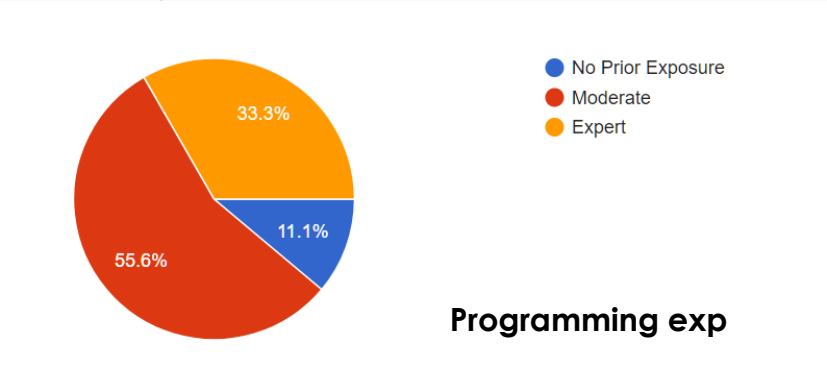
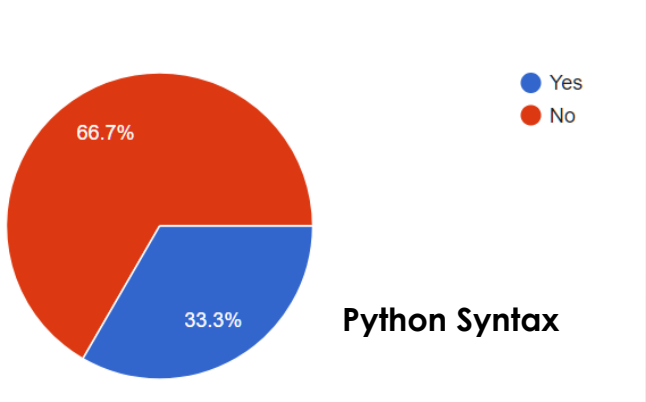
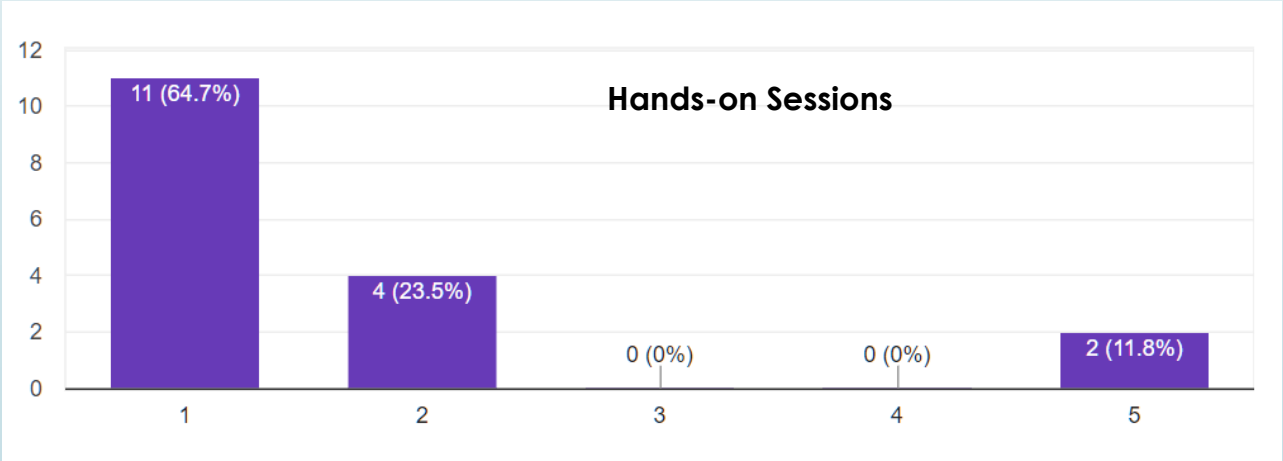
Machine Learning and AI

