Interactive Task Estimation From Unlabelled Teaching Signals

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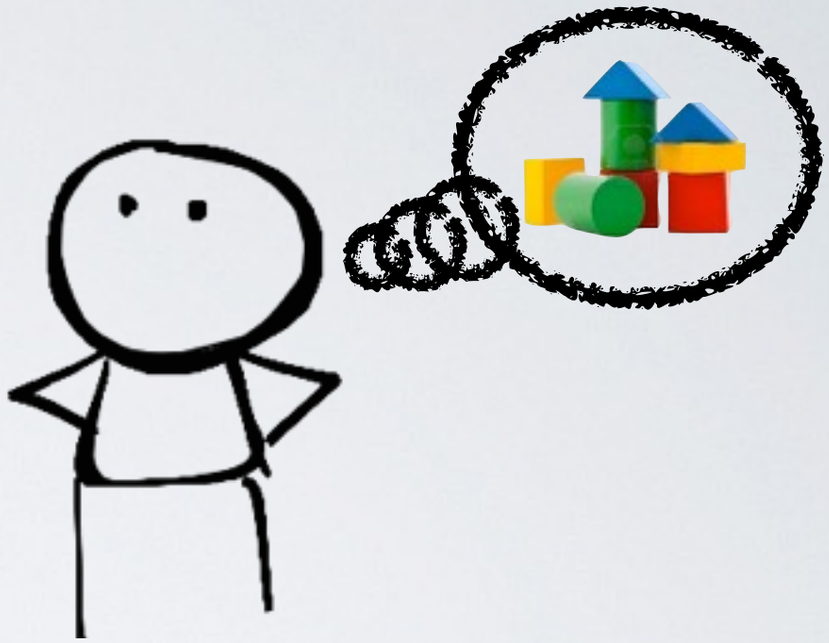
Interactive Learning in Robotics

-What: Teach robots new skills.

-How:

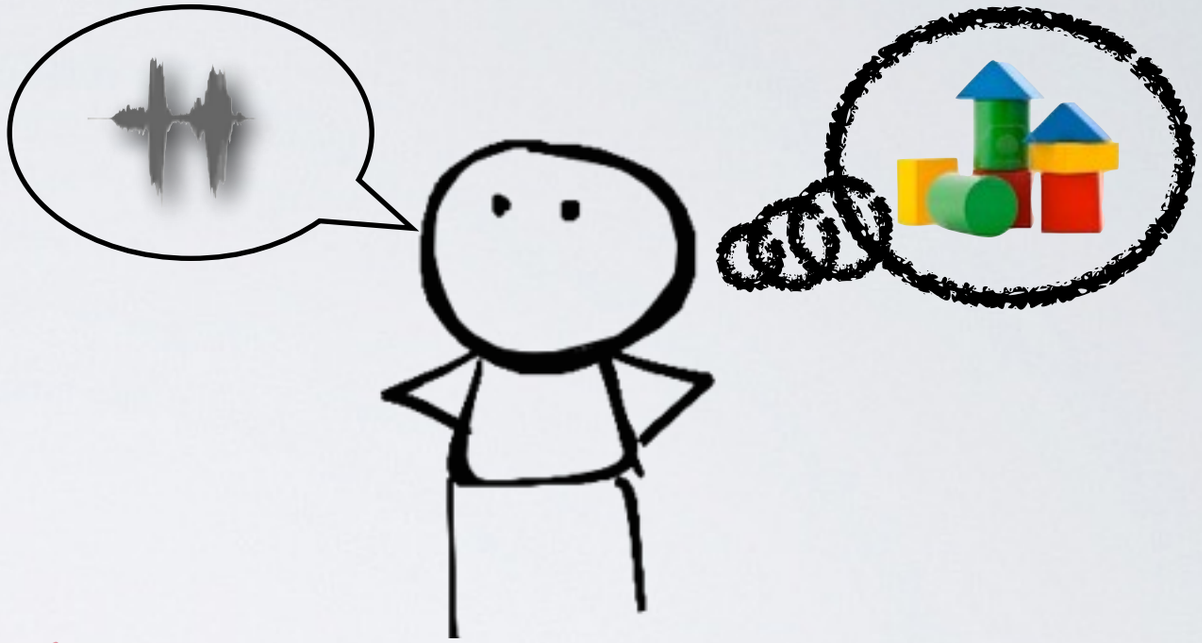
1) Without programming (often not easy, requires an expert)

2) By demonstrating, talking, looking, pointing, directing, advising, rewarding, giving feedback...



Feedback (correct/wrong)

Guidance (push/grasp)



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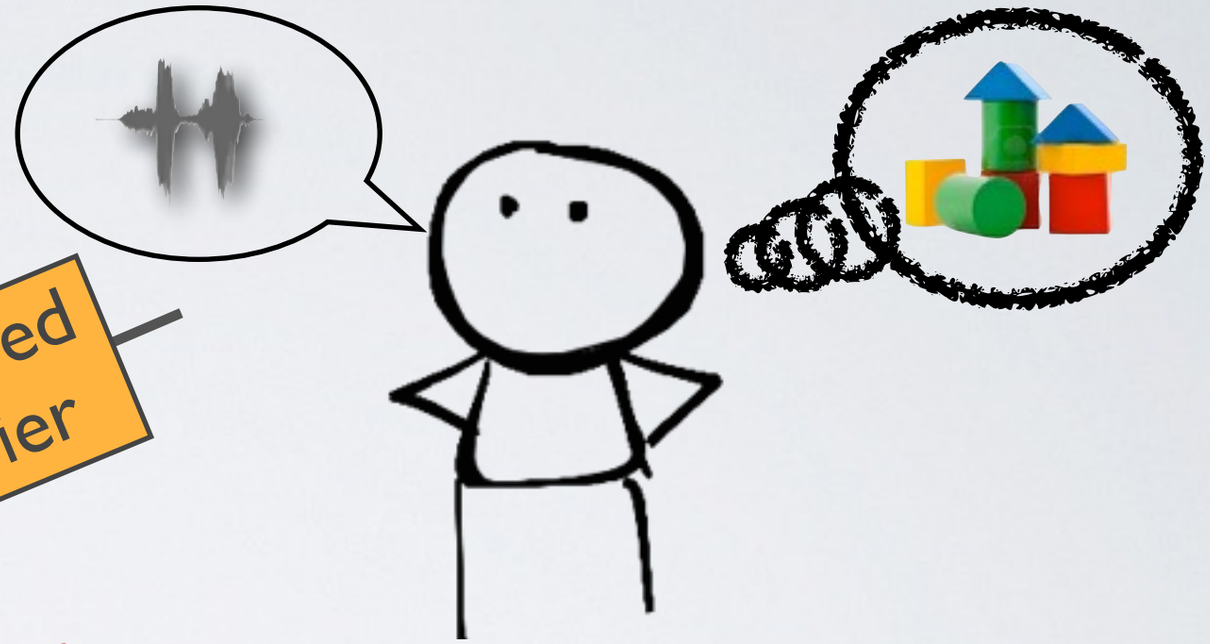

