

Robot

Automatic controller tuning

Human



Automatic LQR Tuning Based on Gaussian Process Global Optimization

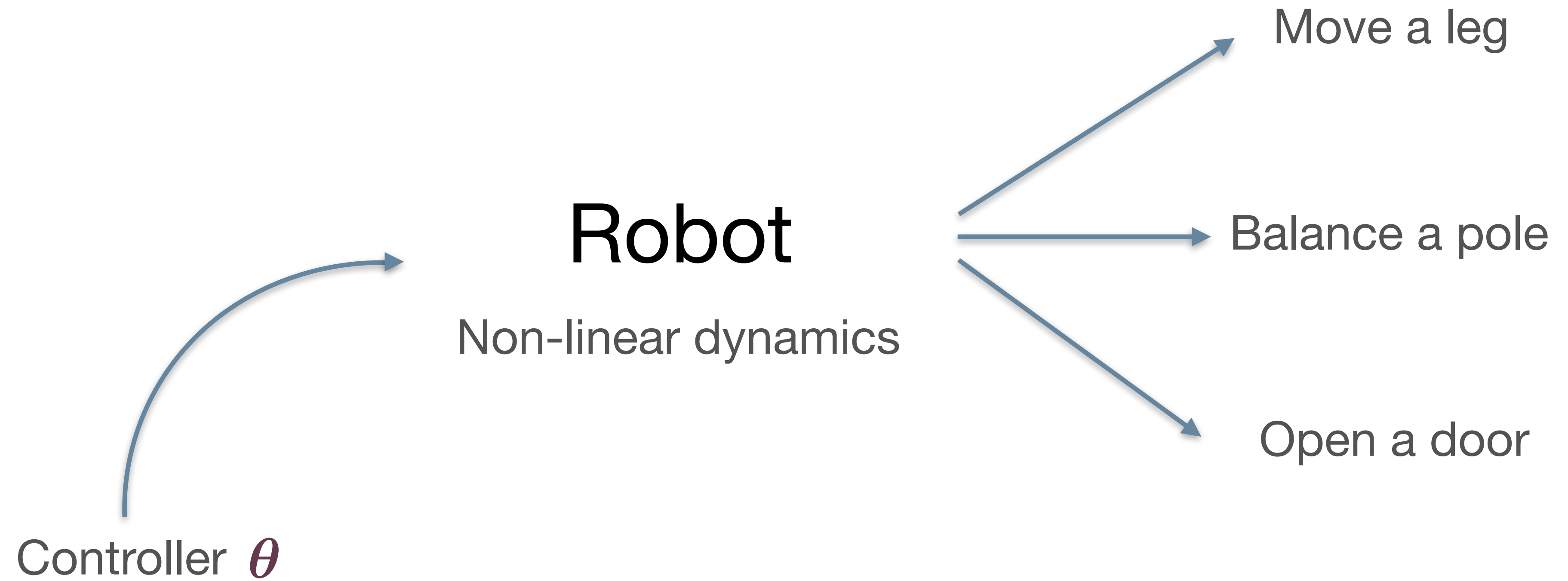
Alonso Marco, Philipp Hennig, Jeannette Bohg, Stefan Schaal and Sebastian Trimpe

