

Real-Time Hardness prediction using COTS Tactile Sensors for Robotic Grippers

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Context

➤ Background

•Robotic Grippers:

- Essential for manipulation in various fields (industrial automation, surgery).

•Importance of Hardness Detection:

- Crucial for applying appropriate force to avoid damage.

•Tactile Sensors:

- Customised sensors, finding ready to deployable to reduce development time and cost.

•Current Challenges:

- Accurate real-time prediction is challenging, COTS tactile Sensors less investigated.

➤ Objective

•Develop Hardness Prediction Model:

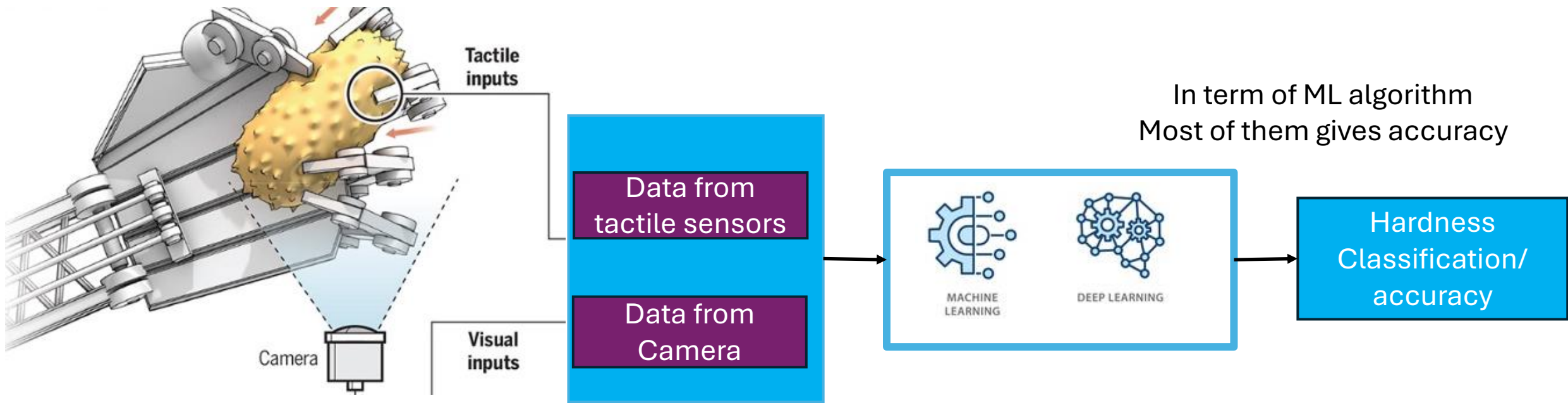
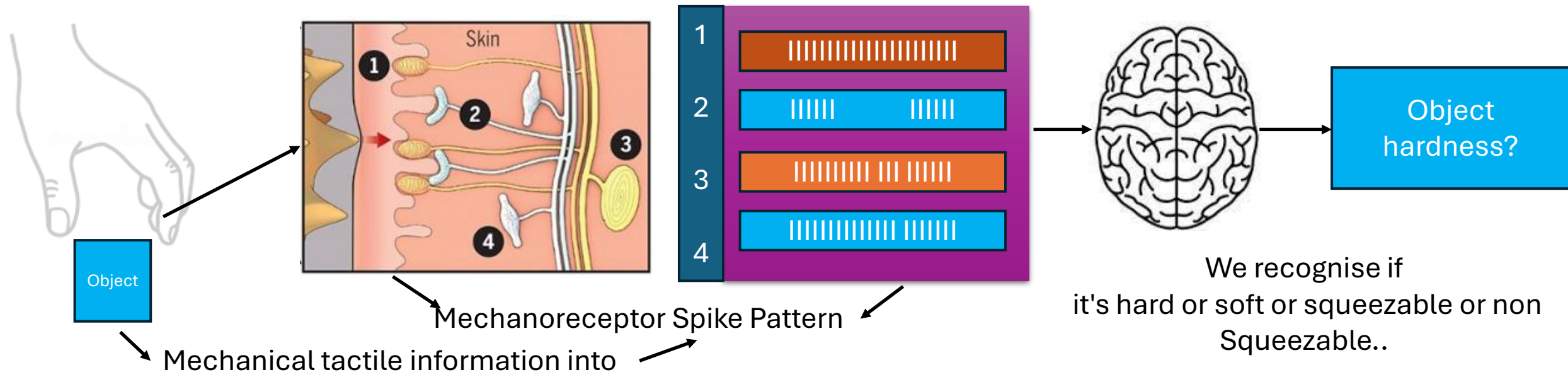
- Accurate real-time hardness prediction using COTS tactile sensors.

•Integration with Robotic Grippers:

- Easy in integration to enhance manipulation precision.

