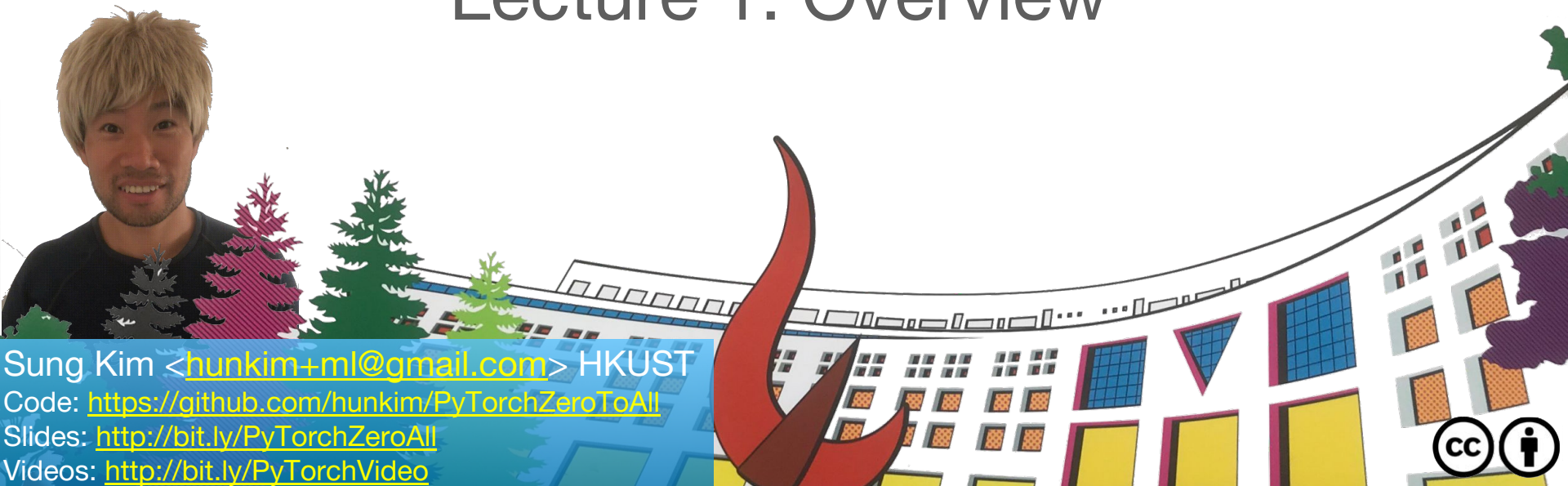
ML/DL for Everyone with PYTORCH

Lecture 1: Overview



Sung Kim <hunkim+ml@gmail.com> HKUST
Code: https://github.com/hunkim/PyTorchZeroToAll
Slides: http://bit.ly/PyTorchZeroAll
Videos: http://bit.ly/PyTorchVideo

Call for Comments

Please feel free to add comments directly on these slides.

Other slides: http://bit.ly/PyTorchZeroAll

Picture from http://www.tssablog.org/archives/3280

for your comments!

- Kyung Mo Kweon
- JooSung Yoon
- jungho choi
- 나로
- Junmo An
- Hwanhee Kim
- Stephen Lai
- SEN GmbH
- Karthick P
- Kabjin Kwon
- Zhou He
- ...
- ...

