

Can we detect participants' expertise in a manual assembly / disassembly scenario based on their gaze behaviour?

*An approach to weigh training data for robotic applications*



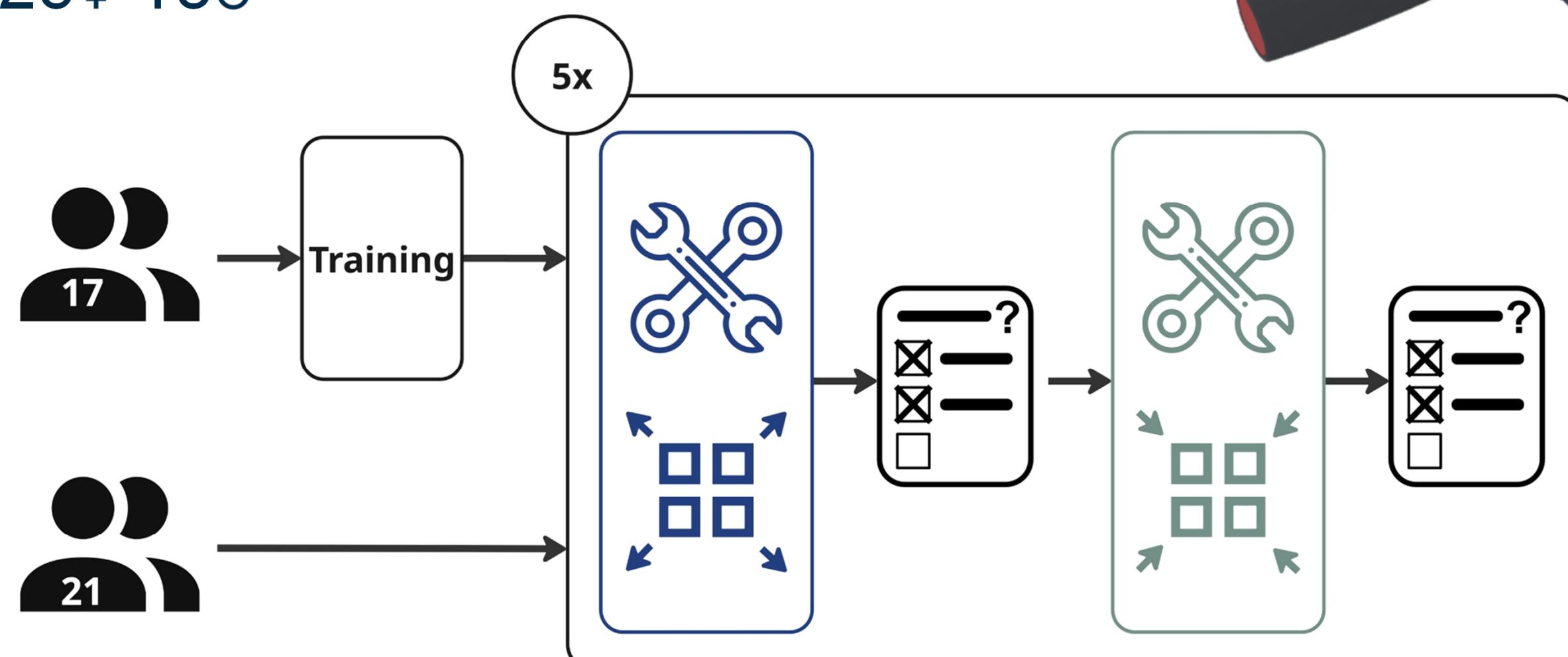
## Background

- Learning from human demonstrations inside a circular factory (LfD)
- Creating valuable insights for application in different robotic settings
- Gaze patterns are different for novices and experts <sup>[1]</sup>
- HMMs have been used to study gaze behaviour and determine expertise before <sup>[2]</sup>
- Goal: automatically determine expertise of human workers based on gaze behaviour**