•Validation and Testing:

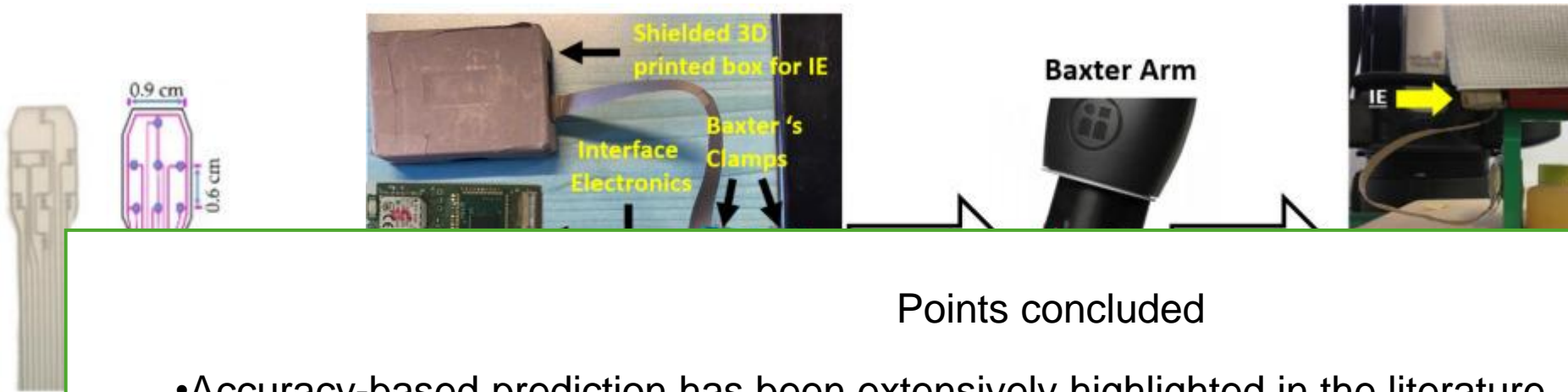
- Real time Prediction for reliability in real-world scenarios.



How Robotic gripper can
Predict in real time like
human?

Background: Real time estimation using customised sensor

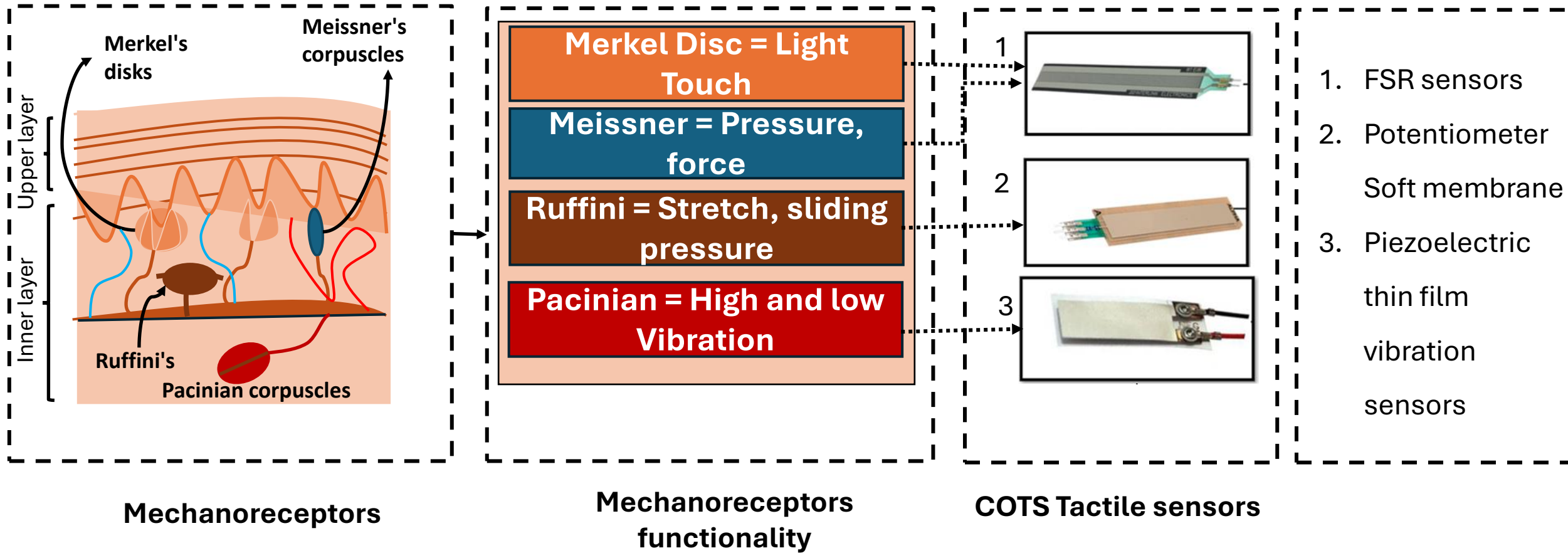
Embedded real-time objects hardness classification for robotic grippers