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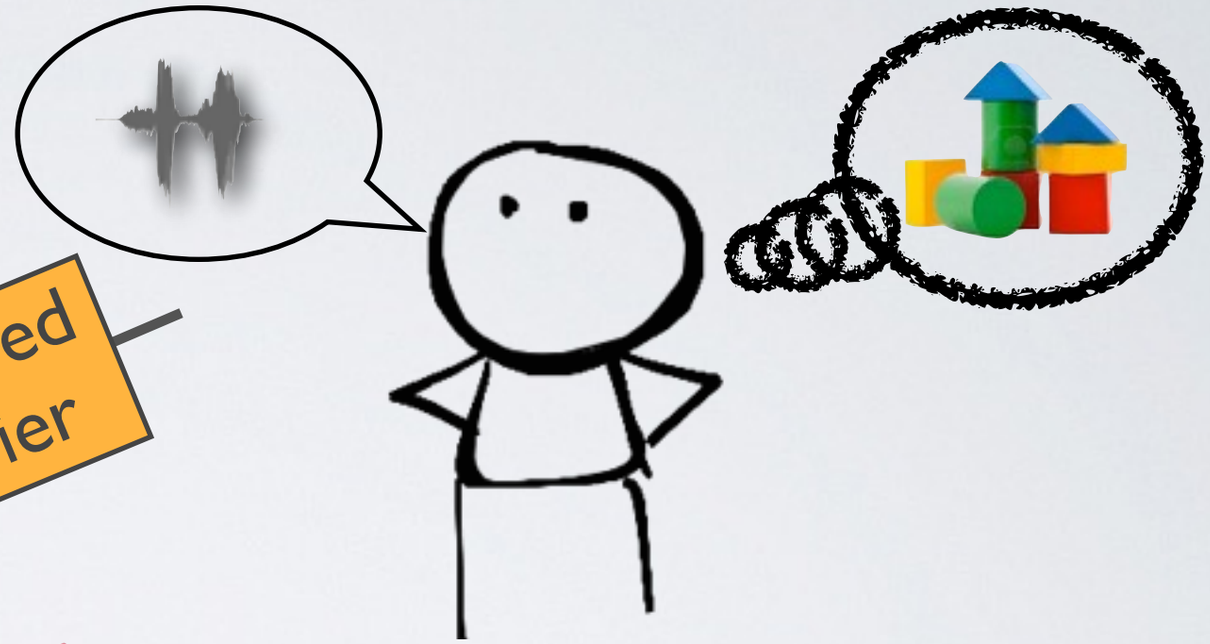
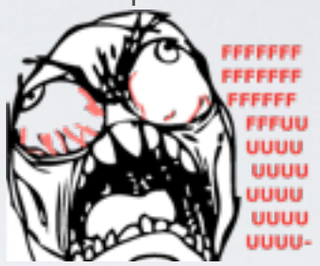


Different people, with their own preferences, skills, and limitations.

