Security is not a single dimension

Simin Nadjm-Tehrani

Dept of Computer and Information Science

LINKÖPING UNIVERSITY

Back to the 50’s

Interesting times

- Our systems have never been as digitally connected as today
- The frequency and severity of data breaches and outages is monotonically increasing
- Geopolitical tension is intertwined with technical development

Rush to use AI but not many are sure why!

If we were to look into future…

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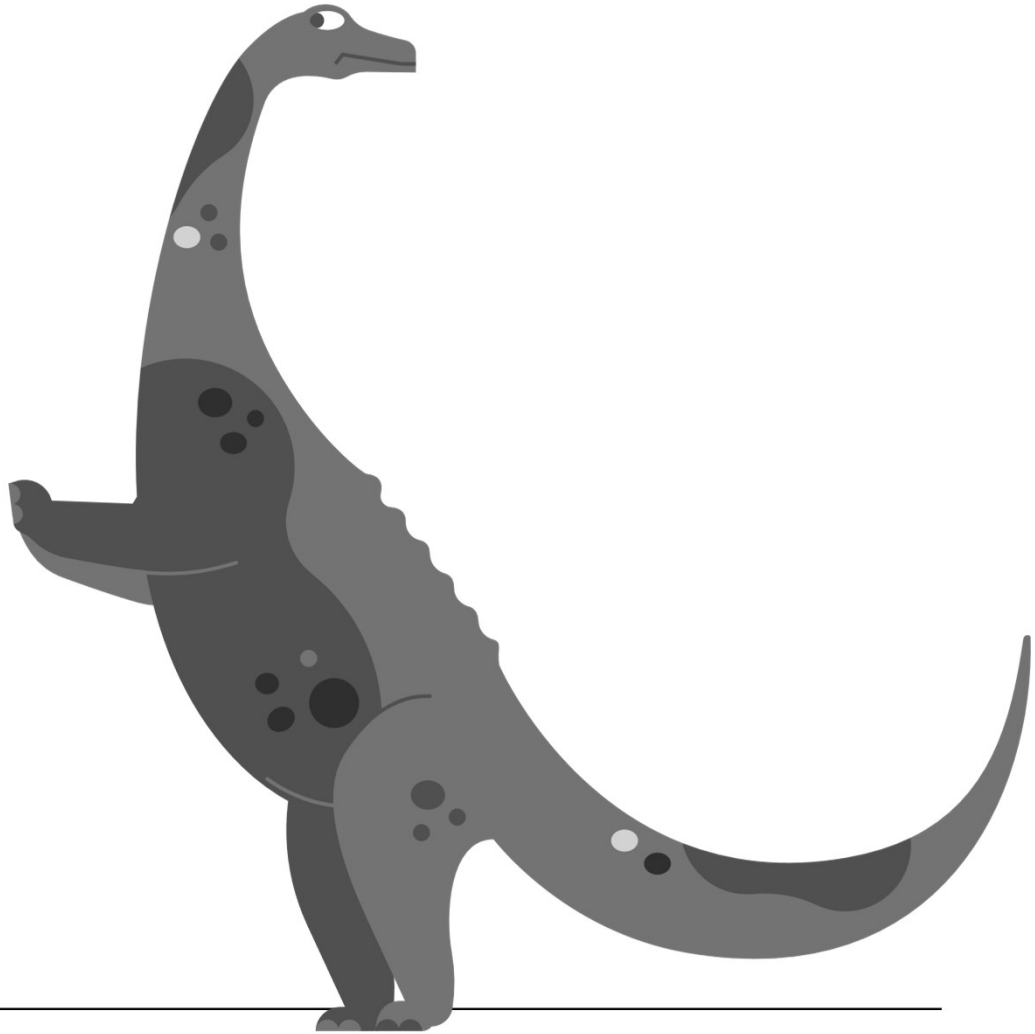
AI can be used for different purposes

- Exploration
- Data fusion
- Optimisation
- Prediction
- Detection
- Decision
- Action
- Autonomous mission