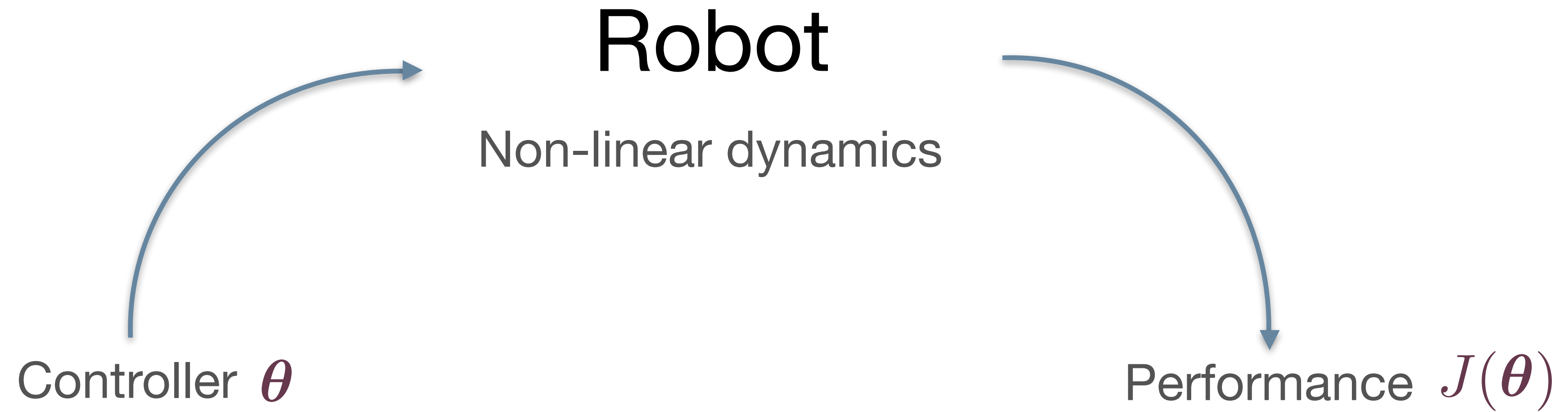


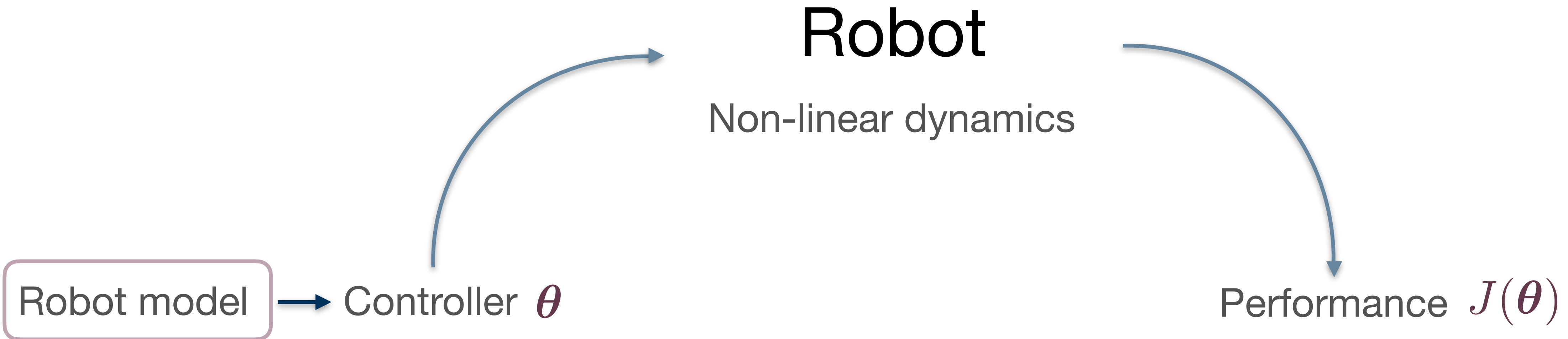
Robot

Non-linear dynamics



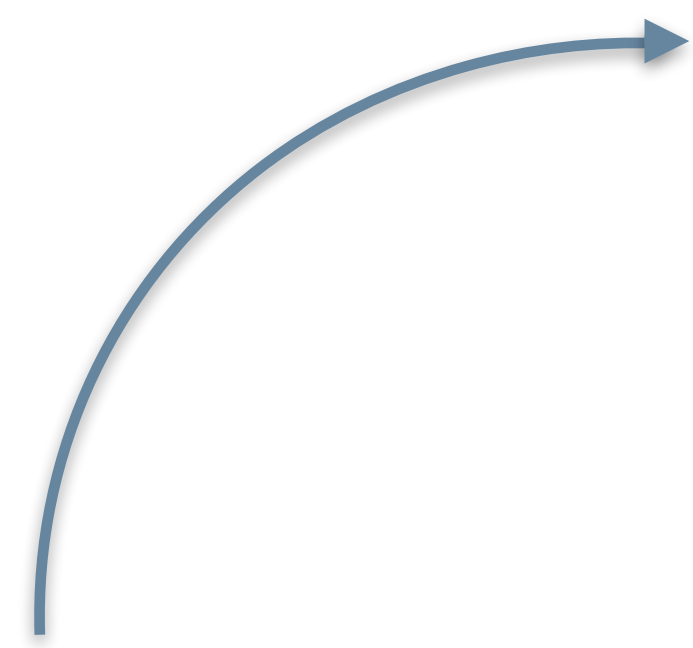






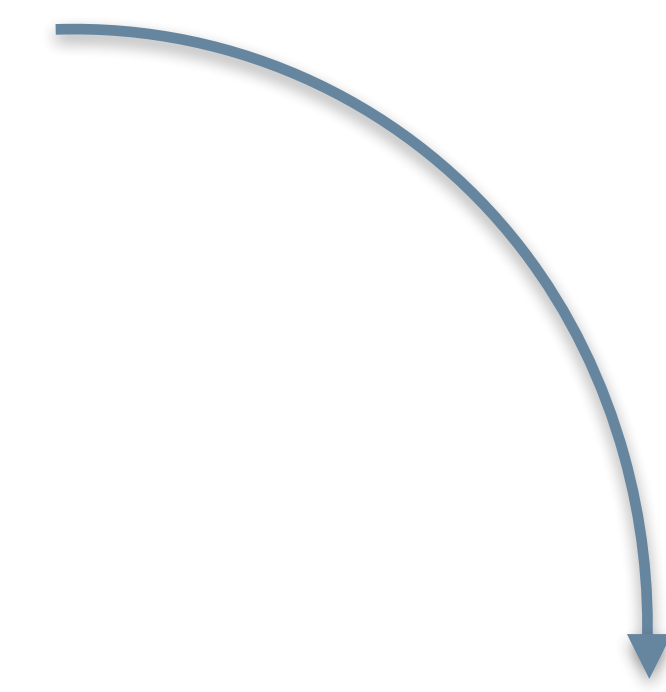
Poor model

→ Controller θ



Robot

Non-linear dynamics



Performance $J(\theta)$



Poor model

Controller θ

Robot

Non-linear dynamics

Performance $J(\theta)$

Manual tuning

$$\theta_{i+1} \leftarrow \theta_i$$



Robot