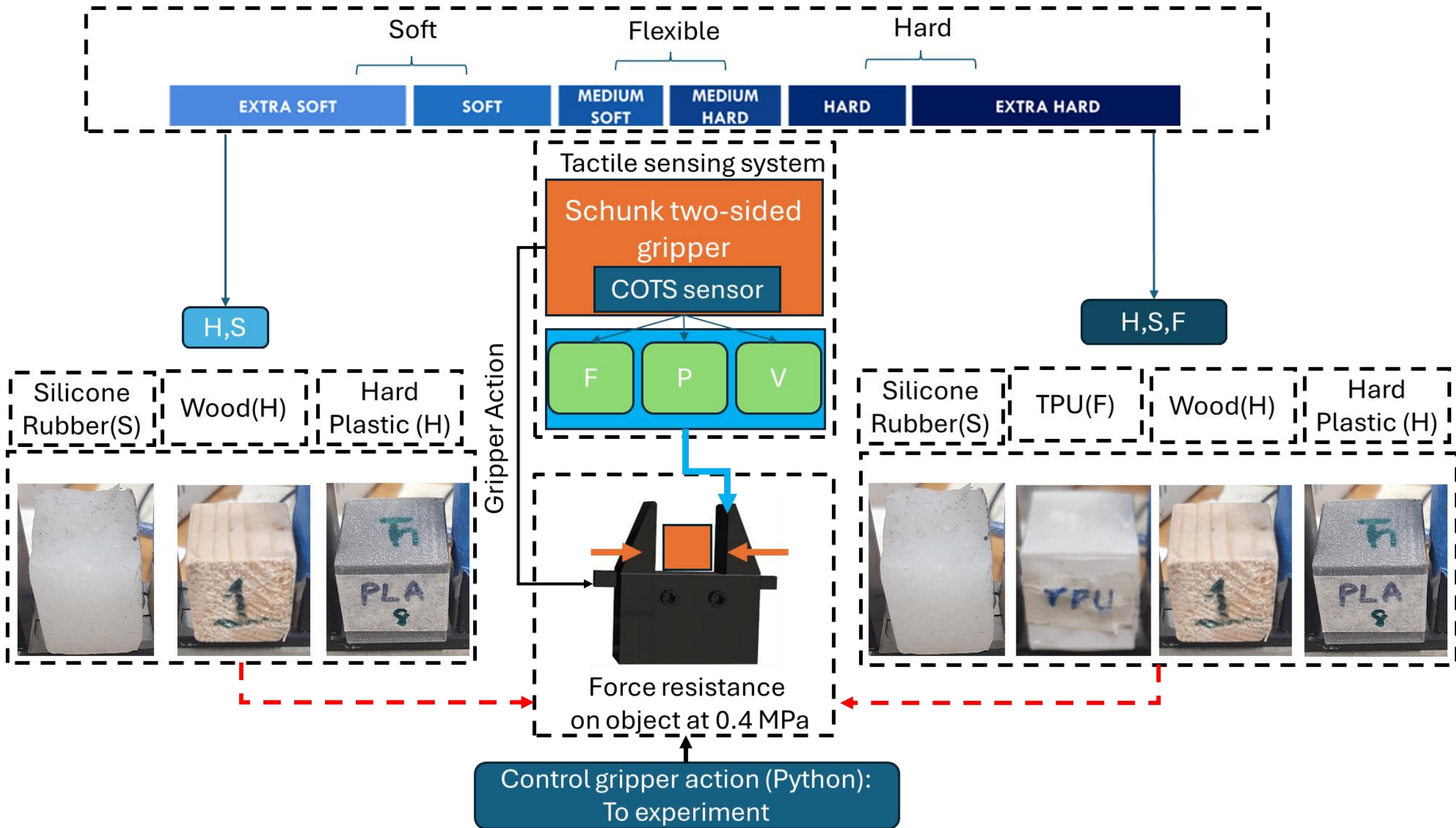
Points concluded

- Accuracy-based prediction has been extensively highlighted in the literature.
- Real-time prediction is often lacking in current studies.
- Customized sensors have been widely used in research.
- Investigations involving COTS sensors are limited, especially for real-time hardness prediction.
- Hardness classification has been performed based on binary and ternary prediction models.
- Real-time applications for hardness classification are often missing in the existing literature.