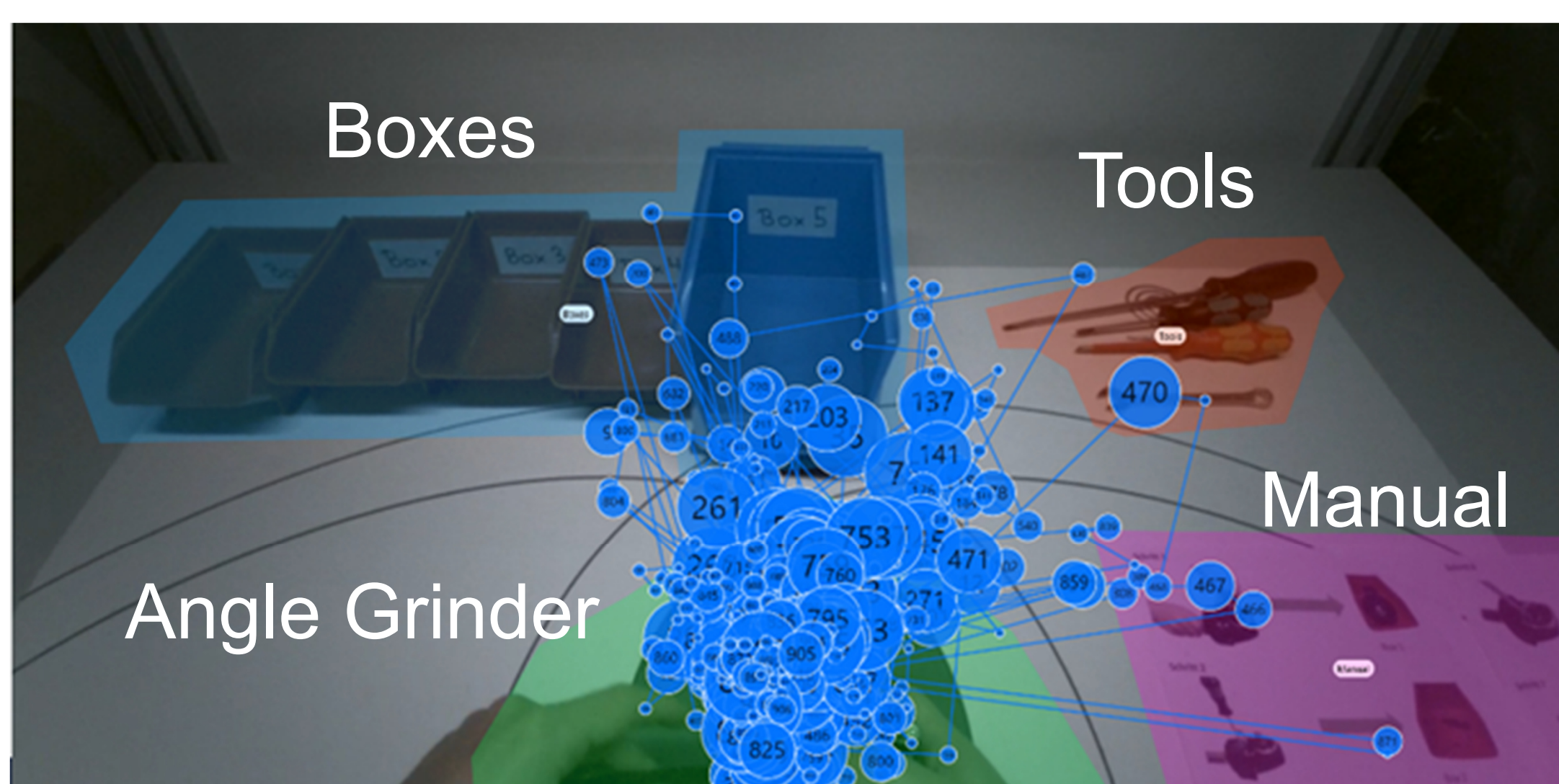
**Use expertise as weighting factor in model training for robotics**

