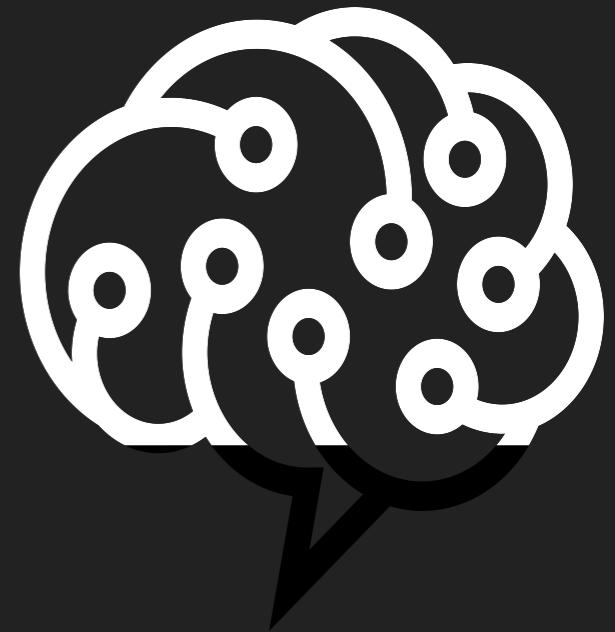


Jubeen Shah

Brandon Johnson



SECOND MEETUP

school of ai

AGENDA

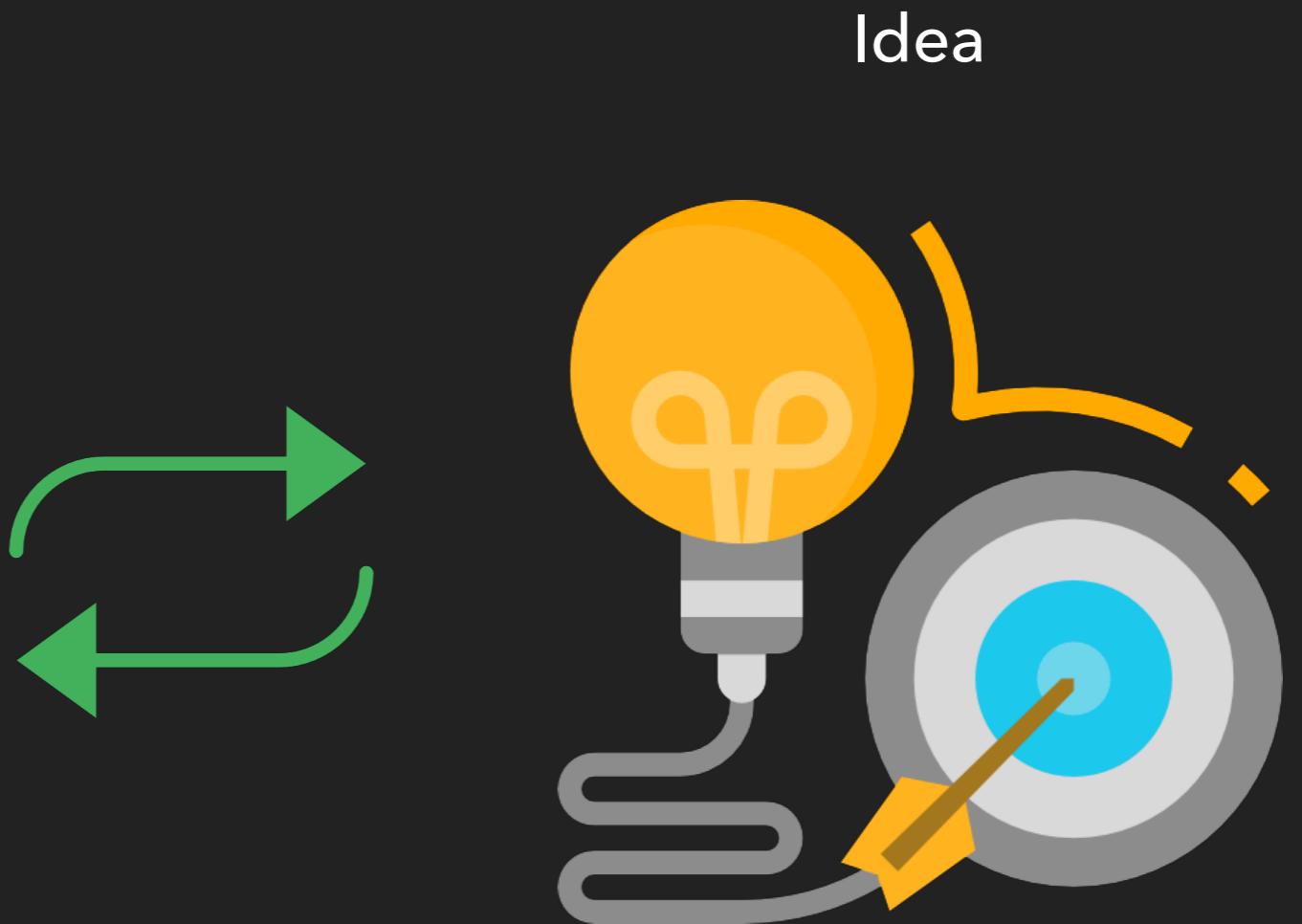
- ▶ From data to information
- ▶ Business Impact of AI
- ▶ Pandas
- ▶ NumPy
- ▶ Matplotlib