This summer…

LLMs being used for

- Hacking into systems

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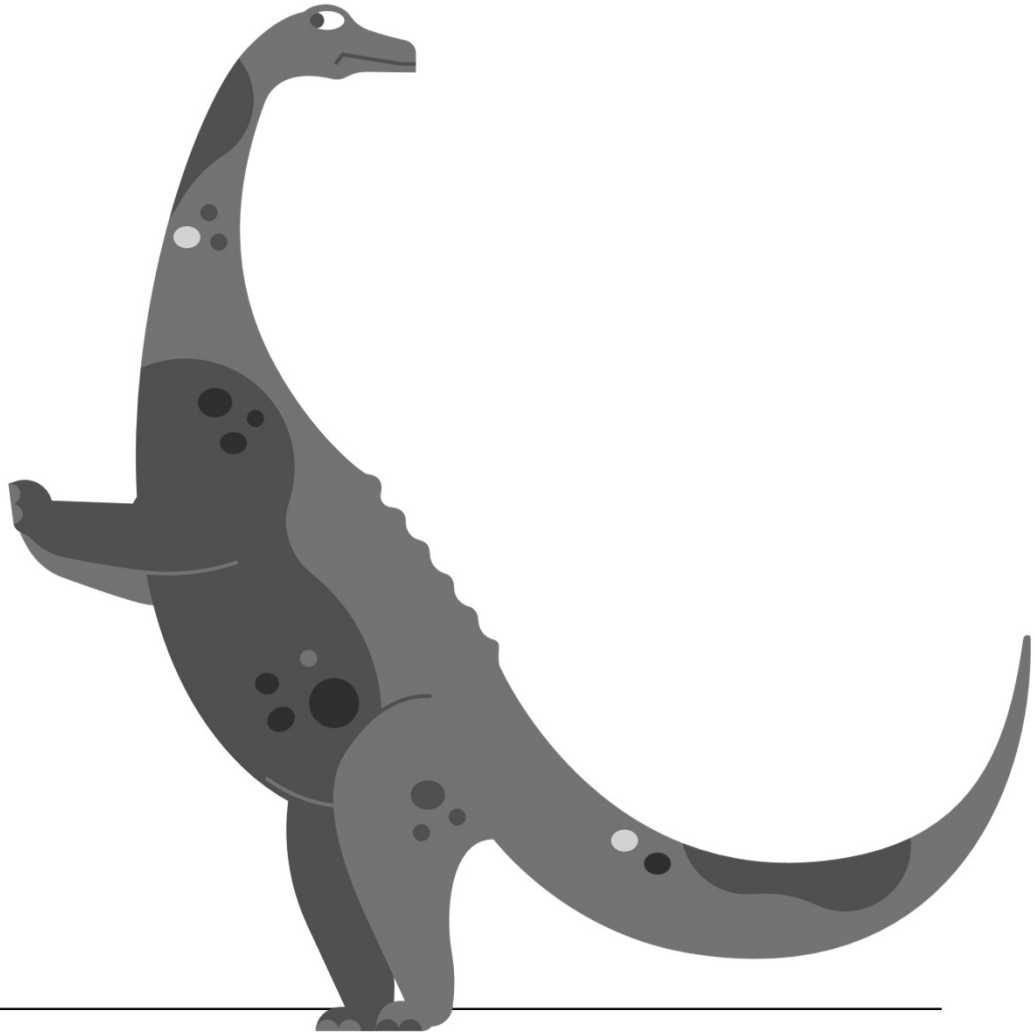
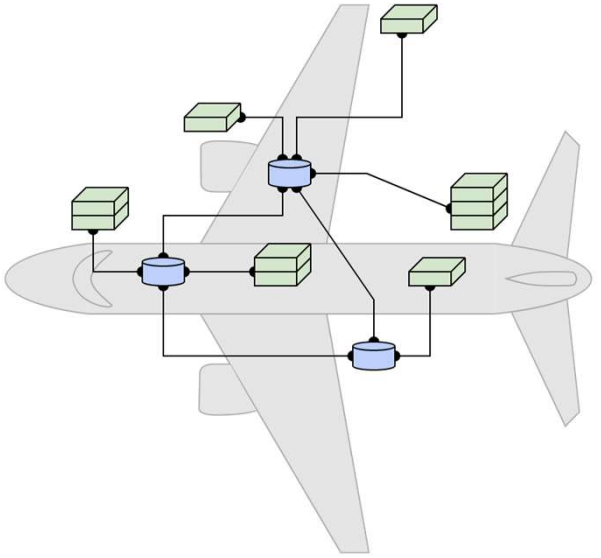


AI & Exploration

Integrated Modular Avionics (IMA)

Avionics concept design

- Resource adequacy
  - find a schedule for a *given* platform configuration
  - proof that a such a schedule exists (does not exist) for a *given* platform configuration
- Our work: Reasoning about *different* platform configurations
  - comparing their merits w.r.t. fault tolerance, security, resource efficiency, cost

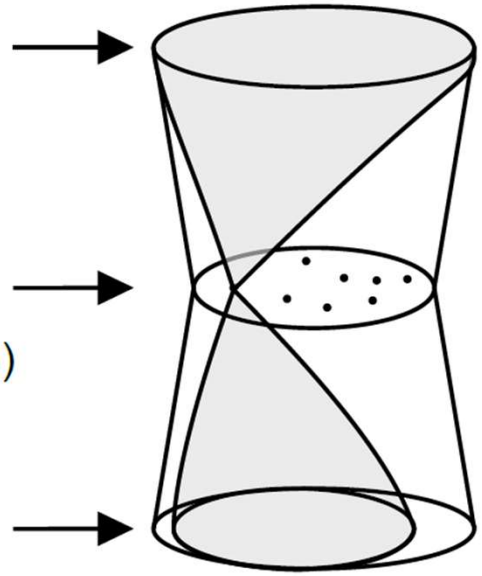


How to find a good enough architecture and mapping?

IMA Platform Modules and Connection Patterns
(HW/SW)

Alternative Platform Configurations
(Sets of Modules and Connections)

Concept Avionic Application Model
(SW Requirements)