Non-linear dynamics

Performance $J(\theta)$

Poor model

Controller θ

LQR design

Automatic tuning

$$\theta_{i+1} \leftarrow \theta_i$$



Robot

Non-linear dynamics

Performance $J(\theta)$

Poor model

Controller θ

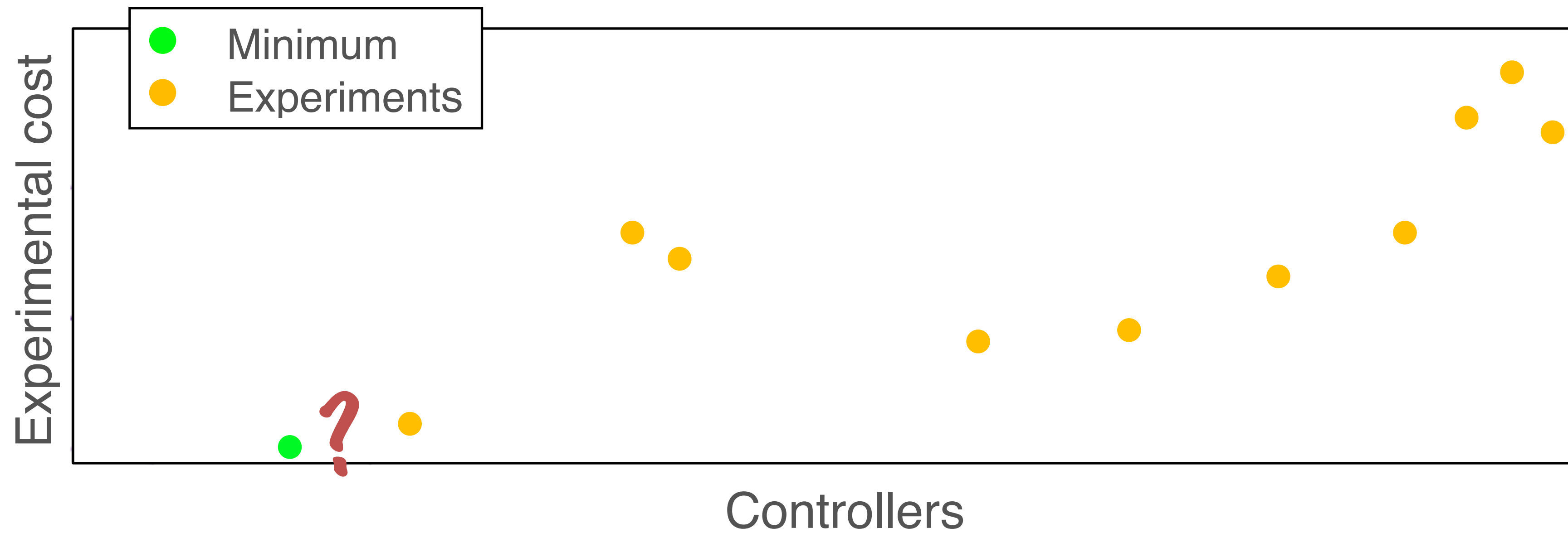
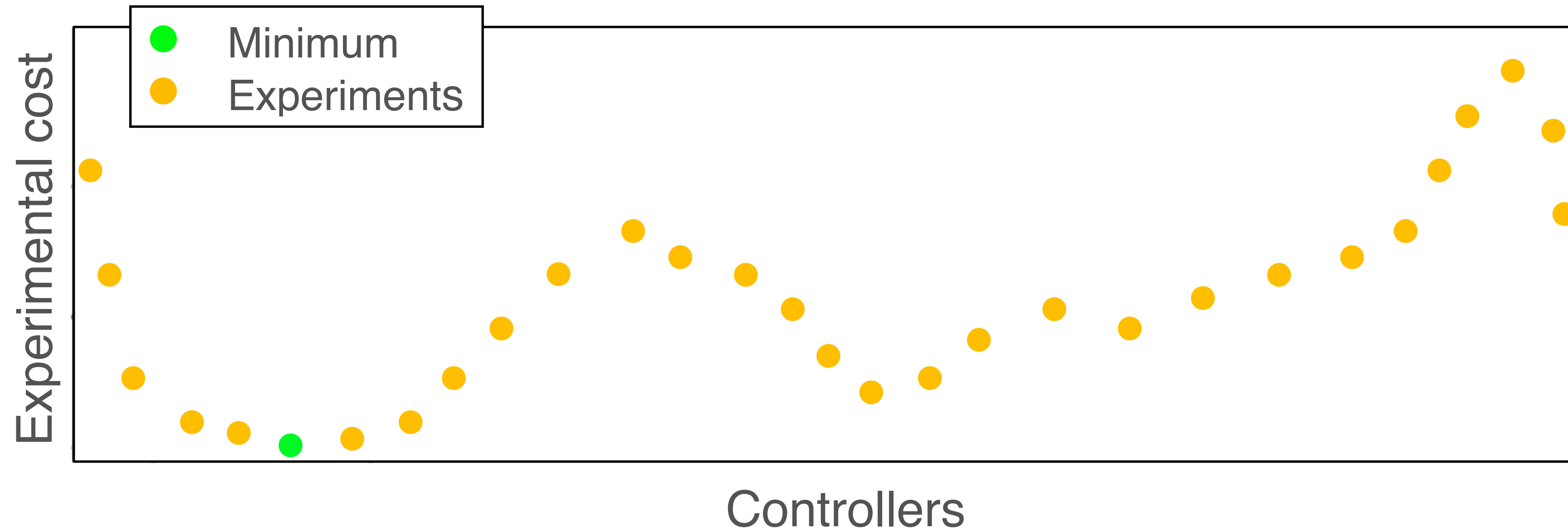
Bayesian optimization

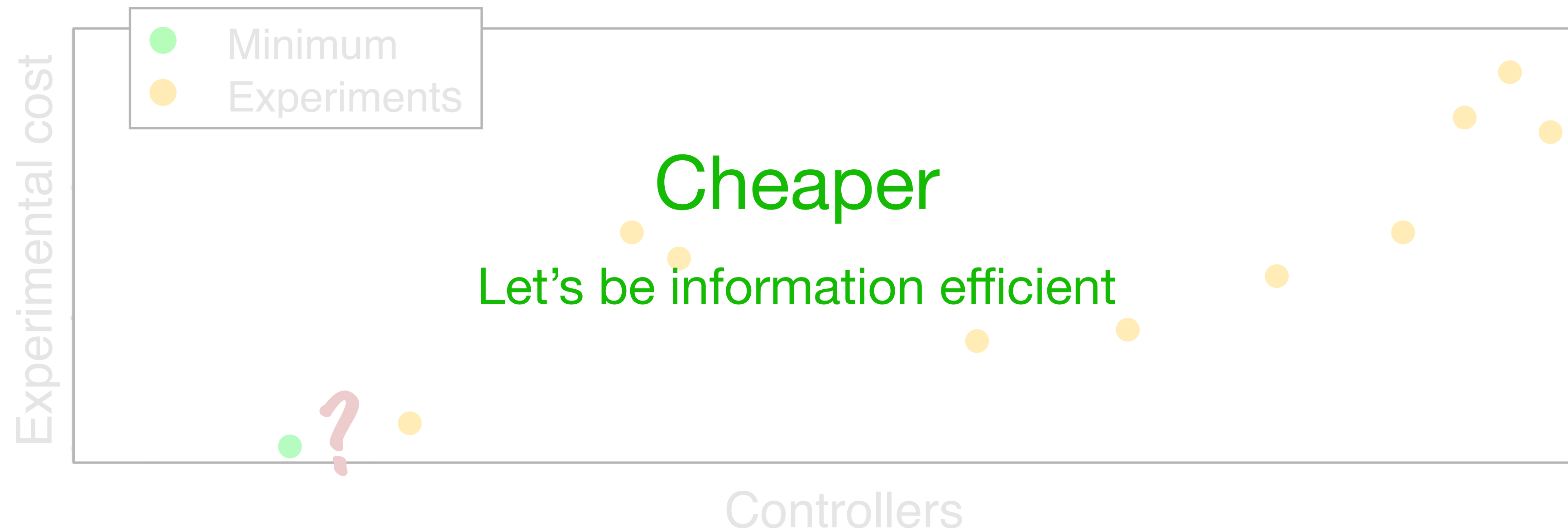
$$\min_{\theta} J(\theta) \quad \text{s.t. } \theta \in \mathcal{D}$$