Different Languages

Facial expressions



Hand signs

Engineered Classifier

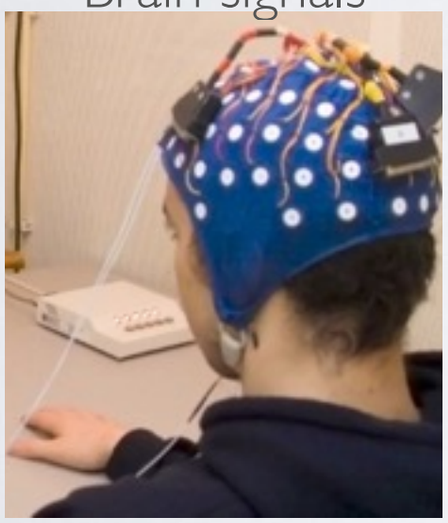
Engineered Classifier

Engineered Classifier

Engineered Classifier

Engineered Classifier

Brain signals

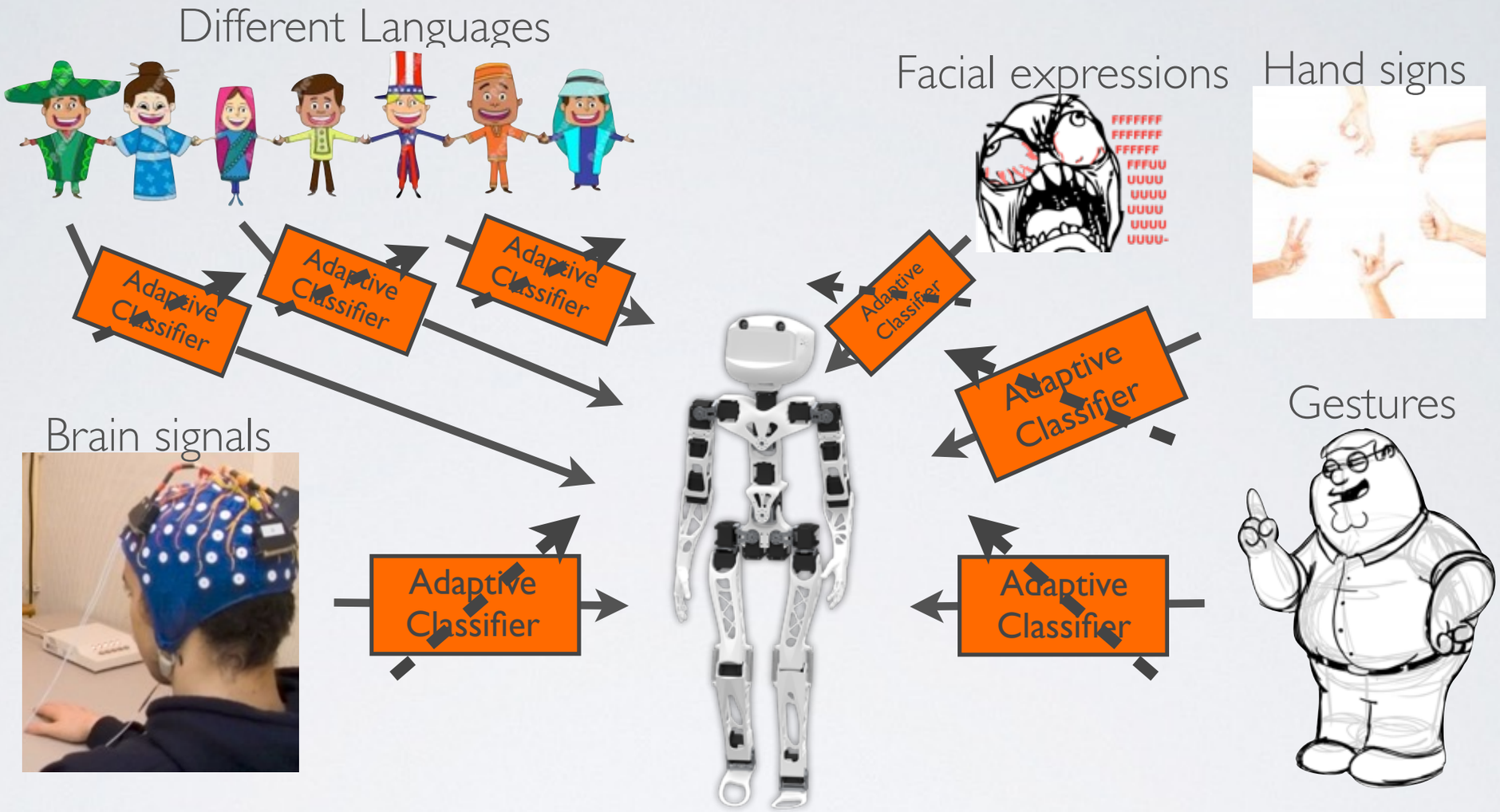


Engineered Classifier

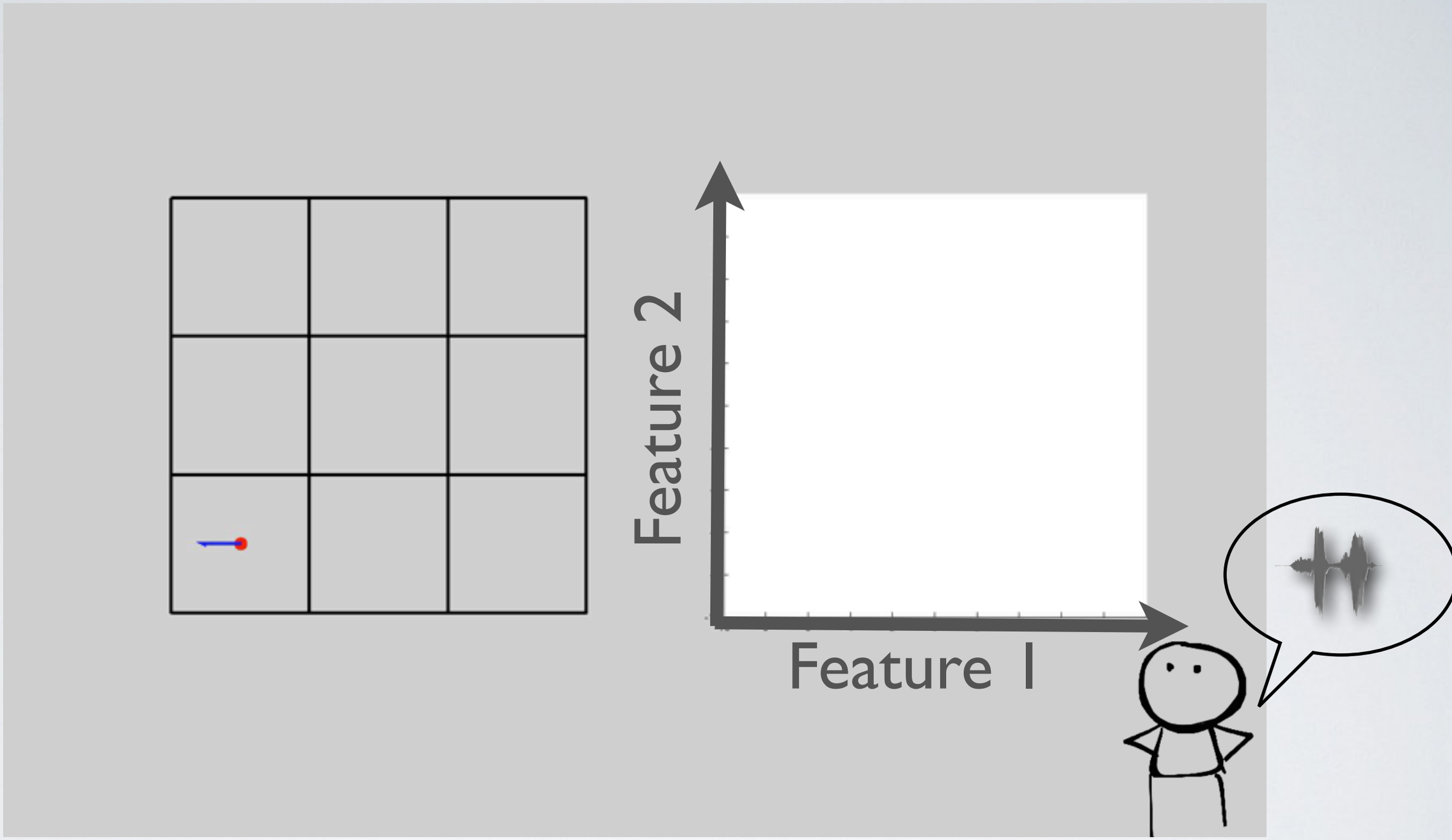
Engineered Classifier

Gestures

Different people, with their own preferences, skills, and limitations.



Can we adapt <u>automatically and online</u>
to each user's own preferred teaching signals ?