Stats from Survey







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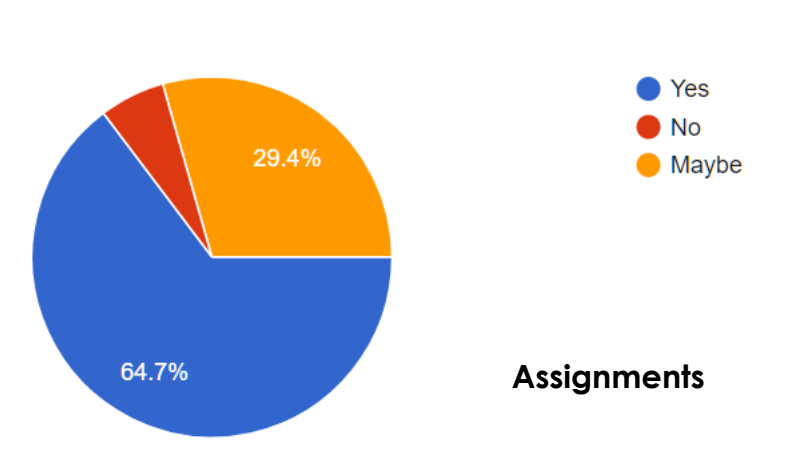
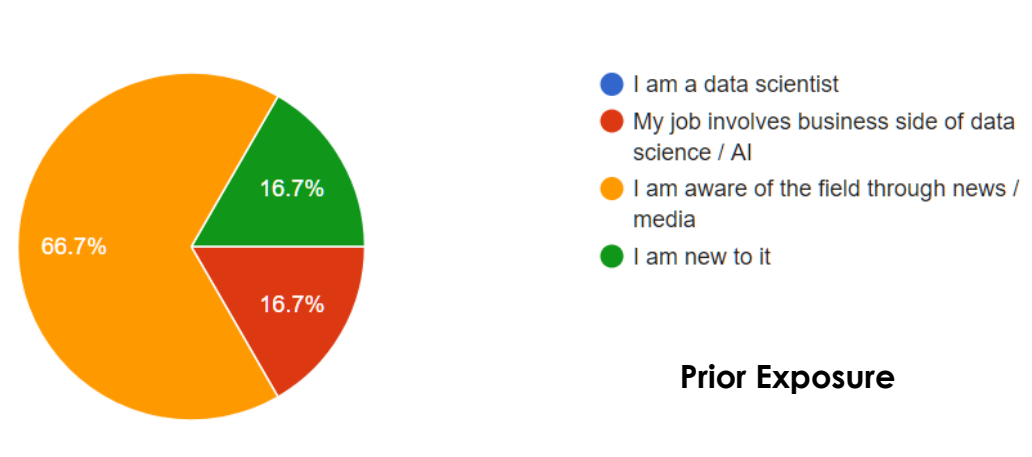




- To prepare myself
- Learning/Update my knowledge with latest stuff
- Leverage the learning in my projects
- Look at data science opportunity

What will I get of out these sessions?

- Intermediate expertise with python and popular ML / Deep Learning libraries
  - Python – the most preferred language in the world of AI/ML
  - numpy, pandas, scikit-learn, matplotlib,
  - Deeplearning libraries - tensorflow, Keras
- Introductory theory of Machine Learning
  - Basics of Linear Algebra and Probability - just enough to get your foundations in place
- Machine Learning techniques like: Regression, Decision Trees and Neural Networks (deep learning)
- Well equipped to look for use cases in your area
- OPTIONAL: tailor a learning path based on your individual needs

What will not be covered

- Mathematical theory of machine learning
- Teach you all the details of individual libraries
- Expertise in Production level coding
- Equip you for data science Competitions

Structure?

- Lectures with hands-on Demos
  - Focus will hands-on with just enough theory
- Weekly assignments
- You need to commit some time for self exploration apart from attending sessions.

