techbash

Microsoft Cognitive Services

Adding AI Smarts to your Software Solutions

CSE

Steve Bohlen
Principal Software Engineer

Microsoft

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CODE CAMP NYC

Saturday, October 20, 2018

http://codecampnyc.org

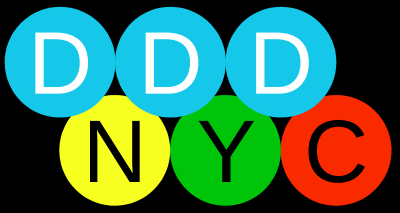
Who am I?

- …and why should you care?
- Steve Bohlen
- I Read Books + Write Software
  - vs. “Read Software + Write Books” ☺
- Blog, Screencast, Speak, Share, Learn

Steve Bohlen

Over 25 years as a software developer
LISP, Delphi, C/C++, VB, VB.NET, Java, Ruby, C#, JavaScript
Principal Software Engineer & Technical Evangelist, Microsoft
Co-Founder, NYC Alt.Net User Group
Co-Organizer, NYC DDD User Group
Contributor: various OSS projects
- NHibernate
- Spring.NET http://www.springframework.net
- Common.Logging http://github.com/net-commons/common-logging

blog: http://blog.unhandled-exceptions.com
e-mail: sbohlen@gmail.com
twitter: @sbohlen
Membership: ASP Insiders, C# Insiders, Telerik Insiders, INETA Board of Directors