FROM DATA TO INFORMATION



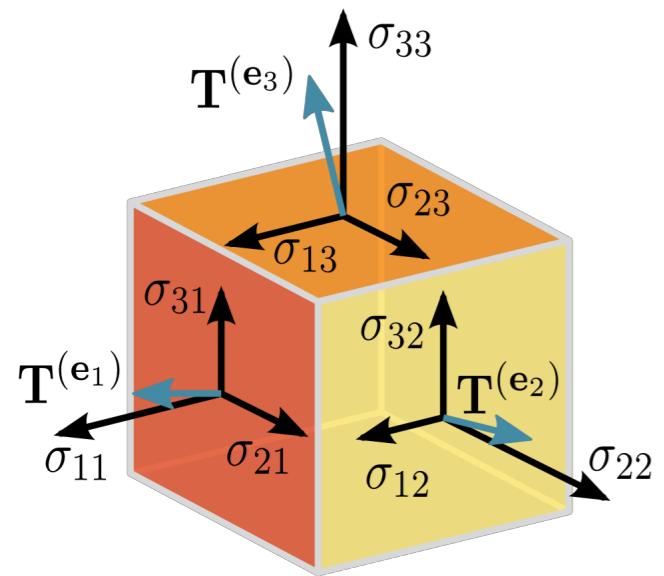
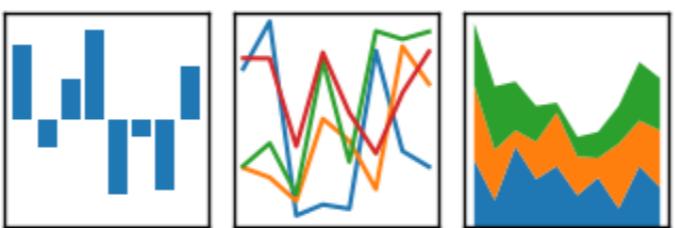
Brainstorming



Idea

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



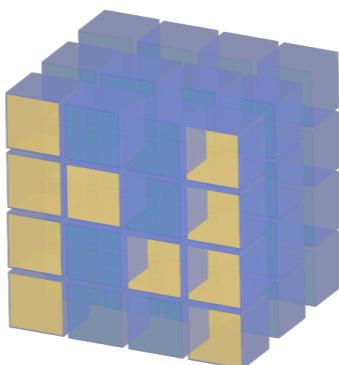
| | | | | |
|---------|---------|---------|---|---|
| 1 x1 | 1 x0 | 1 x1 | 0 | 0 |
| 0 x0 | 1 x1 | 1 x0 | 1 | 0 |
| 0 x1 | 0 x0 | 1 x1 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 1 | 0 | 0 |