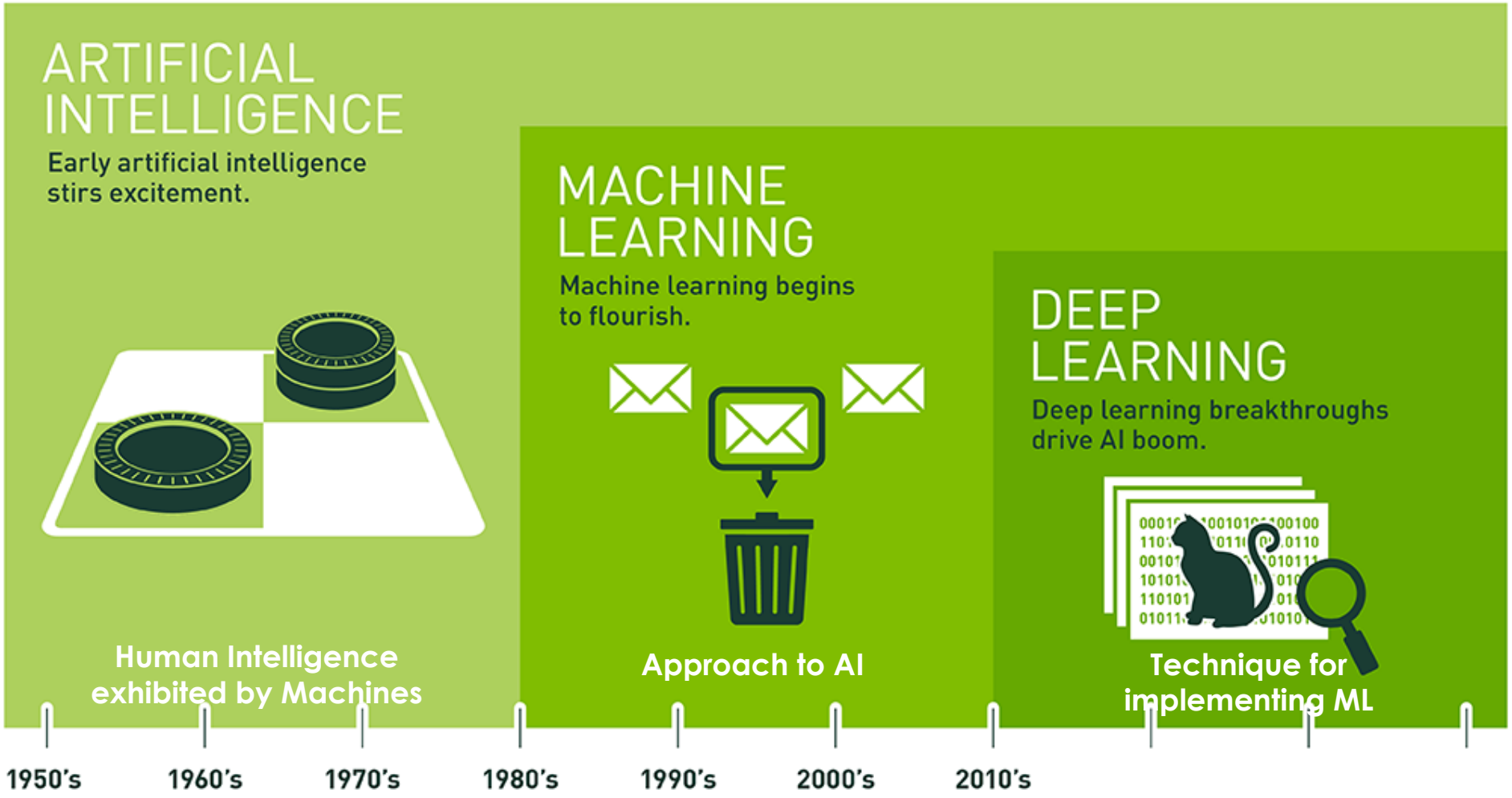
First Look

Basic Terms

- **Machine Learning(ML)** – Application of statistics using computer algorithms to find patterns in data. E.g. Spelling autocorrect, Google Now, Cortana, Amazon recommendations etc

- **Artificial Intelligence (AI)**– Extending ML to have machines perform tasks previously only feasible by humans – like playing chess, self driving cars, voice and face recognition

- **Deep-Learning (DL)** – A form of machine learning algorithm inspired by human brain. It is good for things like language and vision related tasks – self driving cars, intelligent robots, medical diagnosis
  - Problems that are hard to describe but easy to do by humans



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

Source: https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/

Why now?

- Higher Computing power with special purpose hardware (GPU)
- Availability of high volume data auto generated in digital world
- Newer Advances in Computational Models

Some examples

- **Sports – Seen the movie Moneyball?**
  - recruiting bargain-bin players whom the scouts have labeled as flawed, but have game-winning potential
- **Financial**
  - **Fraud detection, credit approvals, process automations (OCR + ML)**
- **Medical**
  - **Imaging, smart robot guided surgeries, process automations (insurance), predictive health care (IOTs/ wearables)**
- **Autonomous Vehicles**
  - **Self driving Cars, flying cars, robotic pets with emotions and many more like that**
- **Consumer market**
  - **E-commerce, devices, mobile and IOT driven applications**
- **And the list keeps growing**