Alumni

I am a

Microsoft

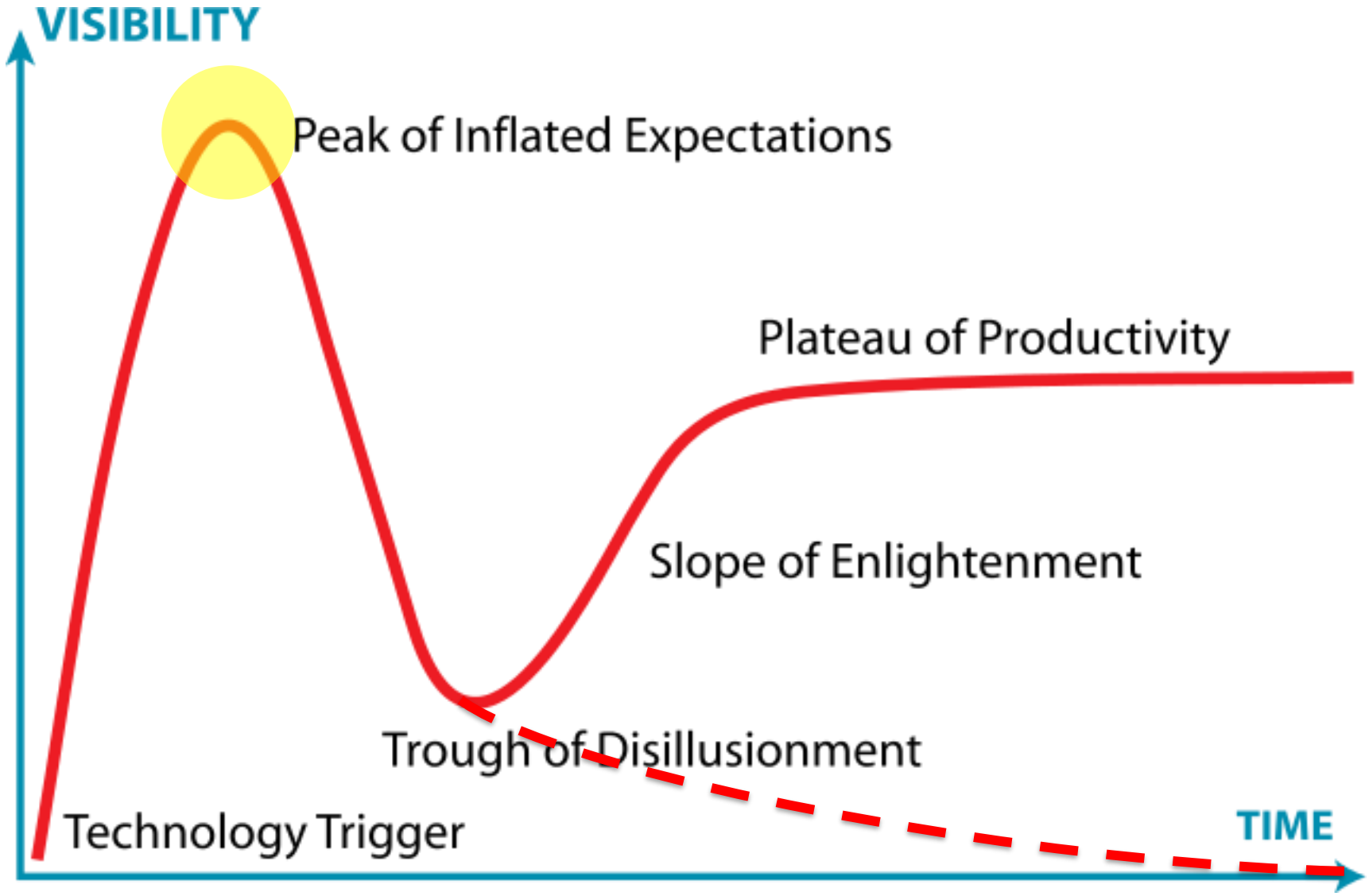
employee…

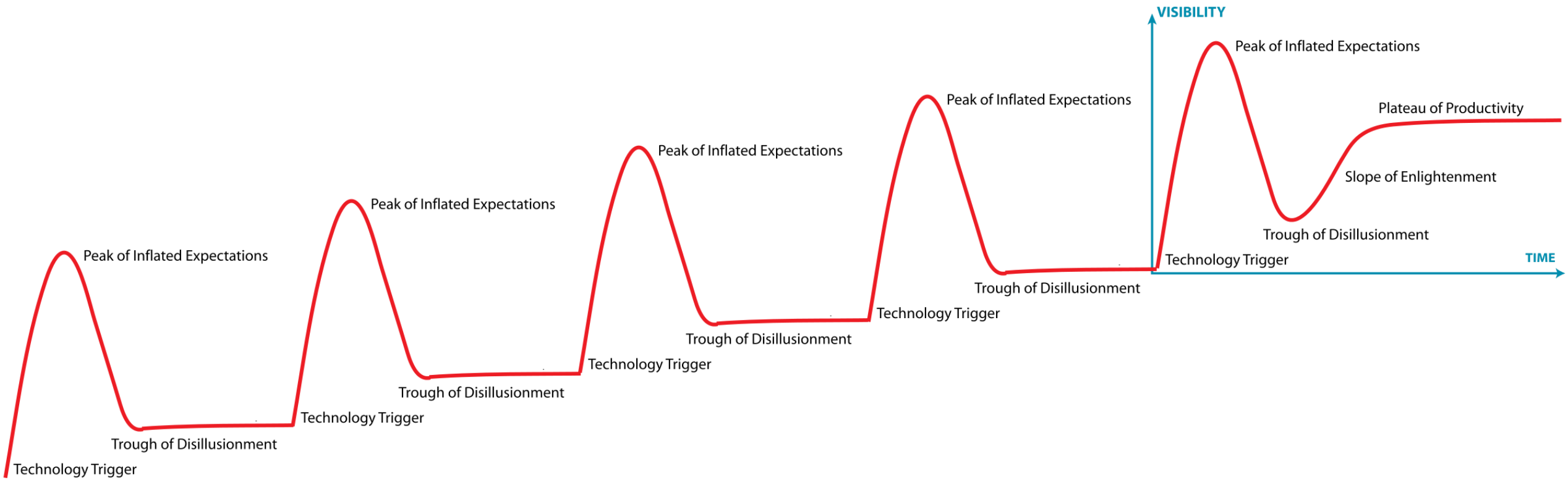
…but these thoughts are my own!

What is Machine Learning?

A computer program is said to learn from experience *E* with respect to some class of tasks *T* and performance measure *P* if its performance at tasks in *T*, as measured by *P*, improves with experience *E*.

Computational Learning using Algorithms to learn from and make predictions on Data.