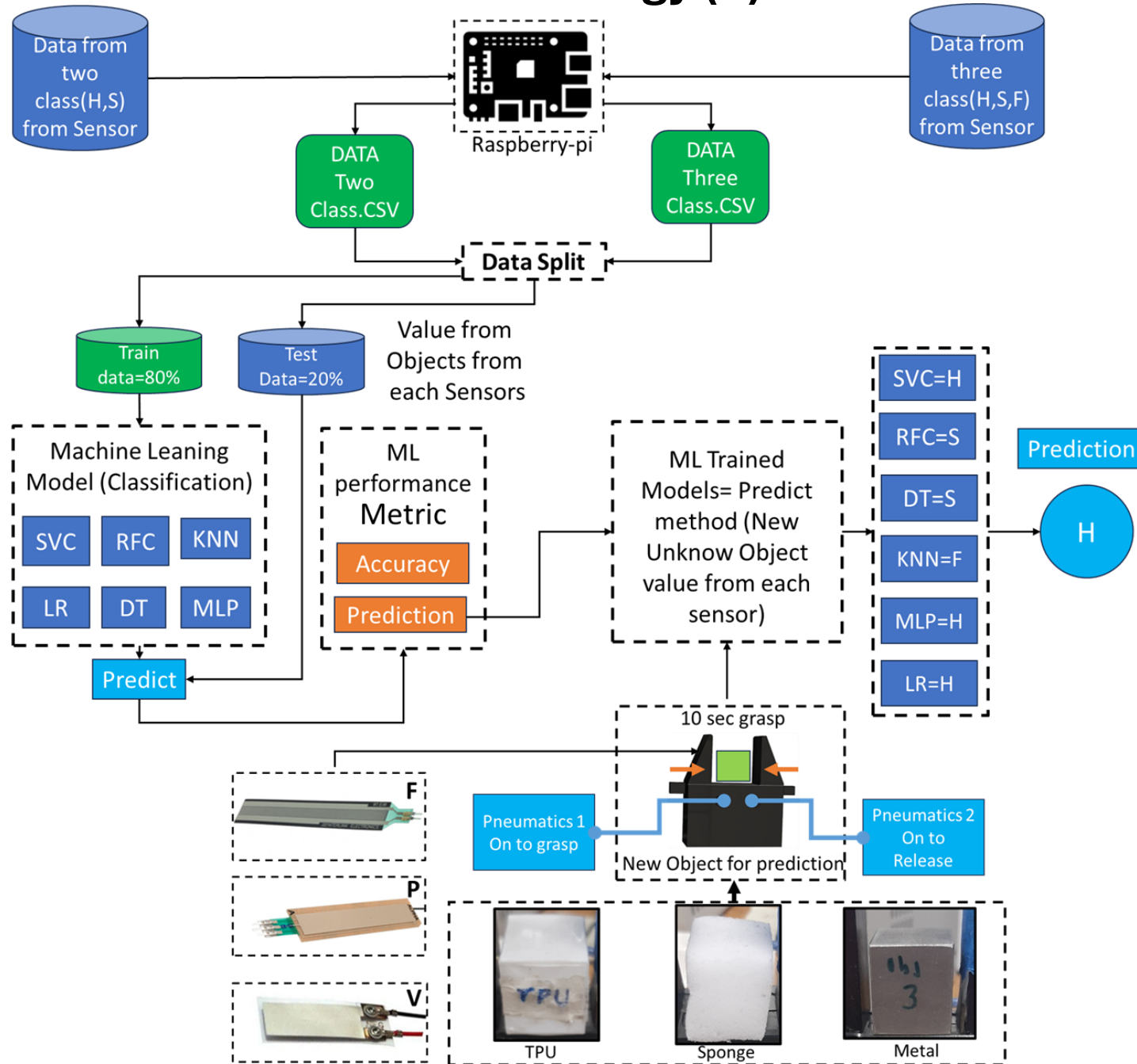
COTS Tactile sensors selectivity



