

IASD M2 at Paris Dauphine

Deep Reinforcement Learning

3: PyTorch and Neural Nets Review Session

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Acknowledgement

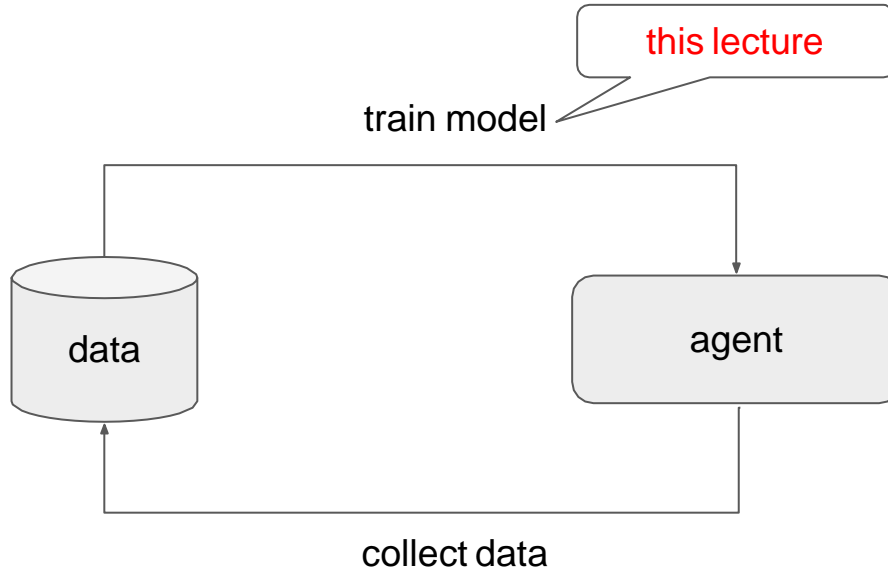
The materials of this course is entirely based on the seminal course of Sergey Levine CS285



Goal of this course

Train an agent to perform useful tasks

common training paradigm



How do we train a model?

$$\theta^* = \arg \min_{\theta} \sum_{(x,y) \in \mathcal{D}} \|f_{\theta}(x) - y\|_2^2$$

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neural network

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gradient descent

neural network

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What is PyTorch?

Python library for...

- Defining neural networks
- Automatically computing gradients

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gradient descent

neural network

What is PyTorch?

Python library for...

- Defining neural networks
- Automatically computing gradients
- And more (GPU, optimizers, etc.)

$$\theta^* = \underbrace{\arg \min_{\theta}}_{\text{gradient descent}} \sum_{(x,y) \in \mathcal{D}} \underbrace{\|f_{\theta}(x) - y\|_2^2}_{\text{neural network}}$$