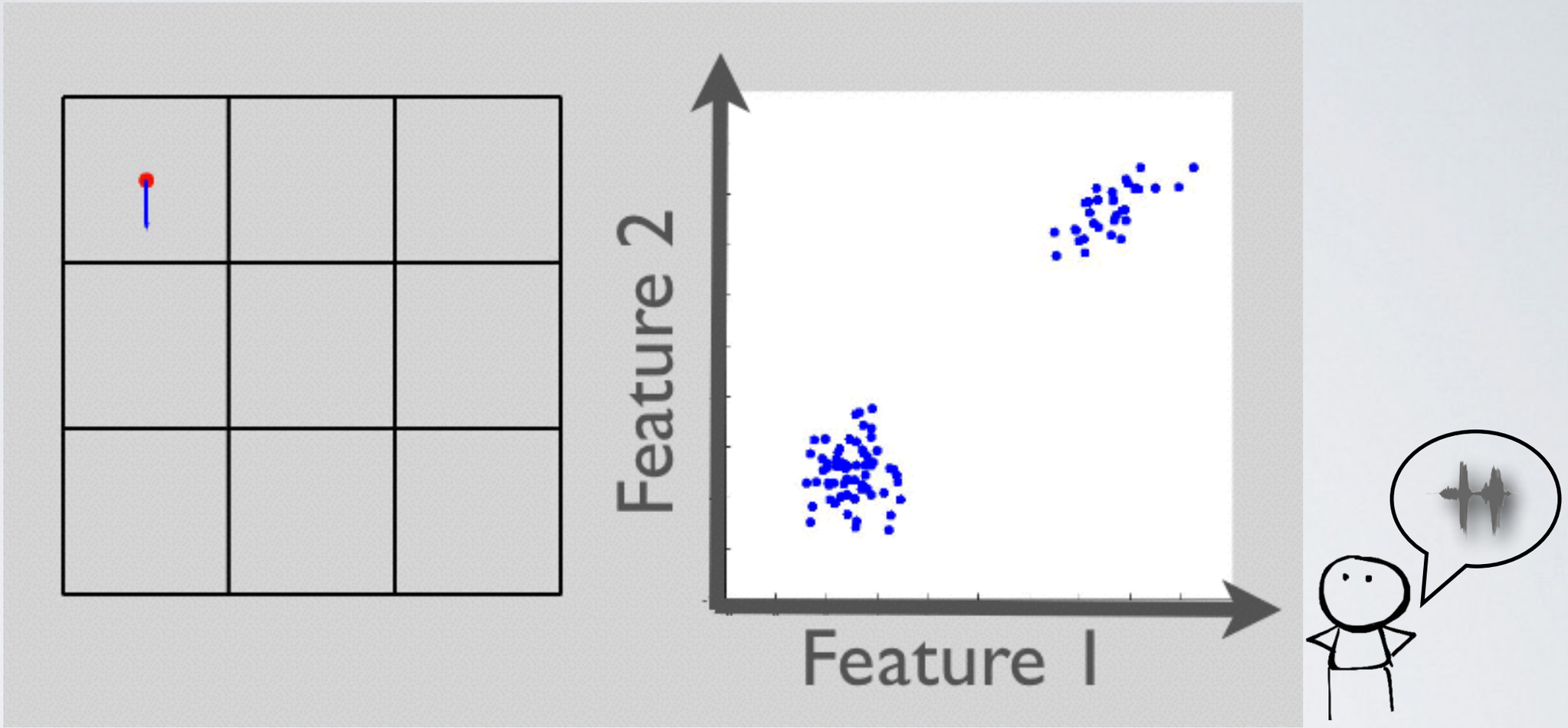


Sequential task

{state, action, instruction} interaction loop

Instruction are feedback or guidance on the robot action

What: Finding the task that best explain the instructions signals



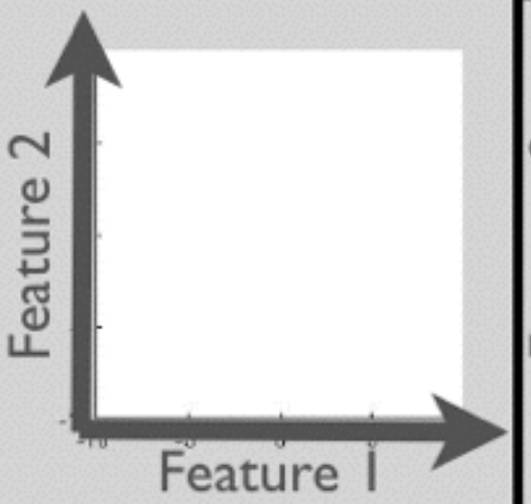
How:

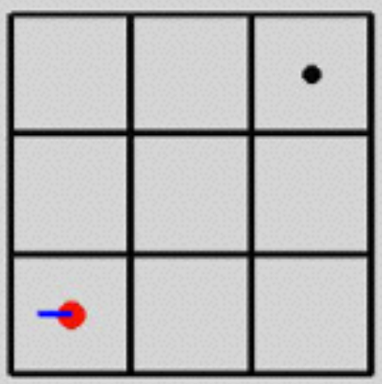
1- assigning hypothetic meanings for each possible task

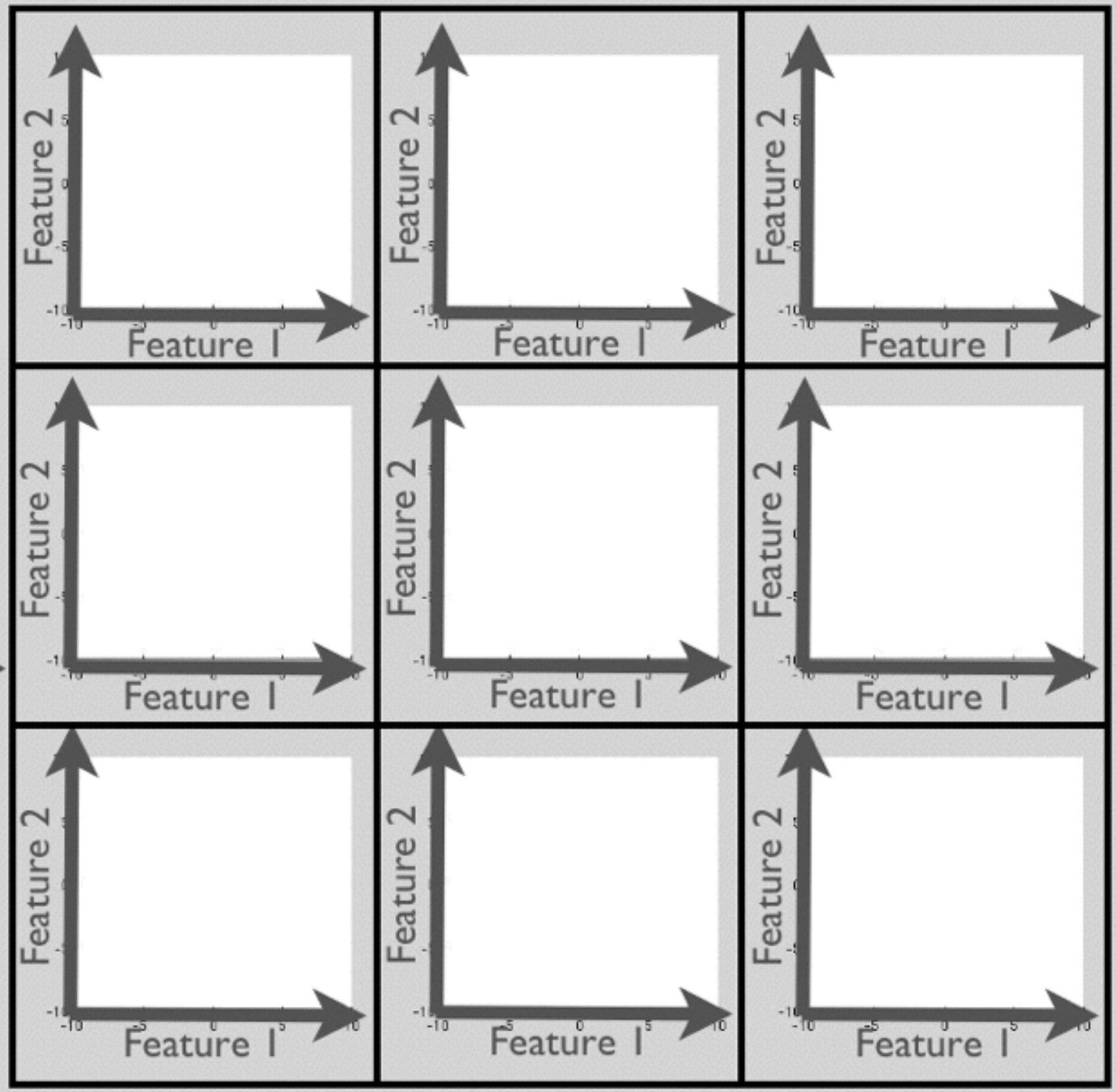
2- computing the likelihood of the resulting dataset

Correct

Wrong







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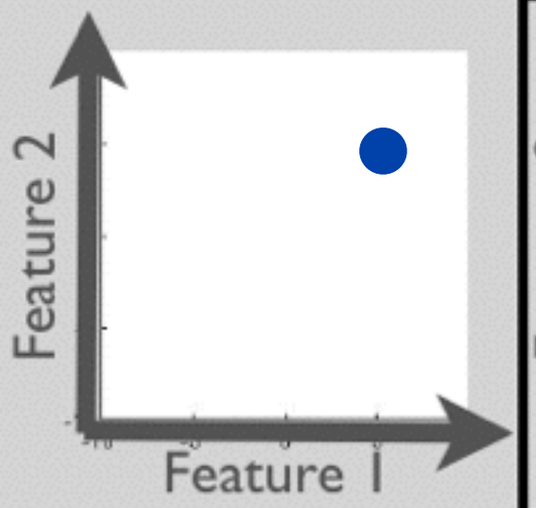

