

Probabilistic Robotics / Uncertainty Quantification



[credit: image is generated by AI]

Overview

Recent advances in machine learning have enabled robots to achieve remarkable performance in perception, manipulation, and decision making. However, many learning-based systems remain poor at reasoning about uncertainty and often become overconfident when operating outside the conditions encountered during training.

This research direction focuses on developing principled methods that enable robots to quantify uncertainty, recognize the limits of their knowledge, and make reliable decisions in complex and changing environments. We are interested in combining modern machine learning, probabilistic inference, and robotics to build intelligent systems that are both capable and trustworthy.

Research Topics

Examples of topics of interest include, but not limited to:

- Uncertainty Quantification in Generative Models
- Uncertainty Quantification in Discriminative Models
- Bayesian Neural Networks
- Deep Ensembles
- Out-of-Distribution Detection

- Approximate Bayesian Inference
- Conformal Prediction
- Sequential Bayesian Inference

Potential application domains include:

- Robotic Manipulation
- Human-Robot Interaction
- Tactile Perception
- Industrial Robotics
- Embodied AI / Physical AI

Prospective Students and Researchers

We welcome highly motivated PhD students and postdoctoral researchers with backgrounds in Robotics, Machine Learning, Artificial Intelligence, Computer Vision, Control, Applied Mathematics, Statistics, or related fields.

Candidates interested in this research direction are encouraged to follow the instructions on the PI website and make an application.