

The Future of Robot Learning

Robotics : Computation in Motion

Artificial Intelligence : Decision making

Machine Learning : Enables human-like learning

- Answers descriptive, predictive, and prescriptive questions

3 Types of Learning

- Supervised learning
- Unsupervised learning
- Reinforcement learning

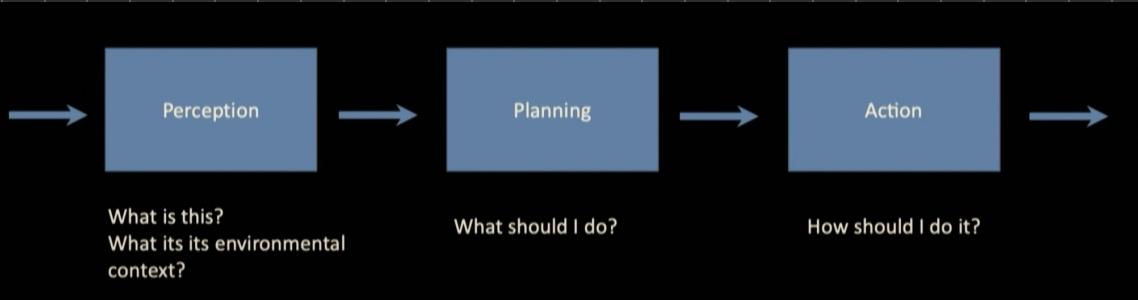


Image Segmentation

- Label parts of images
- Crowdsourcing for labeling

Context really matters for image segmentation models

Autopilot

- In 1995, a Carnegie Mellon project called NavLab to go coast-to-coast
- Visual processing has gone from 1 frame per 10 mins to 100fps

Autonomy Recipe

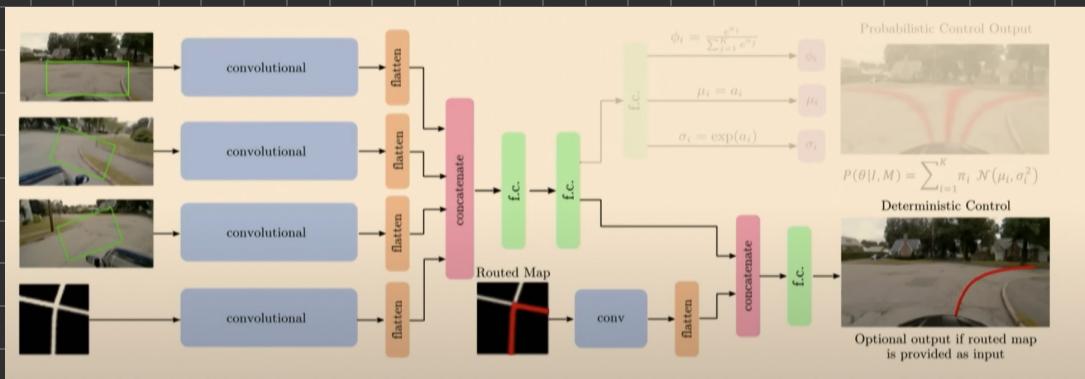
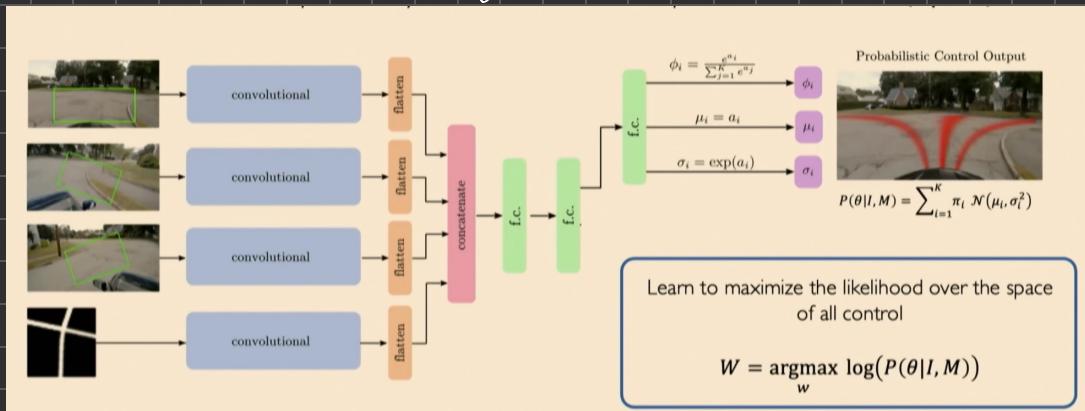
- 1.) Extend your car to drive via electric input
- 2.) Extend your cars vision with cameras and LiDAR sensors
- 3.) Use perception module for perceiving environment
- 4.) Use estimation model powered by infrastructure maps
- 5.) Use planning / control module for actions

Learning to navigate

- Raw perception I
- Coarse maps M
- Probabilistic control $P(\theta | I, M)$

$$P(\theta | I, M) = \sum_{i=1}^K \pi_i \mathcal{N}(\mu_i, \sigma_i^2)$$

End-to-end optimization formulation



Note : CSAIL's VISTA is open source!

LTC Networks

$$\frac{dx(t)}{dt} = - \left[\frac{1}{\tau} + f(x(t), I(t), t, \theta) \right] x(t) + f(x(t), I(t), t, \theta) A$$

"Liquid" variable

- Because of function's inputs, it can adapt after training