Image

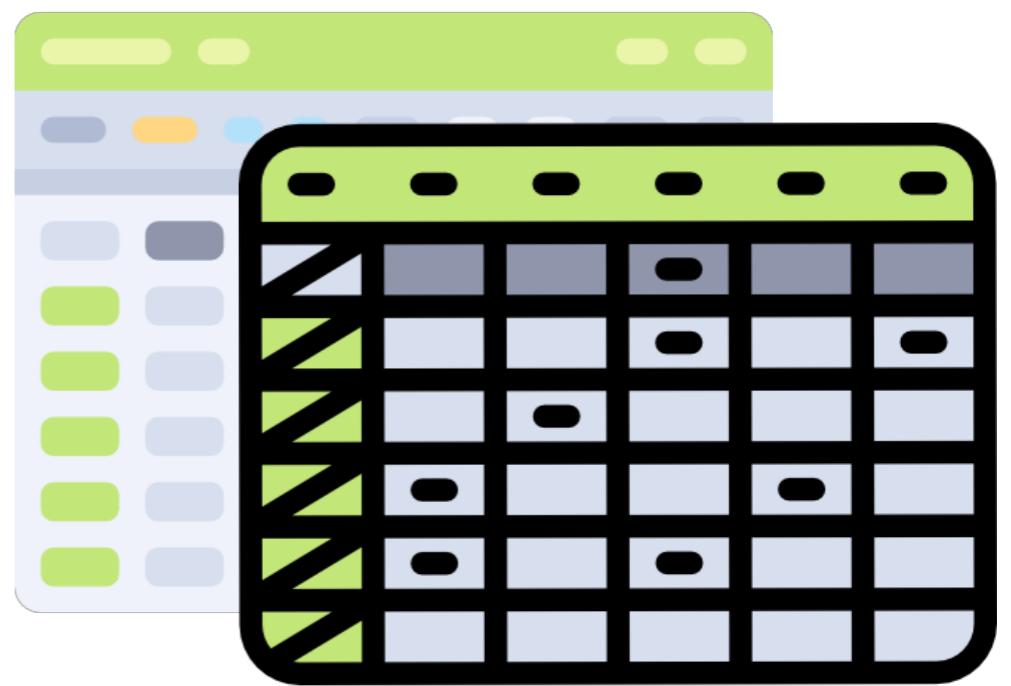
Data processing

| | | |
|---|--|--|
| 4 | | |
| | | |
| | | |
| | | |
| | | |

Convolved
Feature



NumPy



Data extraction

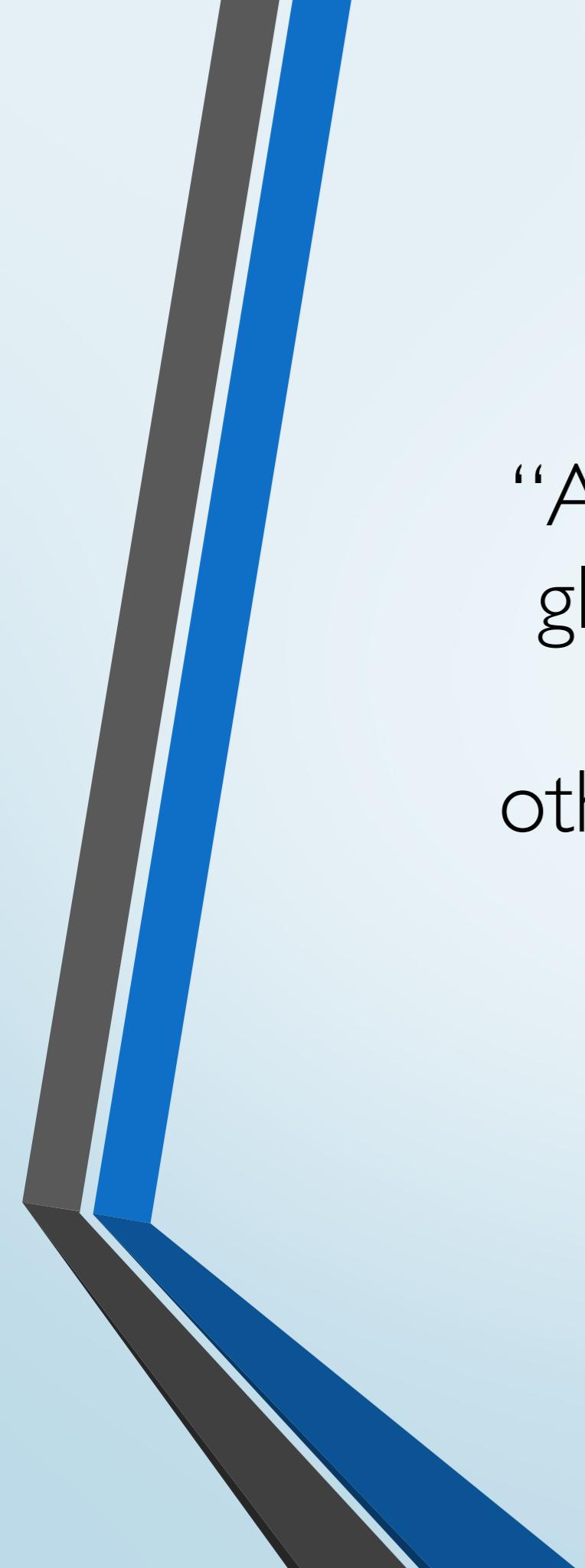
matplotlib



Data
summarization

Karen McCann

FOUNDER — AI NOW - RTP



“AI could deliver **\$13Trillion** in additional global economic activity by 2030, putting it...on par with... the introduction of other transformative technologies such as the **steam engine**.”

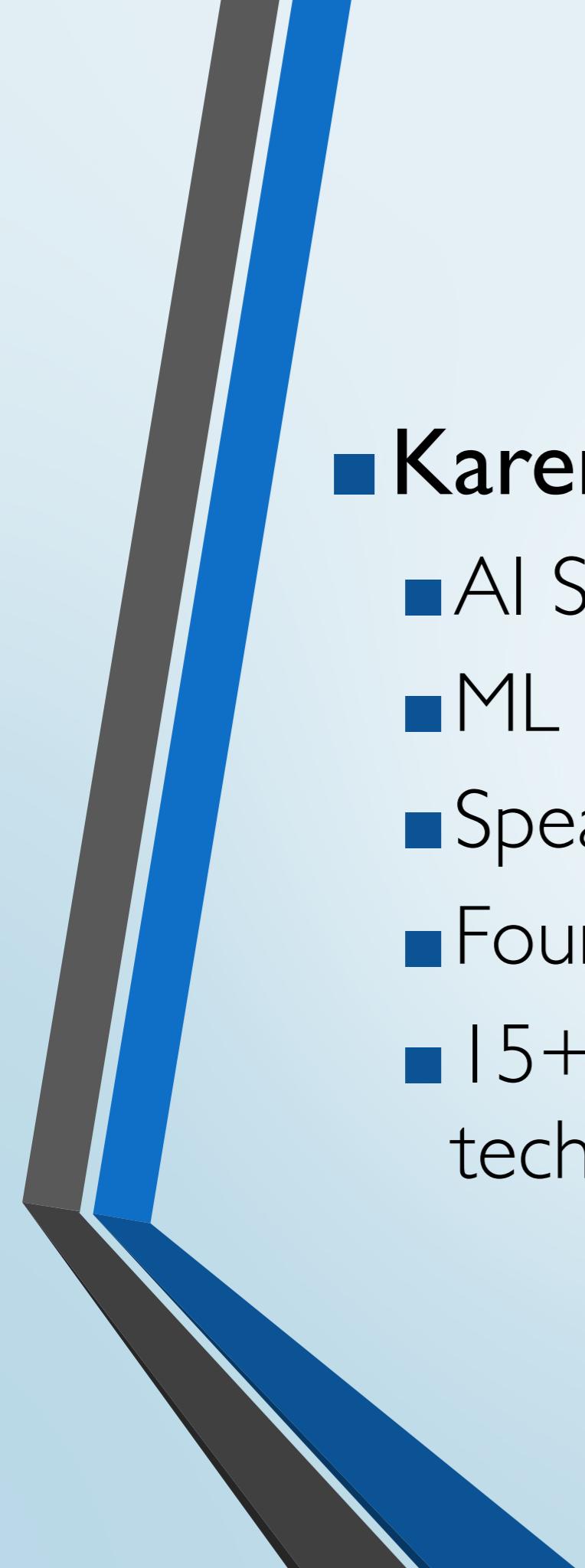
McKinsey Global Institute



AI - Past, Present, Future

Karen McCann,
AI Strategist, AI Now-RTP
11/10/2018

- **Agenda :**
 - Why listen to me?
 - Group Introductions
 - AI – Past, Present, Future
 - AI Now-RTP
 - Questions



■ Karen McCann, PMP, PMI-ACP

- AI Strategist
- ML software development
- Speaker, AI and ML topics
- Founder, AI Now-RTP
- 15+ year career in leading edge technology development

AI Now - RTP

11/10/2018

■ Group Introductions

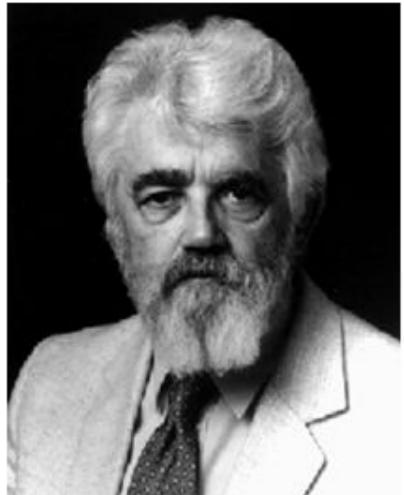
- Who are you?
- Why are you here?

- Why Artificial Intelligence?
 - Changing the world
 - Faster than we can manage it
 - How do we respond?