VISIBILITY
Peak of Inflated Expectations
Plateau of Productivity
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
TIME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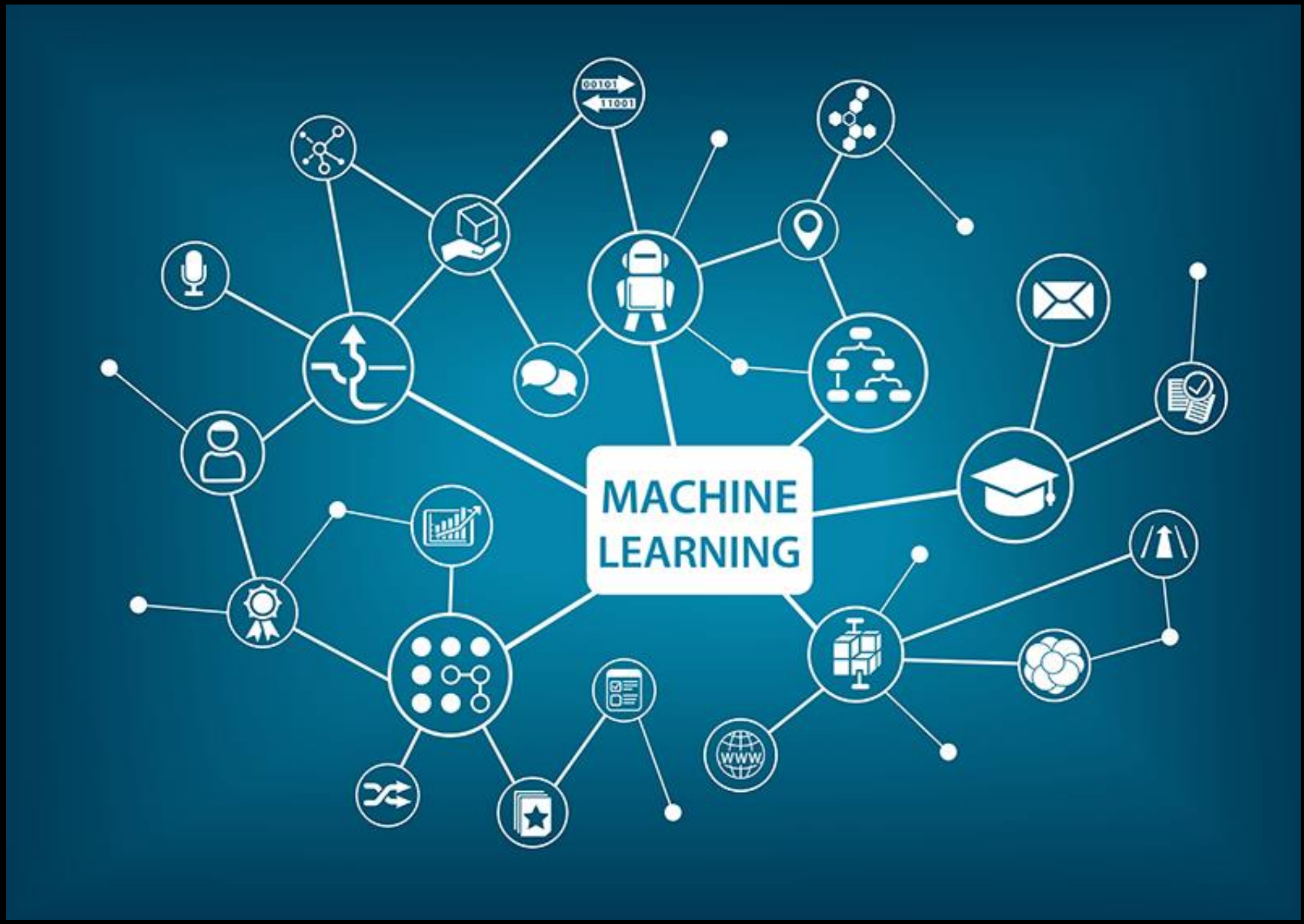
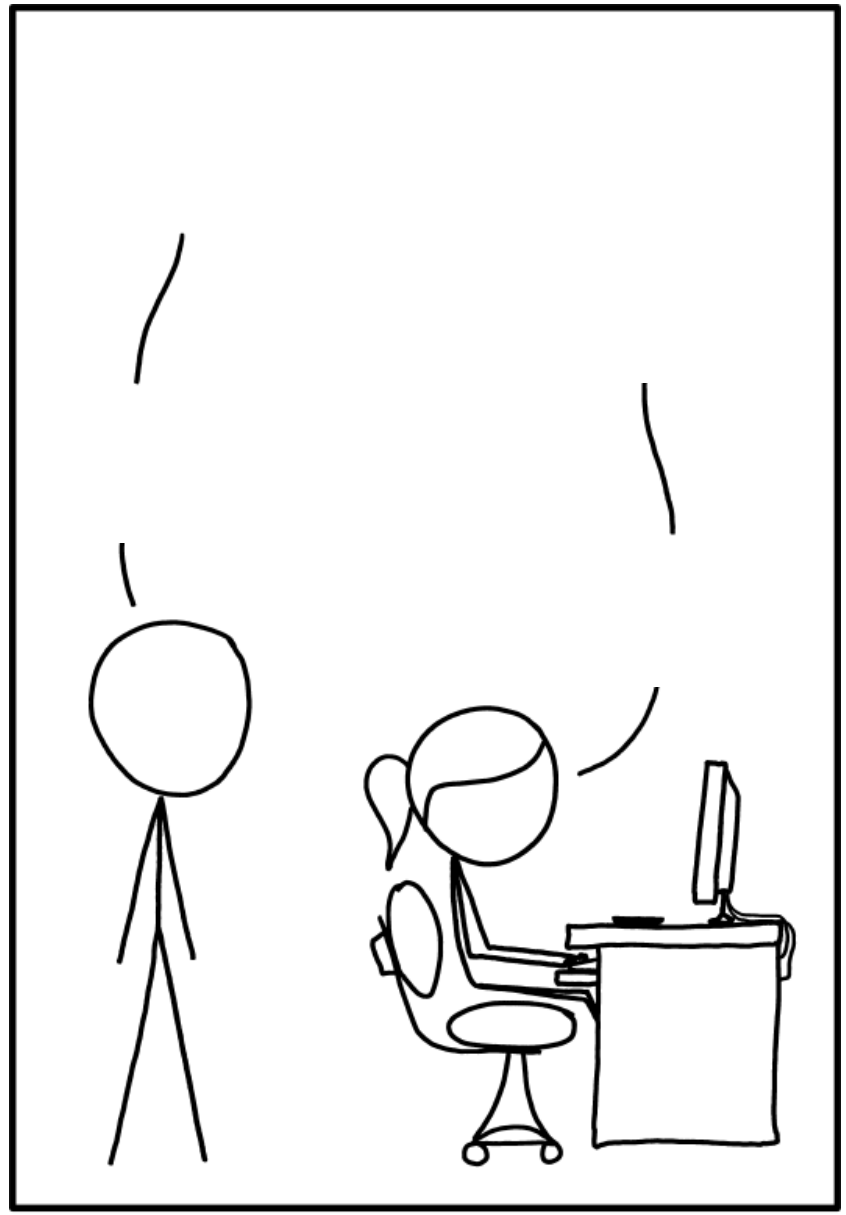
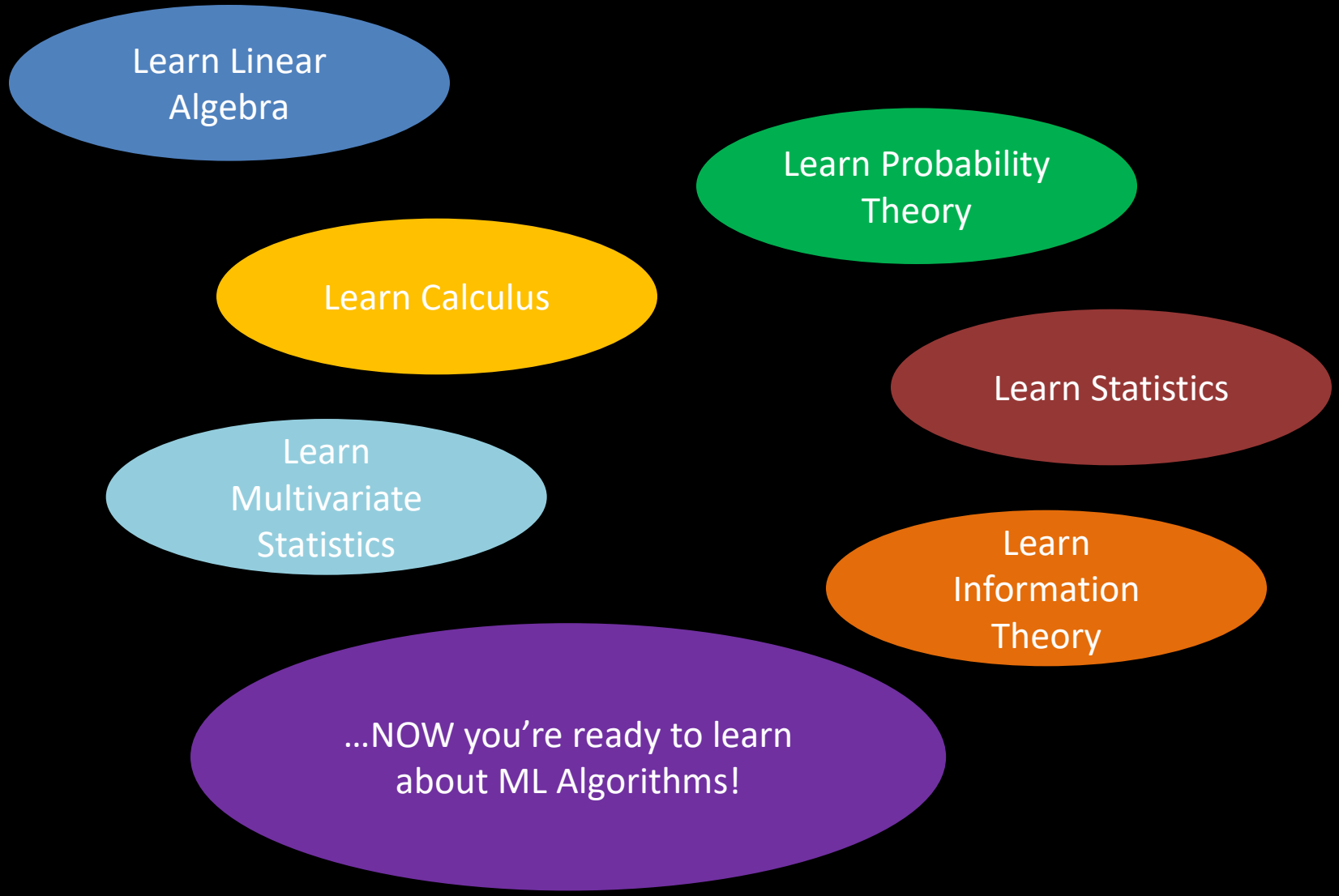
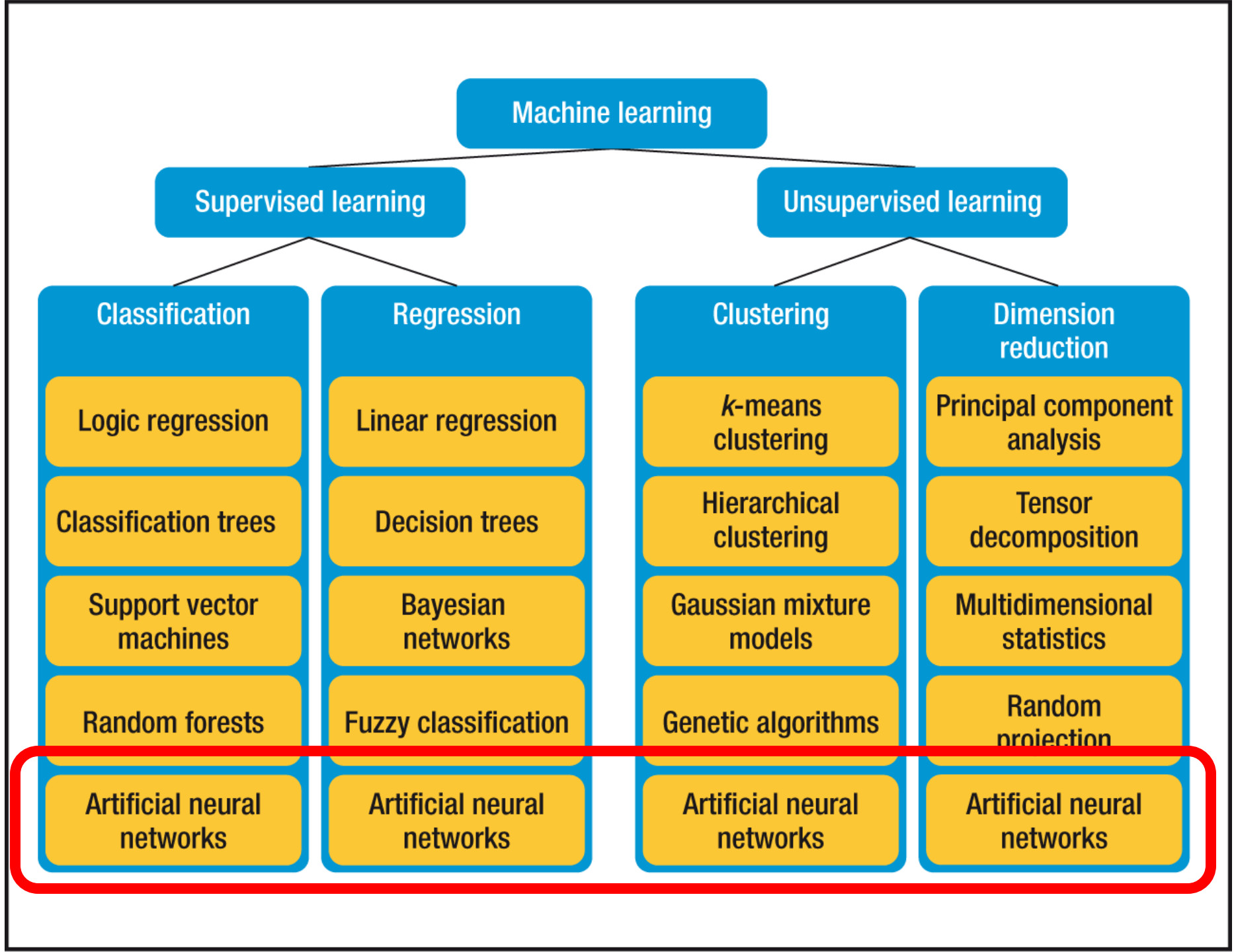

