

# INTRODUCTIONS



# MACHINE INTELLIGENCE



# Machine Learning



what society thinks I do



what my friends think I do



what my parents think I do

$$L_y = \frac{1}{2} \| \mathbf{w} \|^2 - \sum_{i=1}^n a_i y_i (\mathbf{x}_i \cdot \mathbf{w} + b) + \sum_{i=1}^n a_i$$

$$a_i \geq 0, \forall i$$

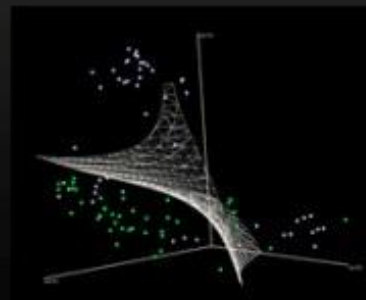
$$\mathbf{w} = \sum_{i=1}^n a_i y_i \mathbf{x}_i, \sum_{i=1}^n a_i y_i = 0$$

$$\nabla \hat{g}(\theta_t) = \frac{1}{n} \sum_{i=1}^n \nabla \ell(x_i, y_i; \theta_t) + \nabla r(\theta_t)$$

$$\theta_{t+1} = \theta_t - \eta_t \nabla \ell(x_{i(t)}, y_{i(t)}; \theta_t) - \eta_t \cdot \nabla r(\theta_t)$$

$$\mathbb{E}_{i(t)}[\ell(x_{i(t)}, y_{i(t)}; \theta_t)] = \frac{1}{n} \sum_{i=1}^n \ell(x_i, y_i; \theta_t)$$