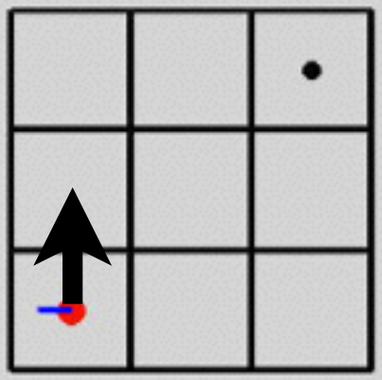

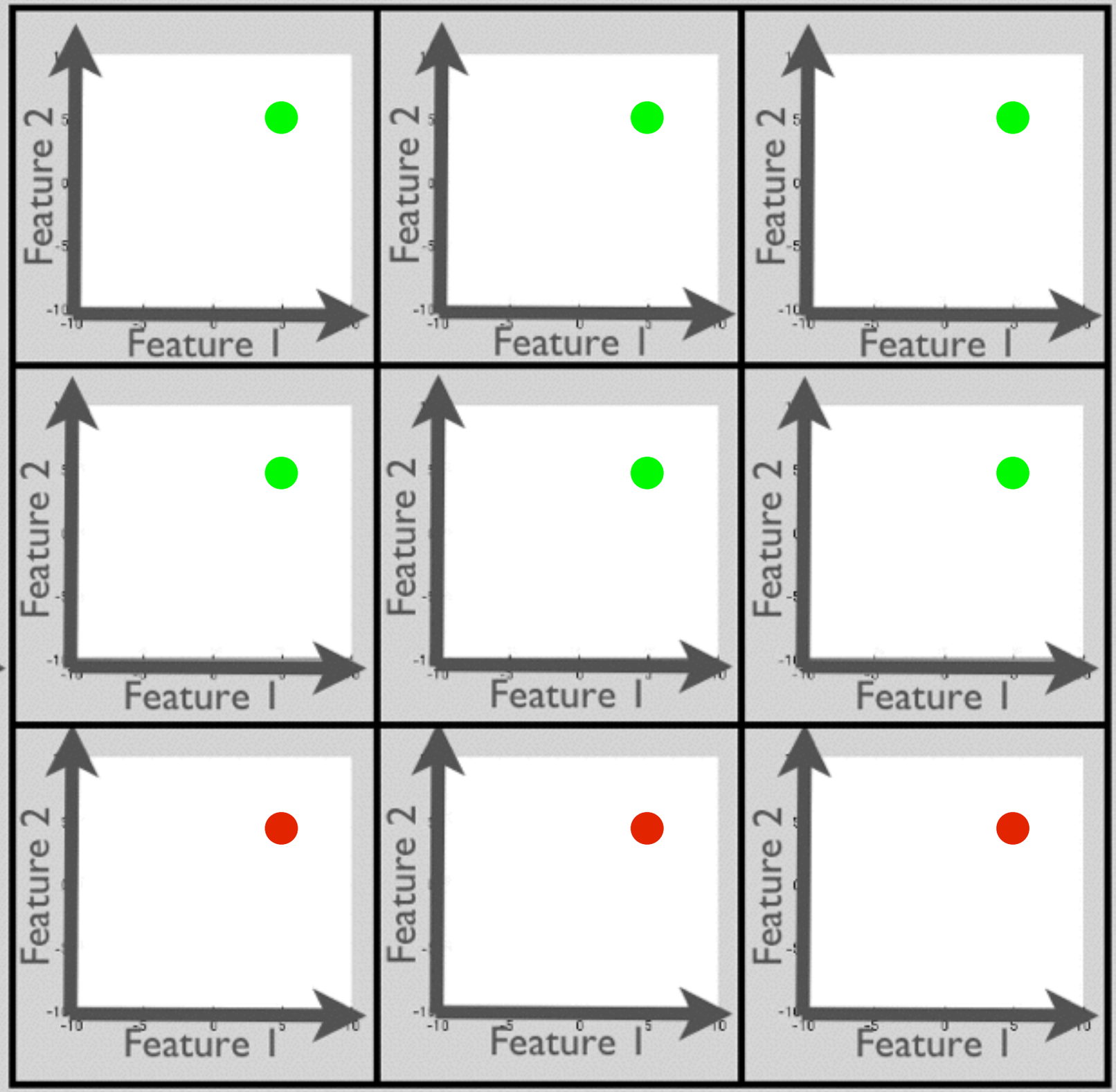

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