■ AI - Past

■ History of AI

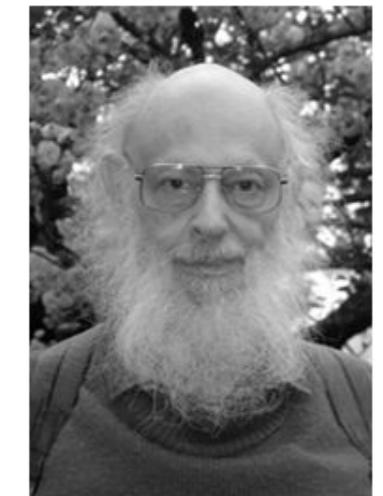
- 1956 - Dartmouth sponsored a workshop “Dartmouth Summer Research Project on Artificial Intelligence”
- 11 brilliant mathematicians and scientists inc:
 - Dr. Marvin Minsky (MIT), legend in computing
 - Dr. John McCarthy (Stanford, Dartmouth) –
 - Coined term “artificial intelligence”
 - Received the Turing Award for his contributions to
 - Dr. Ray Solomonoff (Univ. of Chicago - the father of algorithmic probability)
 - Wrote a paper that became basis of AI - “An Inductive Inference Machine”
 - Pursued how to make machines generally more intelligent (using probability)



John McCarthy



Marvin Minsky



Ray Solomonoff

- 1981 – “Fifth Generation computer project” (Japan)
 - From performing simple calculations to developing a computer that would reason
 - From 1981 – 1991, computing technology drastically changed
 - After 10 years and \$400M (i.e. billions today), project was declared a failure in 1992
 - Benefits –
 - Developed prototypes that performed reasoning functions at high speeds, due to massive amounts of parallel processing
 - Also, trained thousands of engineers in advanced computer science
 - Technical basis for many Japanese industries



- 1997 – IBM's Deep Blue
 - Chess playing computer
 - Won against Garry Kasparov
 - Reigning chess world champion
 - Development began in 1985 (Carnegie Mellon)
 - Basis was brute force computing
 - Massively parallel system with 30 nodes, each with 480 special purpose VLSI chess chips per node
 - Capable of evaluating 200M chess positions per second
 - Optimal values of moves were determined by instant comparison against a library of 700,000 grandmaster games



- 2011 – Watson wins Jeopardy

- IBM's Watson computer played and won against Jeopardy champions Ken Jennings and Brad Rutter
- Proved that IBM had made major progress in intelligent machines
- These machines could understand and respond to humans using natural language processing
- <https://www.youtube.com/watch?v=P18EdAKuCIU> (start at 2:22)
- “I, for one, welcome our new computer overlords”



- **AI - Present**
 - Confluence of 4 trends through drastic improvements in
 - Computing Power (Moore's law)
 - Machine Learning Techniques
 - Industrial design of robots (new materials and methods)
 - Machine perception (interpret visual images much higher accuracy)

- Disruption of industries
 - Taxis into Uber
 - Hotels into AirBnB
 - Grocery stores into Amazon Go stores
- Current AI/ML systems
 - There is no limitation to how expert ML systems can become
 - Internet provides access to unlimited data sets to learn from
 - Freed from human dependence to collect and feed data
 - **Rapidly exceed the capabilities of their creators**



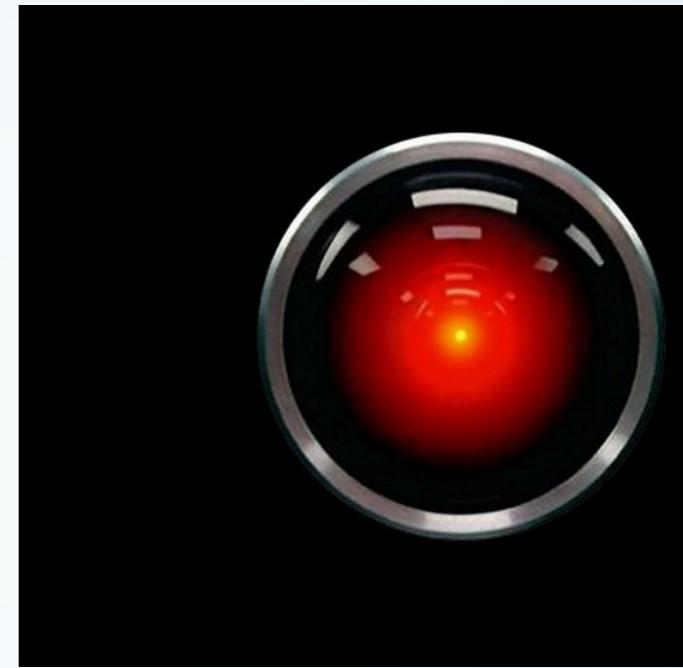
- Self-driving cars
 - Concept has existed for decades
 - Serious development and testing in last 5 yrs
 - Leading companies – Waymo, Tesla, Uber, GM
 - To date, self-driving fleets have driven millions of miles on public roads and in simulations
 - US Govt. Regulation supporting commercialization
 - USDOT creating V-to-V (vehicle-to-vehicle) comm. protocol standards
 - Developed specifically for automotive applications
 - Car will become part of a network
 - **Integrated flexible public transportation system** (same as cell phones)
 - Demo of Waymo <https://www.youtube.com/watch?v=uHbMt6WDhQ8>



■ Other AI applications

- Game changer for cancer
 - https://www.youtube.com/watch?v=HkEOJnn_zlg
- Salesforce Einstein
 - <https://www.youtube.com/watch?v=dYX4SWPrZzo>
 - (Start at 2:00)
- New client - Hyundai Credit Card
 - Using Watson to support an intelligent agent application for credit card users
 - https://www.hyundaicard.com/cpu/cs/CPUCS0201_01.hc

- Not everything goes well
 - Hal from “2001 – A Space Odyssey”
 - 2010 Flash Crash
 - Major US stock exchanges dropped 9% (over \$1 Trillion in value) in 36 min
 - Caused by high-frequency trading between competing computer systems
 - 2018 Uber Self-driving car
 - Hits and kills pedestrian in Arizona



- AI - Future
 - The AI Age – Results on humans
 - May 2017 Pew Research Center : “In 1881, electricity transformed society. By 2020, AI will be as transformative (mystifying, shocking, and scary)”
 - [http://www.elon.edu/docs/eweb/imagining/surveys/2016_survey/
Future%20of%20Jobs%20Skills%20Education%205_3_17%20Elon%20Pew.pdf](http://www.elon.edu/docs/eweb/imagining/surveys/2016_survey/Future%20of%20Jobs%20Skills%20Education%205_3_17%20Elon%20Pew.pdf)
 - 10x as many professional jobs will be automated as manufacturing jobs today
 - AI will beat humans in job skills with speed and volume in :
 - Learning
 - Processing information
 - Matching patterns, and
 - Produce wide arrays of alternatives to problems