ML/DL for Everyone with PYTORCH

Lecture 1: Overview

Sung Kim <hunkim+ml@gmail.com> HKUST
Code: https://github.com/hunkim/PyTorchZeroToAll
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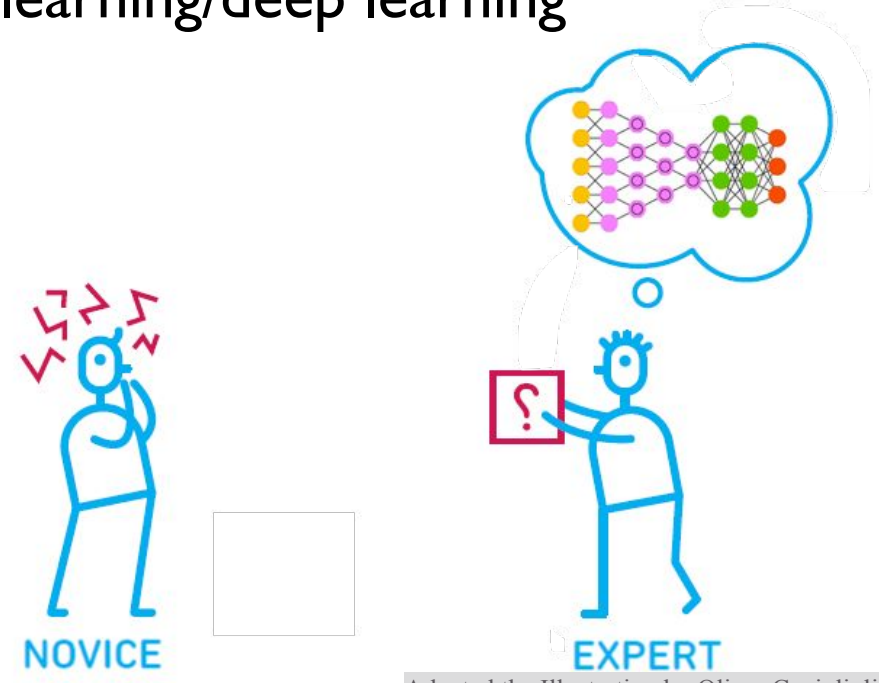
Videos: http://bit.ly/PyTorchVideo

Goals

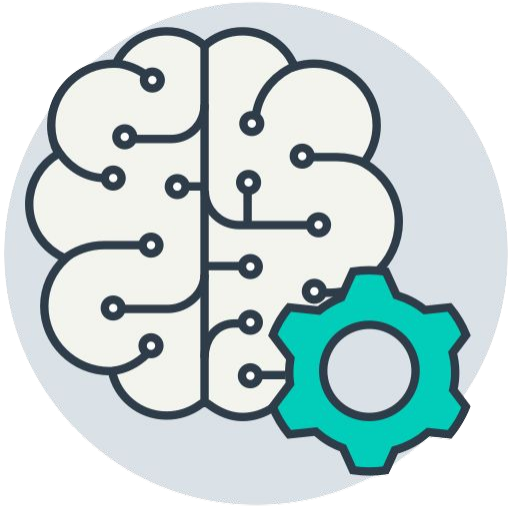
- Basic understanding of machine learning/deep learning
- PyTorch implementation skills

- Zero to All!
  - Basic algebra + probability
  - Basic python



Adapted the Illustration by Oliver Caviglioli

What is ML?



What is Human Intelligence?

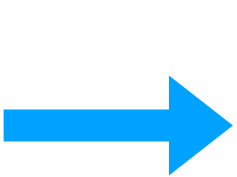
What is Human Intelligence?

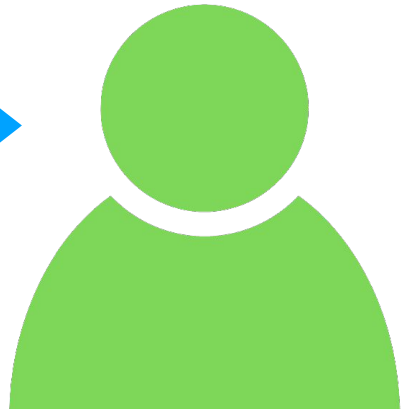
What to eat for lunch?

What is Human Intelligence?

What to eat for lunch?

Information





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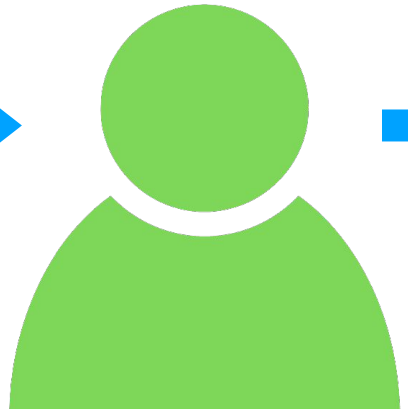
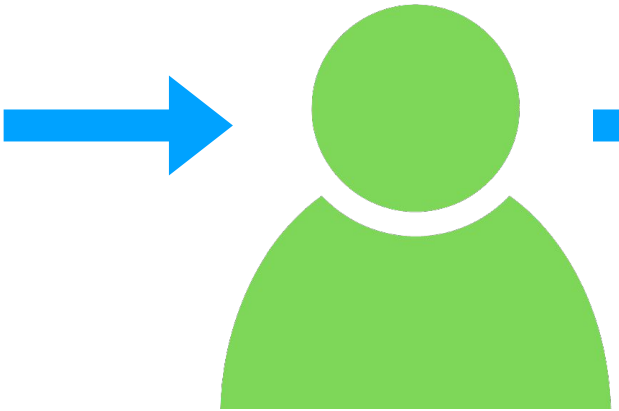


Infer

What is Human Intelligence?