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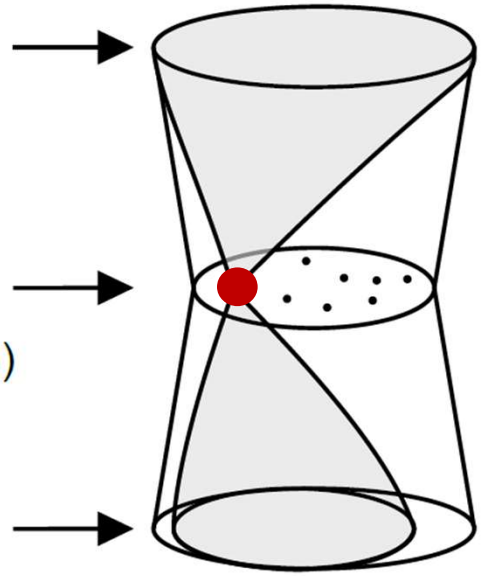
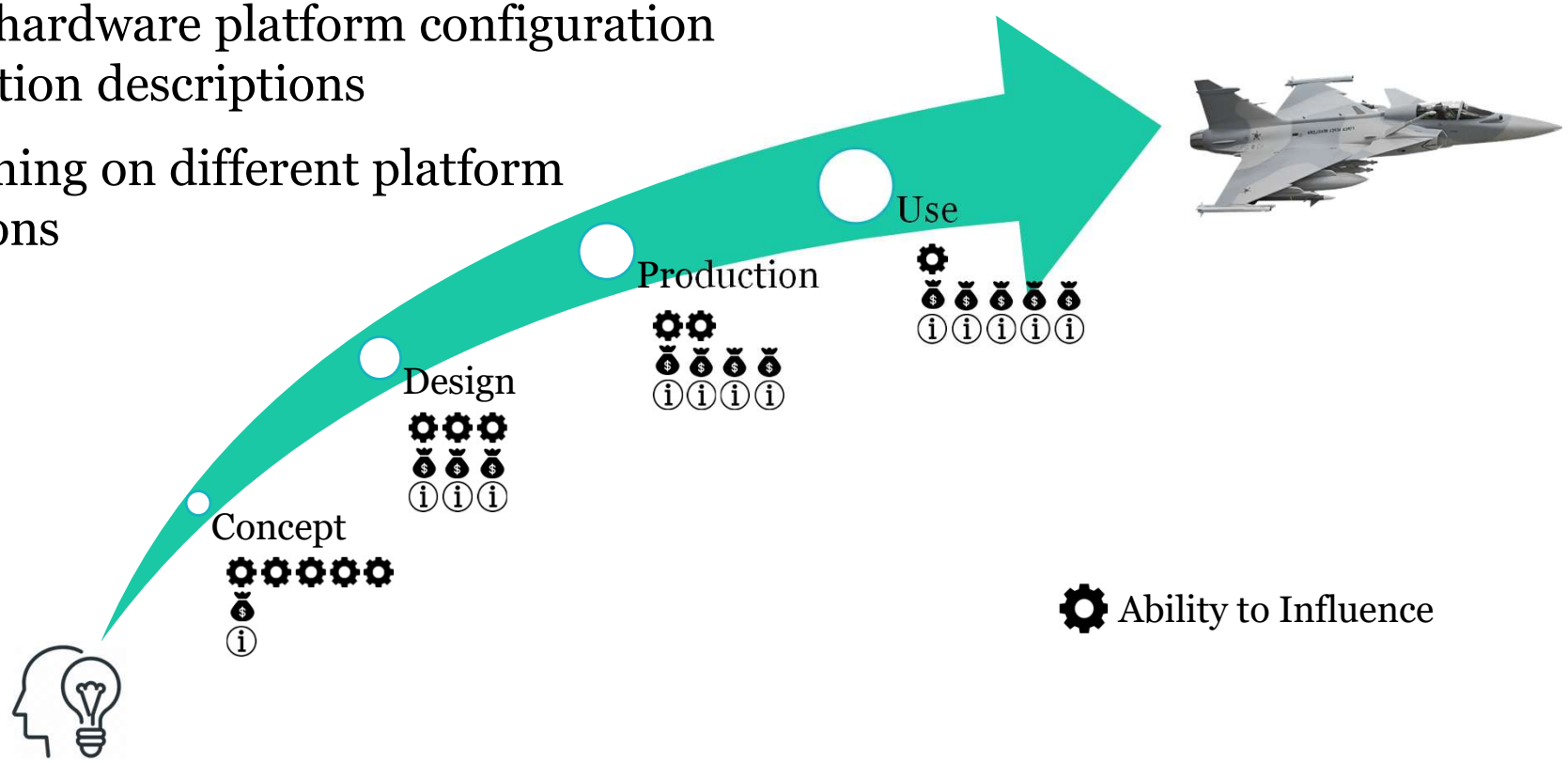