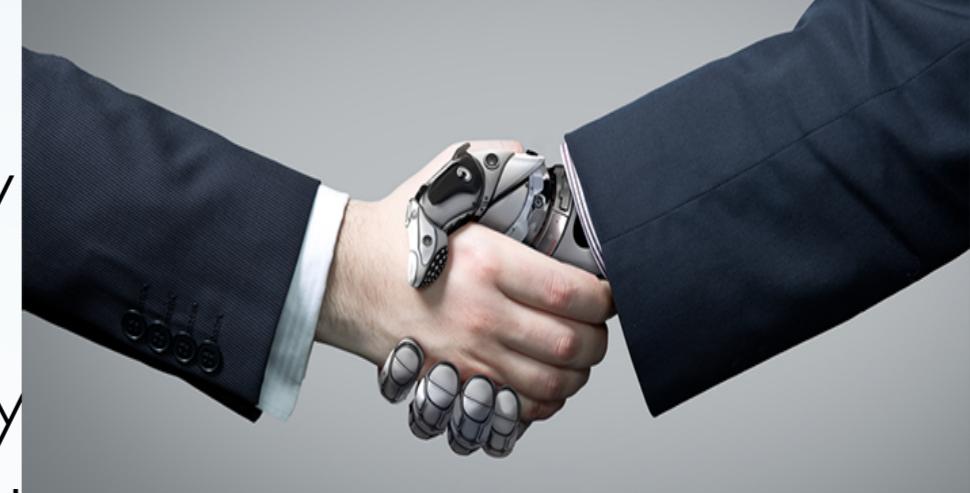
■ The impact on human work

- As AI and robots improve, they will support more applications within all industries
 - Robots were originally created to perform jobs dangerous to humans
 - Now they are being created for economic efficiency to replace expensive human workers across all sectors
- By 2021 (within 3 years), robots will eliminate **6%** of all jobs
- By 2030, robots will eliminate **38%** of all jobs
 - At the World Economic Forum 2017, as much as **47%** of all jobs were predicted
 - <http://www.latimes.com/business/la-fi-pwc-robotics-jobs-20170324-story.html>

- <https://willrobotstakemyjob.com/>
 - Source : US Bureau of Labor and Statistics and their O*Net Resource data center
 - For given profession, % of humans replaced by robots -
 - Highest risk
 - Taxi drivers – 89%
 - Retail clerks - 97%
 - Medium risk
 - Construction workers – 71%
 - Truck Drivers – 70%
 - Lowest risk
 - Teachers – 1%
 - Dentists – 1%
 - Computer Research Scientists – 1%

- **Every physical task** will be performed by a robot
 - Personal services examples
 - Painting houses
 - Cooking meals
 - Walking dogs
 - Shopping
 - Industrial services examples
 - Stocking shelves
 - Laying pipe
 - Fighting fires
 - Military applications examples
 - AI systems making decisions on which enemy combatant to destroy
 - Swarm of human-seeking robotic insects for targeted assassination

- AI/robotic workforce started many decades ago
 - Advances now being made quickly
- Will continue to displace more and more human workers
 - Humans who remain must **learn to work alongside** the mechanical workforce
 - Able to work 24/7
 - Don't complain
 - Don't take vacation or sick leave
 - Incumbent upon society to manage these changes



- Recent AI advances will make a **huge impact on society**
- **Potential of this is staggering**
 - Achieves results more quickly, accurately, and cheaply than any human
 - **Will rival our abilities, then exceed them**
 - **Will transform lives and livelihoods**
- Should expect an extended period of social turmoil
 - Increasing wage inequality
 - **Lavish prosperity amid widespread poverty**



Connect to the future : AI Now – RTP

<https://www.meetup.com/AI-Now/>

■ AI Now - RTP Goals:

- Professional Technology Networking group
 - Promote intellectual dialogue to bring value to the AI community within RTP
 - Promote education on the topics of Artificial Intelligence, Machine Learning, Natural Language Processing, and other related technologies
 - Promote networking (after this event, we will provide an attendee list for additional networking)
- In 2018, 7 events so far -
 - Presenters from corporations connected with AI and ML technologies
 - Corporations - IBM, ABB, NDIVIA
 - Innovators – 3FDS, Imaginovation, Aricent

- Next AI Now-RTP Events
 - November 14th – Microsoft
 - Speaker : Rob Moreira, AI Cloud Architect
 - December 19th – SAS
 - Speaker : Tao Wang, Senior Manager, AI & ML
 - January 9th – IBM Eldercare
 - Speaker : Scott Gerard, Software Architect
on Watson Development team



Thanks for attending

WHAT IS

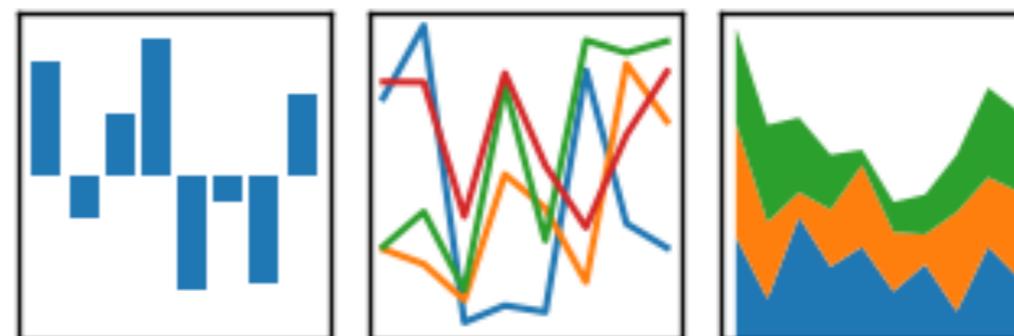
PANDAS

PANDAS

- ▶ Powerful data analysis toolkit
- ▶ [Documentation](#)

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



READING FROM A CSV FILE

- ▶ Why CSV?
 - ▶ Great for starters like you and me
 - ▶ Easily available
 - ▶ Easy to read
 - ▶ Awesome for simple data analysis
 - ▶ [Link](#)

SUMMARIZING DATA

- ▶ Let's analyze the NYC Open Data for 311 service calls
- ▶ Business Requirement
 - ▶ Find the most common complaint type
 - ▶ [Link](#)



SUMMARIZING DATA

- ▶ Let's analyze the NYC Open Data for 311 service calls
- ▶ Business Requirement
 - ▶ Which borough has the most noise complaints?
 - ▶ [Link](#)