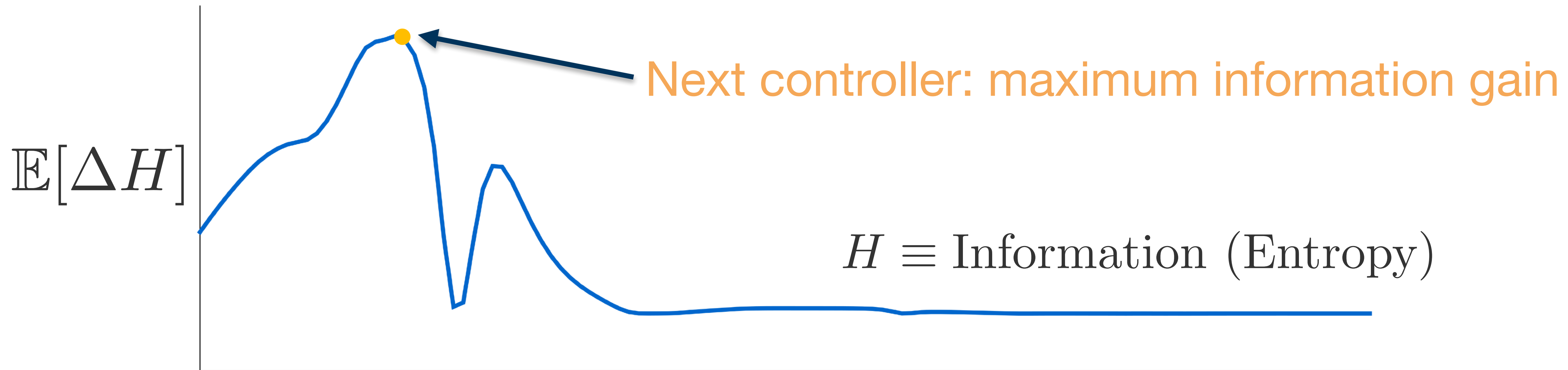
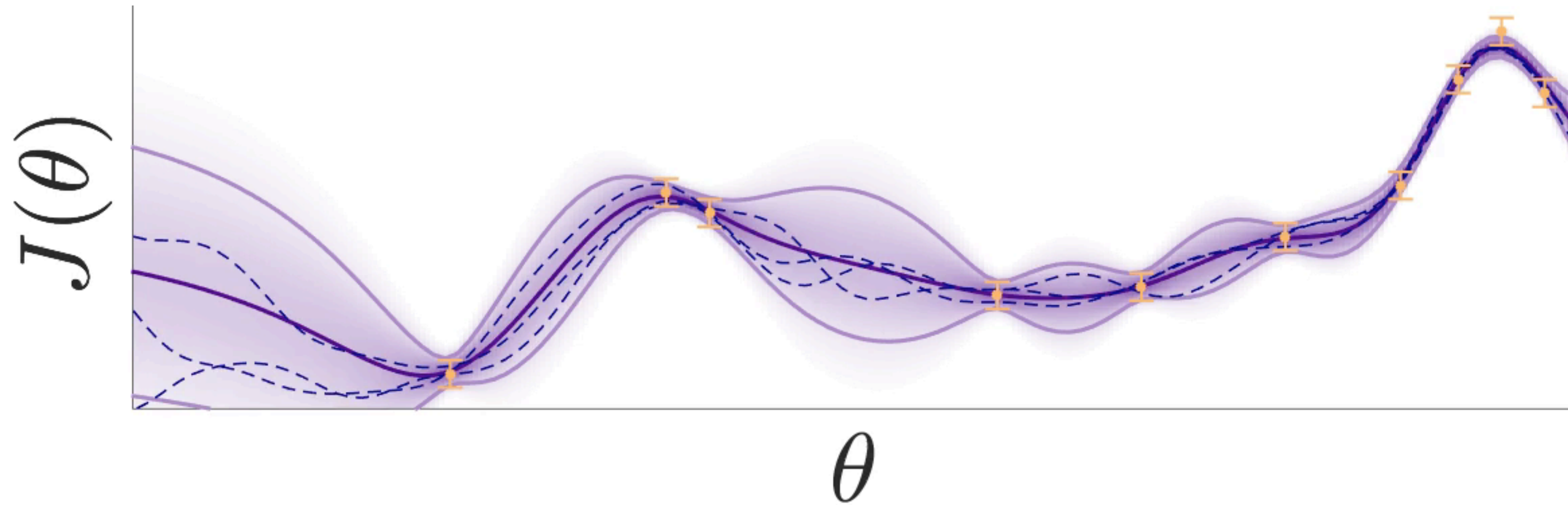
$$\theta_{i+1} \leftarrow \theta_i$$