00101
11001
MACHINE
LEARNING
WWW

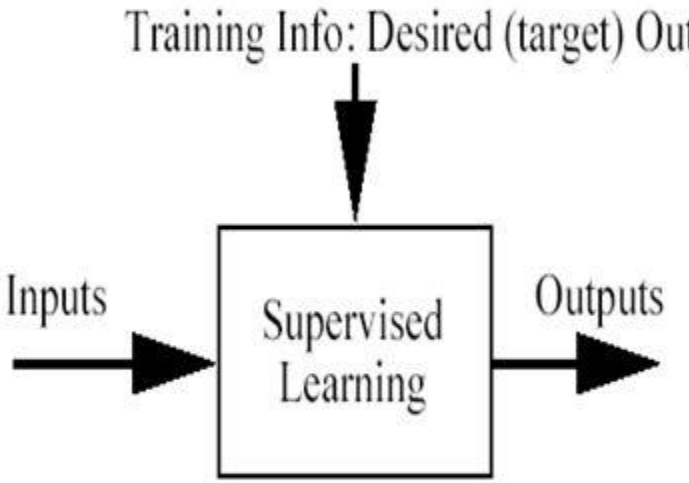


So You Want to do Machine Learning?



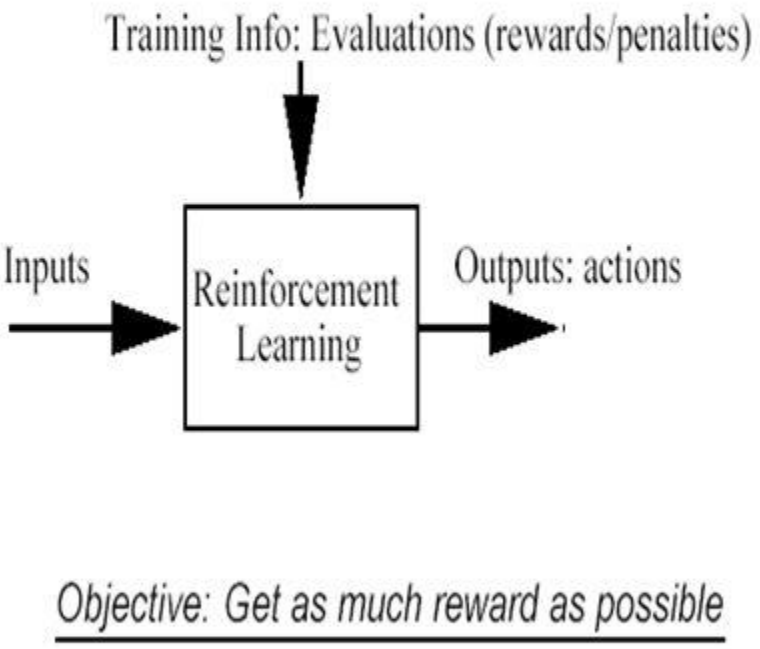

Machine learning
Supervised learning
Unsupervised learning
Classification
Regression
Clustering
Dimension reduction
Logic regression
Linear regression
k-means clustering
Principal component analysis
Classification trees
Decision trees
Hierarchical clustering
Tensor decomposition
Support vector machines
Bayesian networks
Gaussian mixture models
Multidimensional statistics
Random forests
Fuzzy classification
Genetic algorithms
Random projection
Artificial neural networks
Artificial neural networks
Artificial neural networks
Artificial neural networks