ADDING INFORMATION

- ▶ Let's analyze the bike ride data
- ▶ Business Requirement
 - ▶ Find out on which weekday do people bike the most
 - ▶ [Link](#)

CLEANING UP MESSY DATA

- ▶ The data you get would always be messy
 - ▶ Missing data
 - ▶ Anomalous data
 - ▶ Errors in data
 - ▶ [Link](#)

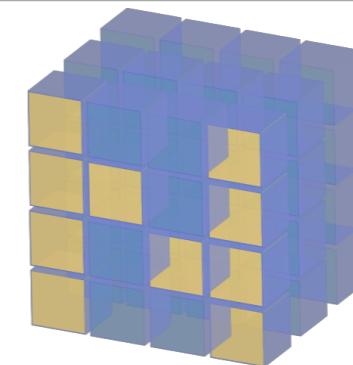
LOADING DATA FROM SQL DATABASE

- ▶ [Link](#)

WHAT IS

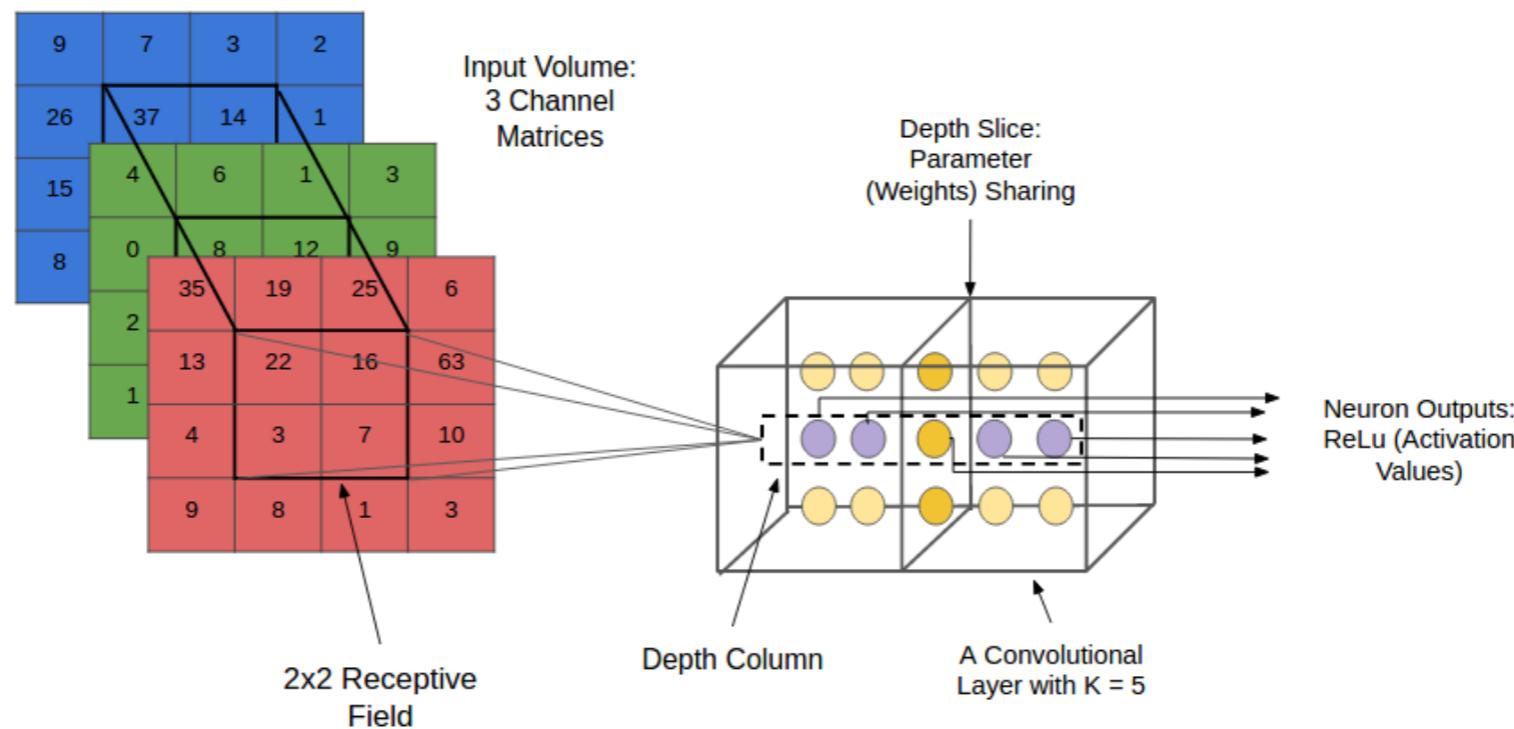
NUMPY

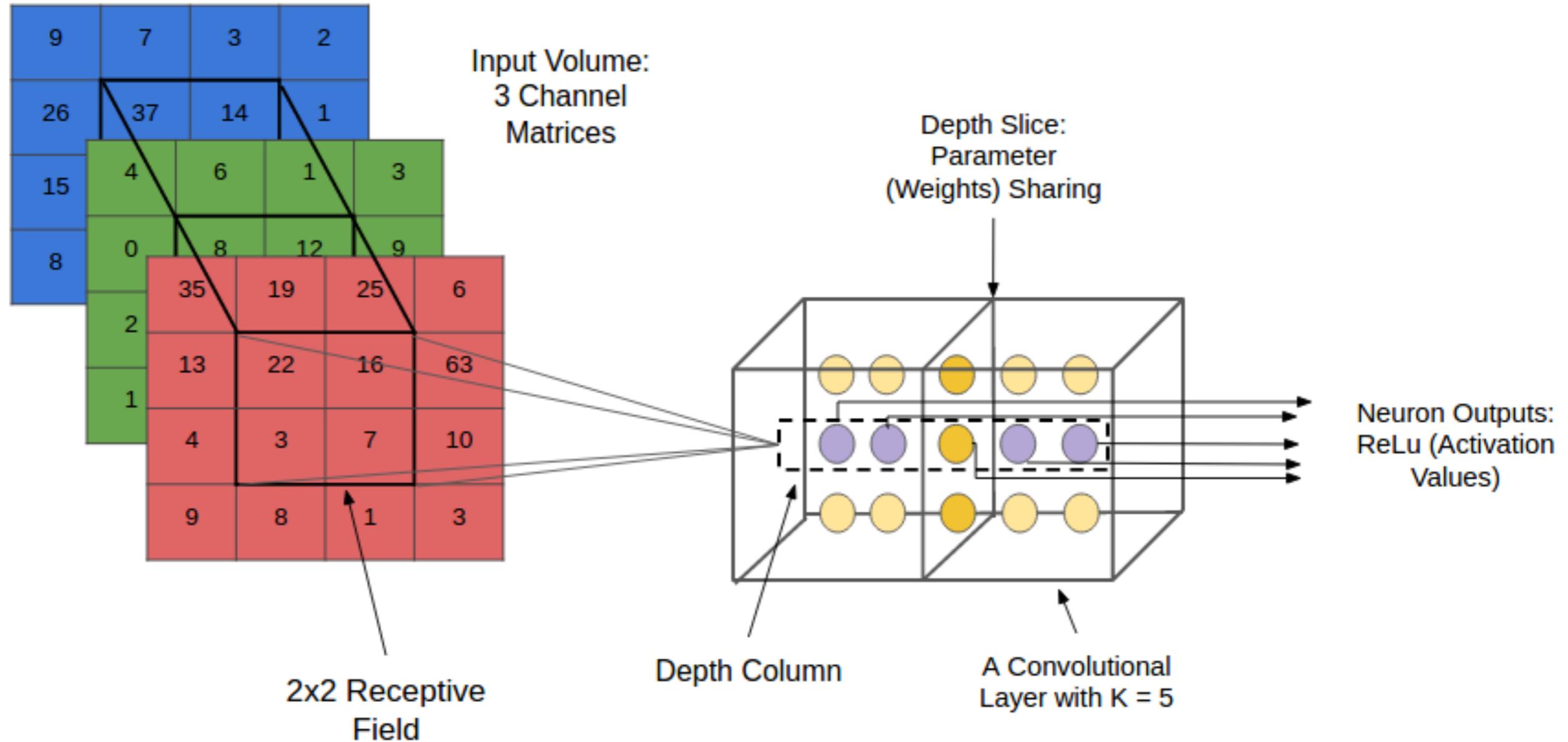
NUMPY



NumPy

- ▶ Scientific Computing
- ▶ Fast mathematical operations
- ▶ Primarily we would work with arrays and matrices





NUMPY

- ▶ NumPy Tutorial – [Link](#)
- ▶ NumPy Quiz – [Link](#)
- ▶ NumPy Quiz Solution – [Link](#)

WHAT IS

MATPLOTLIB

MATPLOTLIB

- ▶ Matplotlib is a library for producing publication-quality figures. MPL (for short) was designed from the beginning to serve two purposes:
