Do Users Exploit XAI-saliency Maps in AI-supported Decision Making? A User Study in Continuous Production of Textile Fibers Via Eye-tracking Technology

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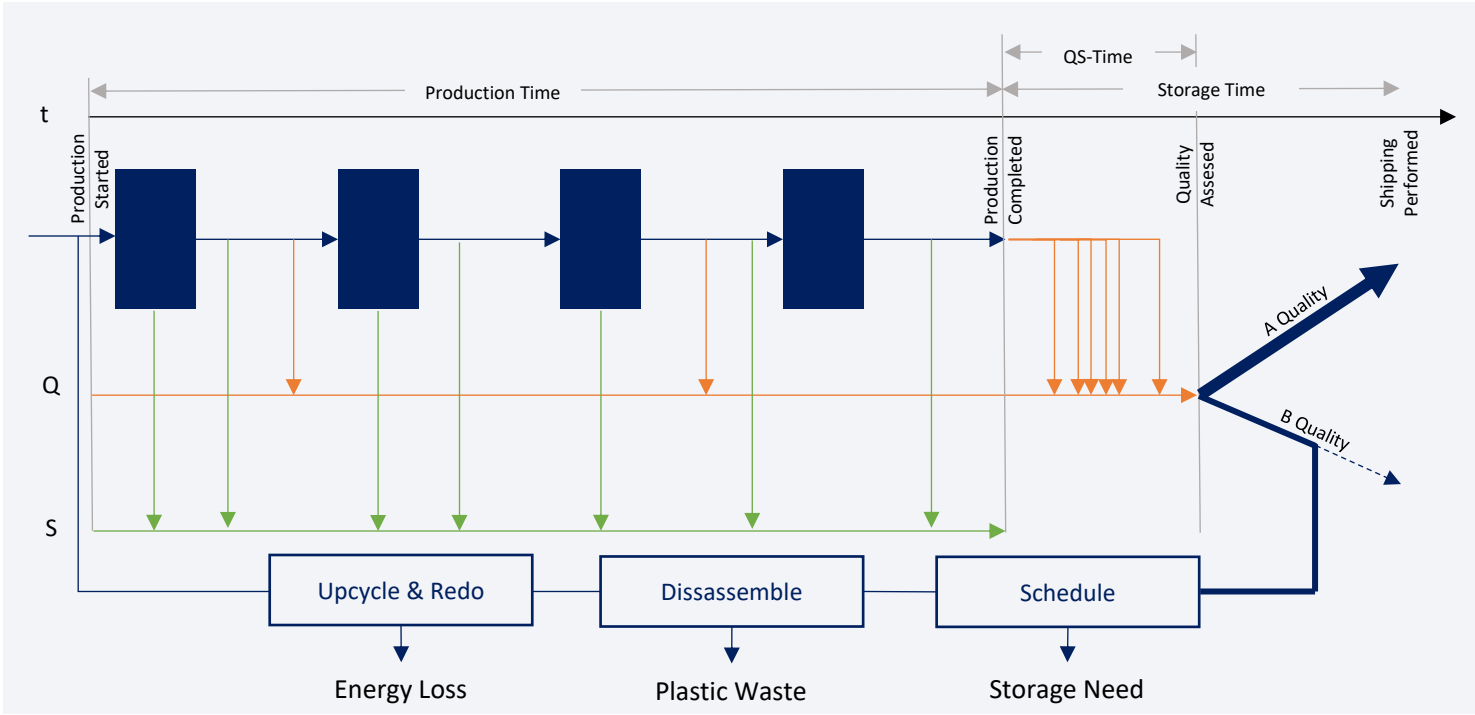
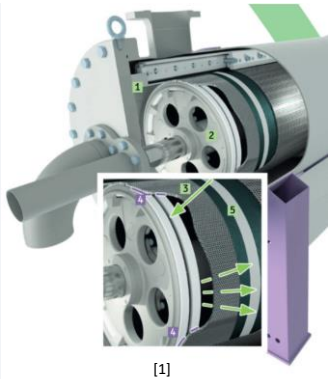
Motivation

XAI for the Industry

Context: REWAI - Reducing Energy and Waste using AI





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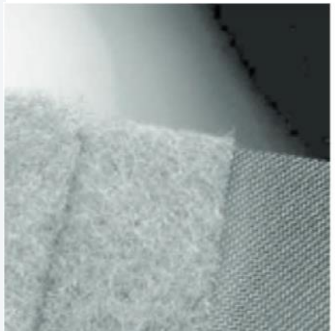