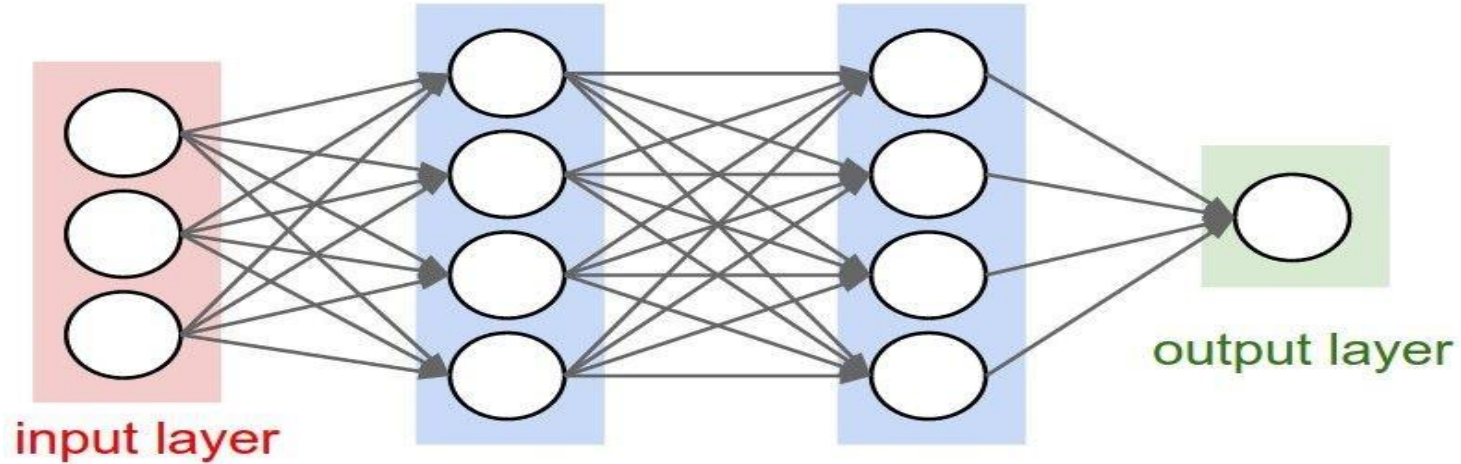
PyTorch Alternatives

TensorFlow, JAX, Chainer, ...

Basically all do the same

How does Pytorch work?

PyTorch: forward pass



hidden layer 1

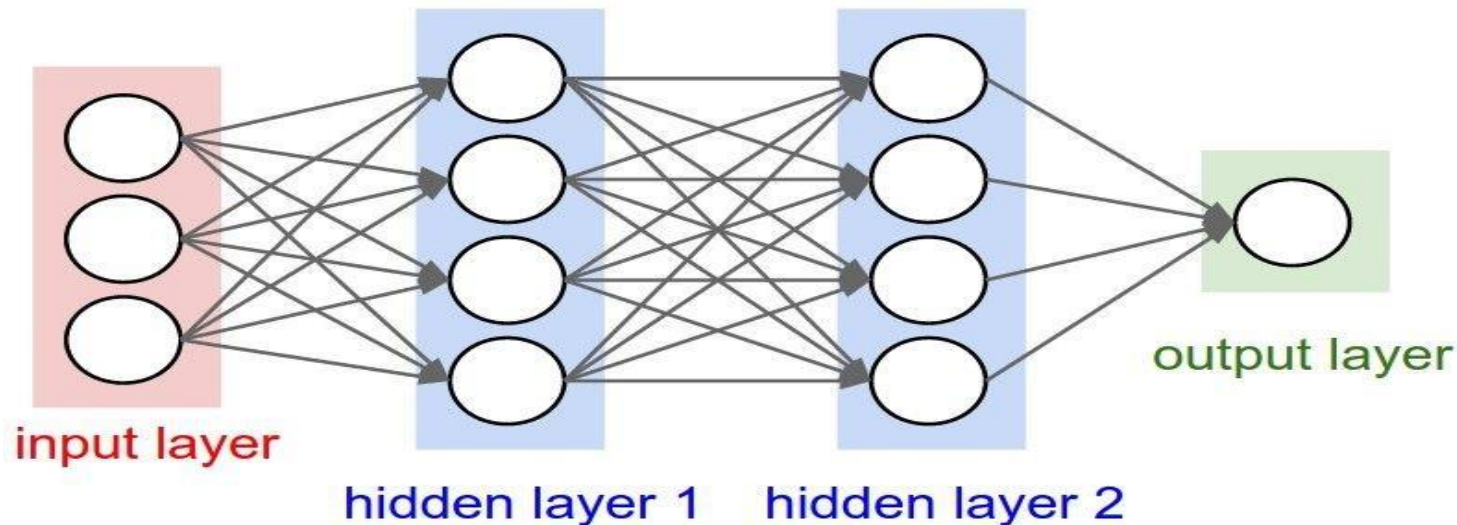
hidden layer 2

$$h_1 = \sigma(W_1x)$$

$$h_2 = \sigma(W_2h_1)$$

$$y = \sigma(W_3h_2)$$

PyTorch: backward pass



You define	$h_1 = \sigma(W_1x)$	$h_2 = \sigma(W_2h_1)$	$y = \sigma(W_3h_2)$
PT computes	$\frac{\partial y}{\partial W_1} = \frac{\partial y}{\partial h_2} \frac{\partial h_2}{\partial h_1} \frac{\partial h_1}{\partial W_1}$	$\frac{\partial y}{\partial W_2} = \frac{\partial y}{\partial h_2} \frac{\partial h_2}{\partial W_2}$	$\frac{\partial y}{\partial W_3}$

PyTorch Tutorial (Colab)

[Google collab link:](#)

<https://colab.research.google.com/drive/135fzWzVf4IULsr68RUoShV-ZDTzXKvbp?usp=sharing>