What to dress?

Information

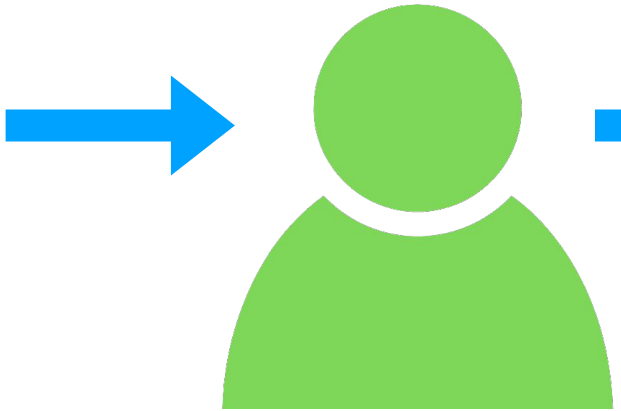


Infer

What is Human Intelligence?

What is this picture?

Image information

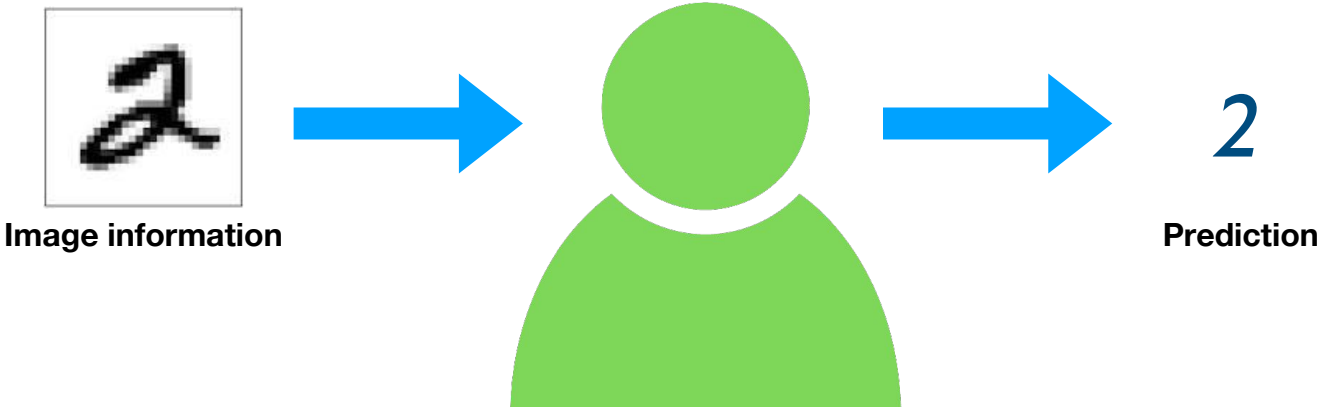


CAT

Prediction

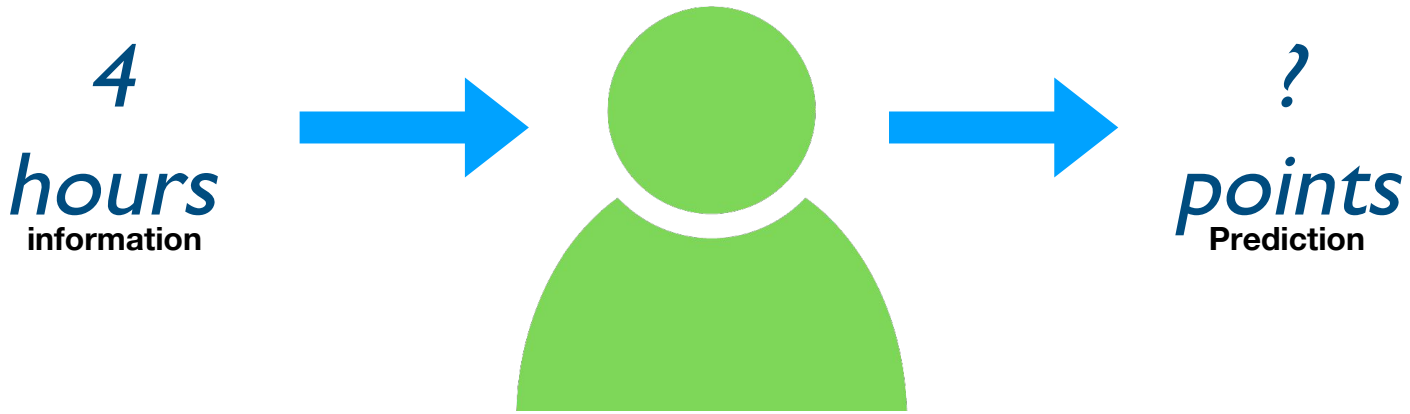
What is Human Intelligence?

What is this number?



What is Human Intelligence?

