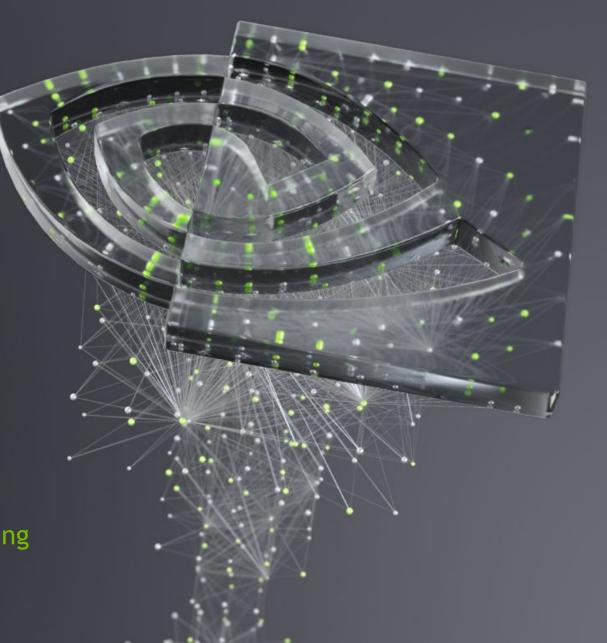
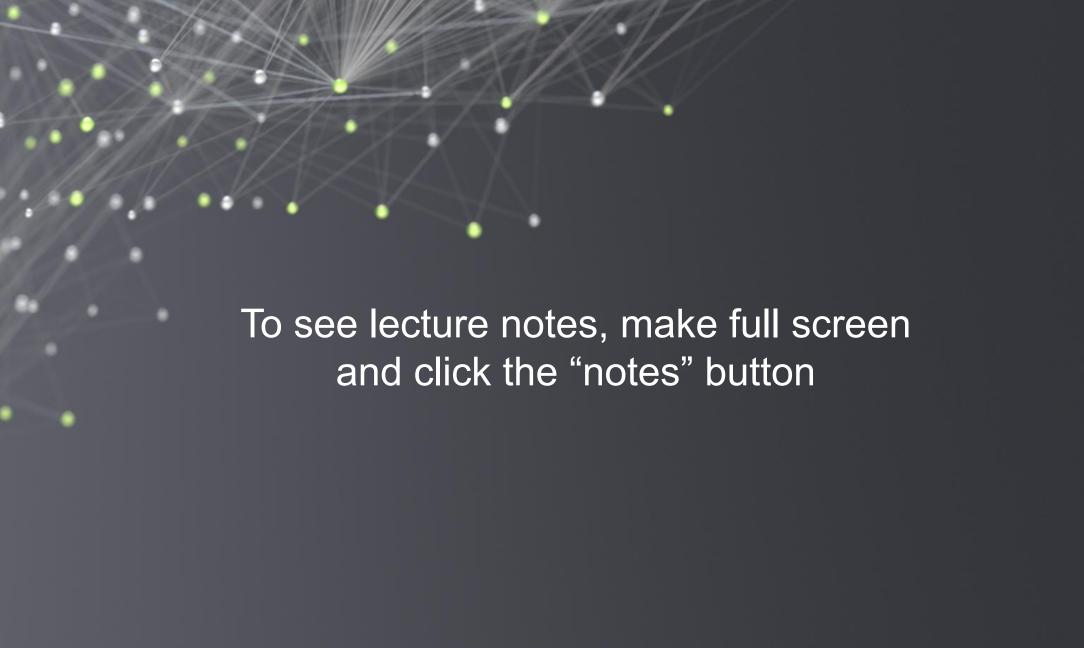


FUNDAMENTALS OF DEEP LEARNING

Part 1: An Introduction to Deep Learning







THE GOALS OF THIS COURSE

- Get you up and on your feet quickly
- Build a foundation to tackle a deep learning project right away
- We won't cover the whole field, but we'll get a great head start
- Foundation from which to read articles, follow tutorials, take further classes