what other programmers think I do



what I think I do

```
>>> from sklearn import svm
```

what I really do

# WHAT IT IS

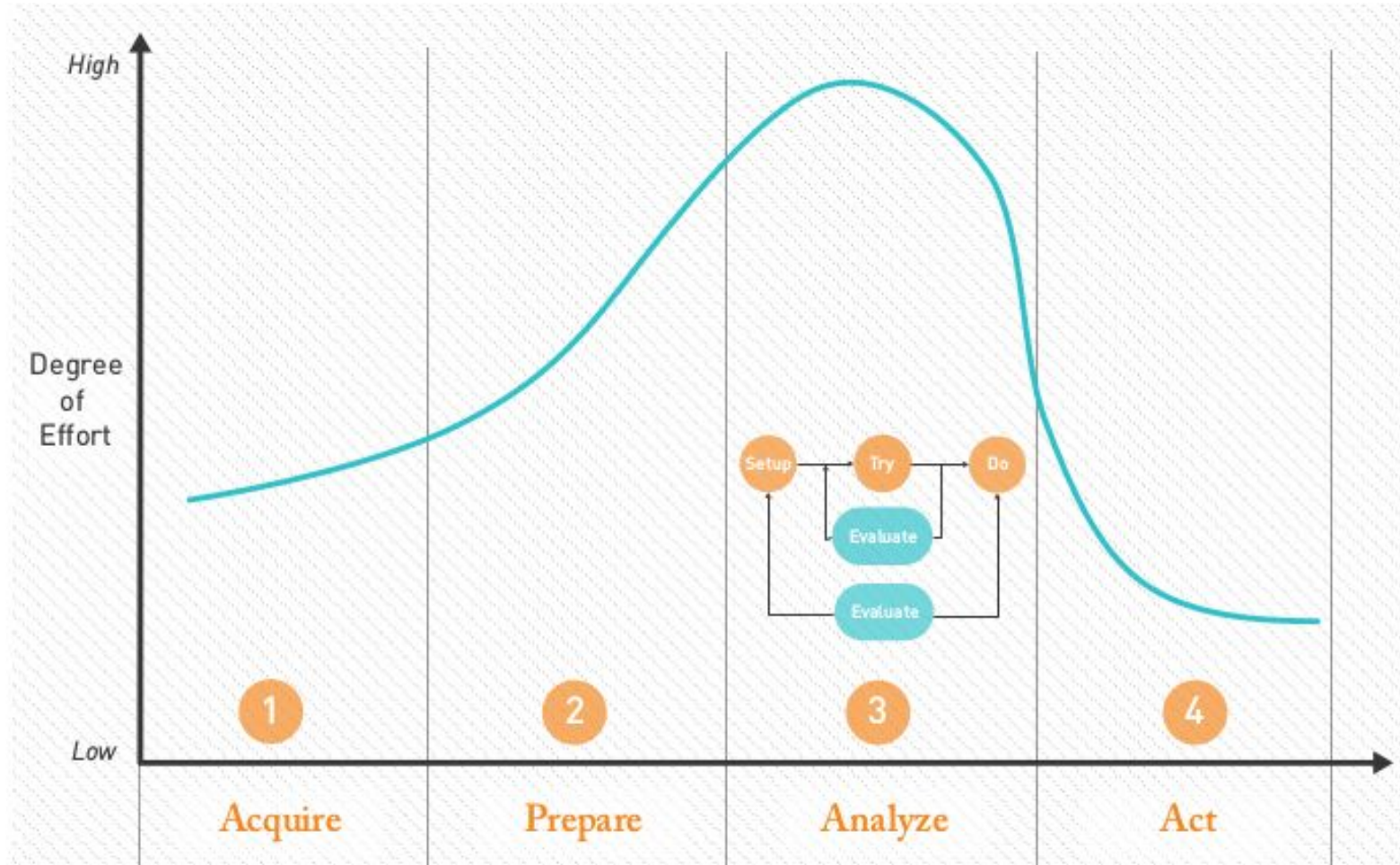




**IT'S MATH, NOT MAGIC**

# LENDING A STRUCTURE





Thanks: Booz Allen Hamilton

# THE DATA SCIENCE LIFECYCLE

1. Collect Data - **Acquire**
2. Understand the structure of the data - **Prepare**
  - + Statistical Reasoning
  - + Patience.
3. Build Predictive Models around the Data - **Analyse**
  - + Iterative Process
  - + Setup - Try - Do
  - + Good Bit: Error Minimization Framework =  $f(\text{Experience})$
4. Put them into practice - **Act**
  - + Let the business people take over





# RECAP: System of Linear Equations



HOW DO YOU SIMULATE THE SAME ON  
A COMPUTER PROGRAMMATICALLY?



# BUILDING ALGORITHMS IS NOT THAT HARD

Why don't you try for yourself?