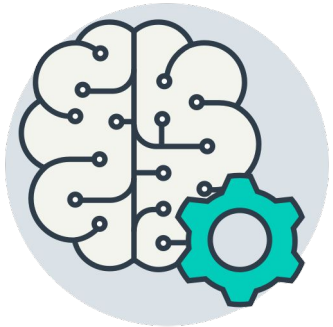
What would be the grade if I study 4 hours?



Machine Learning

What to dress?

Information

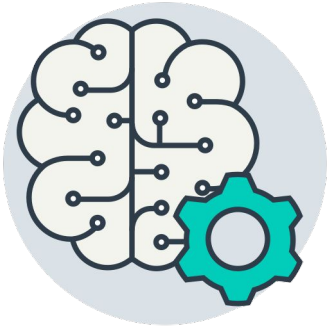


Infer

Machine Learning

What is this picture?

Image information

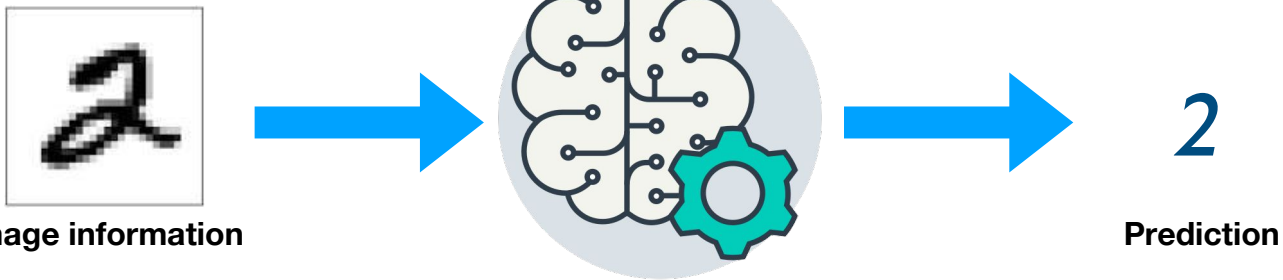


CAT

Prediction

Machine Learning

What is this number?