AGENDA

Part 1: An Introduction to Deep Learning

Part 2: How a Neural Network Trains

Part 3: Convolutional Neural Networks

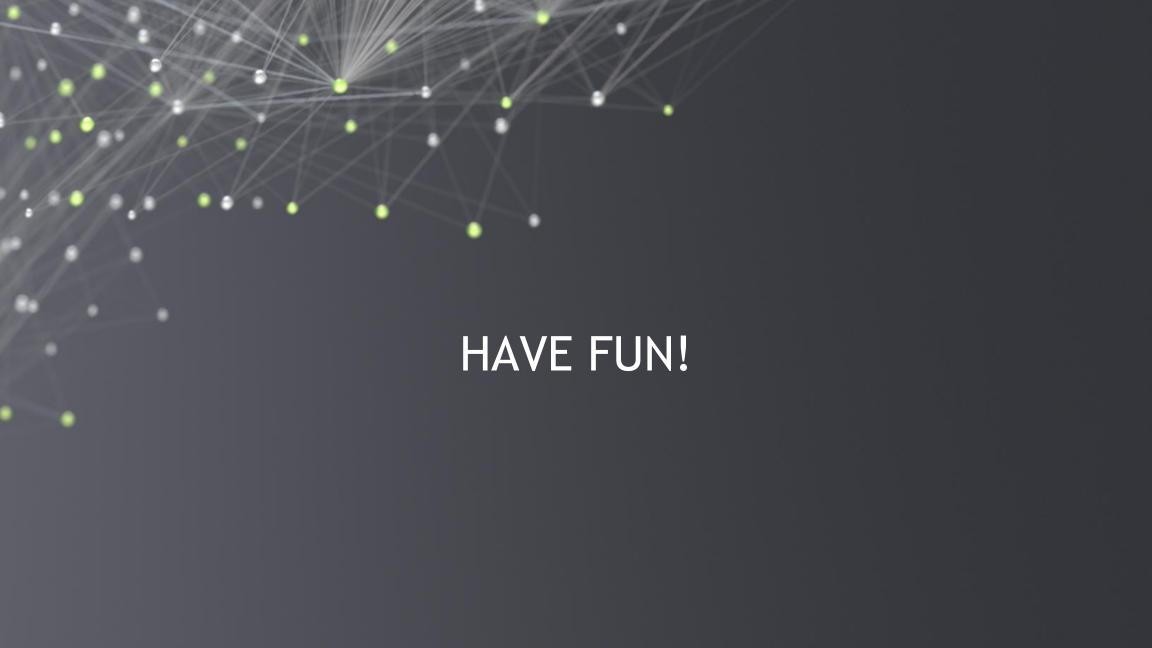
Part 4: Data Augmentation and Deployment

Part 5: Pre-trained Models

Part 6: Advanced Architectures

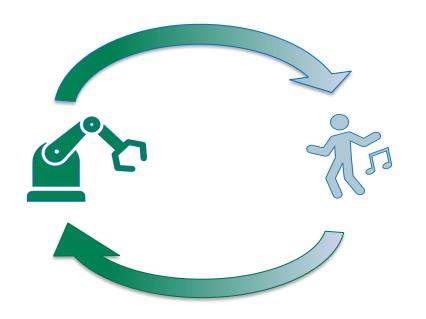
AGENDA – PART I

- History of Al
- The Deep Learning Revolution
- What is Deep Learning
- How Deep Learning is Transforming the World
- Overview of the Course
- First Exercise



HUMAN VS MACHINE LEARNING

Relaxed Alertness



Human	Machine
Rest and Digest	Training
Fight-or-flight	Prediction





BEGINNING OF ARTIFICIAL INTELLIGENCE







COMPUTERS ARE MADE IN PART TO COMPLETE HUMAN TASKS EARLY ON, GENERALIZED INTELLIGENCE LOOKED POSSIBLE

TURNED OUT TO BE HARDER THAN EXPECTED

EARLY NEURAL NETWORKS



Inspired by biology

Created in the 1950's

Outclassed by Von Neumann Architecture

EXPERT SYSTEMS



Highly complex



Programmed by hundreds of engineers



Rigorous programming of many rules



EXPERT SYSTEMS - LIMITATIONS

What are these three images?