Supervised Learning

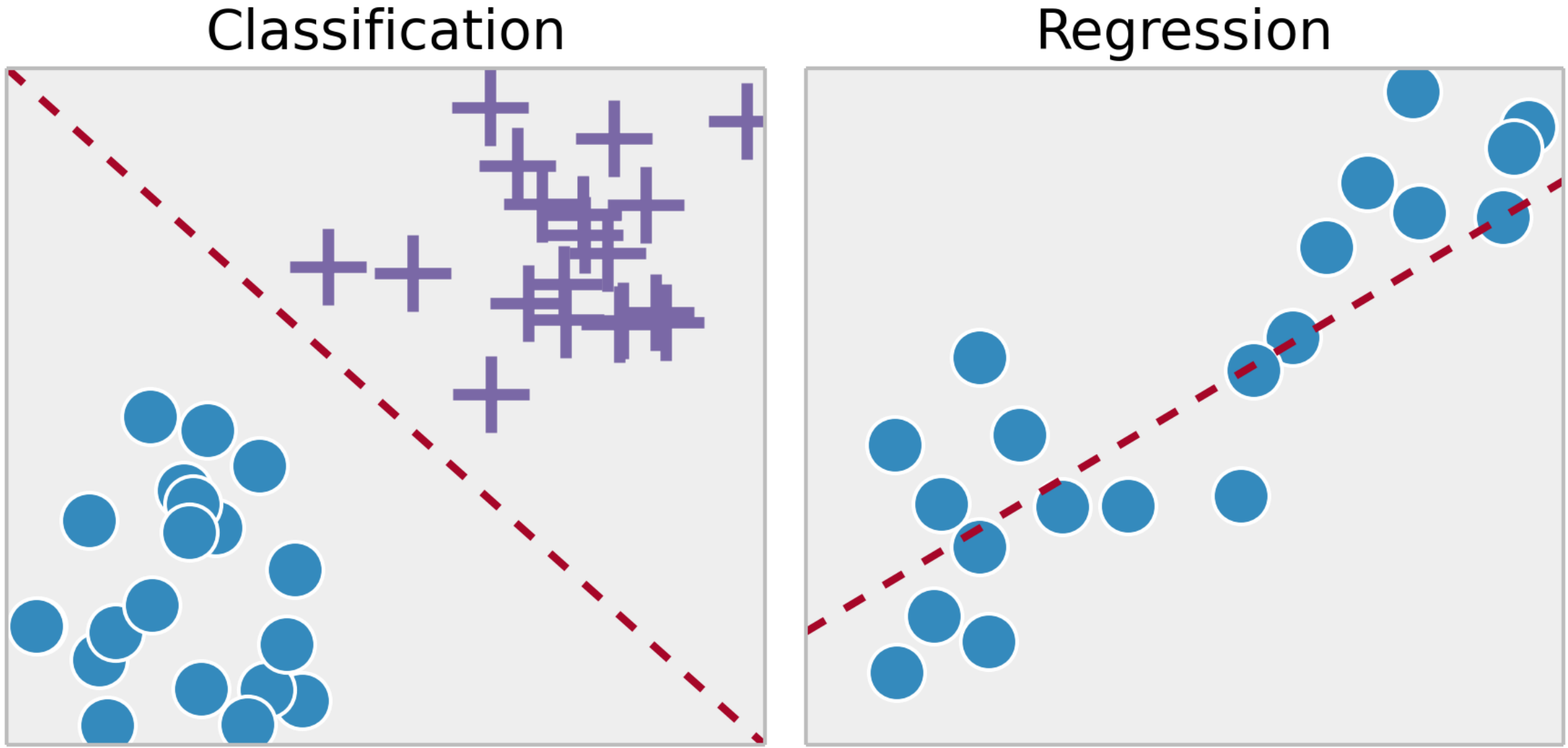


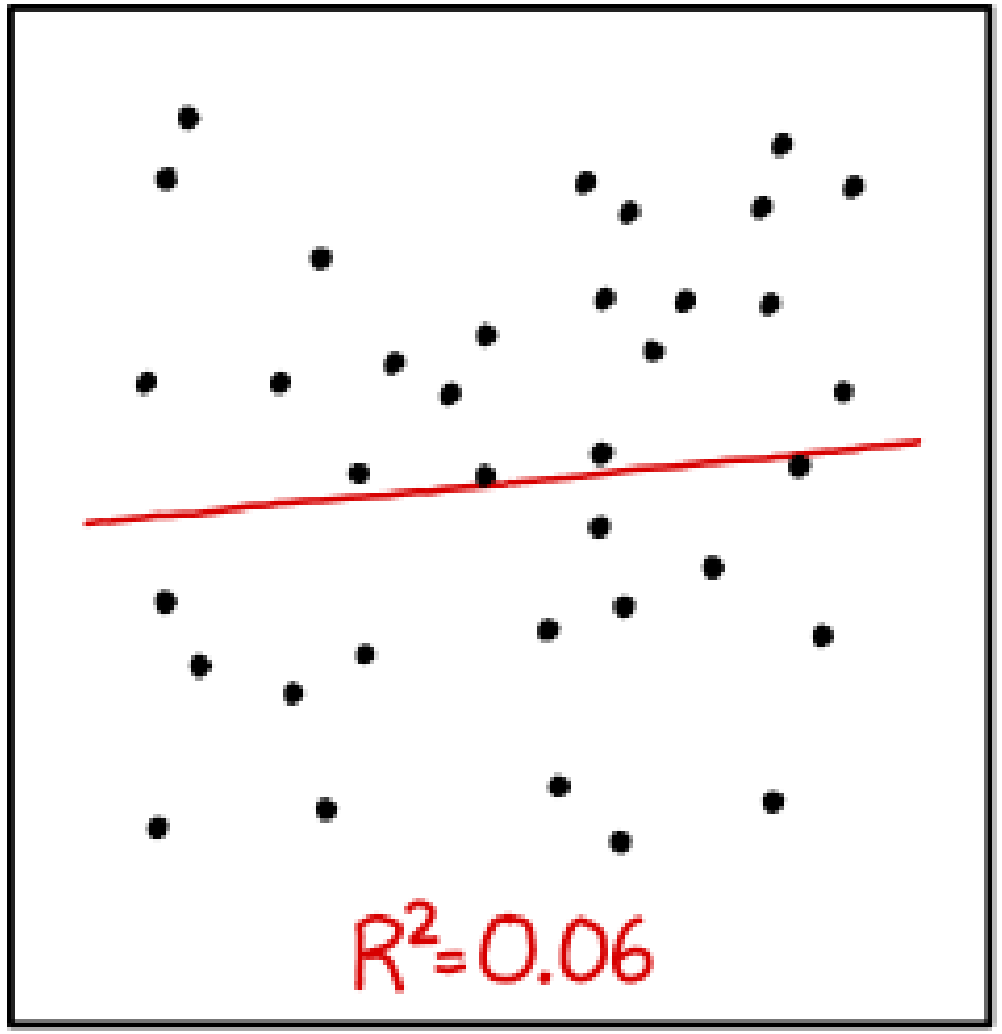
Input is an instance, output is a *classification* of the instance

