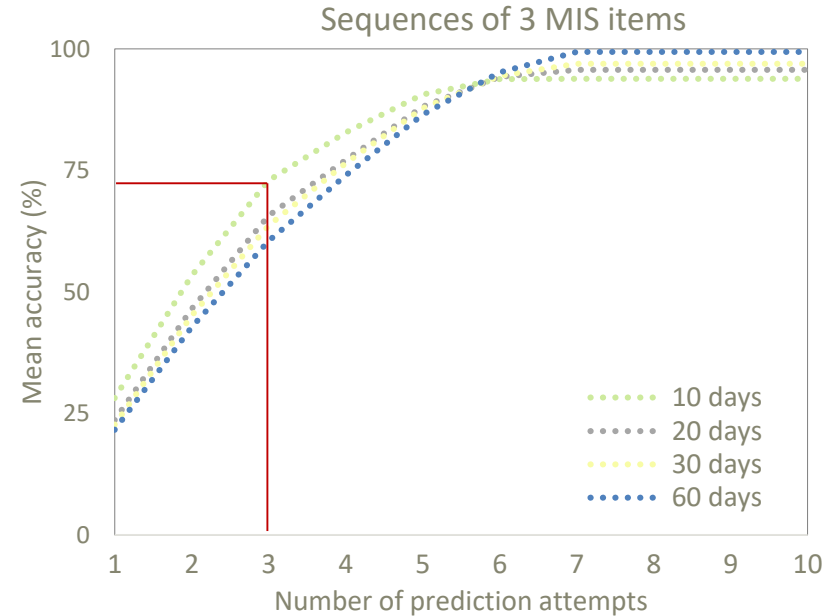
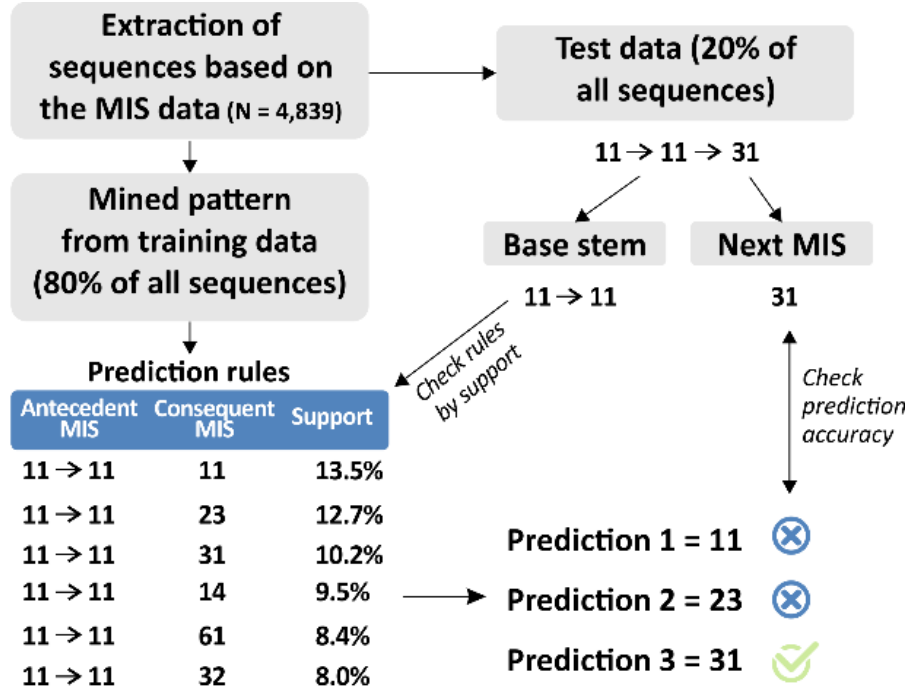
Cascading MIS

Raw cascading paths for
2 items sequences and
considering a 30 days
gap

Edges: 16,115



Estimating future MIS



Conclusions

Our methods allows for:

- simplification and synthesis of complex interactions
- identification of statistically significant patterns
- user-friendly visualization
- prediction of future cascading impacts



Questions?
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