ETH zürich

Center for Sustainable Future Mobility (CSFM)

ExplainAI: Designing explainable ML-based systems for collaborative work in the railways

Lena Schneider[1], Gudela Grote[1], Daniel Boos[2]
[1] Chair of Work and Organisational Psychology, ETH Zurich; [2] SBB

1 Introduction

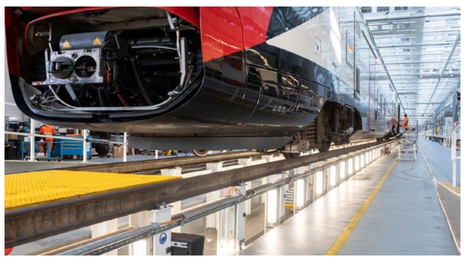
- **Opaqueness** of ML-based systems is a key barrier to overcome (Castelvecchi, 2016)
- The **accountability-control gap** is a phenomenon already known from traditional automation, but is even wider for AI (Grote et al.,2014; Grote et al., 2022)
- Legally, accountability always stays with the human actors, but control increasingly lies within the system (Taddeo & Floridi, 2018),
- The issue is even more relevant in the context of multiple people with diverse backgrounds and different tasks interacting with the same system
- All stakeholders involved in development and use of ML-based systems have to continuously negotiate the **distribution of control and accountability** amongst them (Berente et al., 2021; Grote et al., 2022; Slota et al., 2021)
- For targeted explanations, deep understanding of stakeholders and their tasks is needed (Hafermalz & Huysman, 2021)

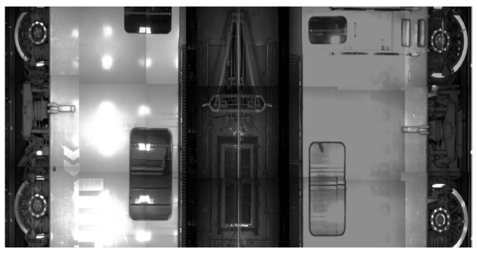
2 Research Questions

- How should we design the **distribution** of **control** and **accountability** in such systems?
- How can we make such systems **explainable** for the involved human **actors with different backgrounds** and professions?
- How can we **support product development** in addressing potential issues with explainability, control & accountability during system development and use?

5 Expected Impact

- Capture of processes involved in collaboration among heterogenous teams and (multiple) AI systems and translation into design requirements for explainable AI
- More effective use of techniques to build in explanations in ML-based systems
- Facilitated decision-making during systems design to create more reliable and safe systems