Reinforcement Learning

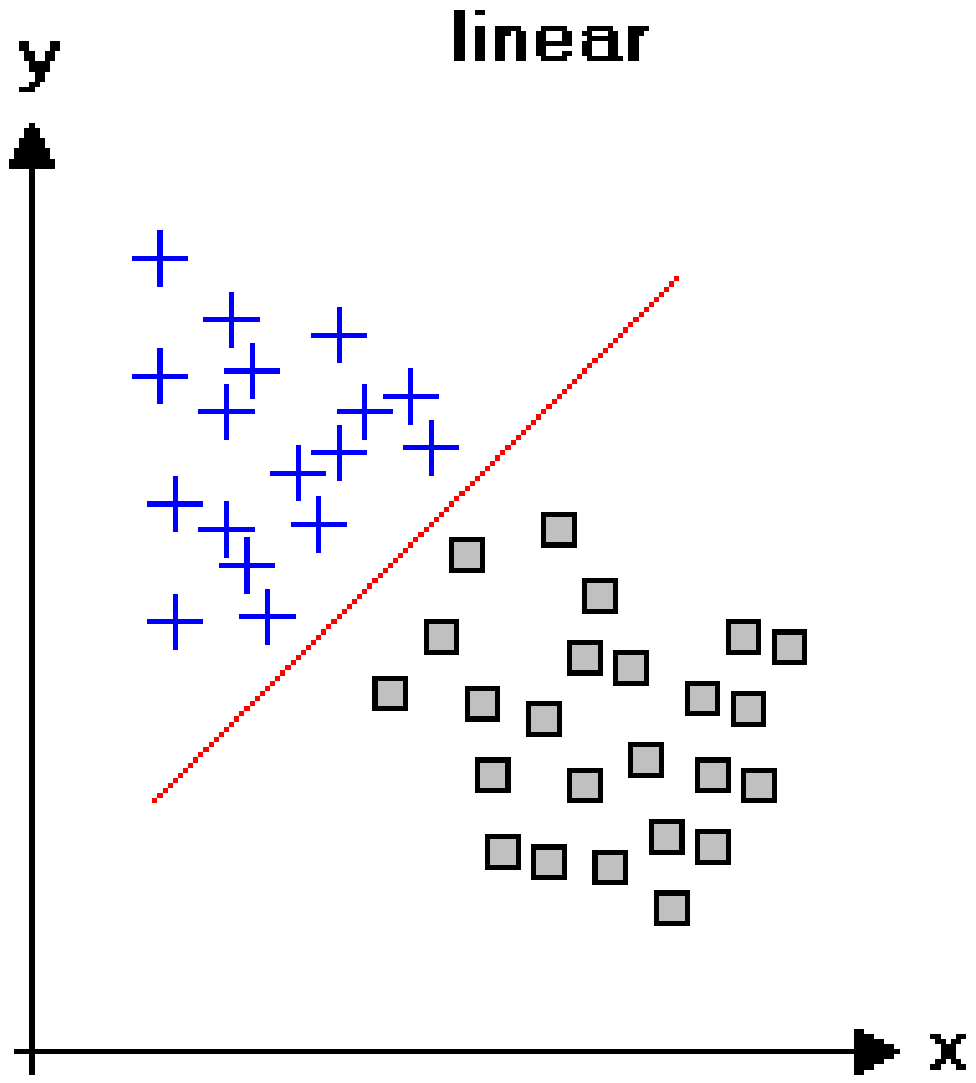


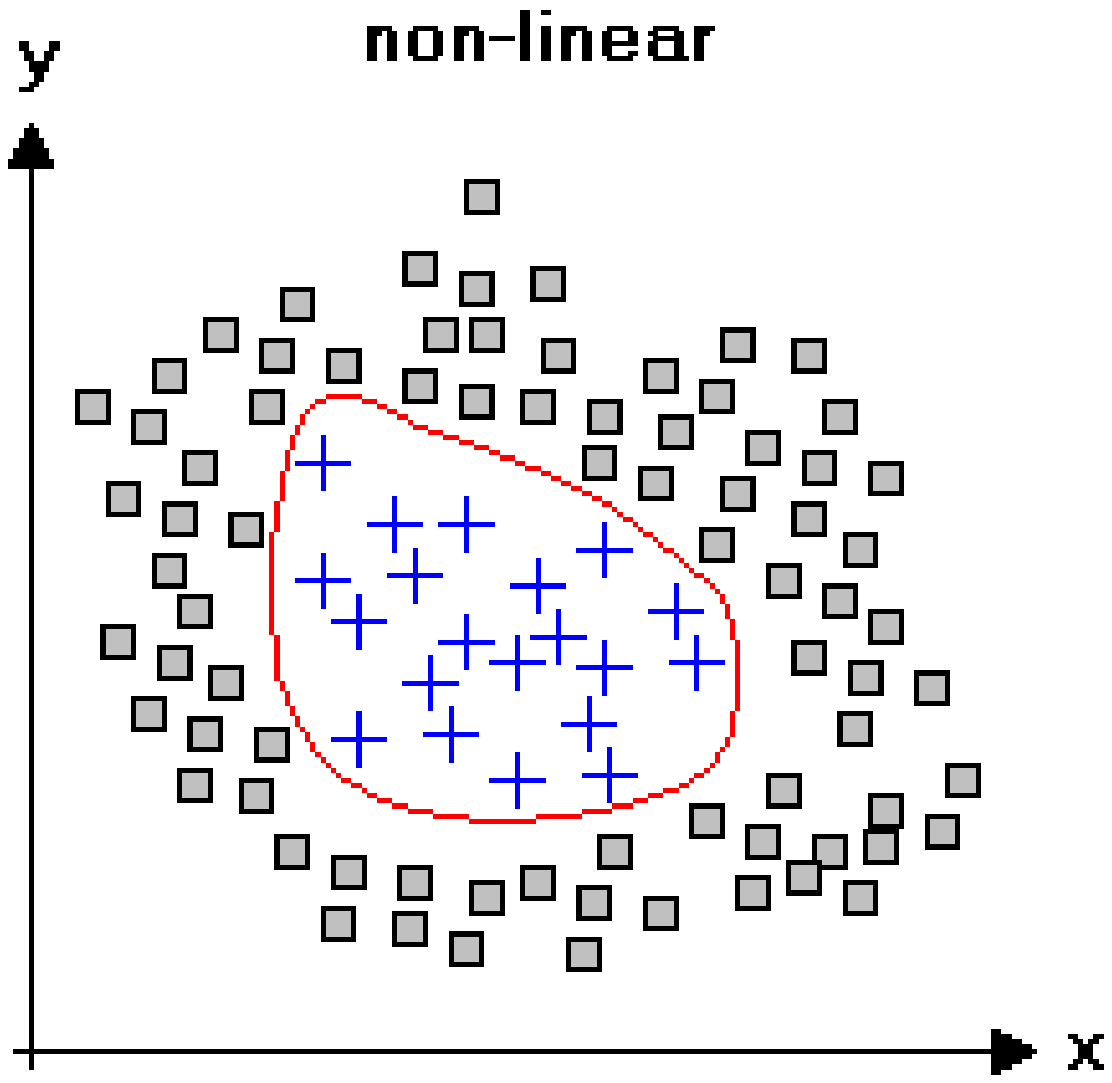
Input is some "goal", output is a sequence of *actions* to optimize the goal (reward)