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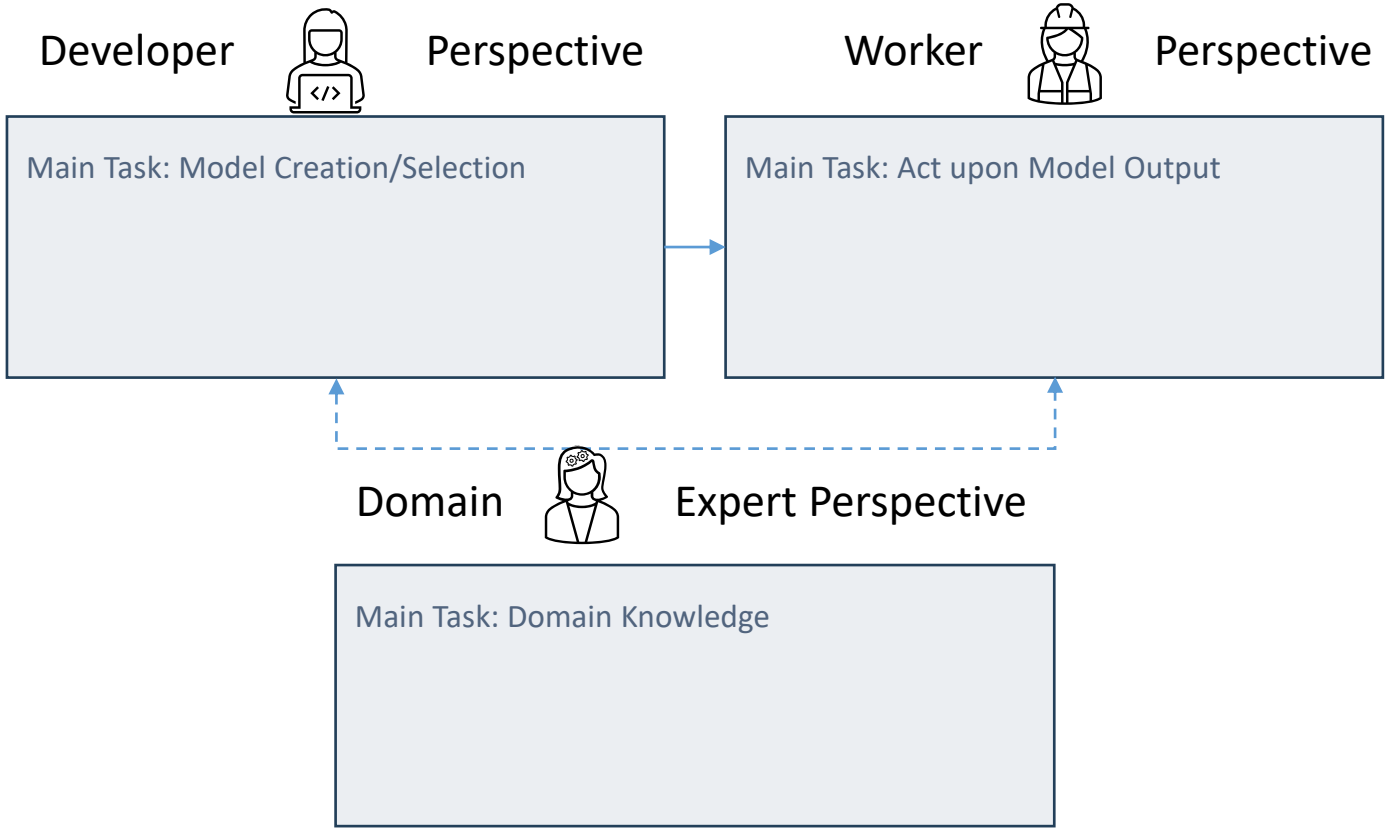
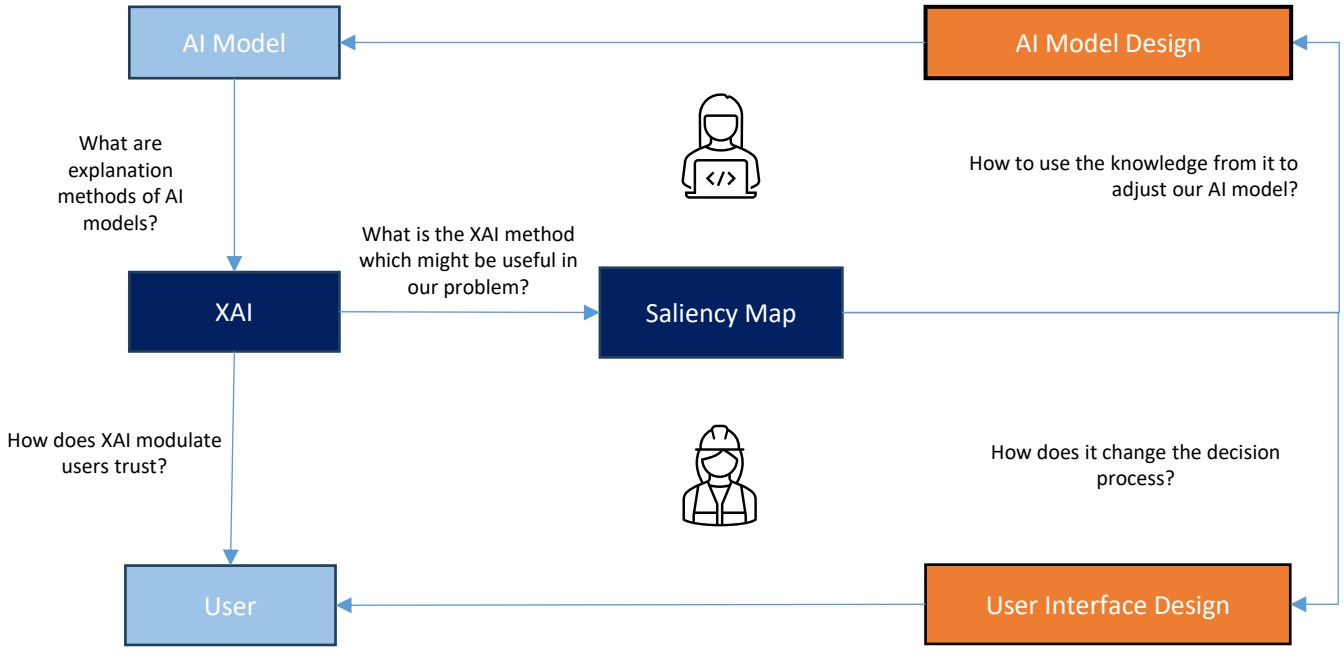
[1] Source: Lenzing ViscoFil (https://www.lenzing-technik.com/fileadmin/template/images/content/produkte/ViscoFil/ViscoFil_01-23_EN.pdf (accessed on 5 June 2024))