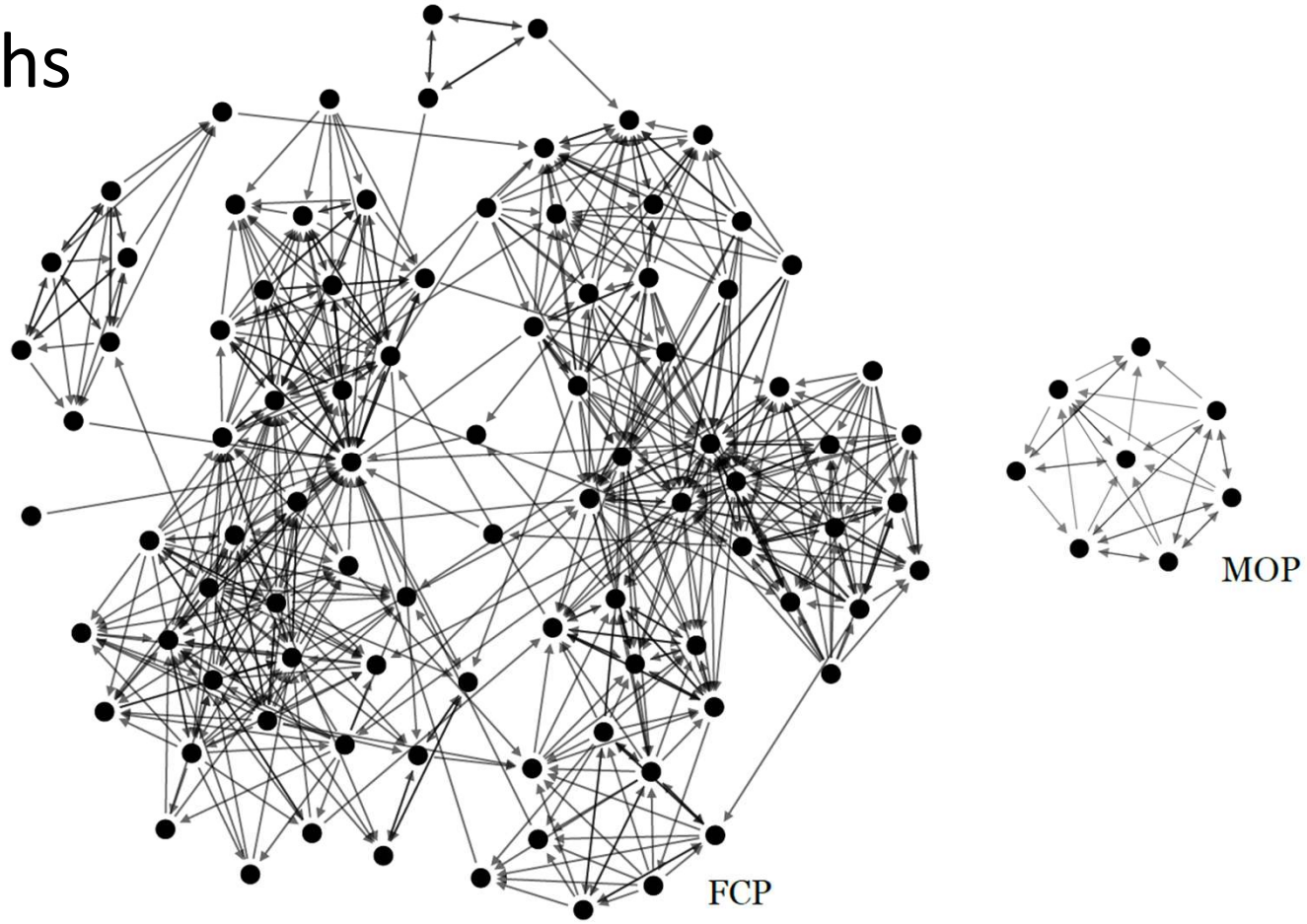
Goals

- Separating hardware platform configuration and application descriptions
- Early reasoning on different platform configurations

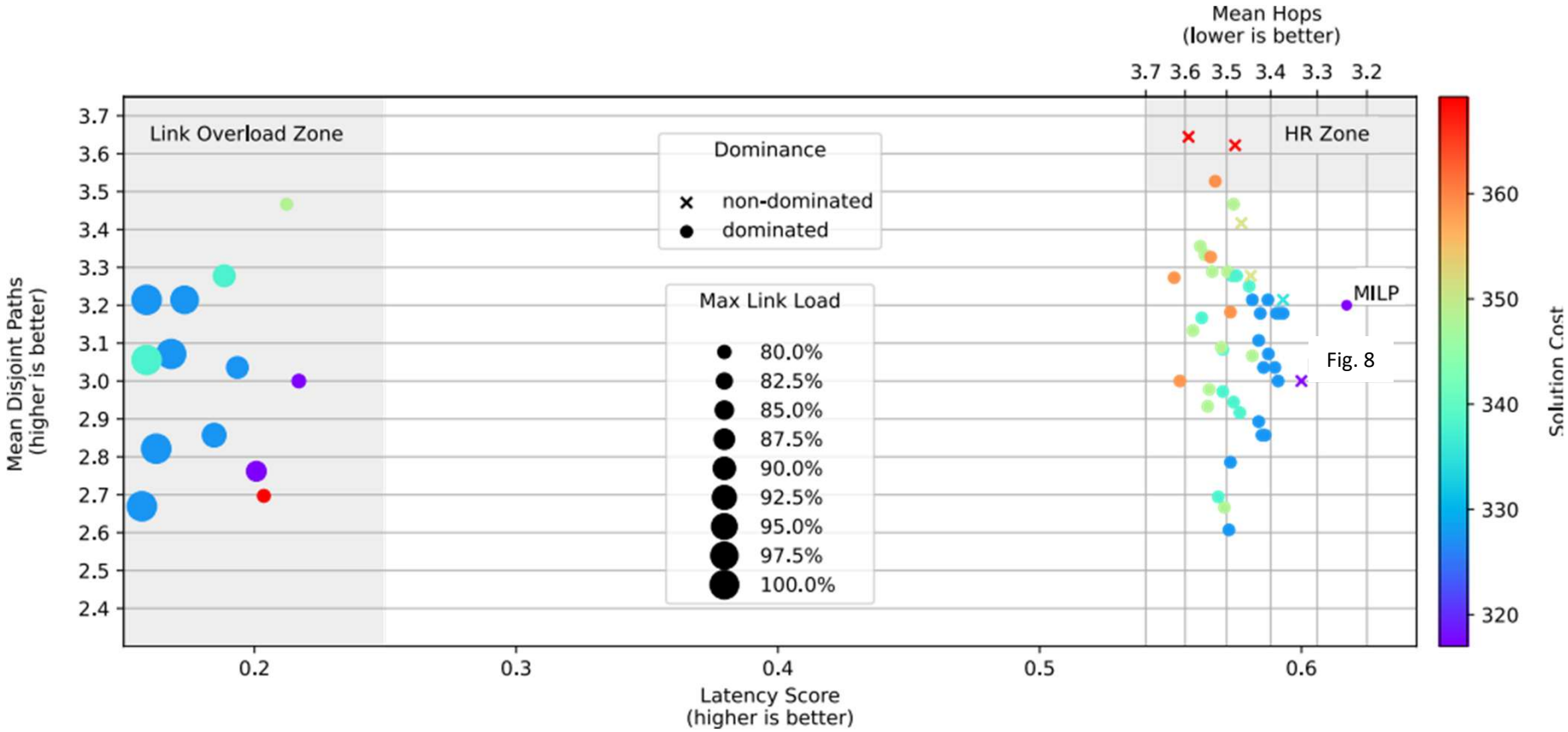


Saab Use Case

- Message paths



Our Approach: NetGAP



R. Moraes, S. Nadjm-Tehrani, *Engineering Applications of Artificial Intelligence,* 2024
doi:10.1016/j.engappai.2024.108089

