PyTorch and Neural Nets Review Session

CS285

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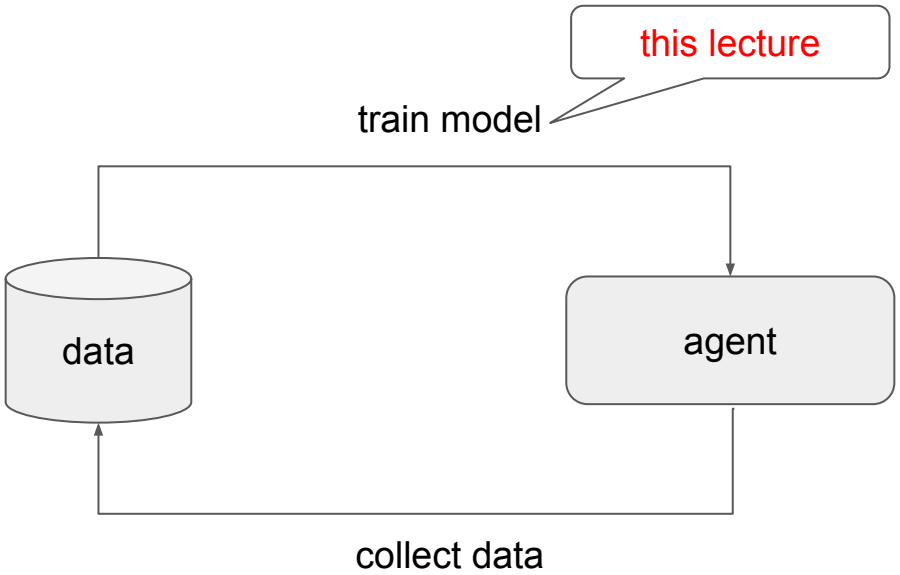
Goal of this course

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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gradient descent

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What is PyTorch?

Python library for…

- Defining neural networks
- Automatically computing gradients

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

gradient descent

neural network

What is PyTorch?

Python library for…

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

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

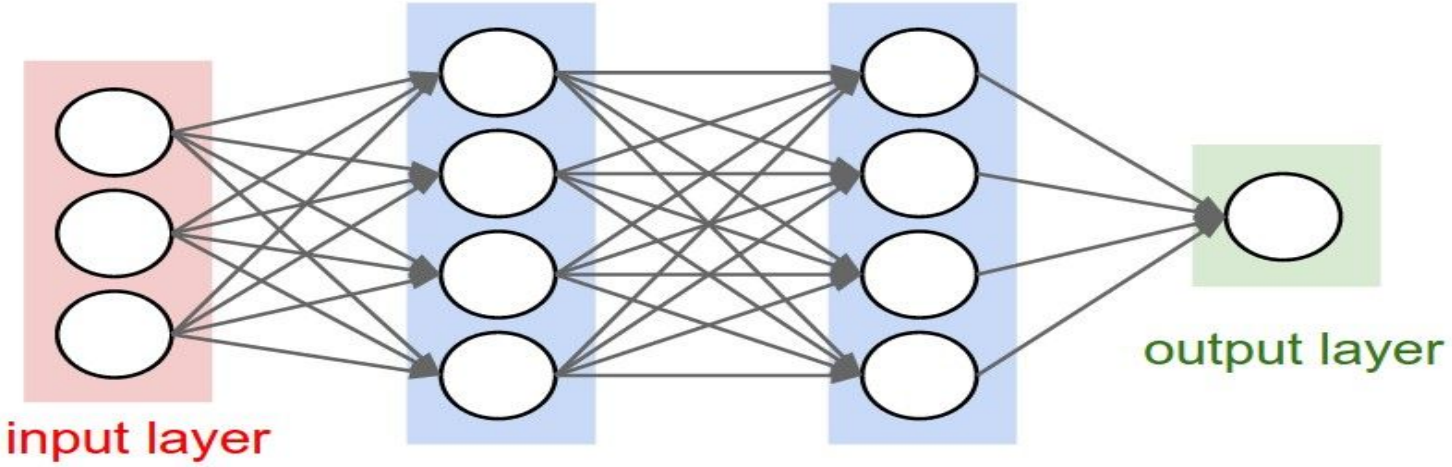
PyTorch Alternatives

TensorFlow, JAX, Chainer, …

Basically all do the same

How does Pytorch work?

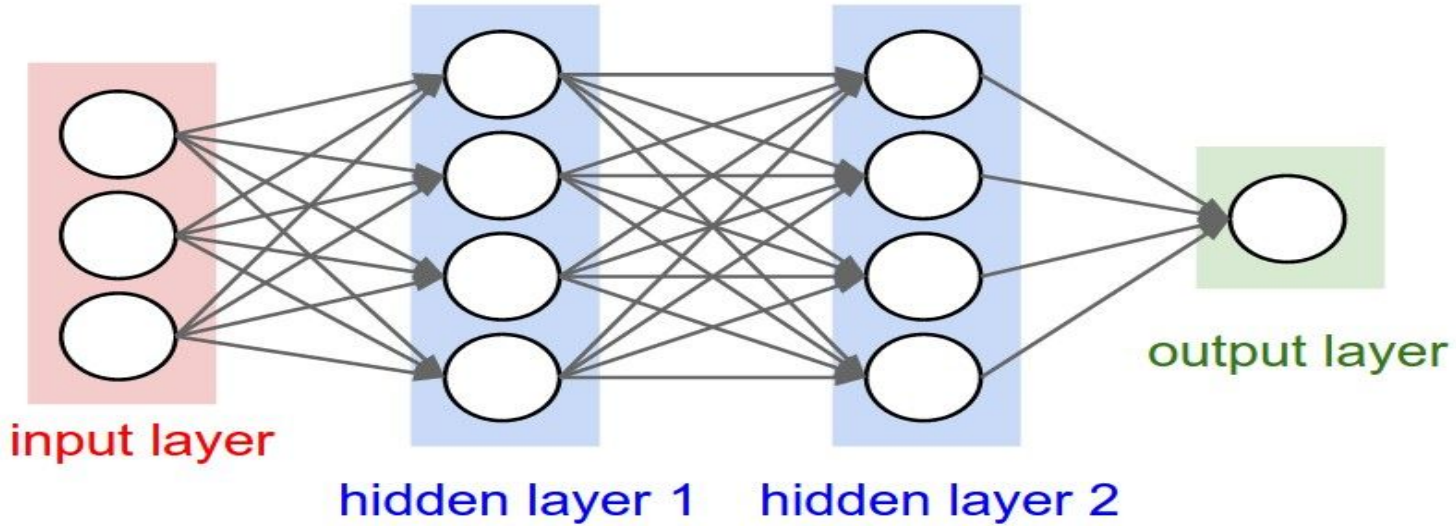
PyTorch: forward pass



$$h_1 = \sigma(W_1 x) \qquad h_2 = \sigma(W_2 h_1) \qquad y = \sigma(W_3 h_2)$$

[picture from Stanford's CS231n]

PyTorch: backward pass



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

[picture from Stanford's CS231n]

PyTorch Tutorial (Colab)

https://colab.research.google.com/drive/1r_-Ow0QYPN58cfuNjZDUy4O6HUvPDxyN?usp=sharing