Supervised Machine Learning

Setting up the problem

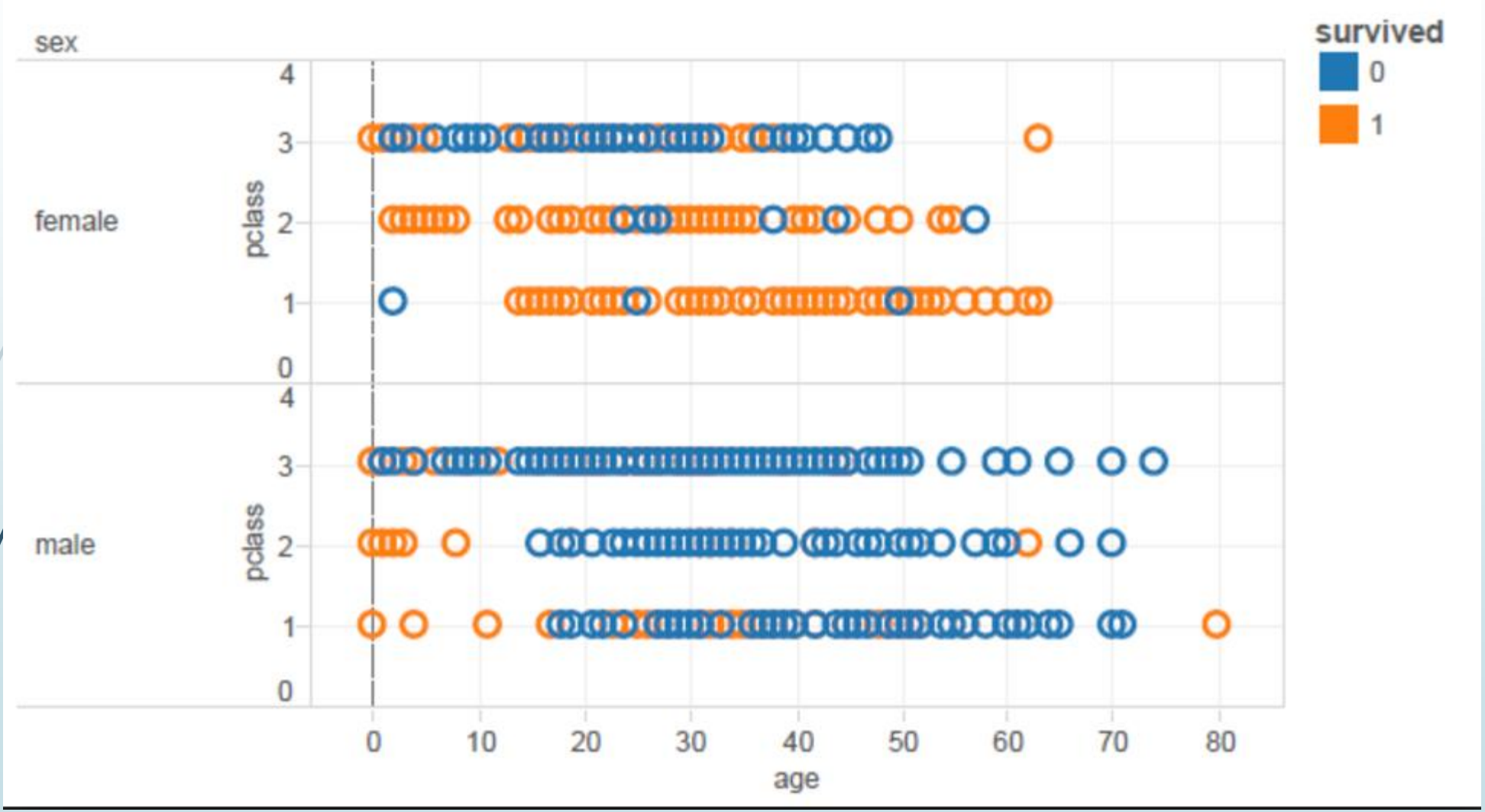
What is machine learning

- Titanic Survivors

Passenger	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
1	0	3	Braund, Mr. Owen Harris	male	22	1	0	A/5 21171	7.25		S
2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Thayer)	female	38	1	0	PC 17599	71.2833	C85	C
3	1	3	Heikkinen, Miss. Laina	female	26	0	0	STON/O2.	7.925		S
4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35	1	0	113803	53.1	C123	S
5	0	3	Allen, Mr. William Henry	male	35	0	0	373450	8.05		S
6	0	3	Moran, Mr. James	male		0	0	330877	8.4583		Q
7	0	1	McCarthy, Mr. Timothy J	male	54	0	0	17463	51.8625	E46	S
8	0	3	Palsson, Master. Gosta Leonard	male	2	3	1	349909	21.075		S
9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27	0	2	347742	11.1333		S
10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14	1	0	237736	30.0708		C
11	1	3	Sandstrom, Miss. Marguerite Rut	female	4	1	1	PP 9549	16.7	G6	S