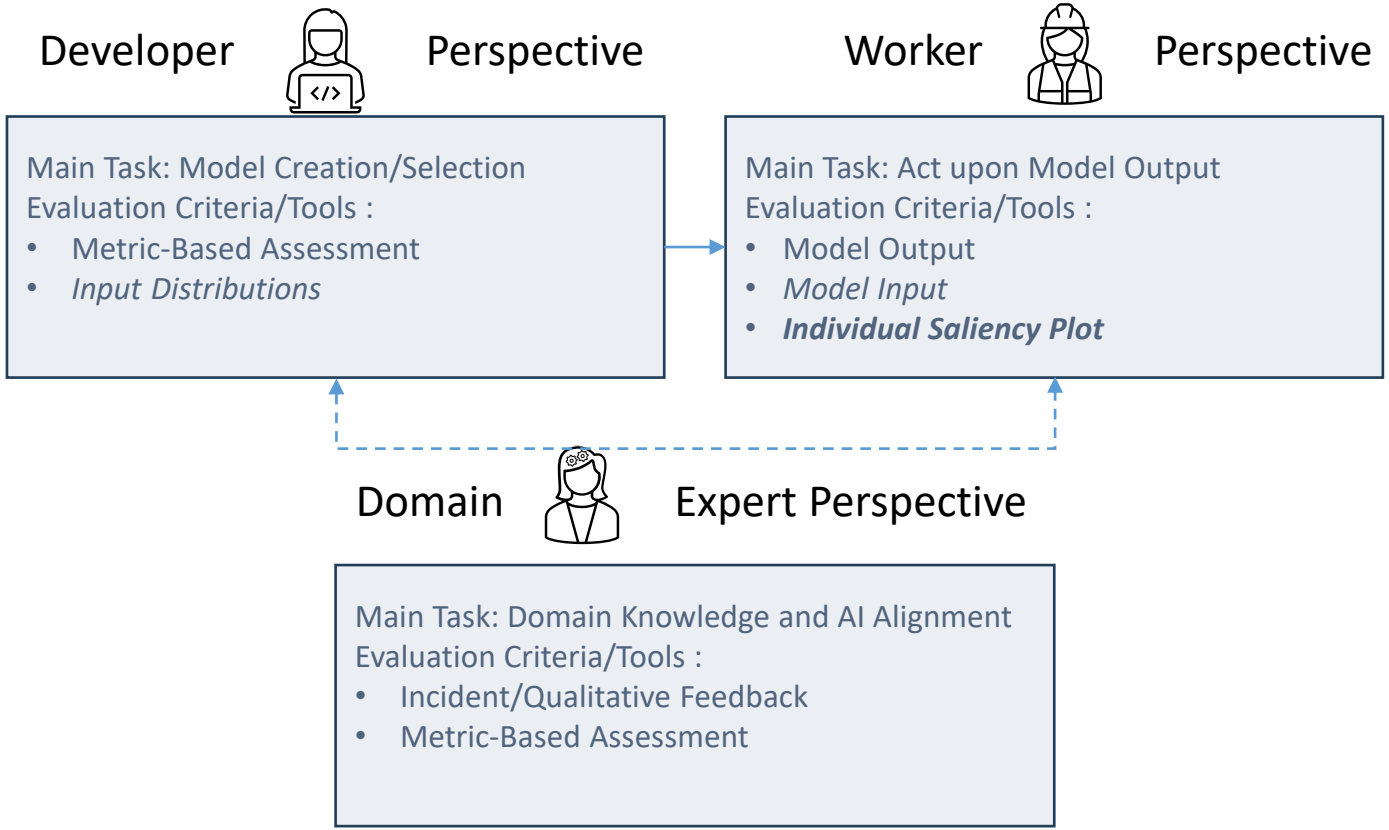
Industrial AI – The need for XAI



Industrial AI – The need for XAI



Industrial AI – The need for XAI



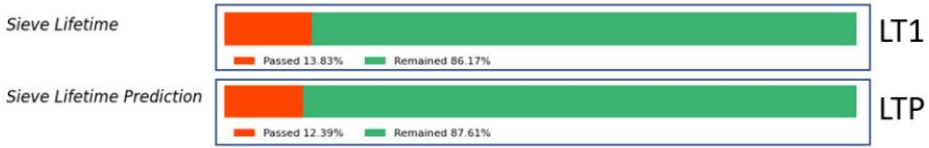
User Study

Predictive Maintenance Task

User Study Setup

Worker  Perspective

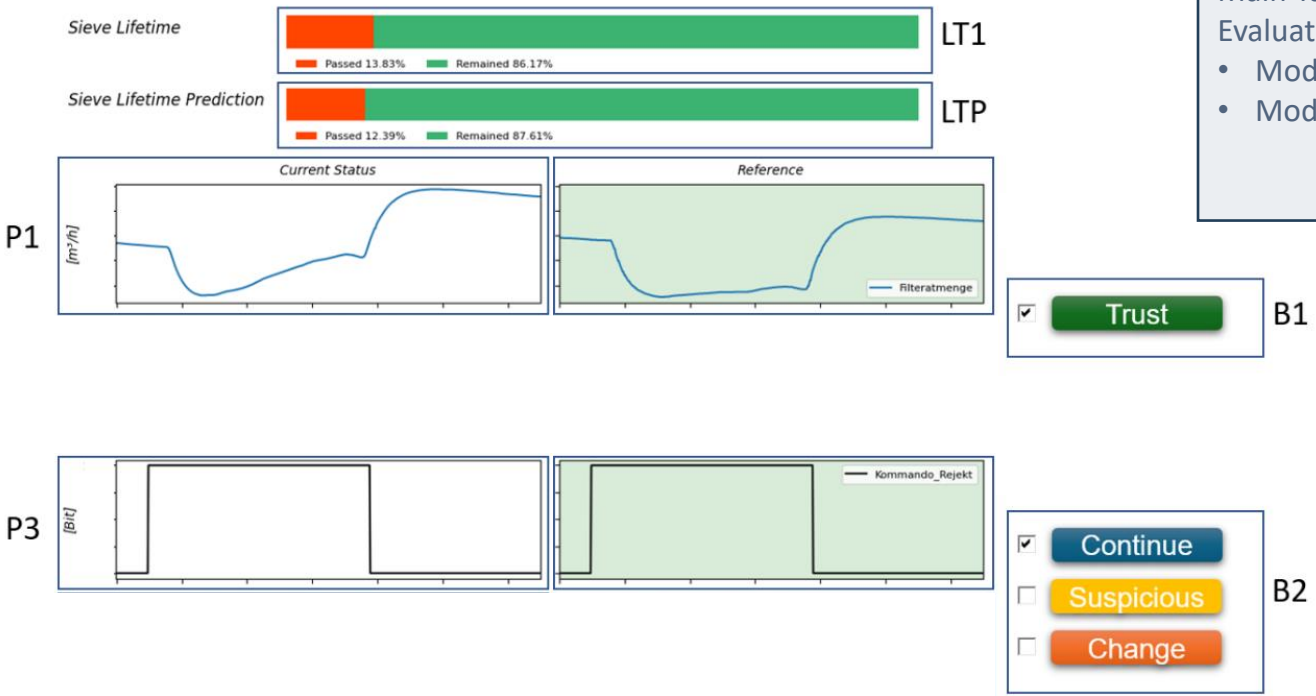
Main Task: Act upon Model Output