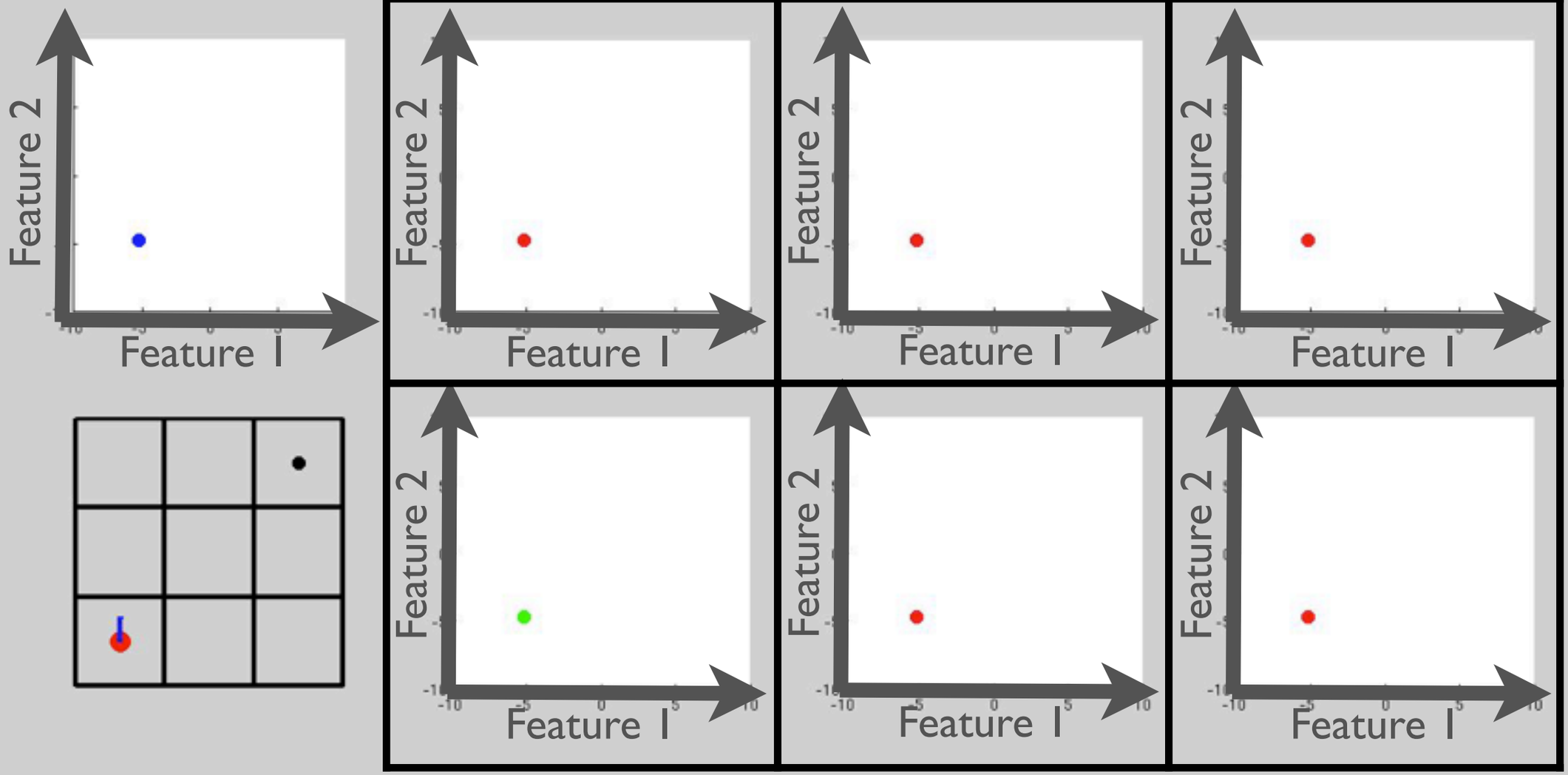
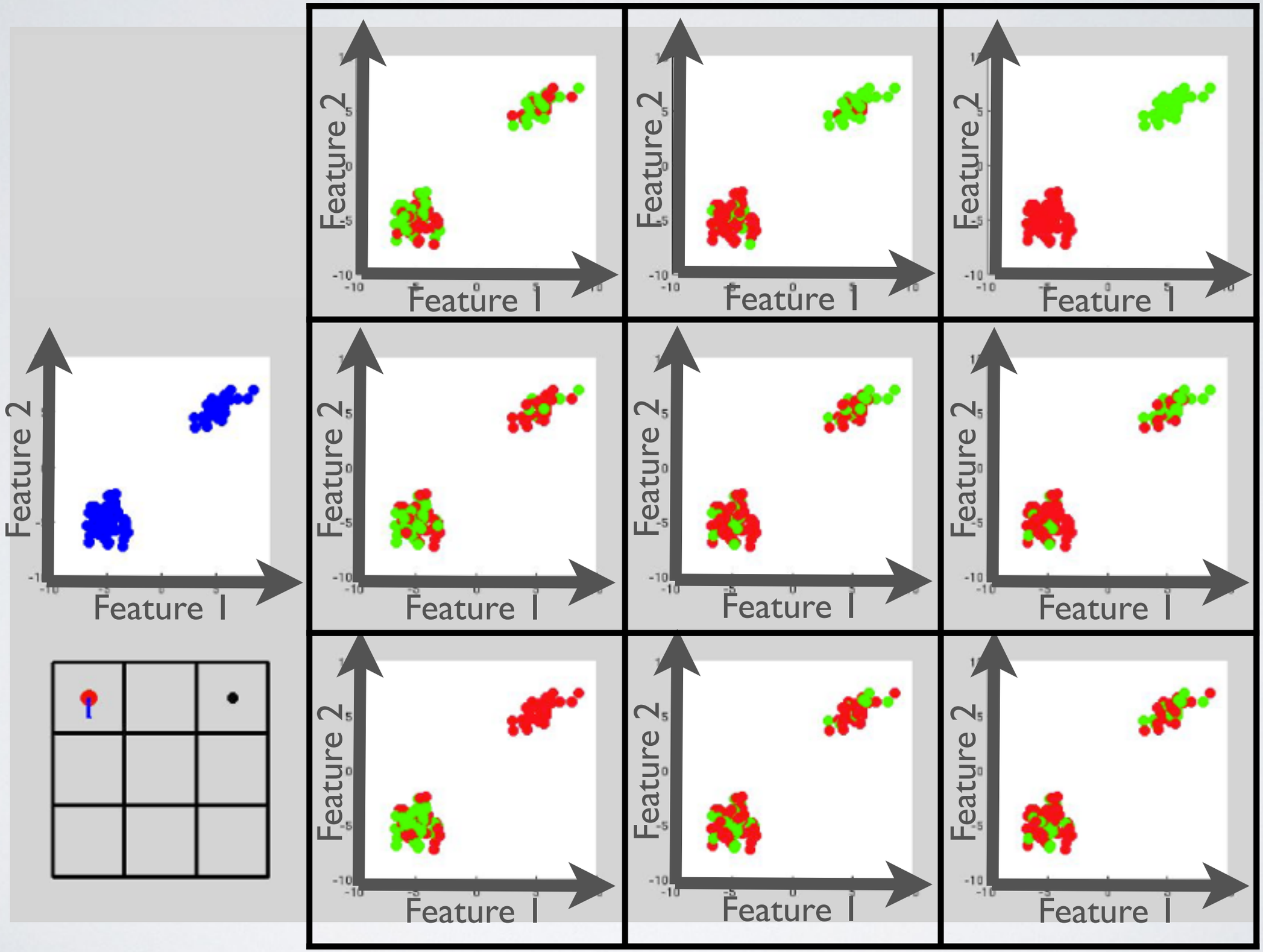
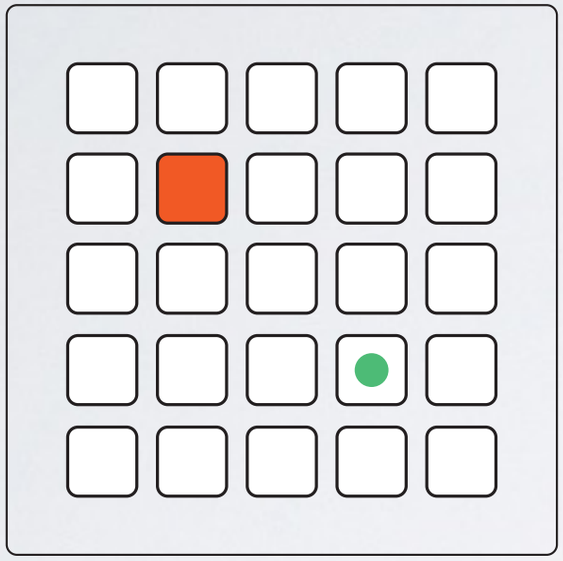