12	1	1	Bonnell, Miss. Elizabeth	female	58	0	0	113783	26.55	C103	S
13	0	3	Saundercock, Mr. William Henry	male	20	0	0	A/5. 2151	8.05		S
14	0	3	Andersson, Mr. Anders Johan	male	39	1	5	347082	31.275		S
15	0	3	Vestrom, Miss. Hulda Amanda Adolfina	female	14	0	0	350406	7.8542		S
16	1	2	Hewlett, Mrs. (Mary D Kingcome)	female	55	0	0	248706	16		S
17	0	3	Rice, Master. Eugene	male	2	4	1	382652	29.125		Q
18	1	2	Williams, Mr. Charles Eugene	male		0	0	244373	13		S

- Can we predict “survived” based on other parameters?

Scatter Plot



what are we trying to do?

- Given sample data (X)
- Trying to predict outcome (survived / did-not-survive) (y)
- Develop rules/models using this data that can be used to predict survival chances for a future disaster

- But easiest way is to just learn the rule for each sample data point
  - This is will be memorizing and not learning – can you think of other examples?

Memorization ≠ Learning

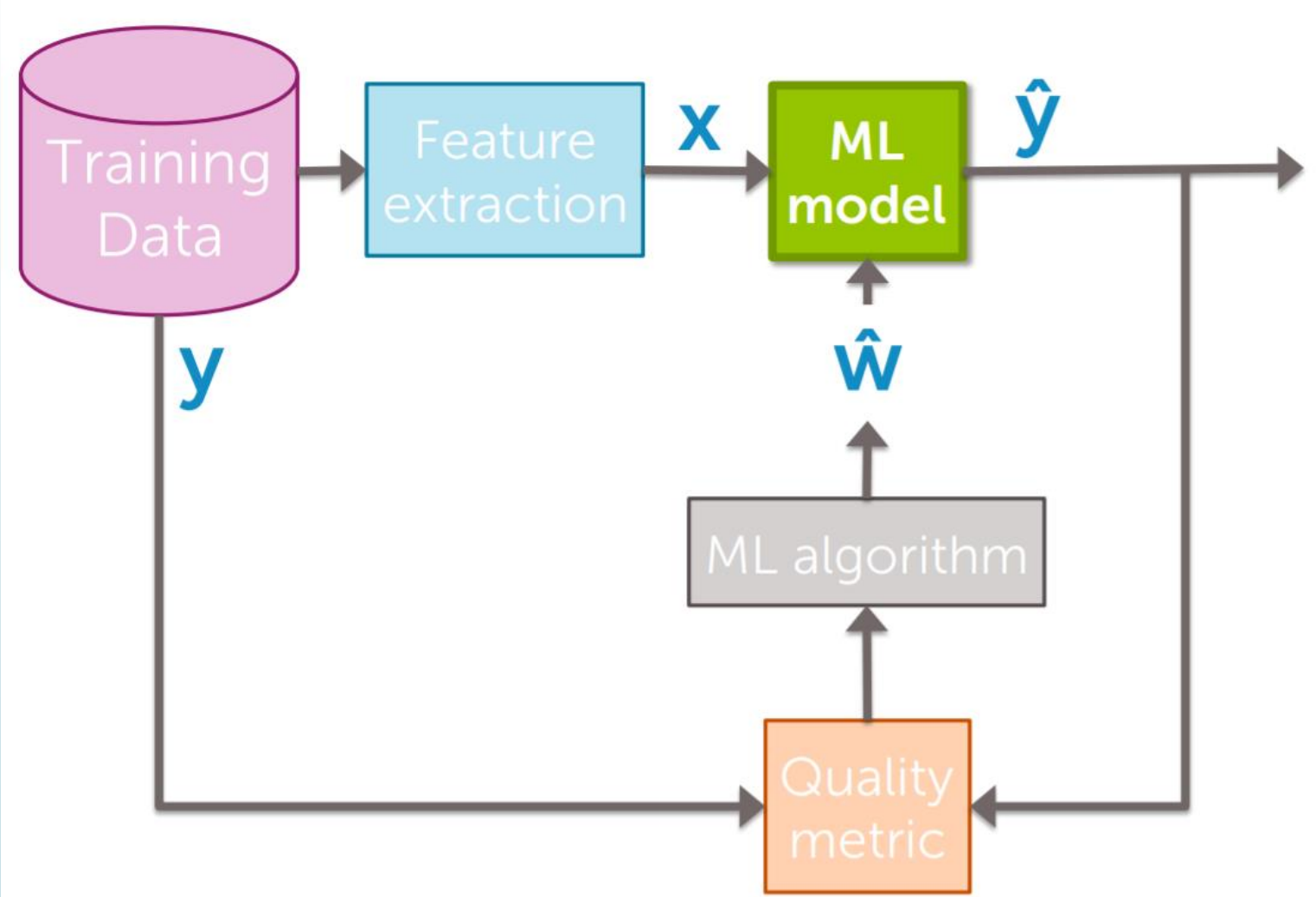
So what are we trying to do?