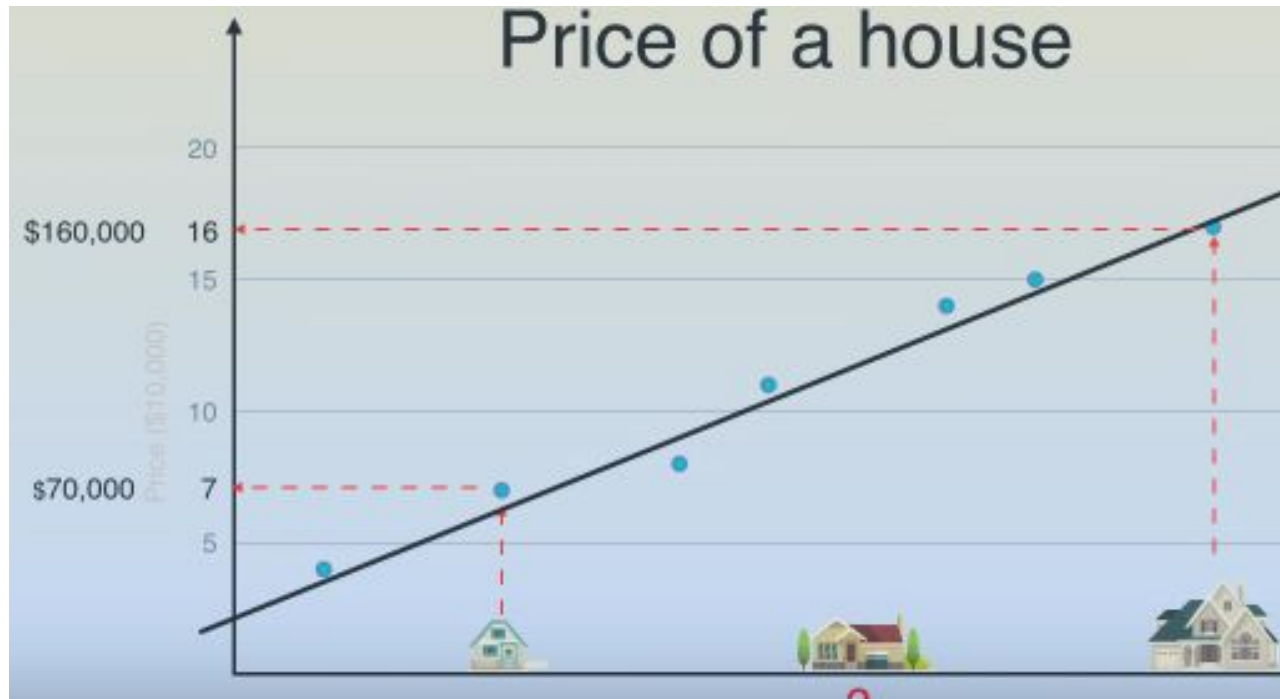
## CASE 1



# Price of a house



## Make a Prediction : Fit a Line



## FOOD FOR THOUGHT

1. Add another variable :- Repute of the Locality
2. Add another variable :- Lease/ Freehold
3. And another :p :- Year of Construction