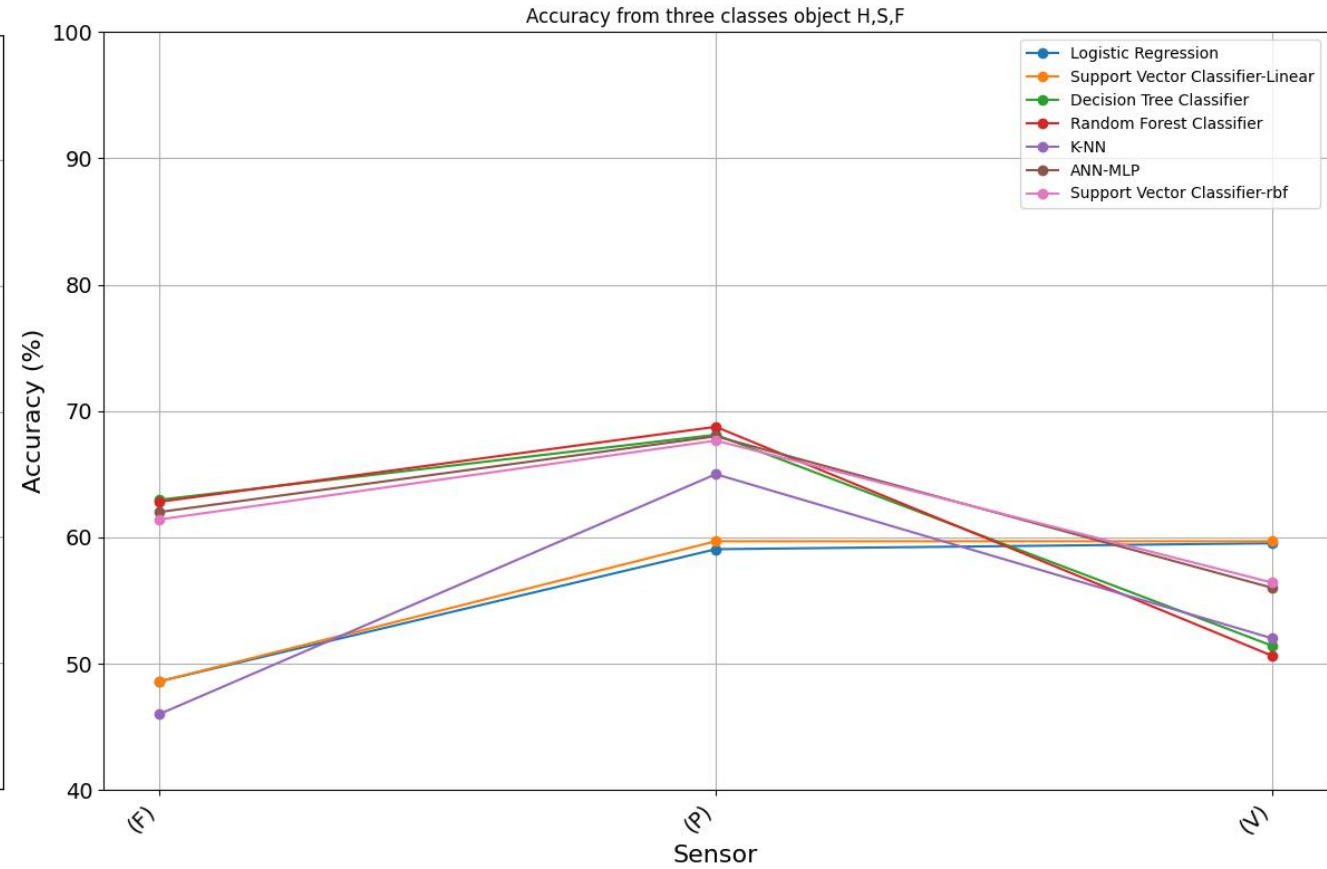
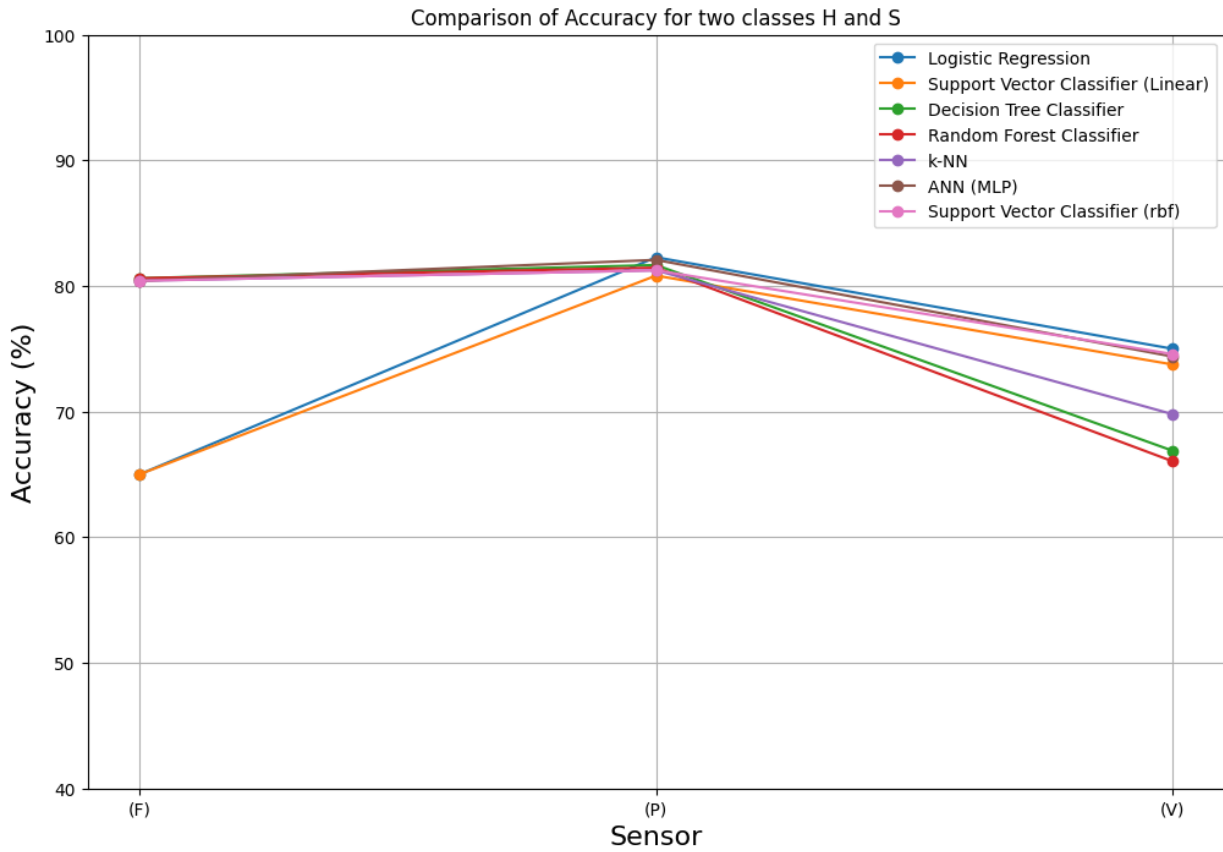
Methodology (a)