Input: X
(features)

Learn X -> y

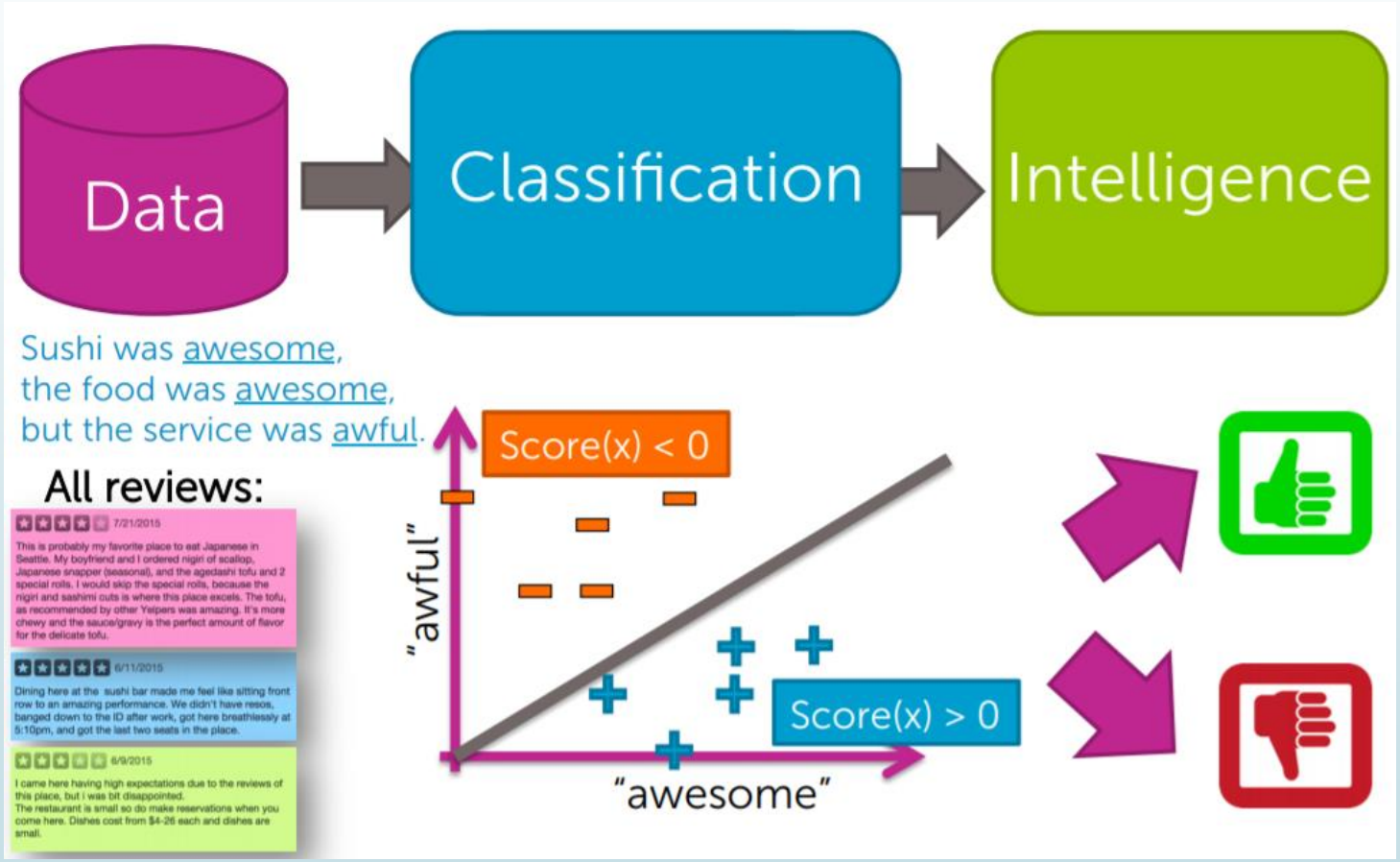
Predict y

So what are we trying to do?