Evaluation Criteria/Tools :
- Model Output



User Study Setup

Worker  Perspective

Main Task: Act upon Model Output
Evaluation Criteria/Tools :
- Model Output
- Model Input

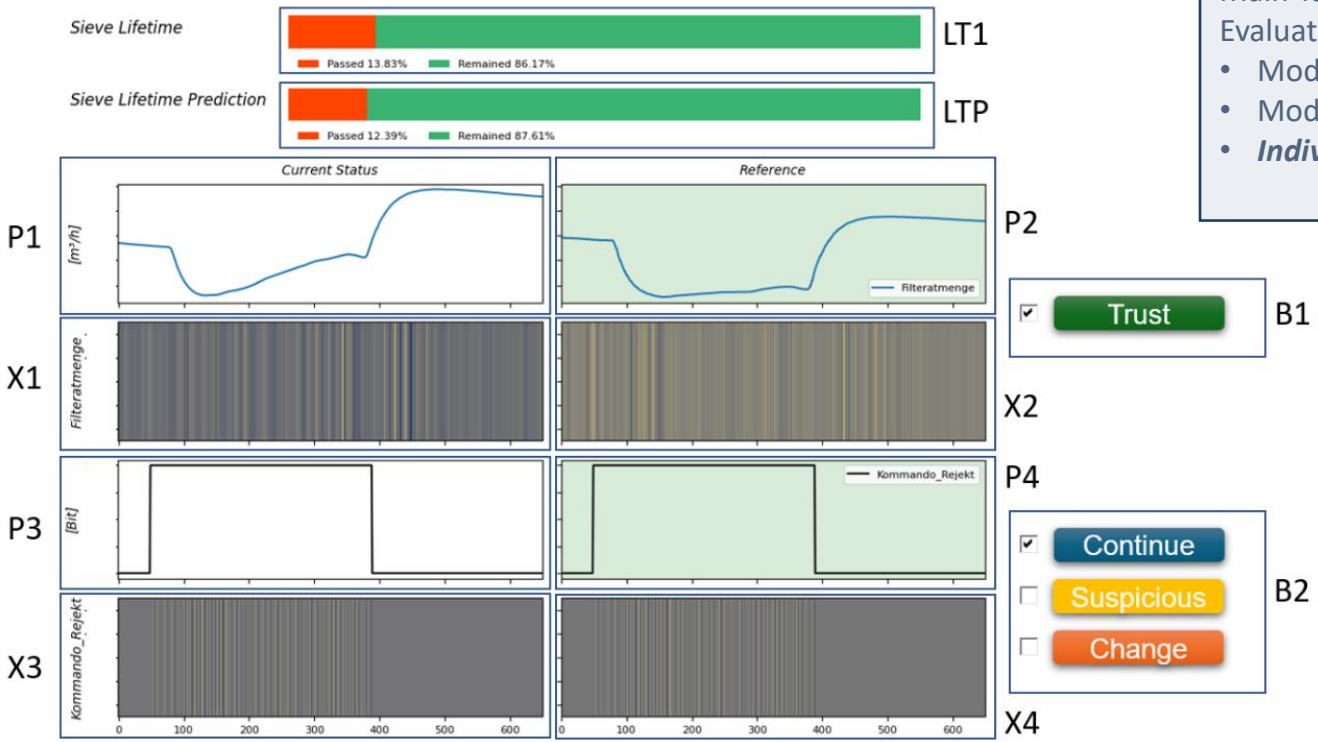


User Study Setup

Worker  Perspective

Main Task: Act upon Model Output
Evaluation Criteria/Tools :