## Methods

- N = 38  $M_{age} = 25.92$  SD = 6.88
- 25♀ 13♂

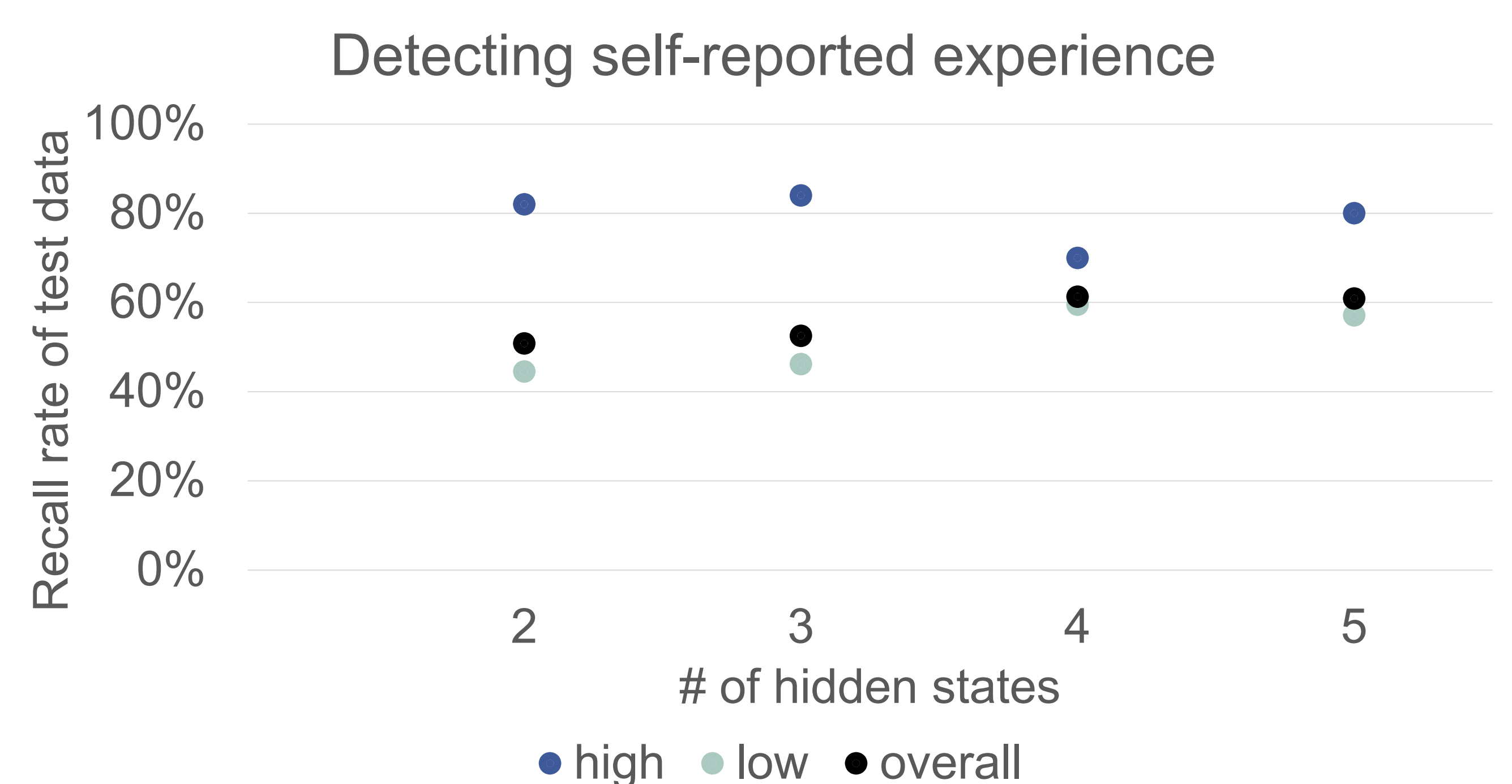


- 2 different dimensions of expertise:
  - Self-reported prior experience in handcrafting
  - With or without training as part of study
- Eye-Tracking data collected using Tobii Pro Glasses 3
- 5 AOIs defined (4 distinct areas + "other")
- String of AOIs used to train HMM



- Trained different HMMs using k-fold Cross Validation
  - One for high experience / training, one for low experience / no training
- 80/20 train/test split, 5 iterations

## Results



**High experience / prior training seems to be easier to classify**

**Prior training could be classified more precisely than self-reported expertise**

**2 or 3 hidden states seem to represent the scenario the best**

## Outlook

Work in progress → further analysis to be done, still open questions

- Identify and contextualize hidden states
- What patterns differentiate novices from experts?
- What strategies can be derived from prevalent patterns?
- Test impact of derived expertise on training data performance
- Generalizability in other scenarios / other tasks