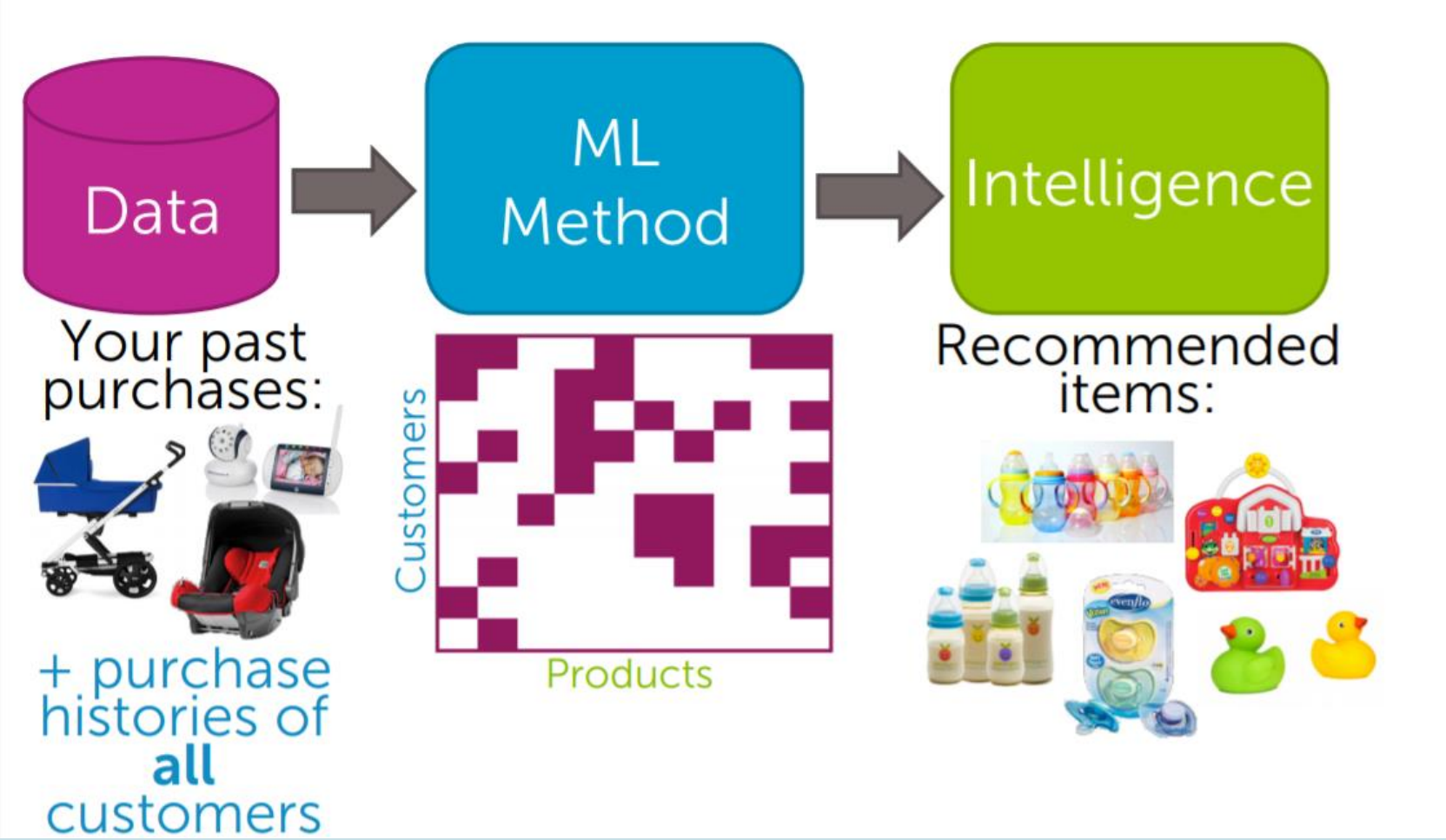
Supervised Learning – Predicting House prices