Machine Learning

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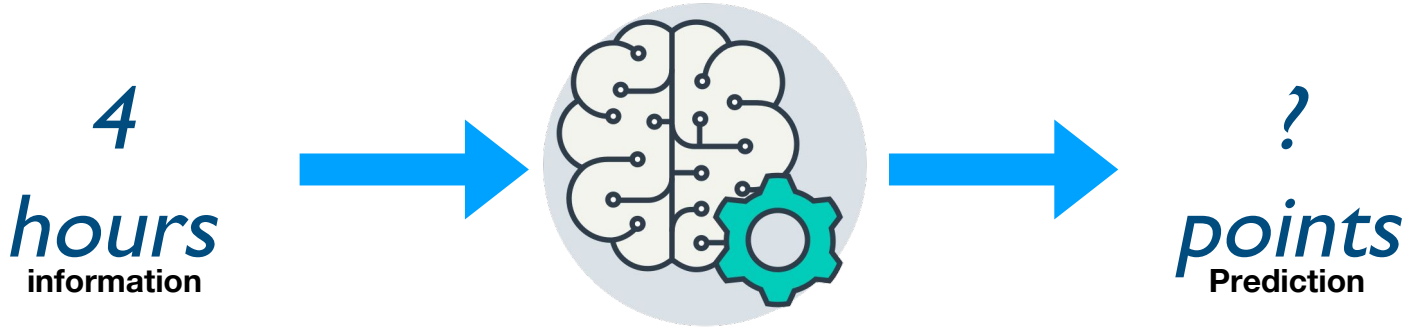
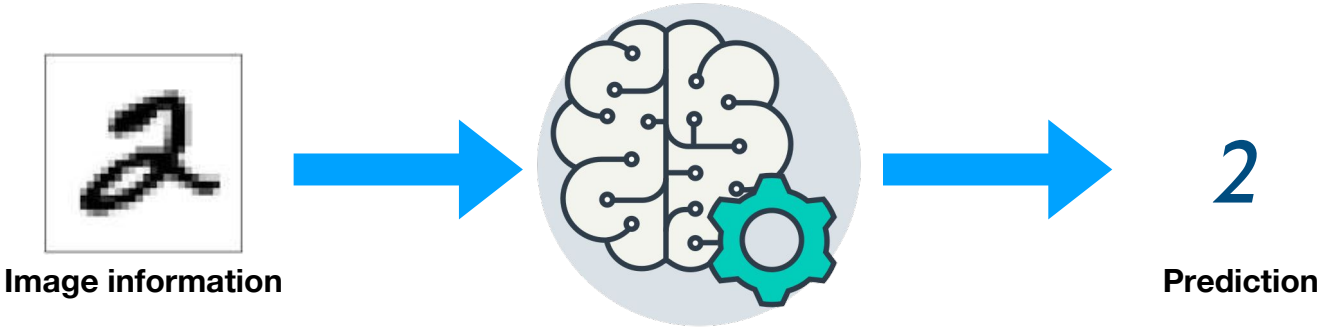


Machine Learning

Machine needs lots of training



Machine Learning

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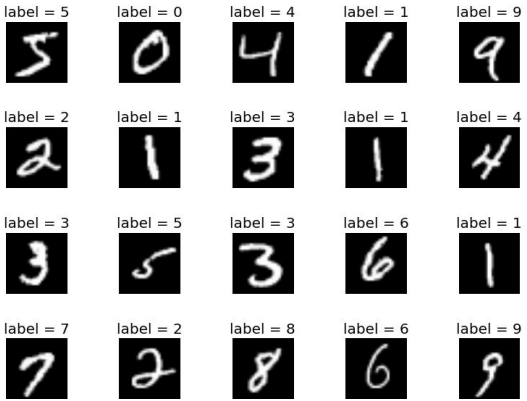
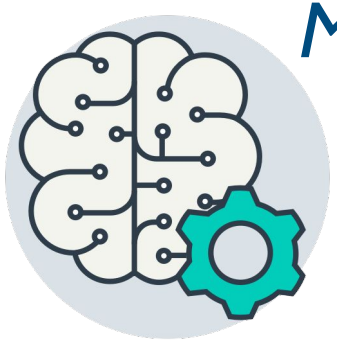