- Model Output
- Model Input
- ***Individual Saliency Plot***



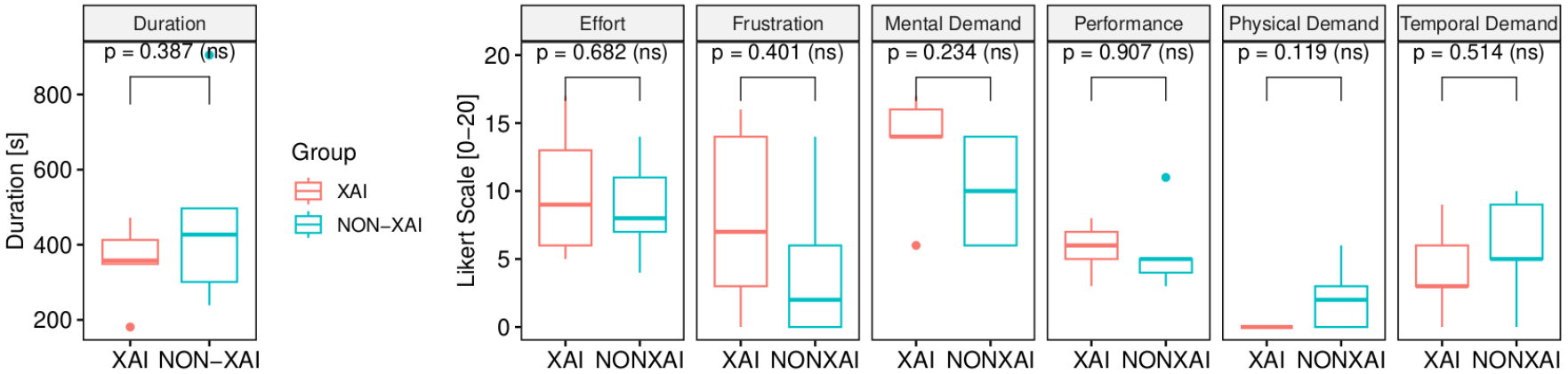
User Study :: Study Design

- **Between Subject Design**
  - Ten subjects
  - 20 Decisions
  - XAI – Users with Visual Saliency Maps
  - Non-XAI – Users without Visual Saliency Maps

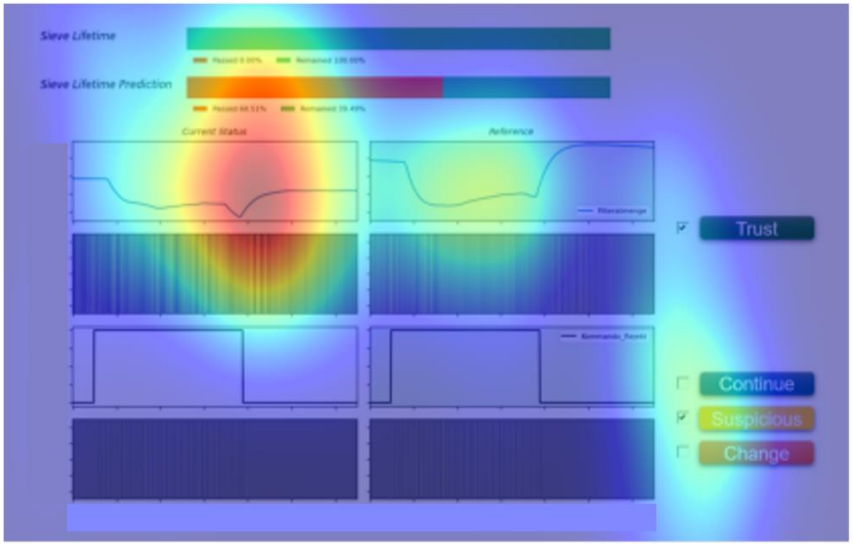
- **Collected Measures**
  - User Decision
  - Eye Tracking Data
  - NASA-TLX – Post-Study Questionnaire

- **Evaluation**
  - Behaviour (Difference) between XAI an Non-XAI
  - Performance Difference to Experts

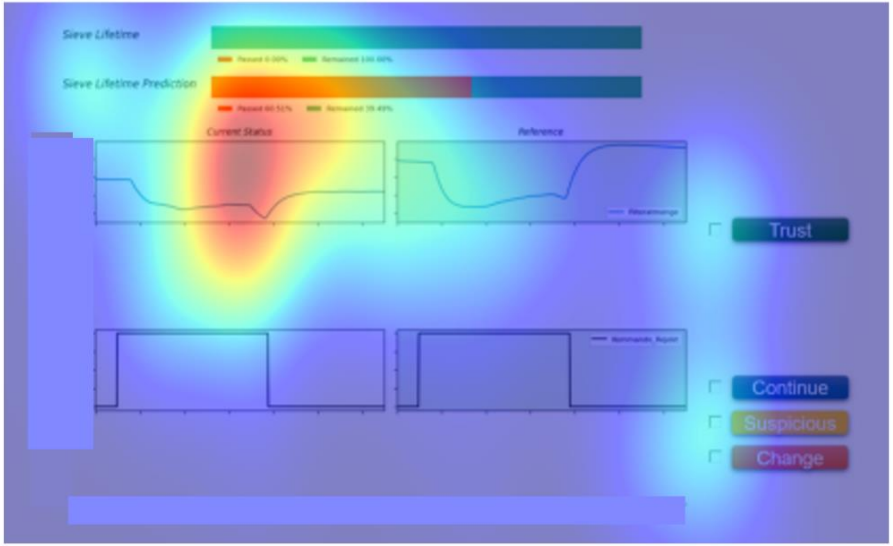
User Study :: Results :: Duration and TLX