Talk of : -

1. Problem Dimensionality
2. Nature of Curve to fit

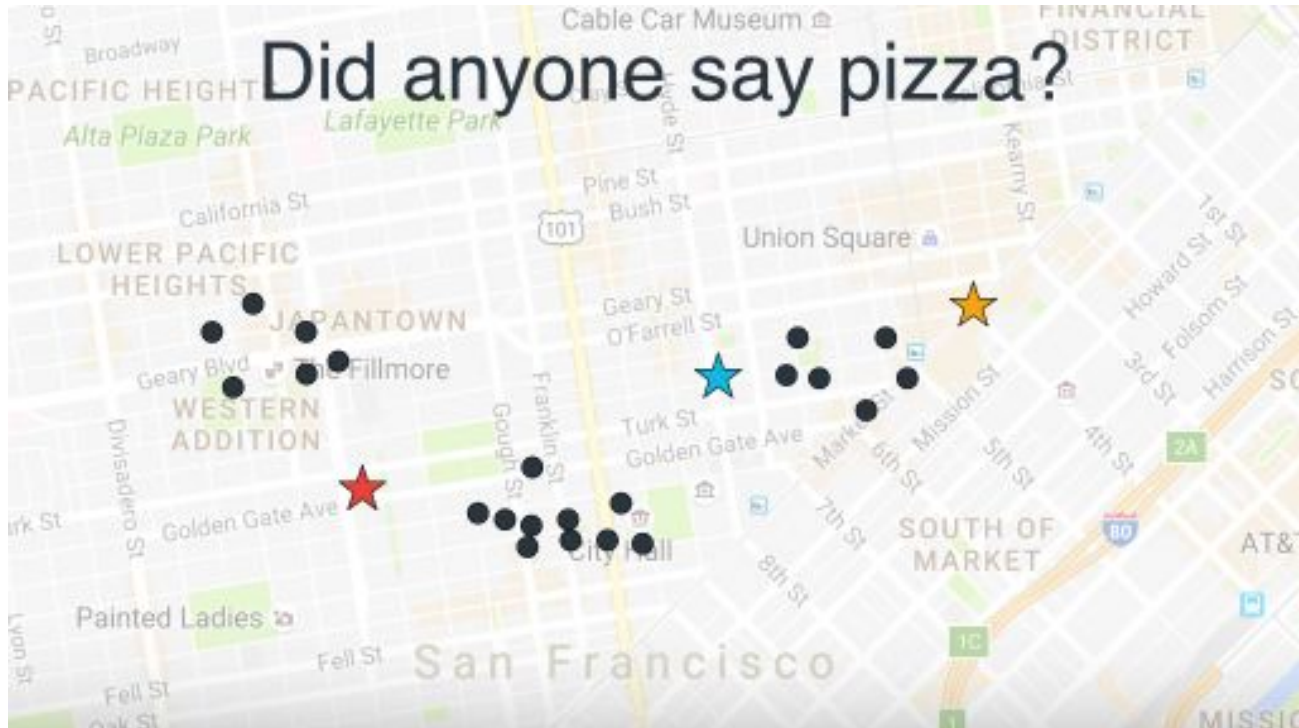
## CASE 2

Optimize Location of 3 pizza parlours





For the algorithm: Initialise to Random Locations





# Did anyone say pizza?



EVENTUALLY



# Buzz Words

- Supervised Learning, Unsupervised Learning, Reinforcement Learning
- Classification/ Regression
- Features
- Training Data
- Validation Data
- Testing Data  
For later!!
- Overfitting, Underfitting
- Weights

WHICH OF THE ABOVE DISCUSSED PROBLEMS IS

1. SUPERVISED

2. UNSUPERVISED

Justify!!

# FORMAL DEFINITION

- Machine learning is a subfield of artificial intelligence (AI) concerned with algorithms that allow computers to learn. What this means, in most cases, is that an algorithm is given a set of data and infers information about the properties of the data—and that information allows it to make predictions about other data that it might see in the future

# DRIVING FACTORS !

- Lots of Data
- Ability to process it

Machine Learning Models are essentially Statistical Machines.



# SOME STATISTICS

- Every minute up to **300 hours of video** are uploaded to **YouTube**.
- Average of **31.25 million messages** and view **2.77 million videos** every minute on **Facebook**.
- More data has been created in the past two years than in the entire previous history of the human race.
- At the moment less than 0.5% of all data is ever analyzed and used, just imagine the potential here.

# THE INDUSTRY IS USING IT..

- **Google** Page Ranking.
- **Netflix** Suggestions.
- **Tesla** Self Driving Cars
- **Amazon** product recommendations.
- **Tinder** matches
- **Facebook** video tagging.

# THE POTENTIAL: FEW INTERESTING APPLICATIONS



# Demystifying Prisma: Neural Art

[A Neural Algorithm of Artistic Style](#)



# The Mathematical Mozart



# Image Captioning: Neural Story

[Deep Visual-Semantic Alignments for Generating Image Descriptions](#)









Generated story about image

Model: Romantic Novels

*"He was a shirtless man in the back of his mind, and I let out a curse as he leaned over to kiss me on the shoulder."*

*He wanted to strangle me, considering the beautiful boy I'd become wearing his boxers."*







### Generated story about image

Model: Romantic Novels

*"My man was within a woman, and she gave him a questioning look. I don't know what else to say to her . For the first time in years , I had never been as beautiful as the rest of my man .*

*In fact, he had his hands on her hips , holding her close to his chest and looking down at her as if she were the most stunning woman I d ever seen . The man released a woman 's blood , and that was the reason for all of them.*

*She hoped to make an appear-  
ance, convincing him and the  
woman who was still her first ."*