Labeled dataset

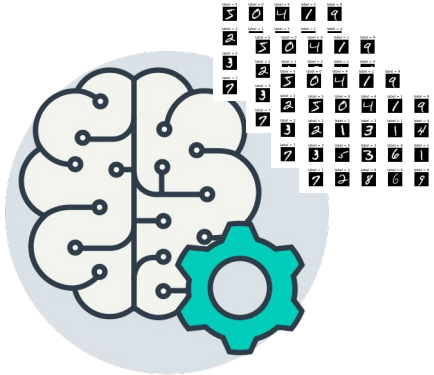
training



Model

Machine Learning

Predict (test) with trained model



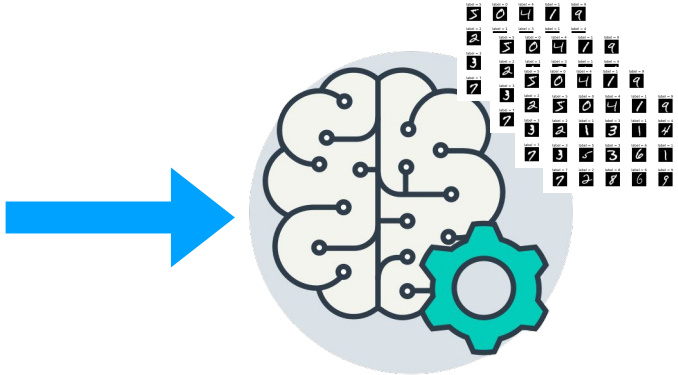
Trained model

Machine Learning

Predict (test) with trained model

Image information

Test dataset



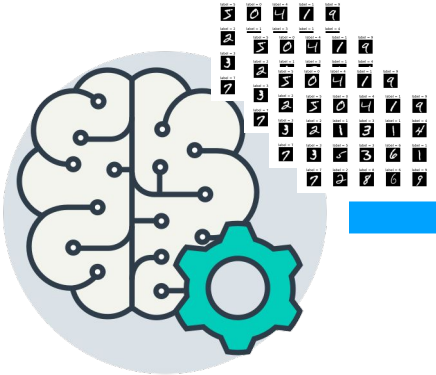
Trained model

Machine Learning

Predict (test) with trained model

Image information

Test dataset



Trained model

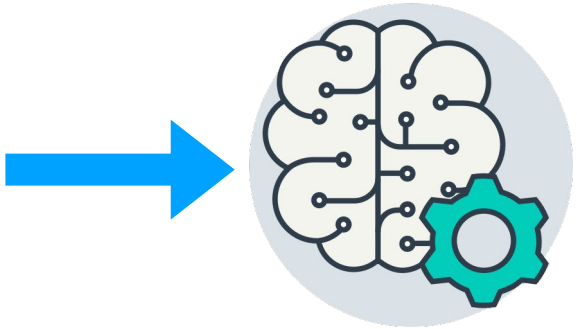
2

Prediction

Machine Learning

What would be the grade if I study 4 hours?

4 hours



? points

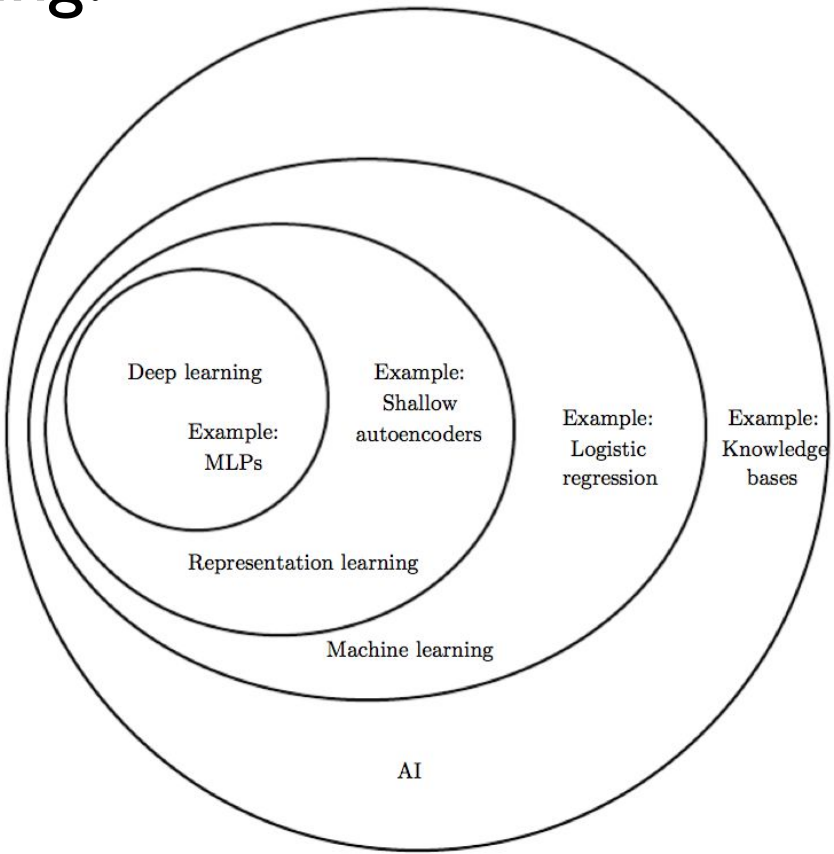
Prediction

Hours (x)	Points (y)
1	2
2	4
3	6
4	?

Training dataset

Test dataset

Deep Learning?



Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville

Why We Care?

Visual Question Answering

Answering Questions Based On Images

Generating New Words

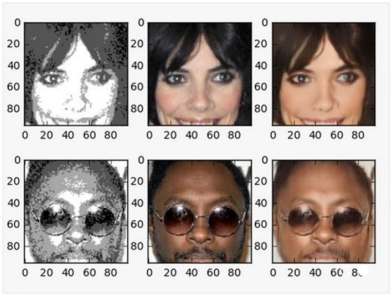
Word Generator Using RNNs

Artistic Style Transfer

Applying The Style Of An Artwork To A Photo

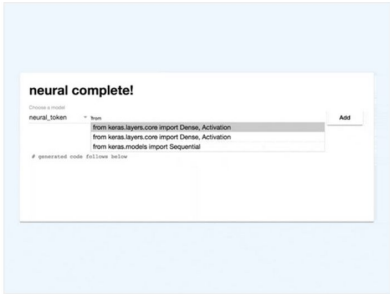
Predicting Cardiac Abnormalities

Using Phonocardiogram (PCG) Data



Creating Photorealistic Images

Improving Images From A Gameboy Camera

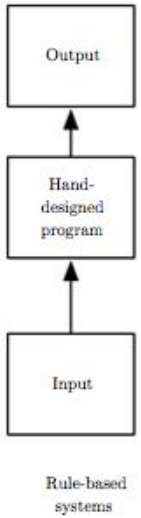


Code Autocompletion

NN That Autocompletes NN Code

More demos at https://ml-showcase.com/

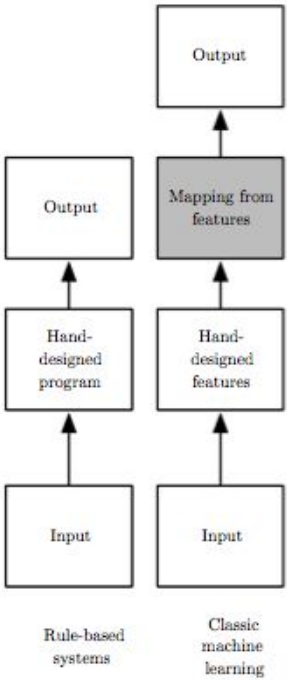
Why We Care as Developer?



Rule-based
systems

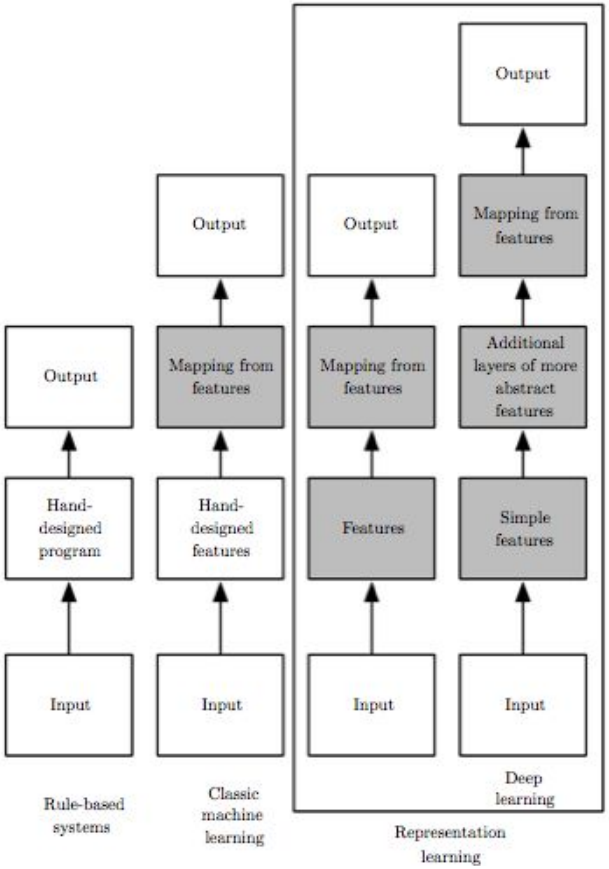
Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville

Why We Care as Developer?