HOW DO CHILDREN LEARN?



- Expose them to lots of data
- Give them the "correct answer"
- They will pick up the important patterns on their own



DATA

- Networks need a lot of information to learn from
- The digital era and the internet has supplied that data



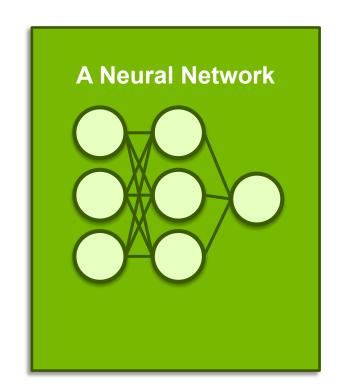
COMPUTING POWER

Need a way for our artificial "brain" to observe lots of data within a practical amount of time.



THE IMPORTANCE OF THE GPU







DEEP LEARNING FLIPS TRADITIONAL PROGRAMMING ON ITS HEAD

TRADITIONAL PROGRAMMING

Building a Classifier



Define a set of rules for classification



Program those rules into the computer



Feed it examples, and the program uses the rules to classify

MACHINE LEARNING

Building a Classifier

1

Show model the examples with the answer of how to classify

2

Model takes guesses, we tell it if it's right or not



Model learns to correctly categorize as it's training. The system learns the rules on its own





WHEN TO CHOOSE DEEP LEARNING

Classic Programming

If rules are clear and straightforward, often better to just program it

Deep Learning

If rules are nuanced, complex, difficult to discern, use deep learning

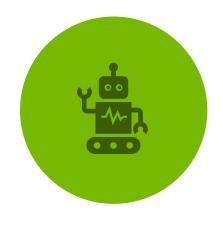
DEEP LEARNING COMPARED TO OTHER AI

Depth and complexity of networks Up to billions of parameters (and growing) Many layers in a model Important for learning complex rules





COMPUTER VISION



ROBOTICS AND MANUFACTURIN G



OBJECT DETECTION



SELF DRIVING CARS

NATURAL LANGUAGE PROCESSING







VOICE RECOGNITION



VIRTUAL ASSISTANTS

RECOMMENDER SYSTEMS



CONTENT CURATION



TARGETED ADVERTISING



SHOPPING RECOMMENDATI ONS

REINFORCEMENT LEARNING







ALPHAGO BEATS WORLD CHAMPION IN GO AI BOTS BEAT PROFESSIONAL VIDEOGAMERS

STOCK TRADING ROBOTS



HANDS ON EXERCISES

- Get comfortable with the process of deep learning
- Exposure to different models and datatypes
- Get a jump-start to tackle your own projects



STRUCTURE OF THE COURSE

"Hello World" of Deep Learning Train a more complicated model New architectures and techniques to improve performance Pre-trained models Transfer learning

PLATFORM OF THE COURSE



GPU powered cloud server



JupyterLab platform

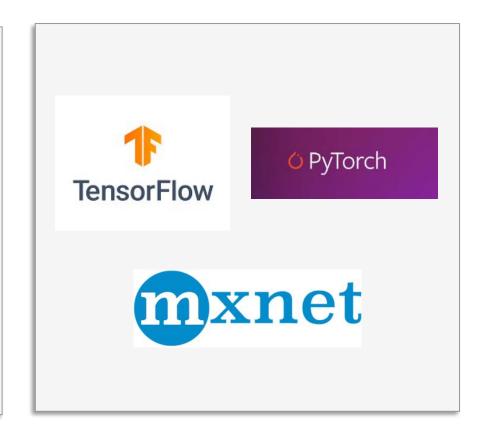


Jupyter notebooks for interactive coding



SOFTWARE OF THE COURSE

- Major deep learning platforms:
 - TensorFlow + Keras (Google)
 - Pytorch (Facebook)
 - MXNet (Microsoft)
- We'll be using TensorFlow and Keras
- Good idea to gain exposure to others moving forward





HELLO NEURAL NETWORKS

Train a network to correctly classify handwritten digits

 Historically important and difficult task for computers

Try learning like a Neural Network

 Get exposed to the example, and try to figure out the rules to how it works