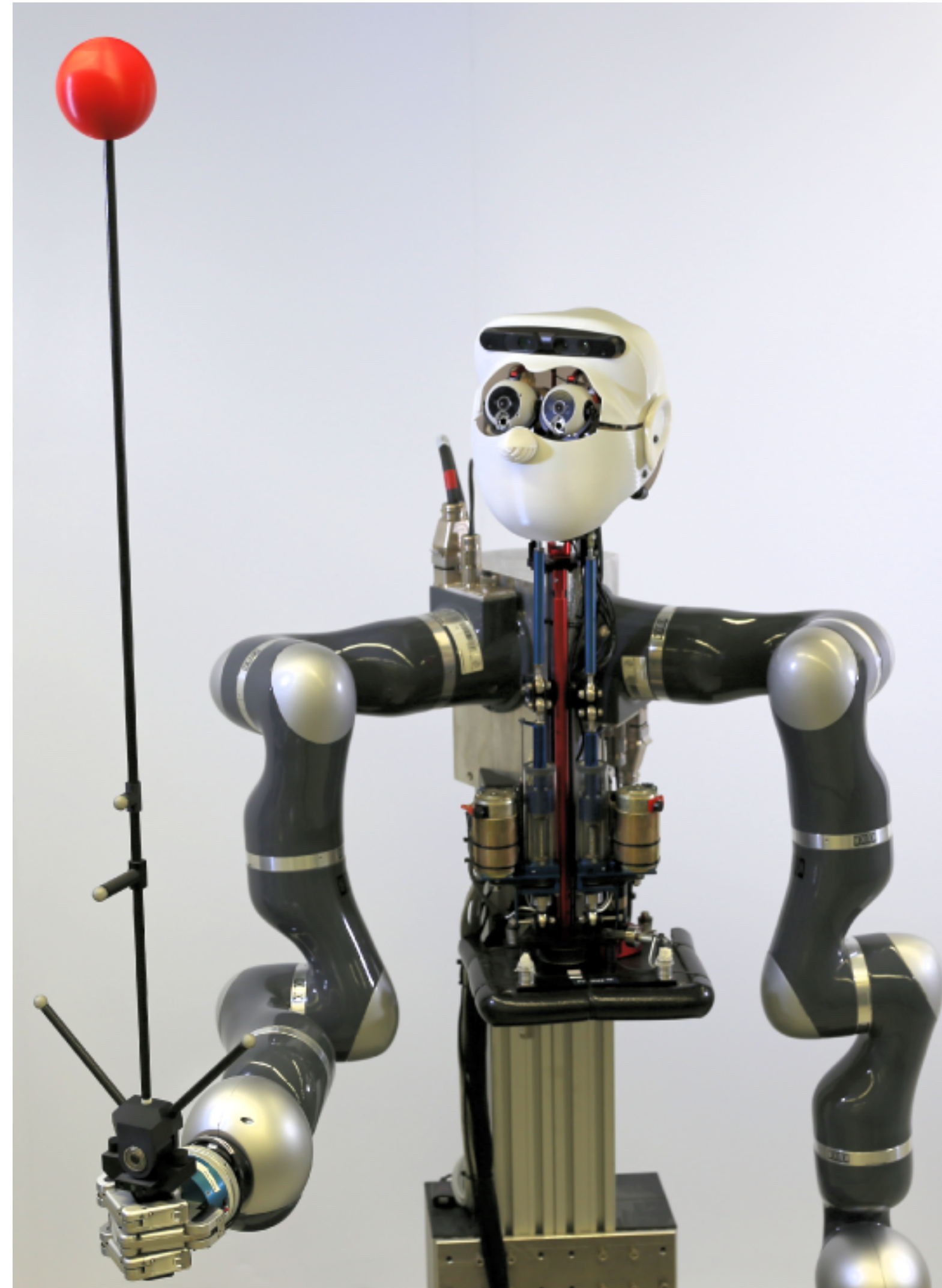
LQR design