Supervised Learning – Sentiment analysis

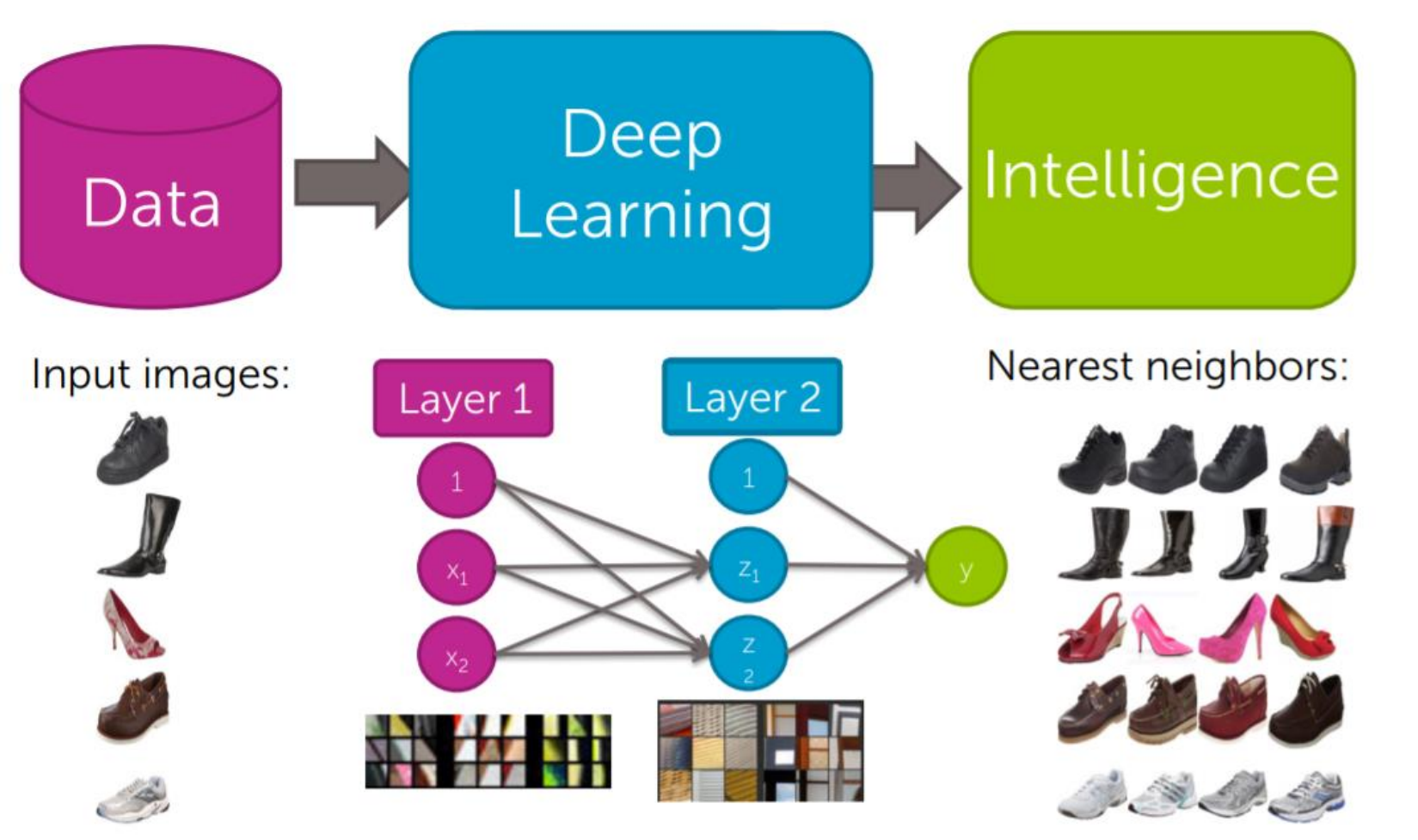


Unsupervised Learning – Document Retrieval

Unsupervised Learning – Product Reco



Supervised Learning – Visual Product Reco



Learning types

- Supervised Learning
  - Given X^{Train} and Y^{Train}
  - Learn relationship: X^{Train} -> Y^{Train}
  - Use relationship to predict output for new set of inputs

Learning types

- Unsupervised Learning
  - Given X^{Train}
  - Try to find common patterns to segment /cluster the data
  - The trained system predicts the segment/cluster a new data belongs to

Learning types

- Reinforcement Learning
  - Learn from responses system gets for some action taken and slowly become more intelligent in taking right steps
  - Example – chess playing program trained to beat human champs
  - One of the hottest areas