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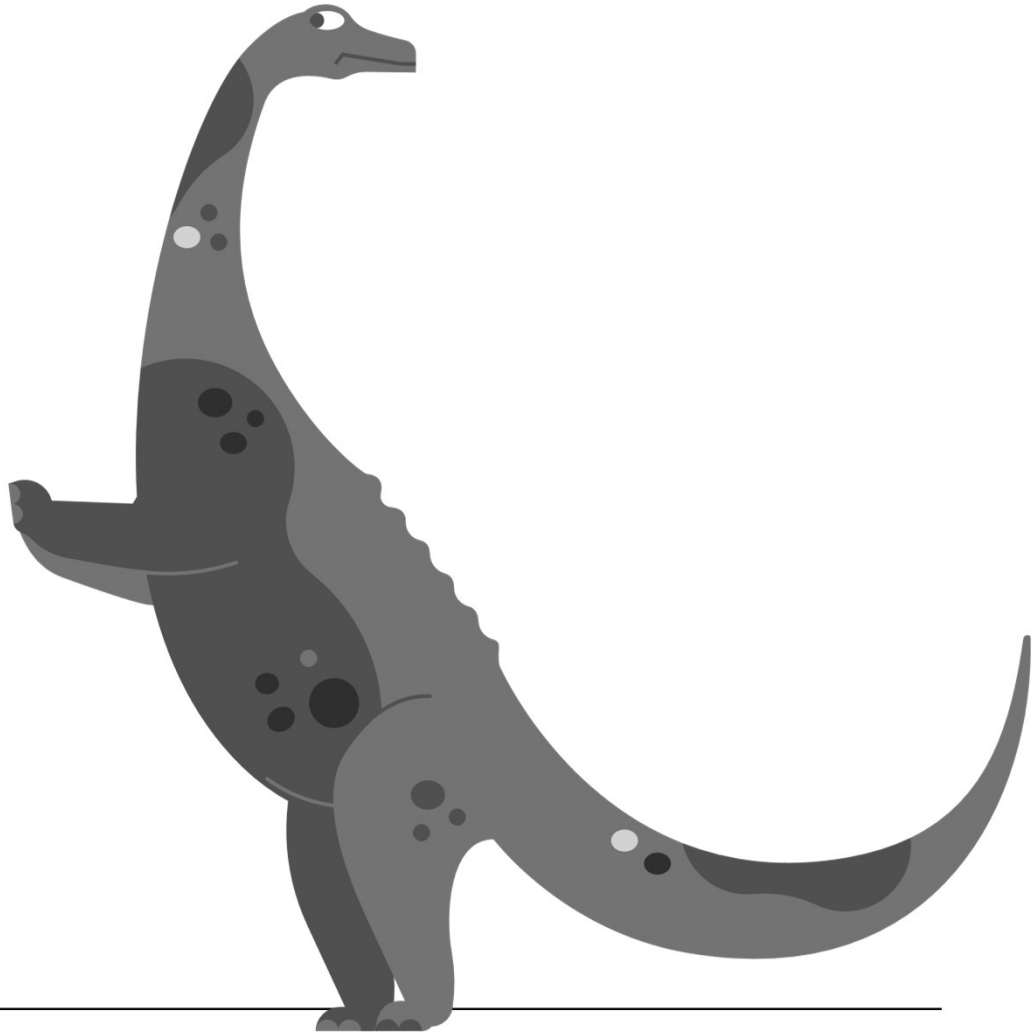

AI & Decisions

Protecting Critical Communication Infrastructures

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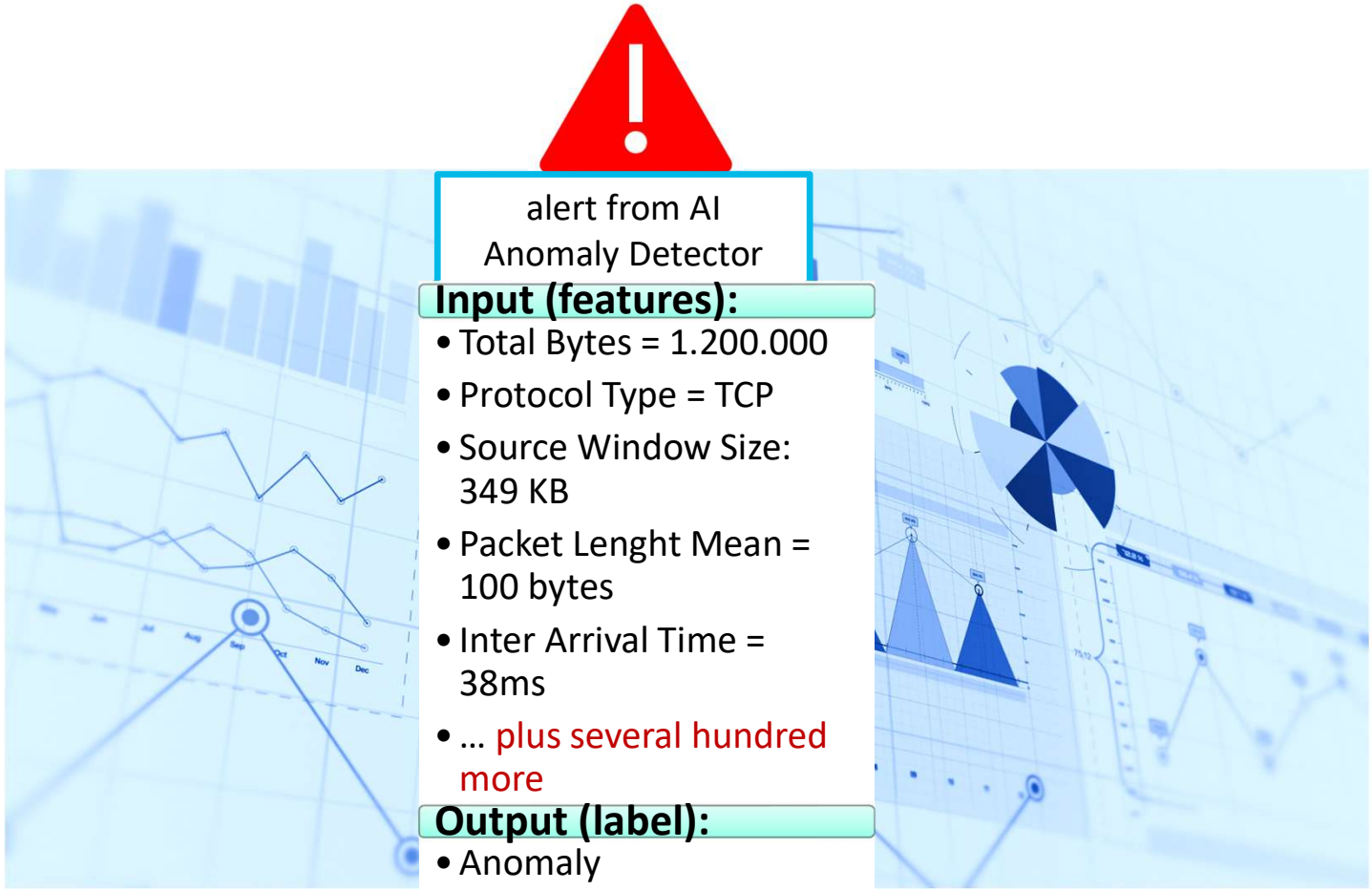
AI & decisions