User Study :: Results :: Gaze Behaviour

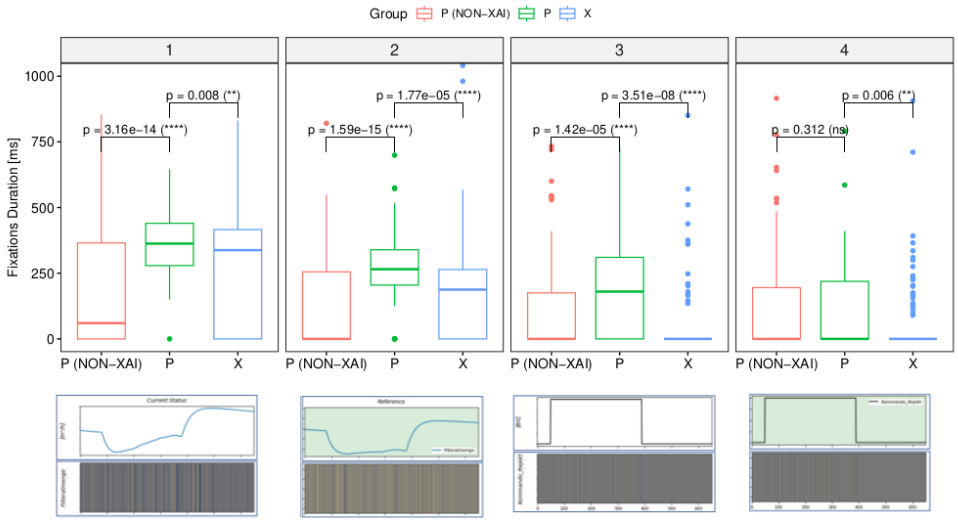


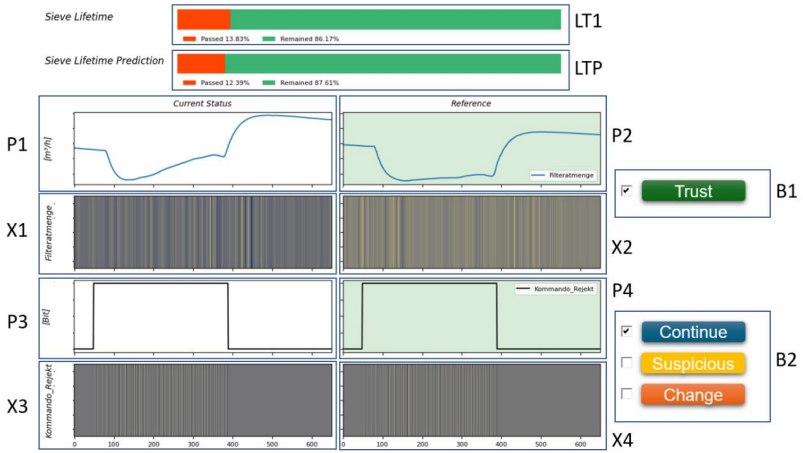
XAI



Non-XAI

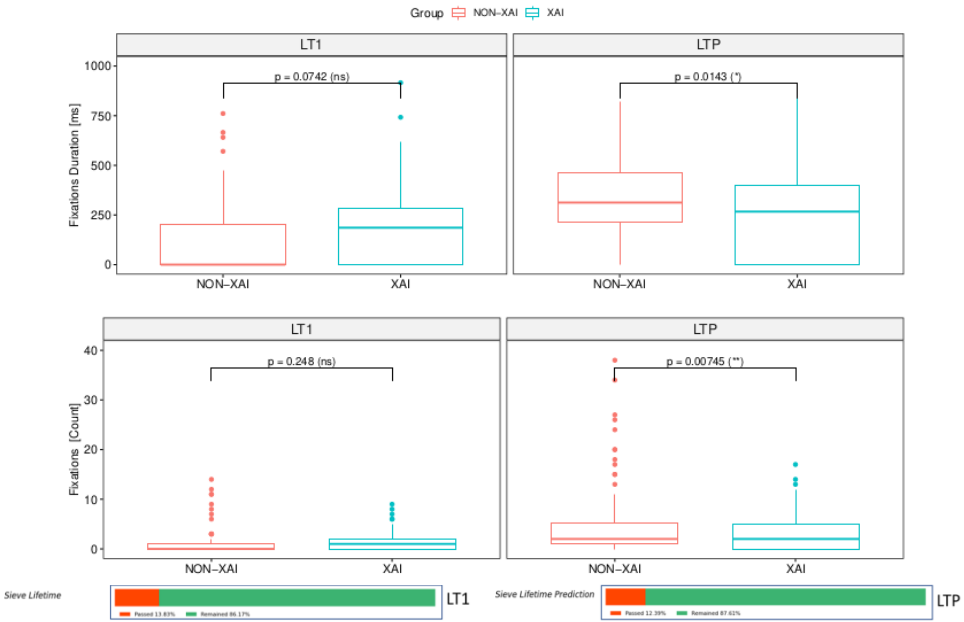
User Study :: Results :: Fixation Duration - Input Data/Saliency Map