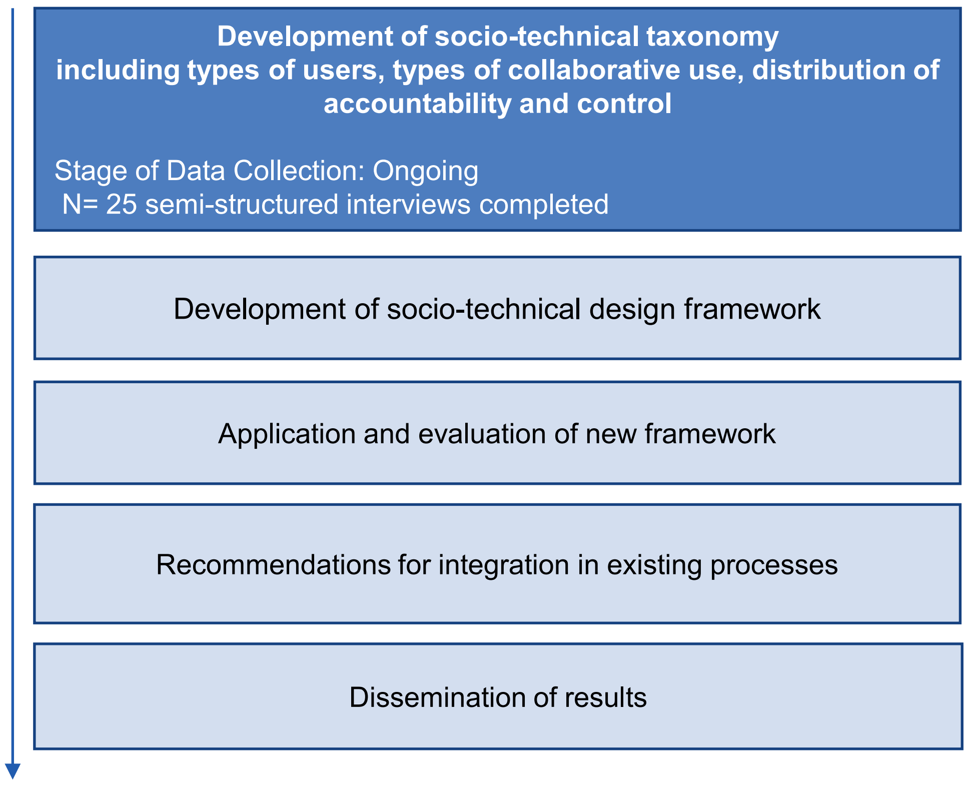




Partner: SBB CFF FFS SIEMENS

3 Project Outline

Project Start: October 2022



Development of socio-technical taxonomy including types of users, types of collaborative use, distribution of accountability and control

Stage of Data Collection: Ongoing
N= 25 semi-structured interviews completed

Development of socio-technical design framework

Application and evaluation of new framework

Recommendations for integration in existing processes

Dissemination of results

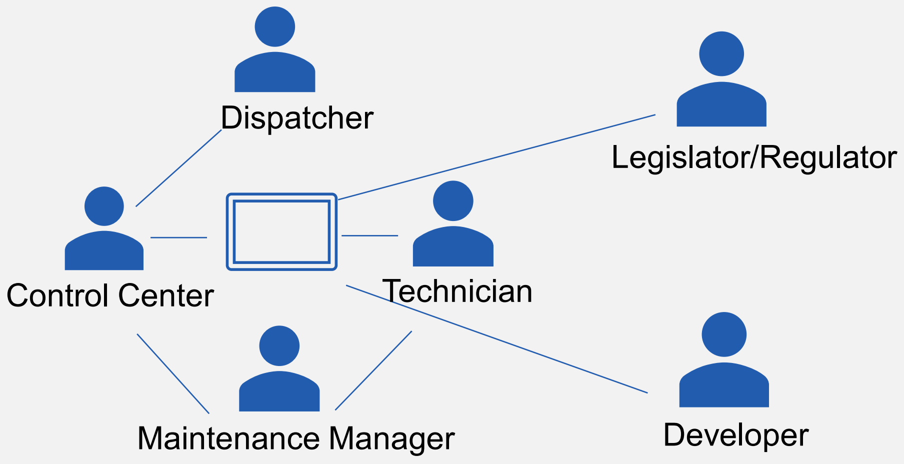
Expected Completion: September 2025

4 Preliminary Results

Identified **Use Cases** include

- Visual inspection & (predictive) maintenance
- Traffic Management
- Automated Train Operation
- Surveillance and detection of switch malfunctions

Example **Stakeholder Network**



References

Berente, N., Gu, B., Recker, J. & Santhanam, R.(2021). Managing Artificial Intelligence. MIS Quarterly. 45. 1433-1450. 10.25300/MISQ/2021/16274.

Castelvecchi, D. (2016). The blackbox of AI. Nature, 538(7623), 21-23.

Grote, G., Parker, S. K., & Crowston, K. (2022). Organizing AI: A design theory for organizational decision-making on and with learning algorithms in networks of accountability. Paper presented at the WAIM conference, June 6-7, Washington D.C.

Grote, G., Weyer, J., & Stanton, N. (2014). Beyond human-centred automation - concepts for human machine interaction in multilayered networks. Ergonomics, 57, 289-294.

Hafermalz, E. & Huysman, M. (2021). Please explain: Key questions for explainable AI research from an organizational perspective. Morals & Machines, 2, 10-22.

Slota, S. C., Fleischmann, K . R. , Greenberg, S., Verma, N., Cummings, B. , Li, L., & Shenefiel, C. (2021). Many hands make many fingers to point: Challenges in creating accountable AI. AI & Society.

Taddeo, M., & Floridi, L. (2018). How AI can be a force for good. Science, 361(6404), 751-752.

CSFM