- EU AI Act constrains use of AI in decision making
- Some decisions are important
- Some have severe consequences
- **Our research:** Correctness of AI outputs needs to be verified

Intrusion detection in critical infrastructure



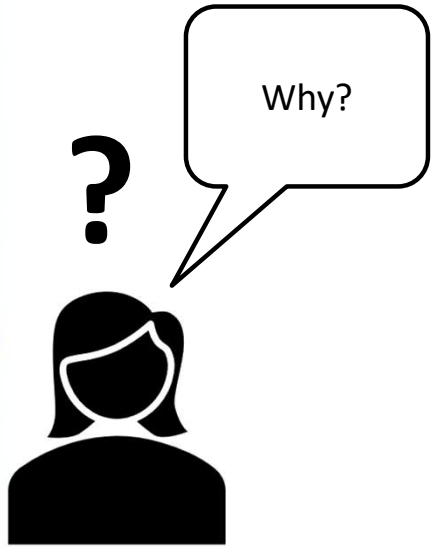
alert from AI Anomaly Detector

Input (features):

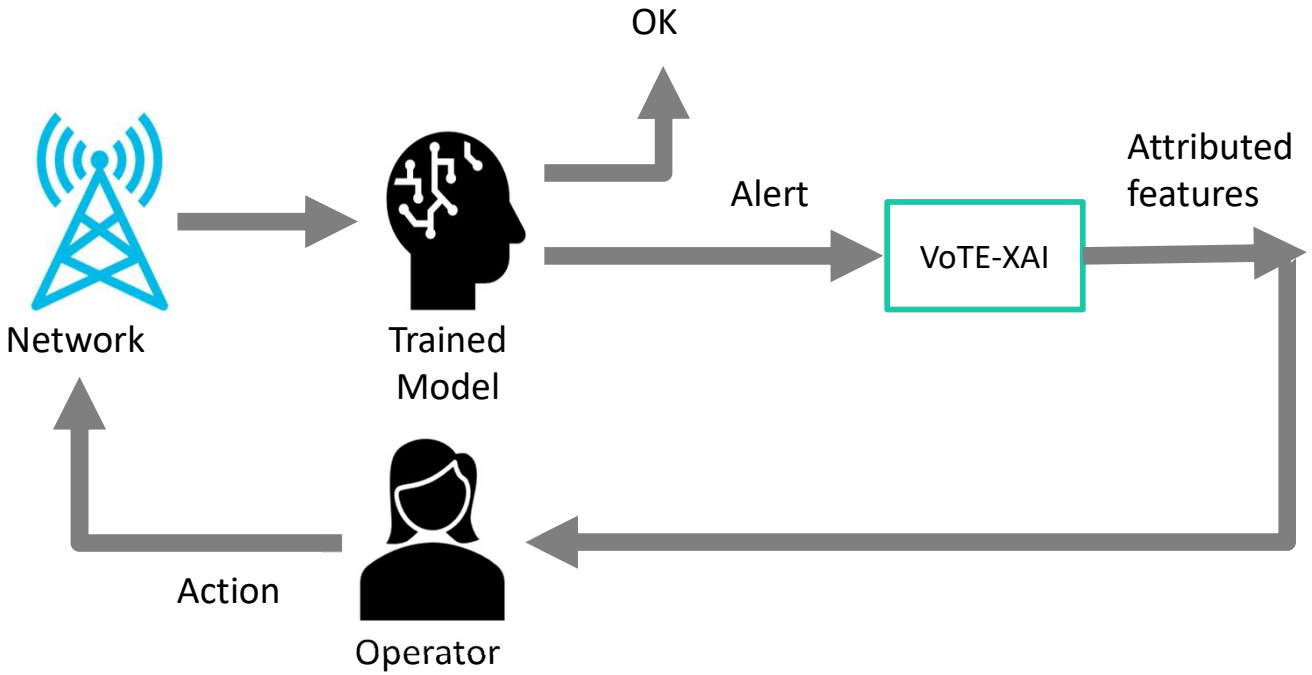
- Total Bytes = 1.200.000
- Protocol Type = TCP
- Source Window Size: 349 KB
- Packet Lenght Mean = 100 bytes
- Inter Arrival Time = 38ms
- … plus several hundred more

Output (label):