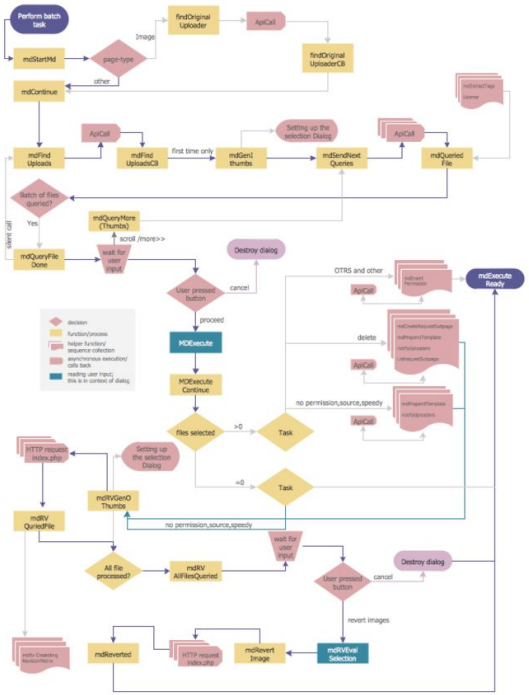
Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville

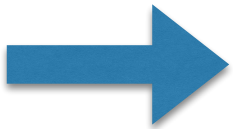
Why We Care as Developer?

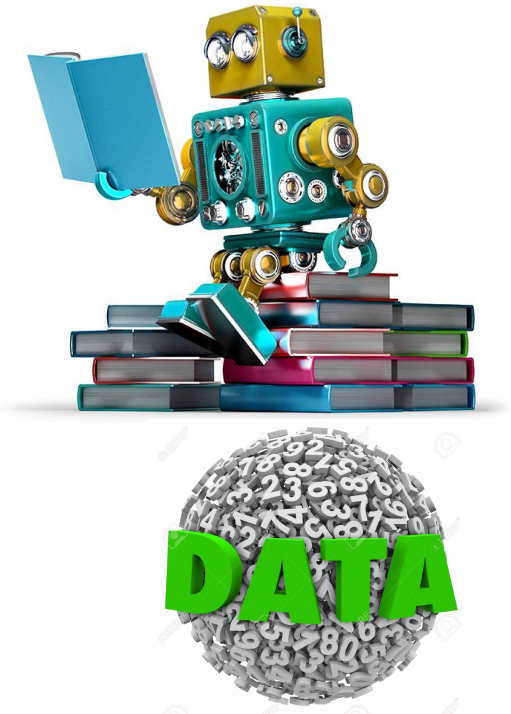


Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville

Rule based VS representation learning







Good News

- Deep Learning is not too difficult (yet)
  - Basic algebra + probability + python
  - Less than one year study
- Many frameworks
- Unlimited study resources

- And most of all, it's really fun

PyTorch is a python package that provides two high-level features:

- Tensor computation (like numpy) with strong GPU acceleration
- Deep Neural Networks built on a tape-based autograd system

http://pytorch.org/about/

Why PYTORCH

- More Pythonic (imperative)
  - Flexible
  - Intuitive and cleaner code
  - Easy to debug
- More Neural Networkic
  - Write code as the network works
  - forward/backward

Install PYTORCH

Get Started.

Select your preferences, then run the PyTorch install command.

Please ensure that you are on the latest pip and numpy packages.
Anaconda is our recommended package manager

OS	Linux	**OSX**	
Package Manager	conda	**pip**	Source
Python	2.7	3.5	**3.6**
CUDA	7.5	8.0	**None**

Run this command:

```
pip3 install http://download.pytorch.org/whl/torch-0.2.0.post3-cp36-cp36m-macosx_10_7_x86_64.whl
pip3 install torchvision
# OSX Binaries dont support CUDA, install from source if CUDA is needed
```

http://pytorch.org

Exercise 1-1:
Install PyTorch on your computer!

```
09:40 $ python3
Python 3.6.2 (v3.6.2:5fd33b5926,Jul 16 2017, 20:11:06
[GCC 4.2.1 (Apple Inc. build 5666) (dot 3)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> import torch
>>> print(torch.__version__)
0.2.0_3
>>> # Happy!!
```

Topics

- Linear, Logistic, softmax models
- DNN: Deep Neural Net
- CNN: Convolutional Neural Net
- RNN: Recurrent Neural Net

- Write everything in PyTorch

WHAT NEXT

Lecture 2: Linear Model