Feature 2
Feature 1

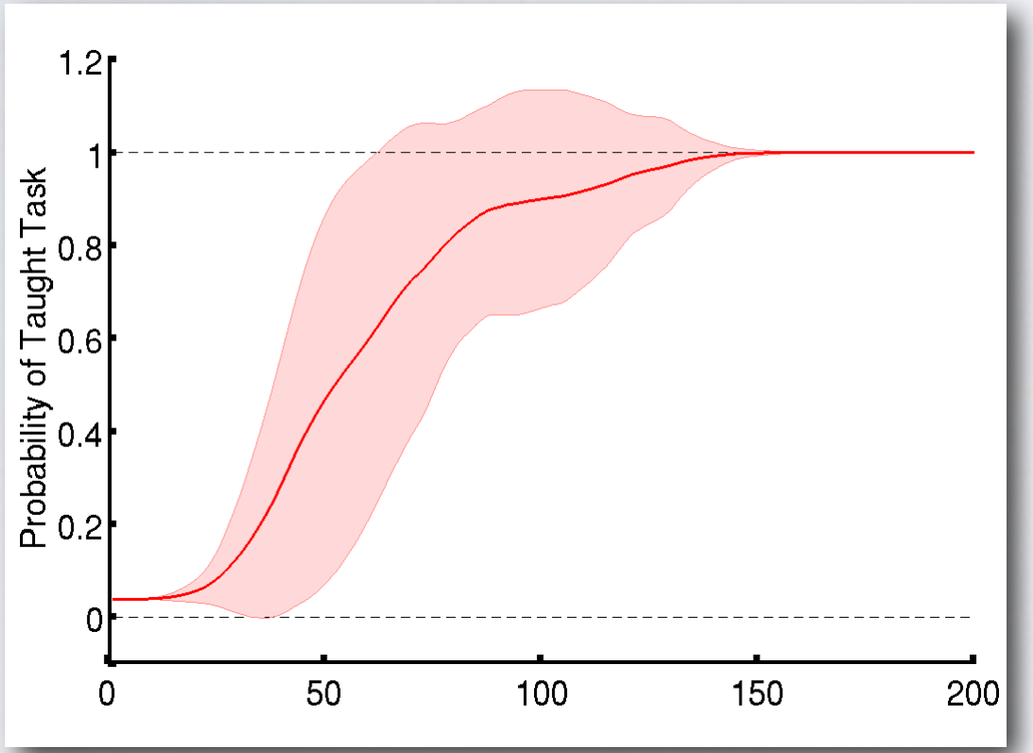
BCI control task

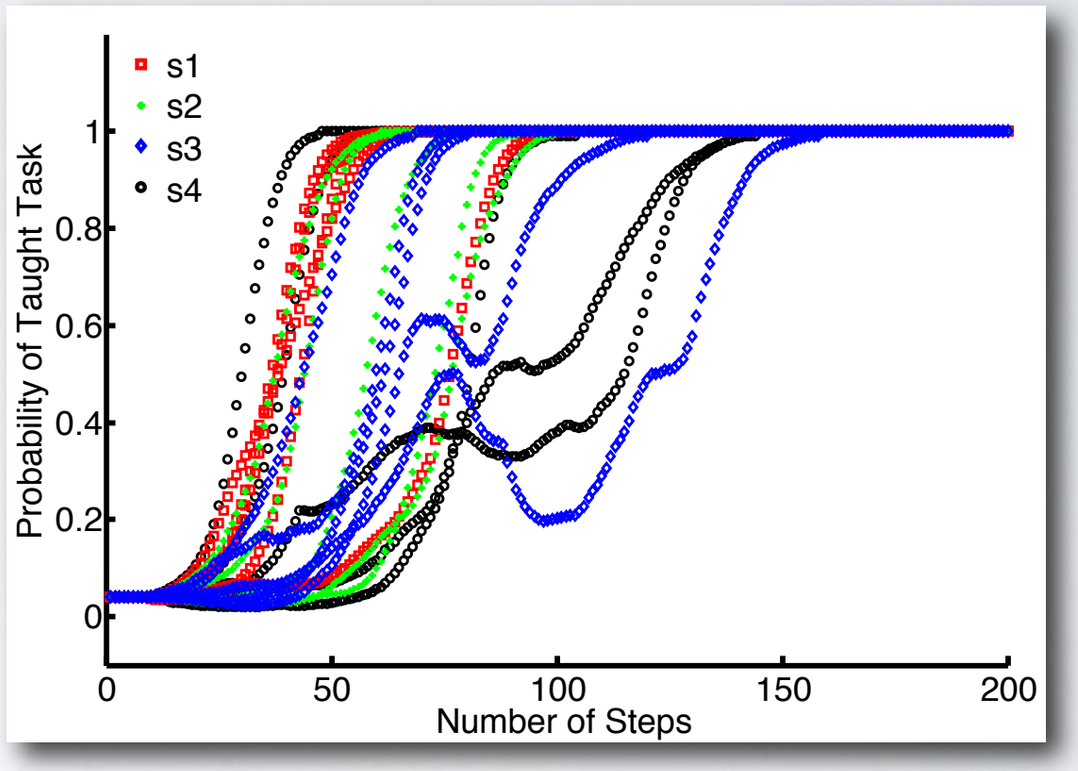
with Iñaki Itturrate and Luis Montesano, Universidad de Zaragoza, Spain



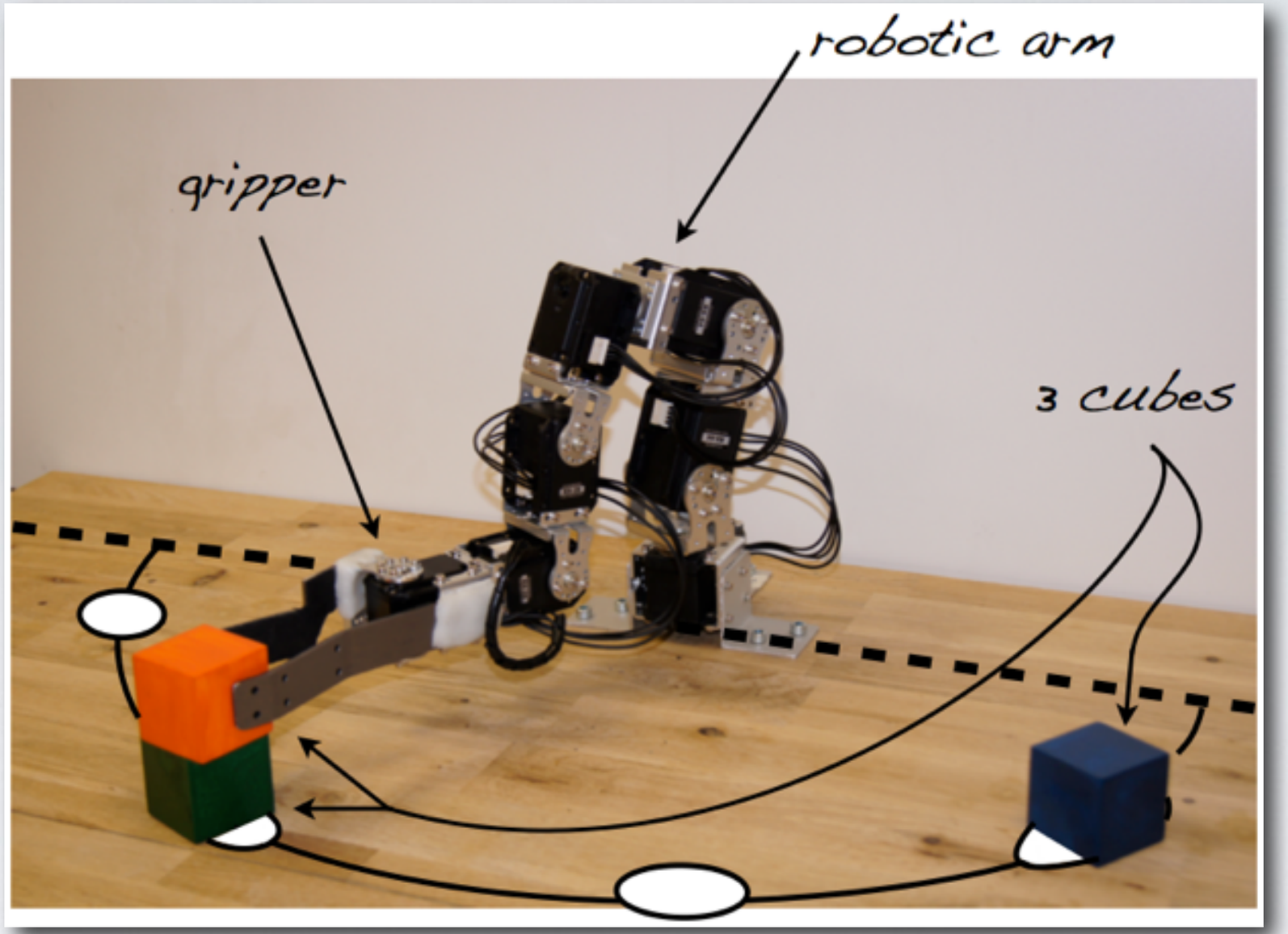
- 34 features, high amount of noise
- 25 possible tasks (5x5 grid world)