Methodology (b)



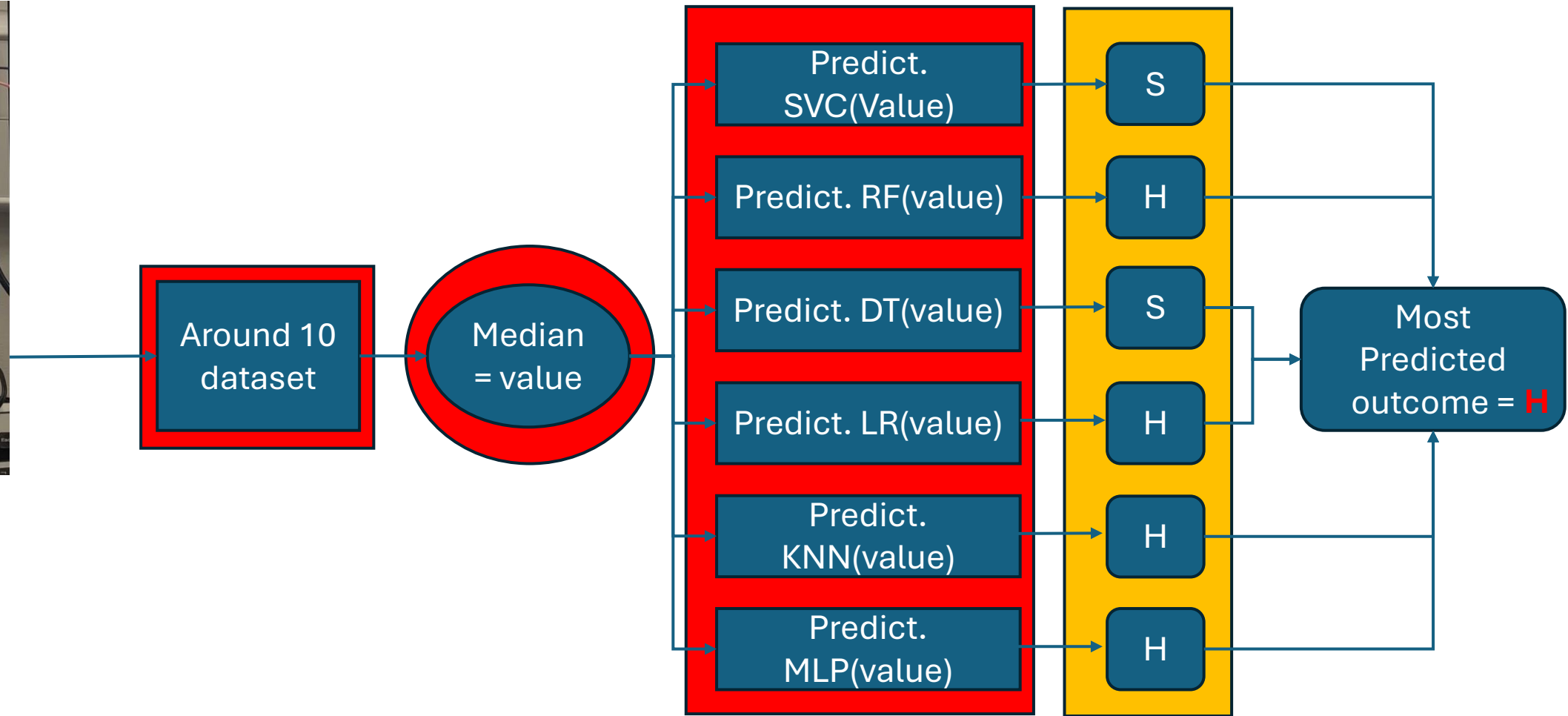
Result for hardness classification



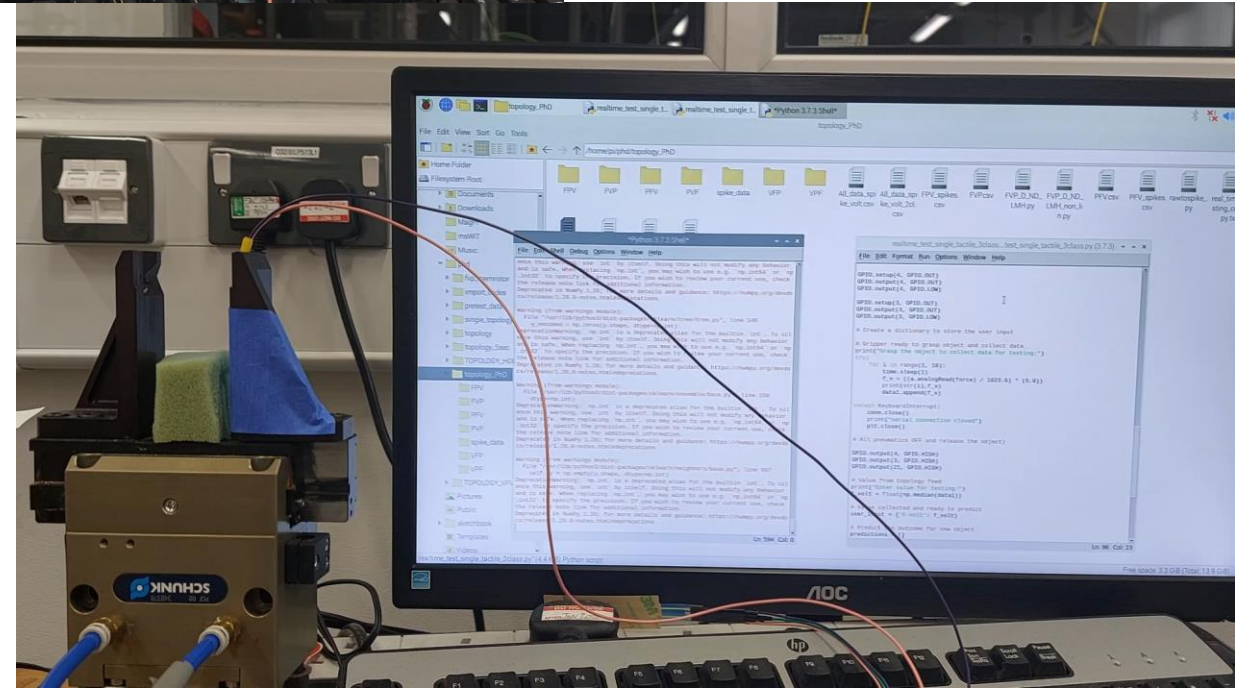
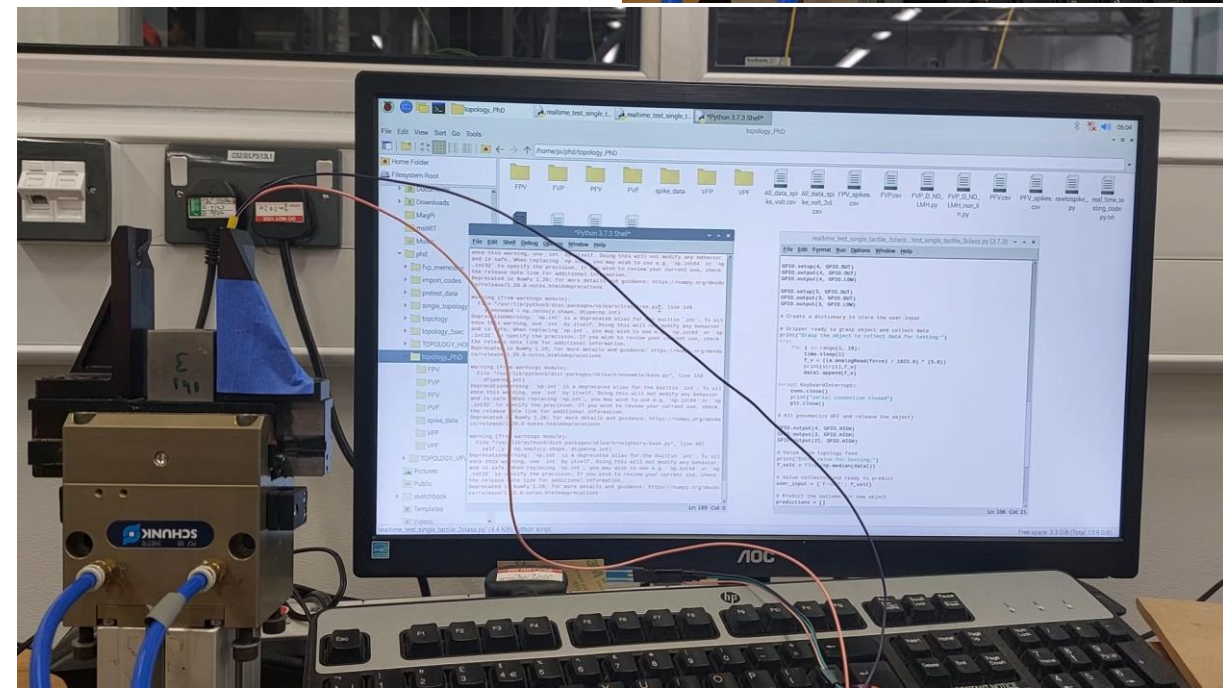
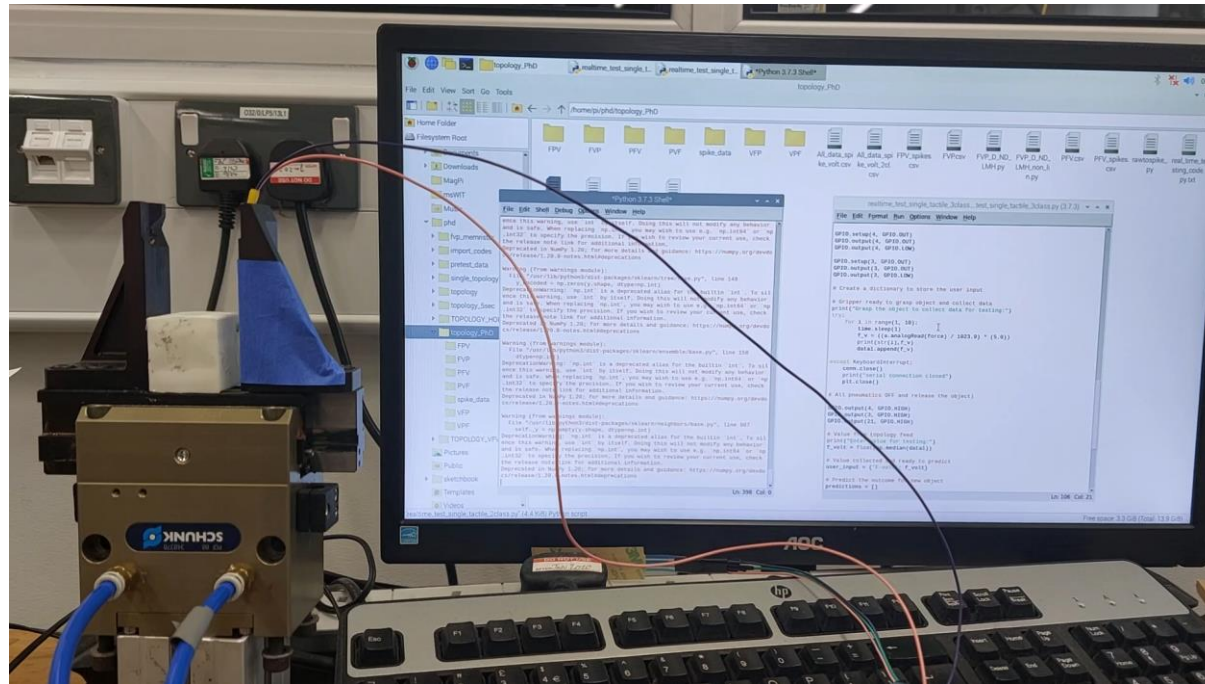
Approach for Hardness Prediction



10 sec grasp



Video Presentation Hardness Prediction



Result for Hardness Prediction outcome at first attempt

Unknown Object	S1-FSR (Prediction)	S2-Potentiometer (Prediction)	S3 Vibration (Prediction)
H(Metal)	H	S	H
S(TPU)	S	S	S
S(White sponge)	S	S	S

Unknown Object	S1-FSR (Prediction)	S2-Potentiometer (Prediction)	S3 Vibration (Prediction)
H(Metal)	F	H	F
F(TPU)	F	F	F
S(White sponge)	H	S	F

Thank You

Q&A

References

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