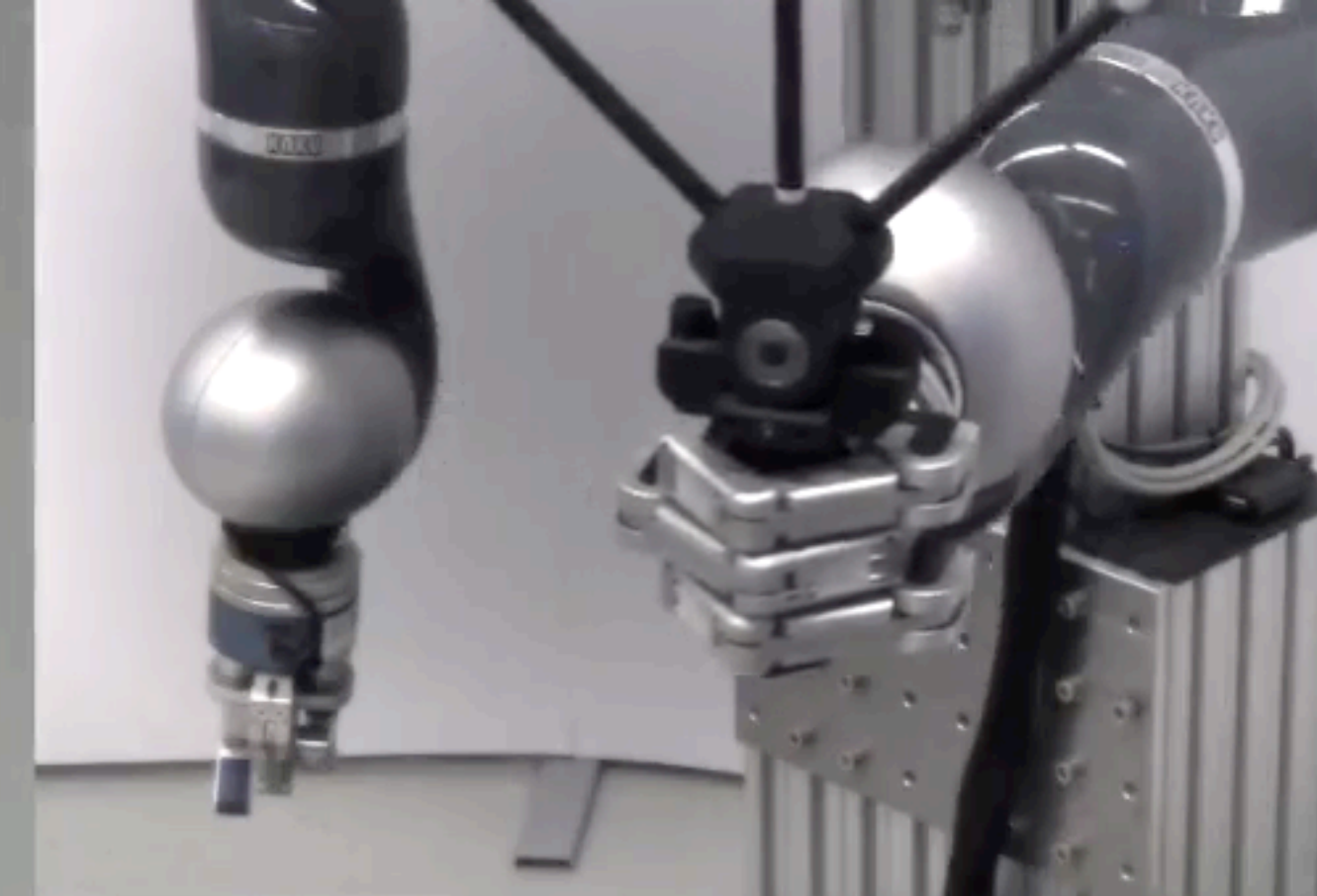
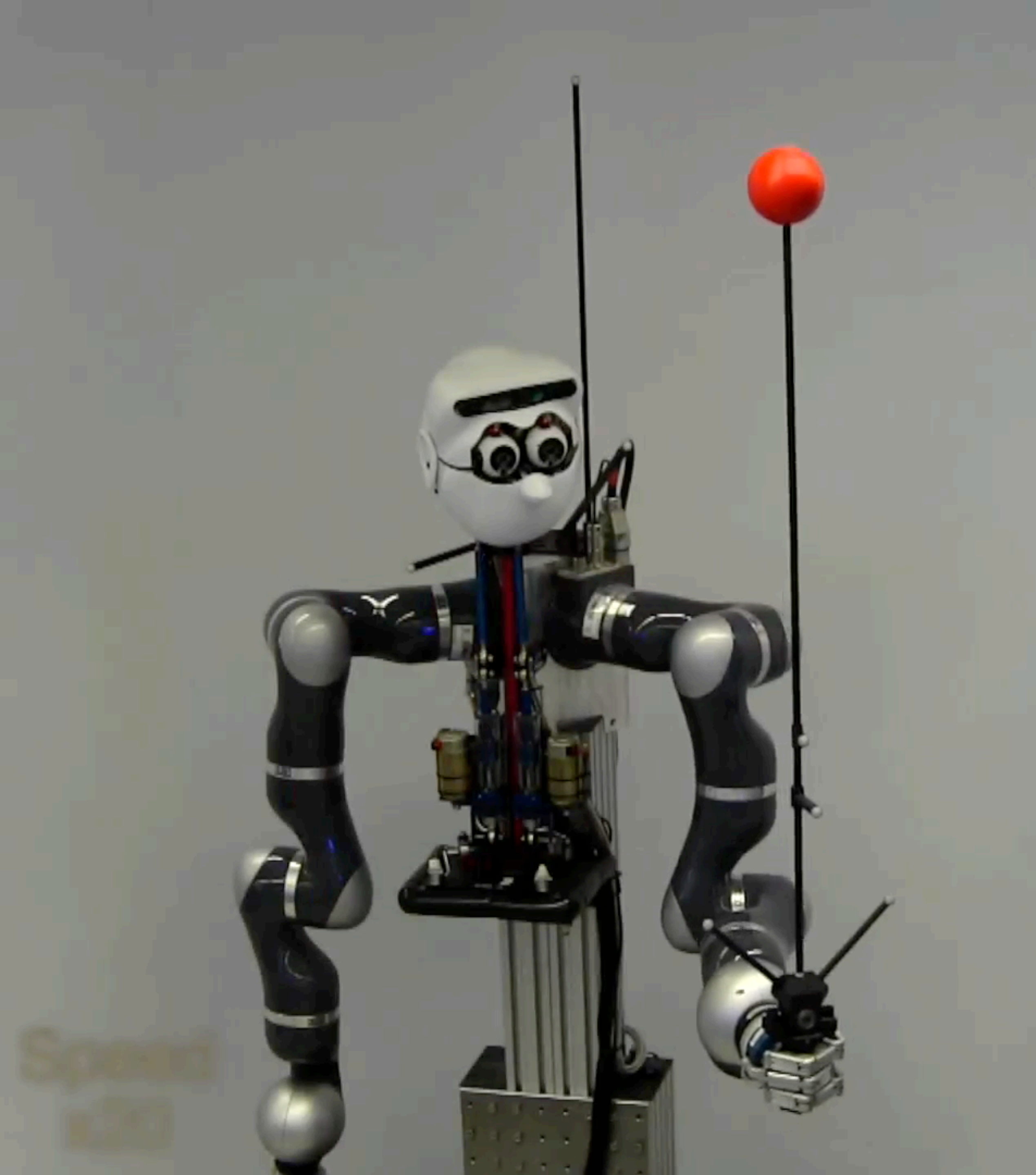