Online experiments



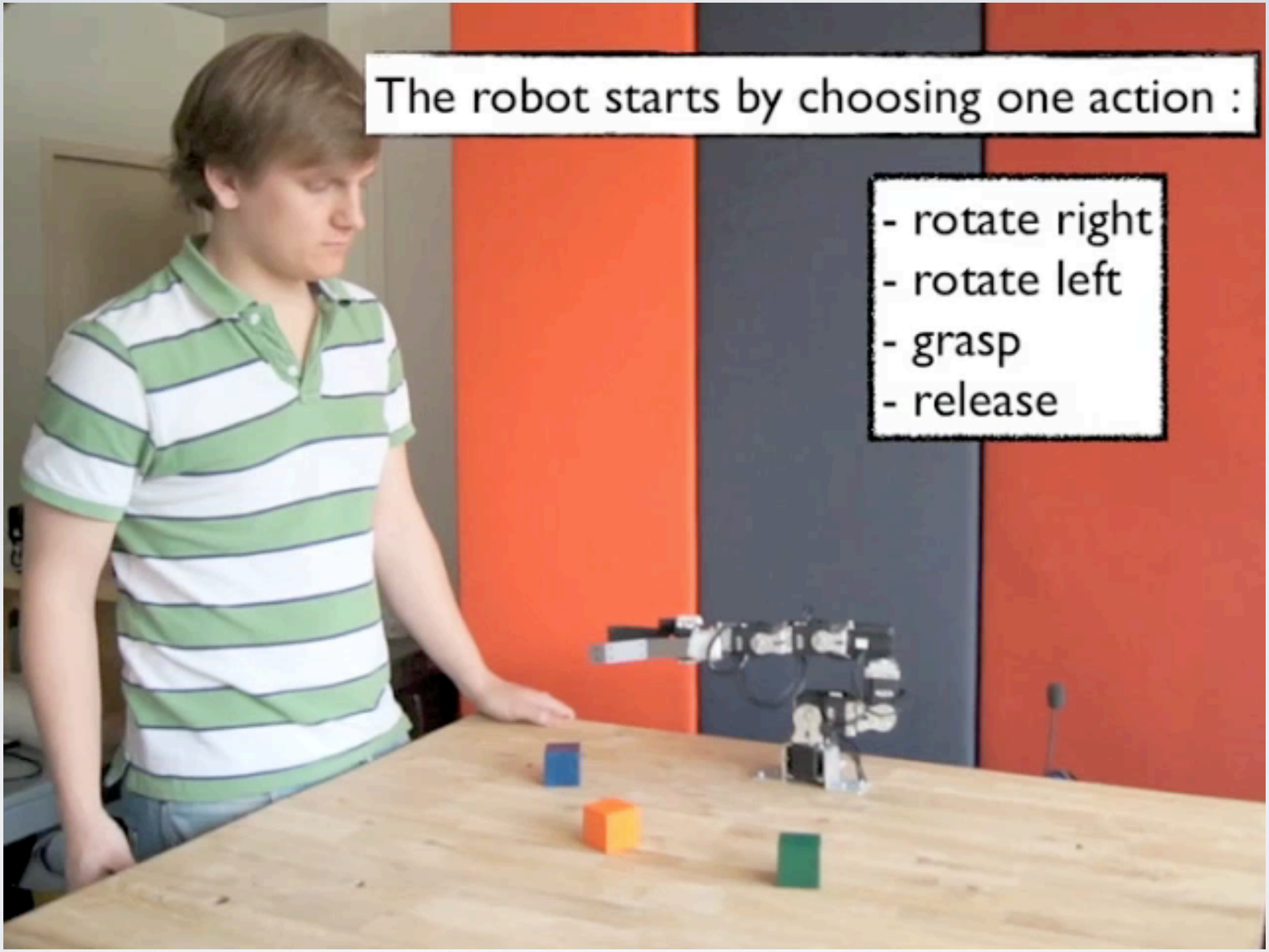


HRI Pick and Place

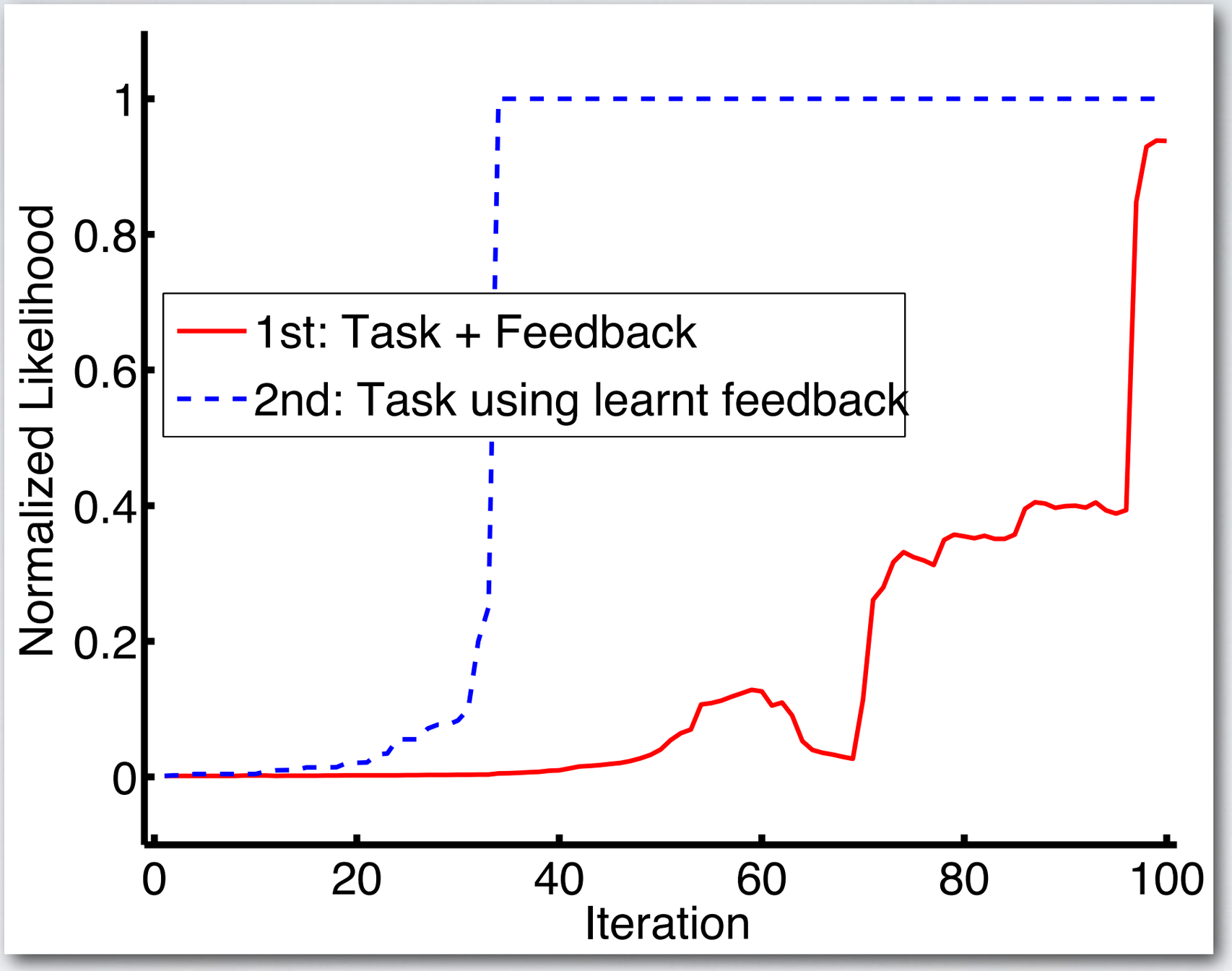


- Spoken words (20 features)

- 624 states, 4 actions (left,right,grasp,release)


The robot starts by choosing one action :
- rotate right
- rotate left
- grasp
- release

Reuse acquired knowledge



Using ε-greedy with ε = 0.1

Thank you for your attention

Questions ?

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