- Anomaly

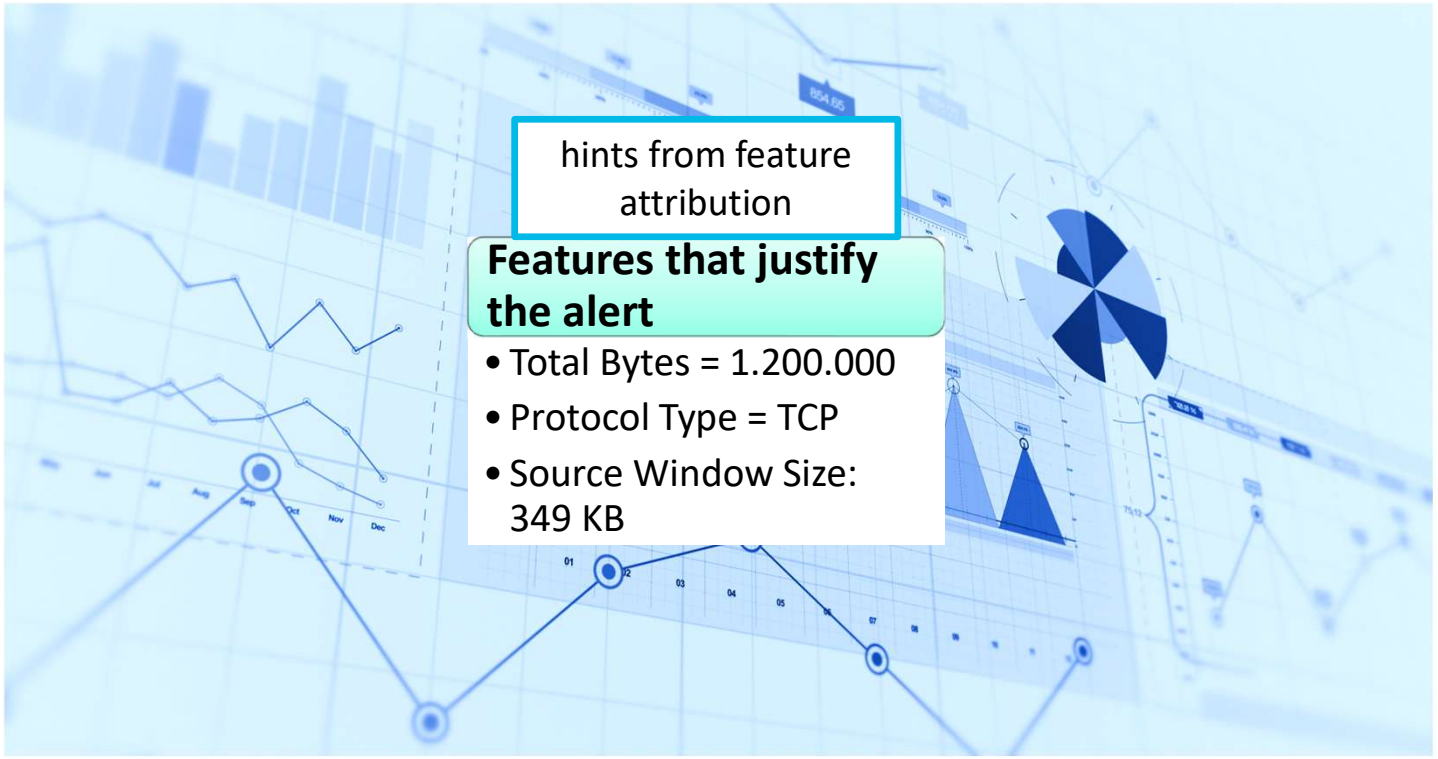


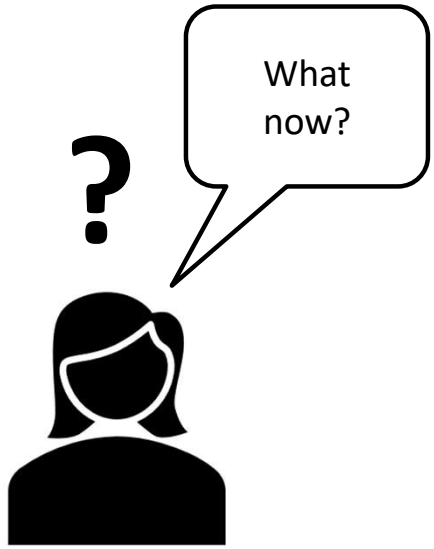
Which set of features explain the alert?



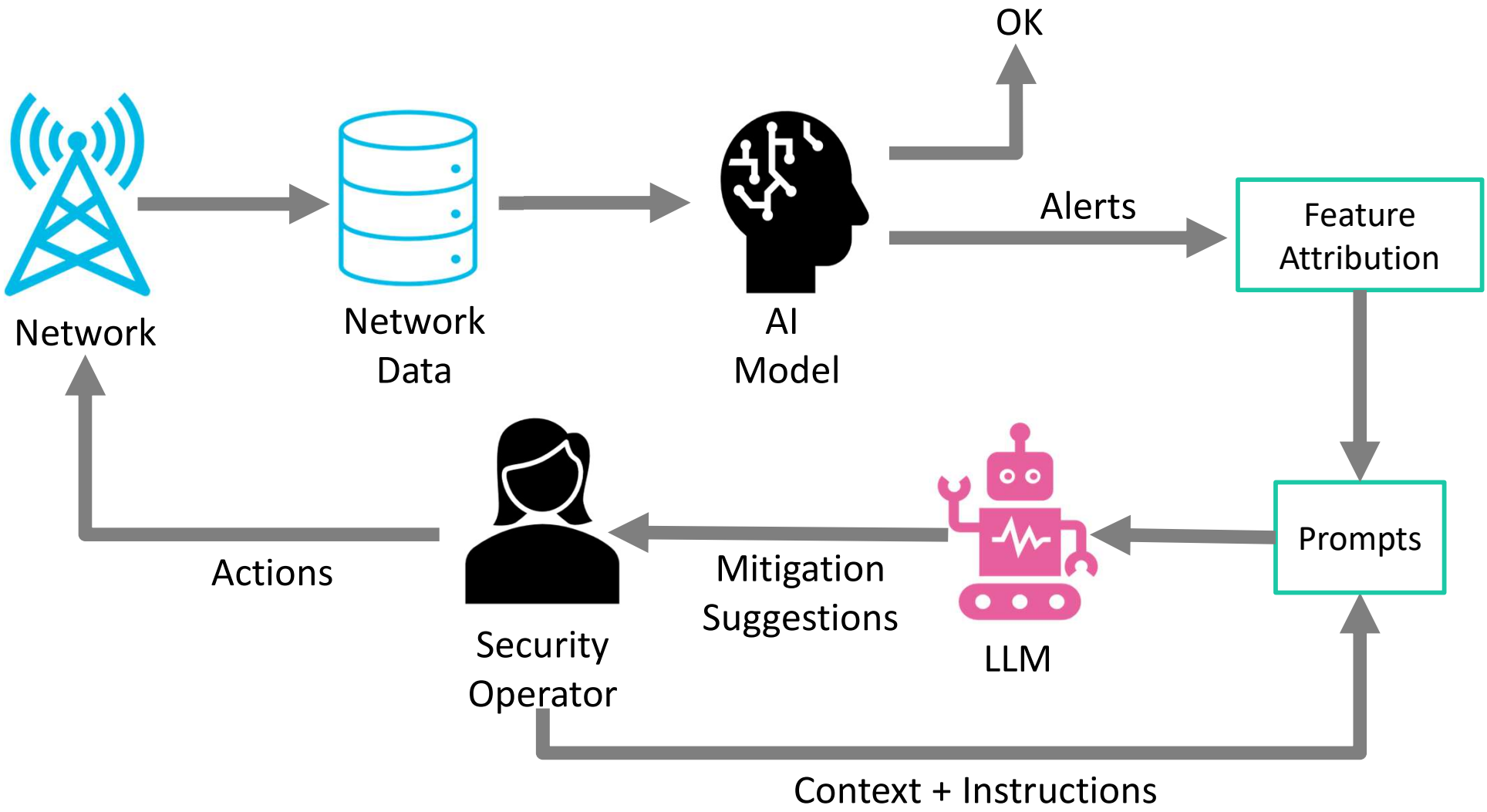
J. Törnblom, E. Karlsson, S. Nadjm-Tehrani, Finding Minimum-Cost Explanations for Predictions Made by Tree Ensembles, March 2026, https://doi.org/10.1002/spe.70061