 - ▶ allow for interactive, cross-platform control of figures and plots
 - ▶ make it easy to produce static raster or vector graphics files without the need for any GUIs.
- ▶ Furthermore, MPL – much like Python itself – gives the developer complete control over the appearance of their plots, while still being very usable through a powerful defaults system.

NOTEBOOKS

- ▶ [Chapter 1 - Subplots and Layouts](#)
- ▶ [Chapter 2 - Plotting Methods : Overview](#)
- ▶ [Chapter 3 - Speaking MPL](#)
- ▶ [Chapter 4 - Limits, Legends, and Layouts](#)
- ▶ [Chapter 5 - Artists](#)
- ▶ [Chapter 6 - MPL Tool Kits](#)

AGENDA

- ▶ From data to information
- ▶ Business Impact of AI
- ▶ Pandas
- ▶ NumPy
- ▶ Matplotlib

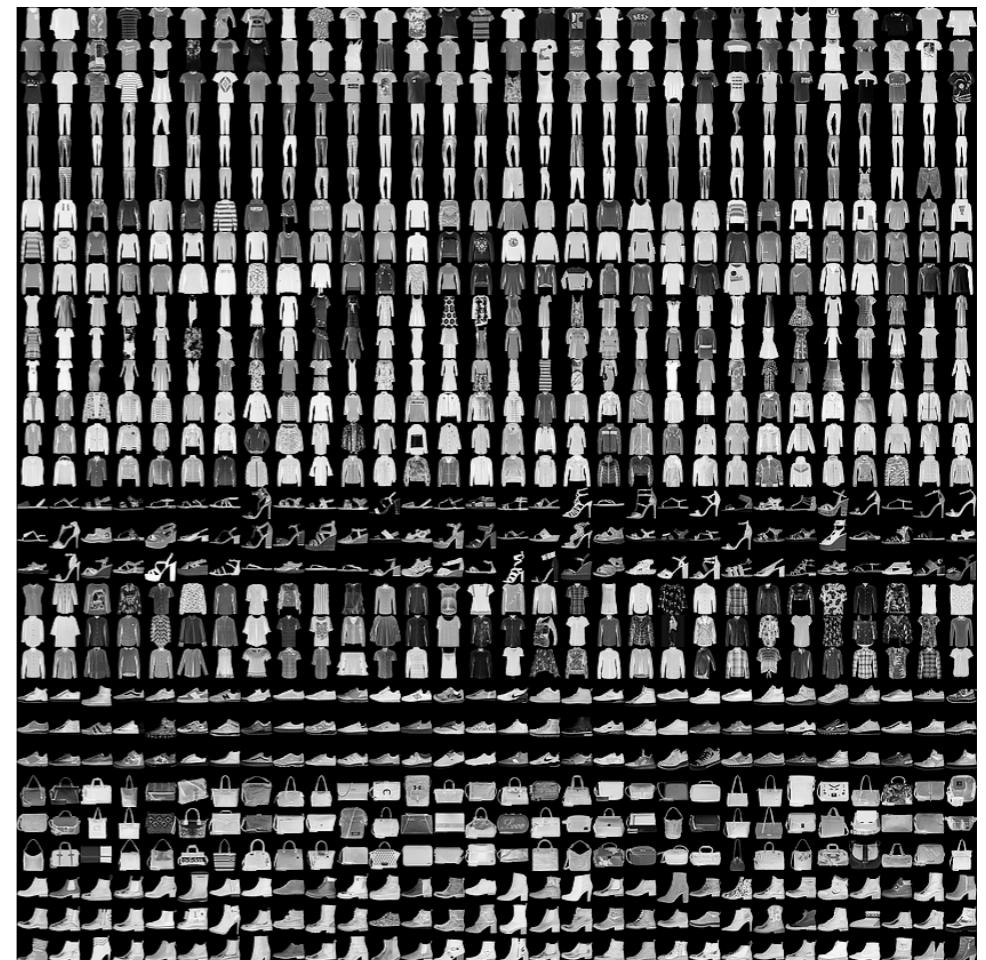
WHAT IS

TENSORFLOW

CLASSIFICATION

The [first notebook](#) is a basic Classification Notebook using the [Fashion MNIST](#) dataset which contains 70,000 grayscale images in 10 categories.