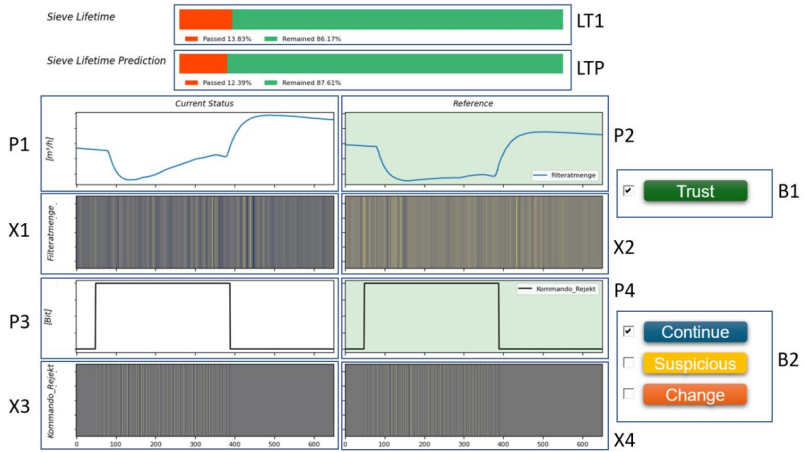




XAI Users look less at the input data

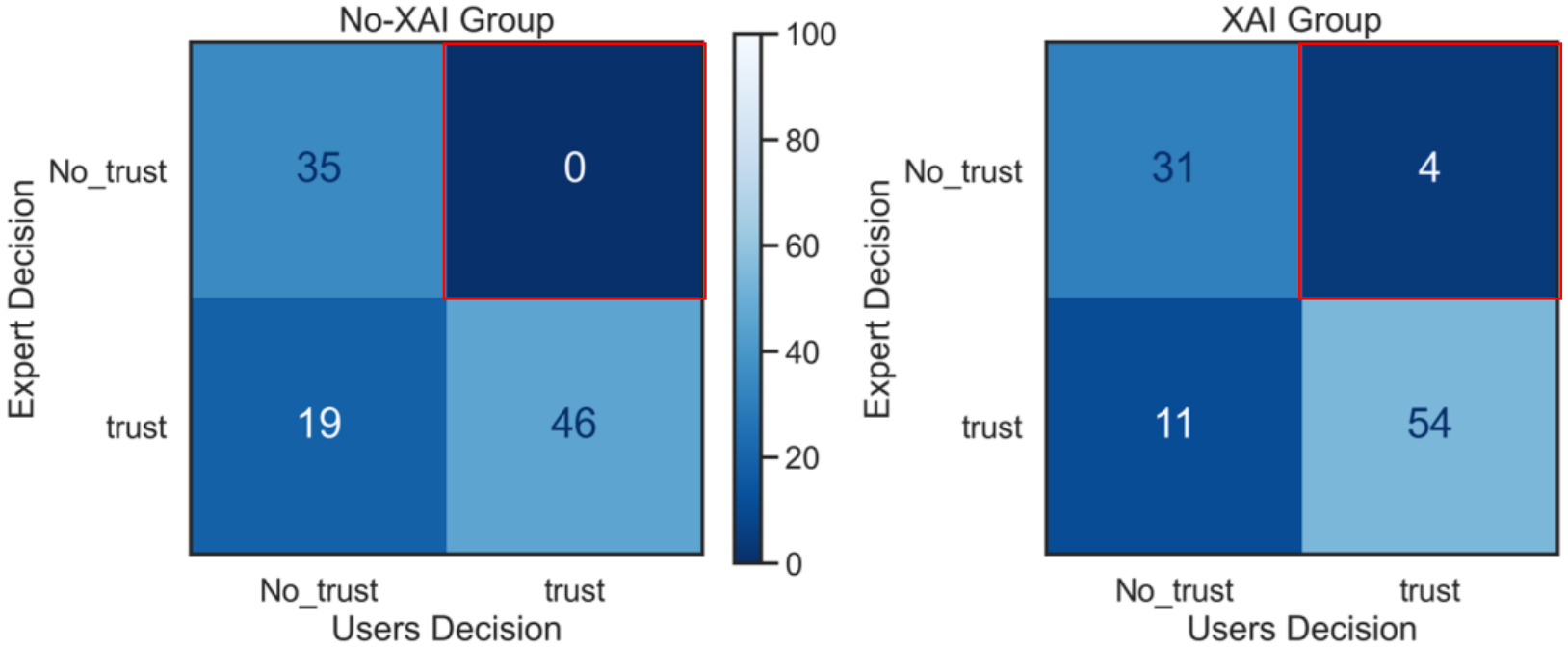
User Study :: Results :: Fixation Count – Model Output





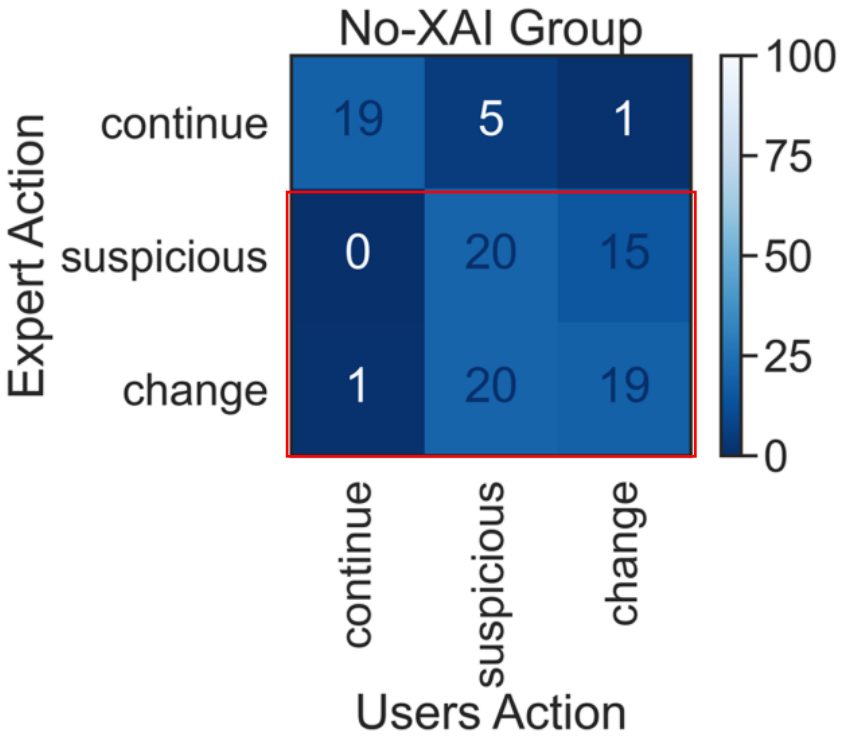
User seem to look less on the outcome?