# Conversational Engine



# Pacman Champ: The Gamer



# How easy do you think Lip Reading is ?

## Lip-Reading AI

Human Accuracy : 20% to 60%

LipNet Accuracy : 93.4%

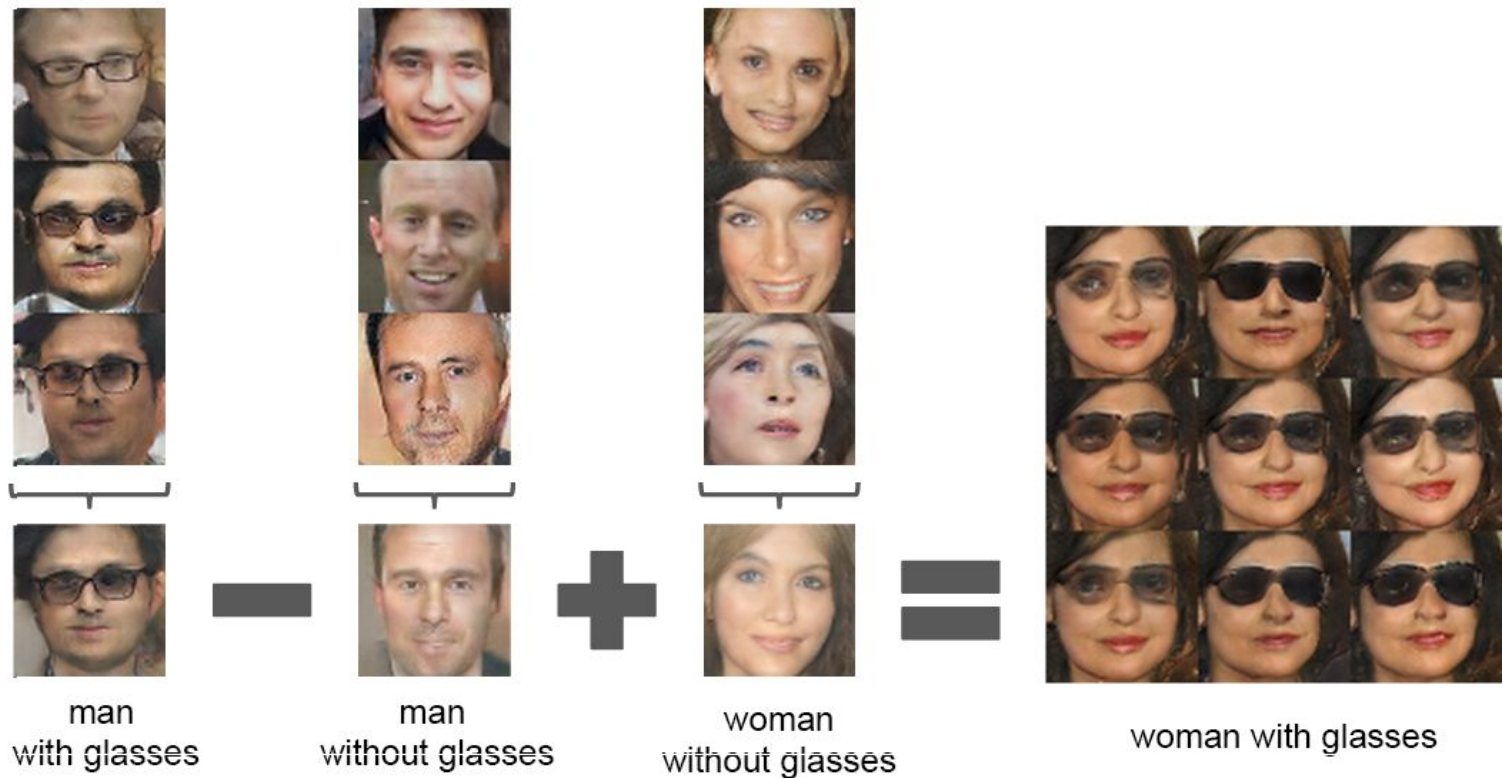




# Colorizing the World: Autoencoders



# Playing with Words and Image







# DEVELOPER CHECKLIST

- Programming Language
  - Python (Recommended)
  - R
- IDE
  - Jupyter Notebooks
  - IPython
- Mathematical Libraries
  - Numpy
  - Scipy
- Data PreProcessing
  - Pandas
  - OpenCV



# DEVELOPER CHECKLIST

- Machine Learning
  - Scikit-Learn
- Deep Learning
  - Keras
  - Tensorflow
  - Caffe
- And..

# Passion and Perseverance !



# GENERAL RECOMMENDATIONS

1. Read a lot of Research Literature.
2. Get a good grasp on the mathematics.

# INTRODUCTION TO PYTHON



# Setting Up Jupyter Notebooks



# Variable and Data Types





# String, Lists and Dictionaries



# Packages and Imports



# Conditionals Loops and Functions



# Object Oriented Paradigm



# Doubts and Queries!!