Explanations help the human



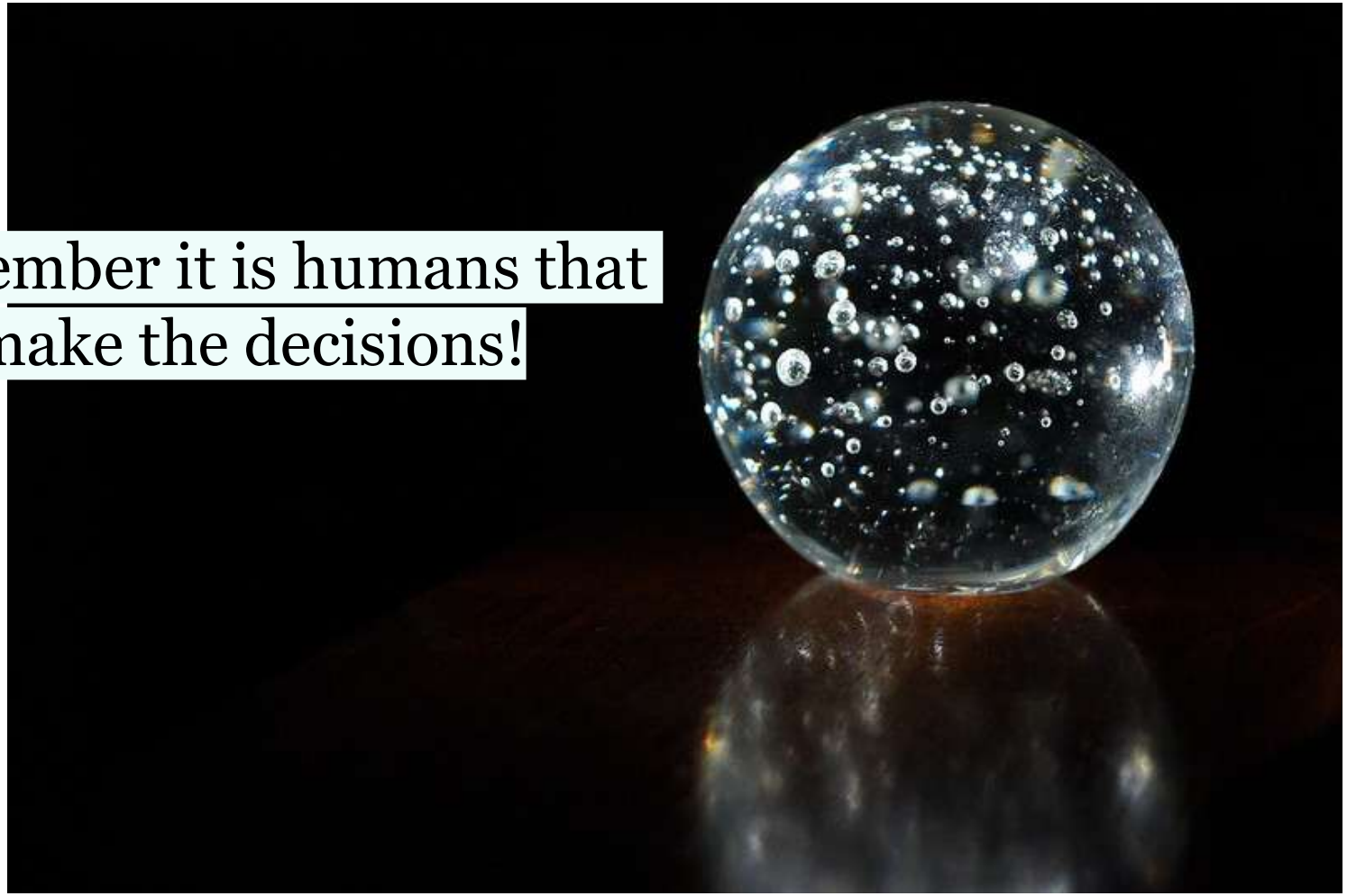


Joint work with Purdue University



Federica Uccello, et al. Mission Explainable: From Feature Attribution to Mitigation in 5G Anomaly Detection, ICNC 2026, DOI: 10.1109/ICNC68183.2026.11416967

AI or no AI?



simin.nadjm-tehrani@liu.se

New Centre: https://liu.se/en/research/resist