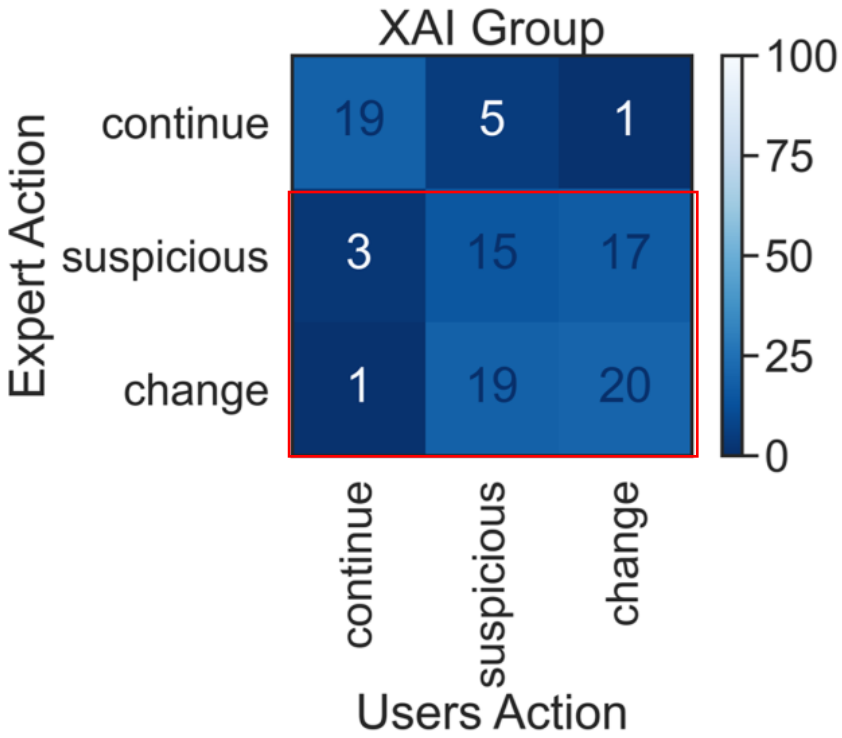
User Study :: Expert vs Study Users :: Trust Behaviour



XAI Group more similar to expert but over-trusting may be a problem?

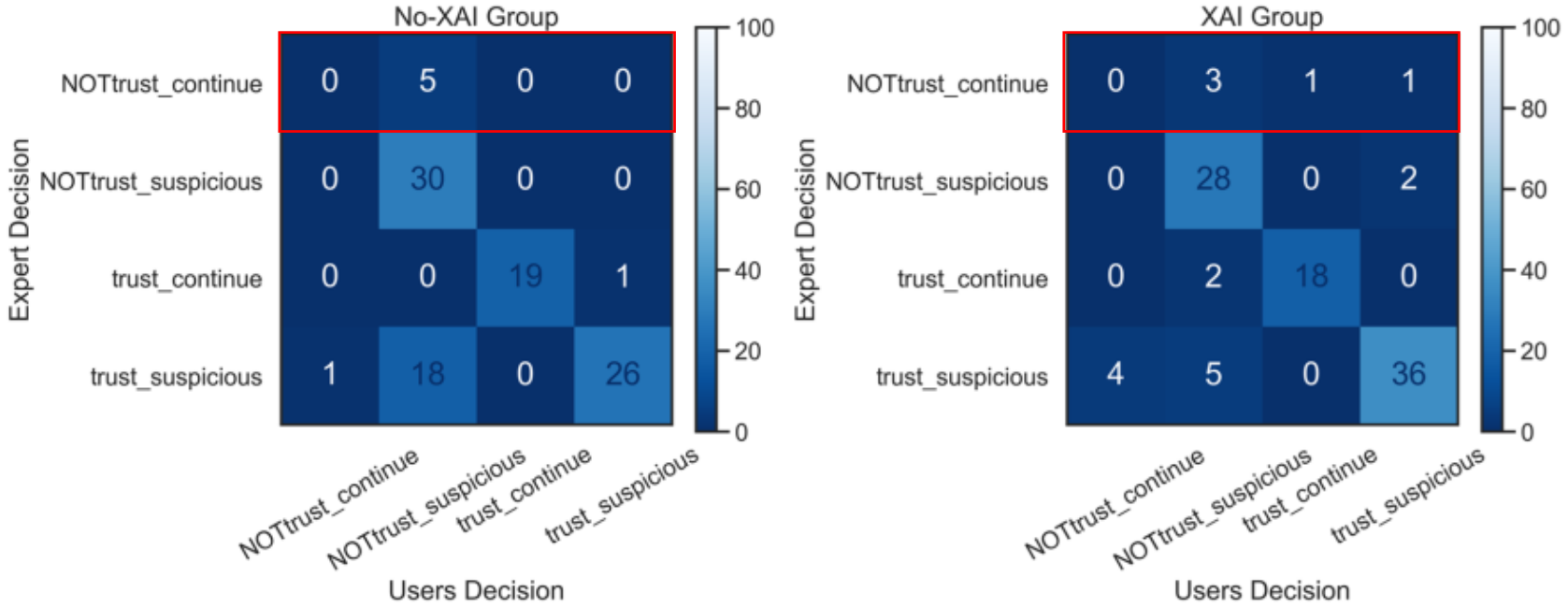
User Study :: Expert vs Study Users :: Action Choosen Behaviour





Suspicion and Change Behaviour slightly different

User Study :: Expert vs Study Users :: Trust and Action Chosen Behaviour



XAI slightly better decisions but first condition was never choosen

User Study :: Takeaways

For XAI - Saliency Maps

- XAI Users seem to match Expert Performance better
- It doesn't significantly slow users down

Against XAI – Saliency Maps

- Non-XAI were more suspicious of the model, that's something we want?
- XAI trusted the model more but did look less at the input!

Future work:

- Which Saliency Map Techniques to use?
- How should User Interface modulate (and measure) confidence?