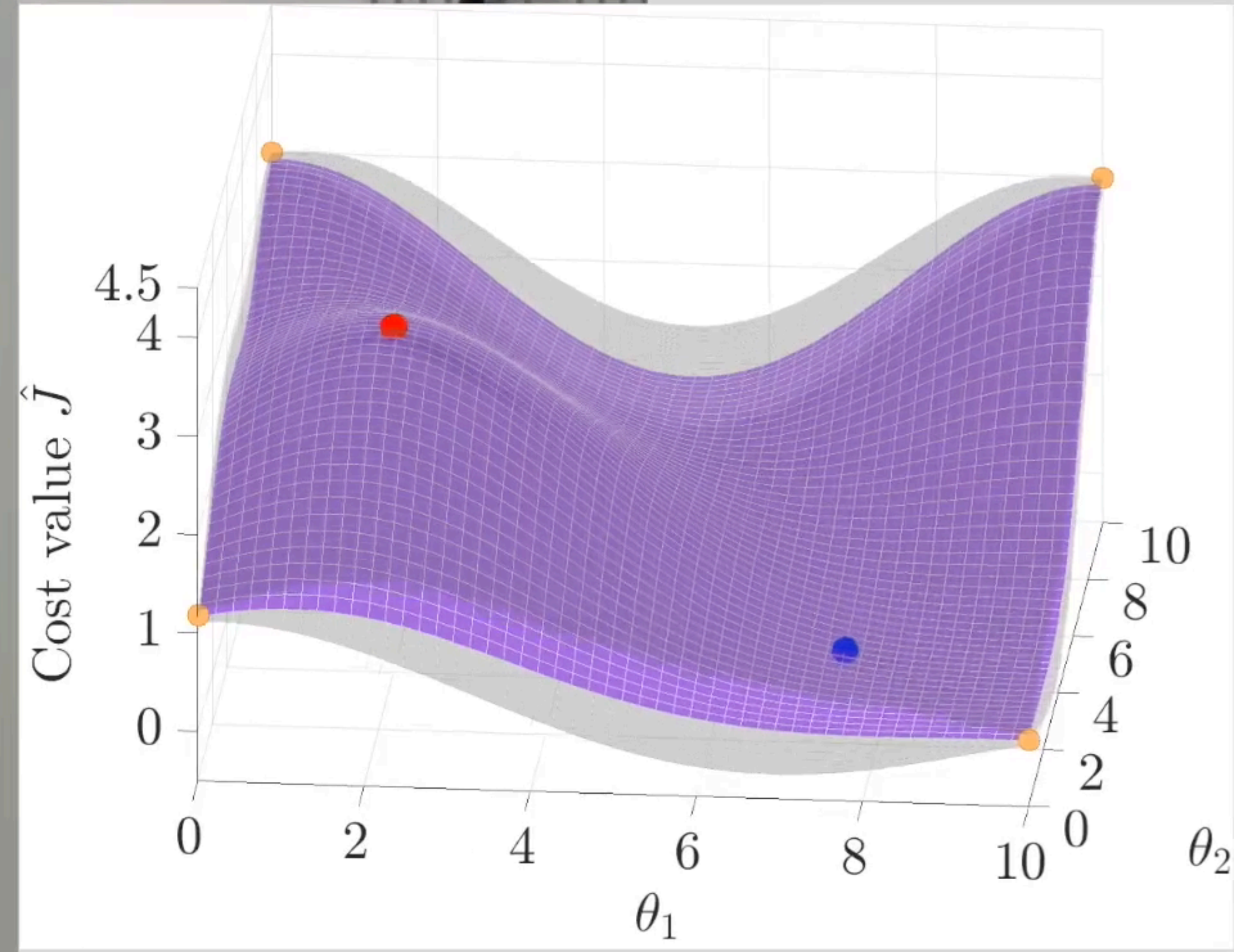




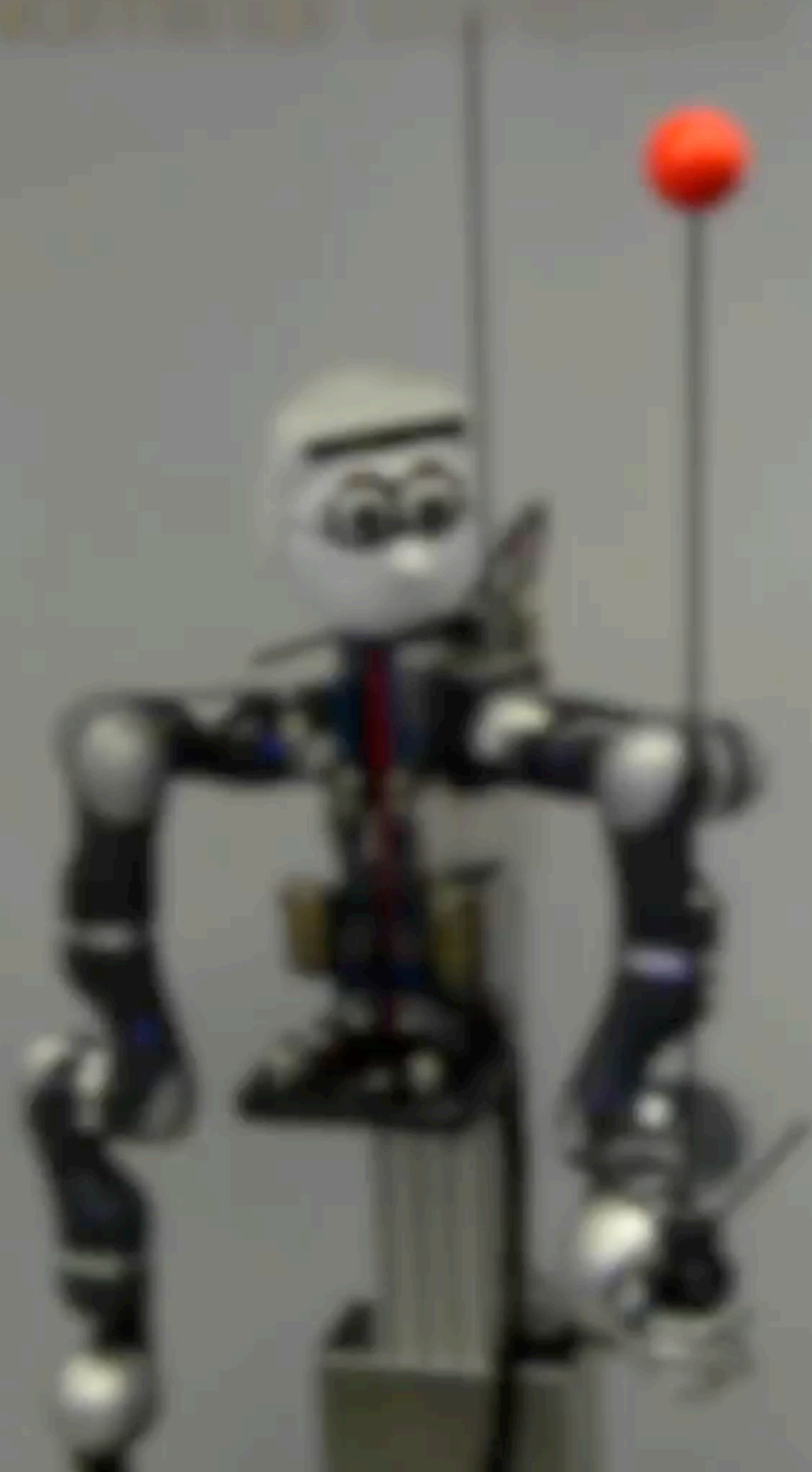


Global search

Iteration 1

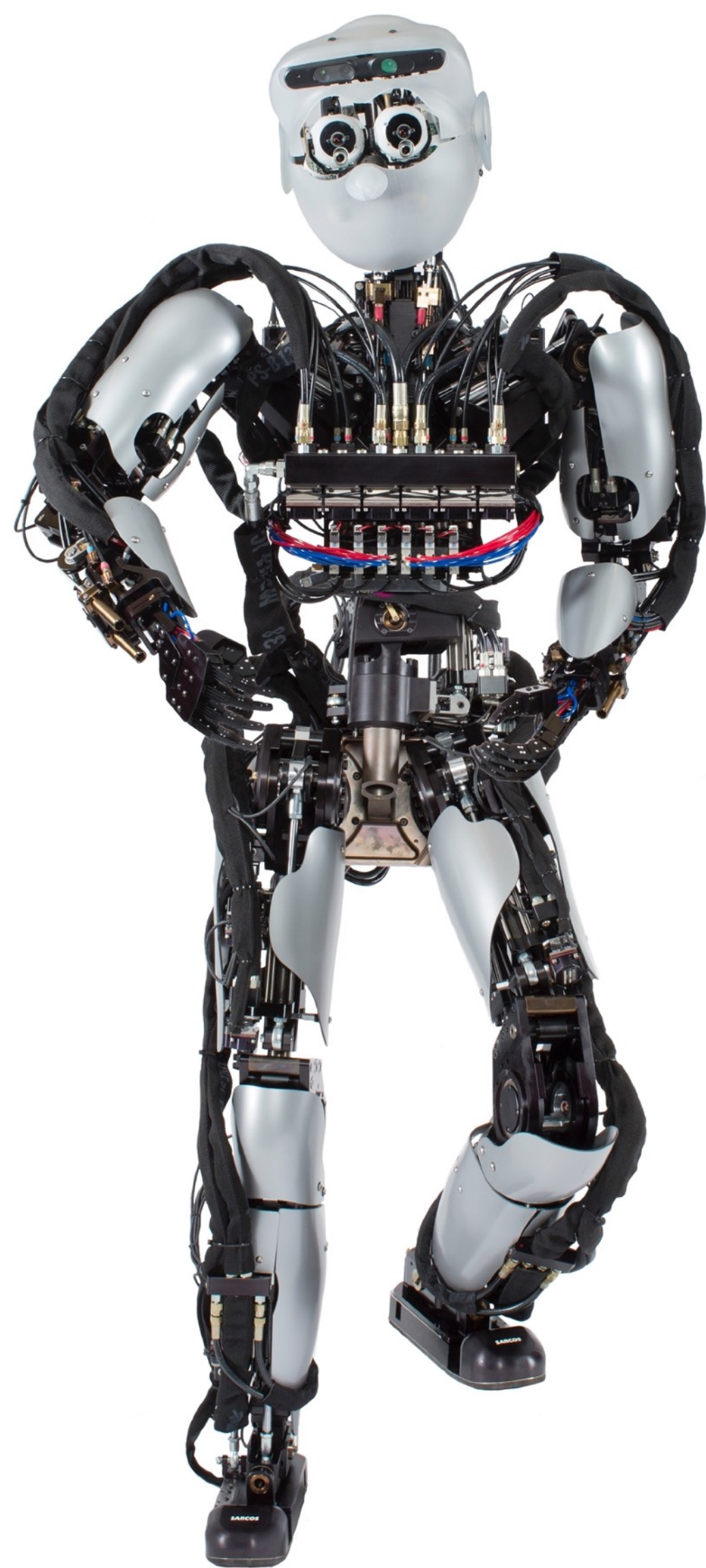


Normal

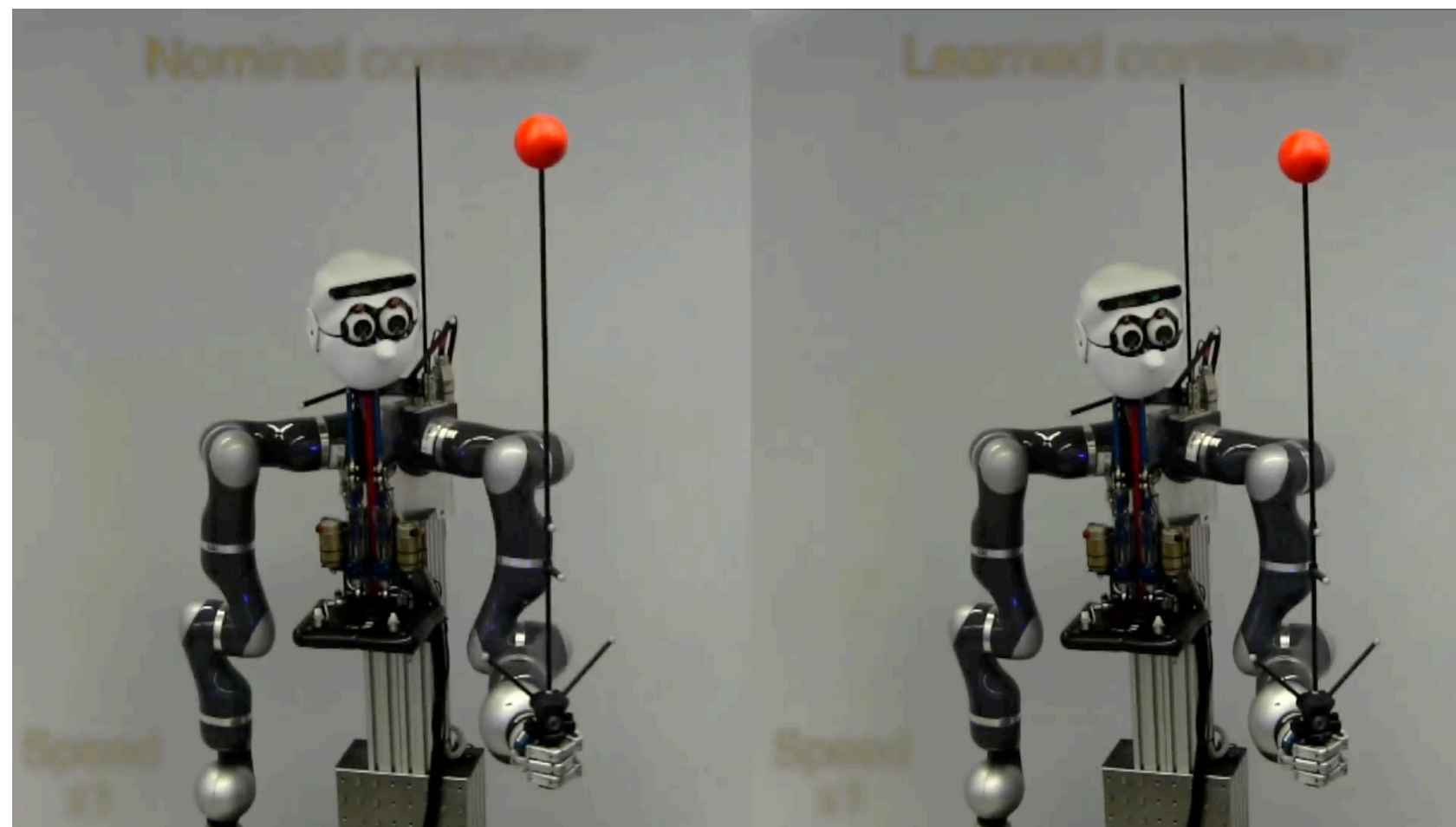