[This guide](#) trains a neural network model to classify images of clothing, like sneakers and shirts.



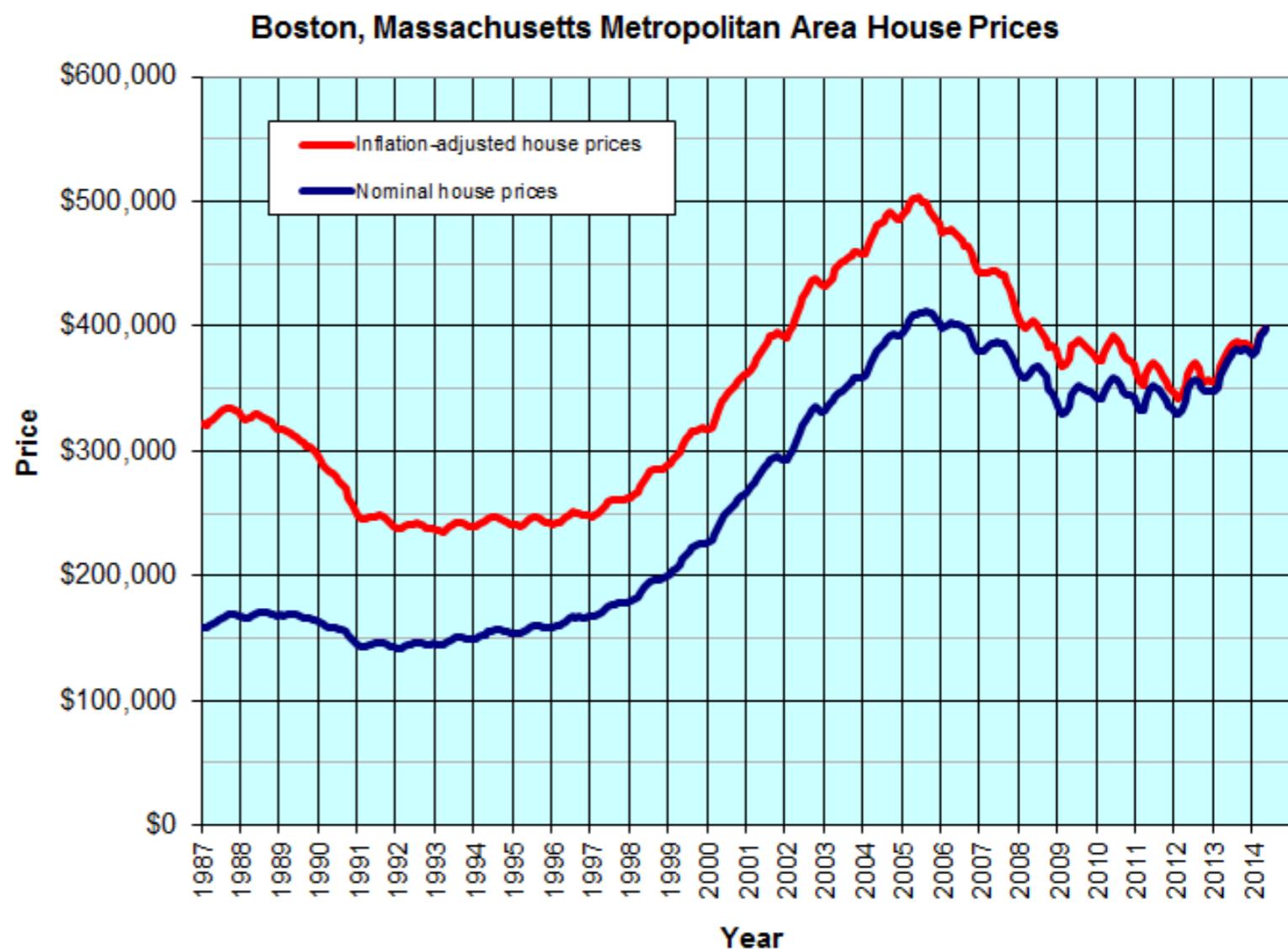
TEXT CLASSIFICATION

The [second notebook](#) is a text classification example that makes use of the reviews from [IMBD dataset](#) as positive or negative.



REGRESSION

The [third notebook](#) is regressions notebook for the [boston housing prices](#) dataset.



OVERFITTING AND UNDERFITTING

The [fourth notebook](#) is focussed towards overfitting and underfitting data.

In this notebook, we'll explore two common regularization techniques—weight regularization and dropout—and use them to improve our IMDB movie review classification notebook.



TENSORFLOW

► Basics

- ▶ **Hello World** notebook will help you set up your environment if you're having problems with setting up the TensorFlow environment, or haven't done it yet.
- ▶ **Understanding tensors** notebook will help you understand the basics of the tensors and setting up sessions for running your code.
- ▶ **Working with Inputs** notebook will help you gain understanding about how you can give inputs to the session variable you define in TensorFlow using `feed_dict`

TENSORFLOW

► Basics

- ▶ **TensorFlow math** notebook will help you gain familiarity with performing math operations using TensorFlow. Be advised, this is a bit different than your usual programming practices.
- ▶ **Declaring Tensors** notebook is aimed towards helping you understand different types of tensors.
- ▶ **Placeholders and Variables** notebook is aimed towards making your foundations strong by helping you understand placeholders and variables for your data.

SOME (RELATIVELY) ADVANCED TOPICS

- ▶ [Intro to TensorFlow](#)
- ▶ [Softmax in TensorFlow](#)
- ▶ [Cross Entropy](#)
- ▶ [Minibatching](#)
- ▶ [MNIST in TensorFlow](#)