Learned

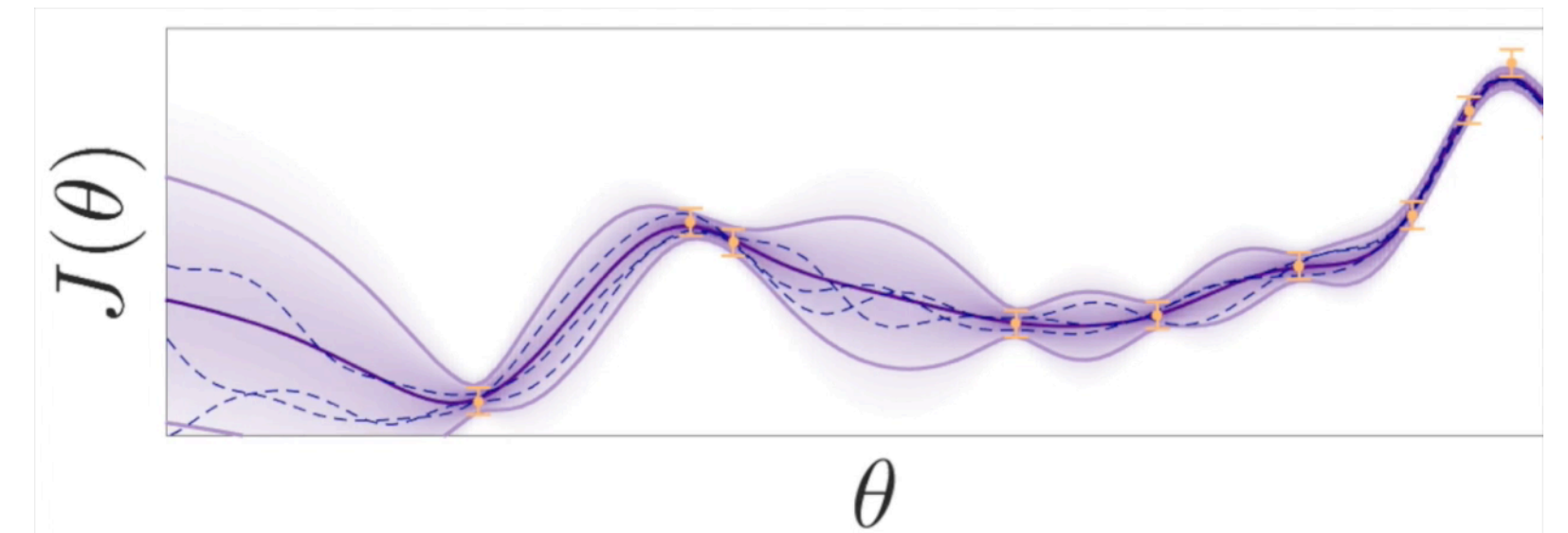




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Poster
TuAaT3.13



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