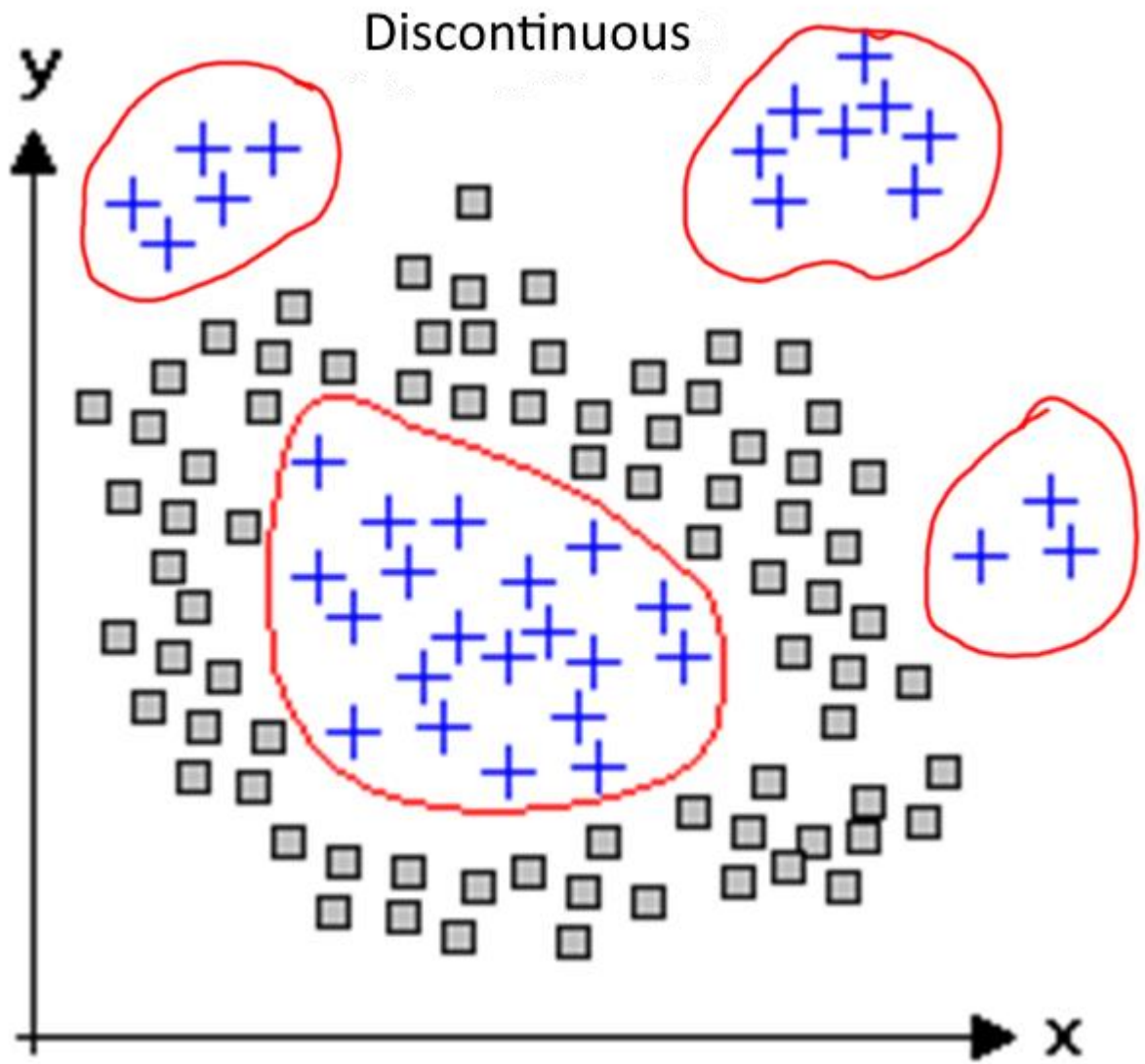

Classification
Regression

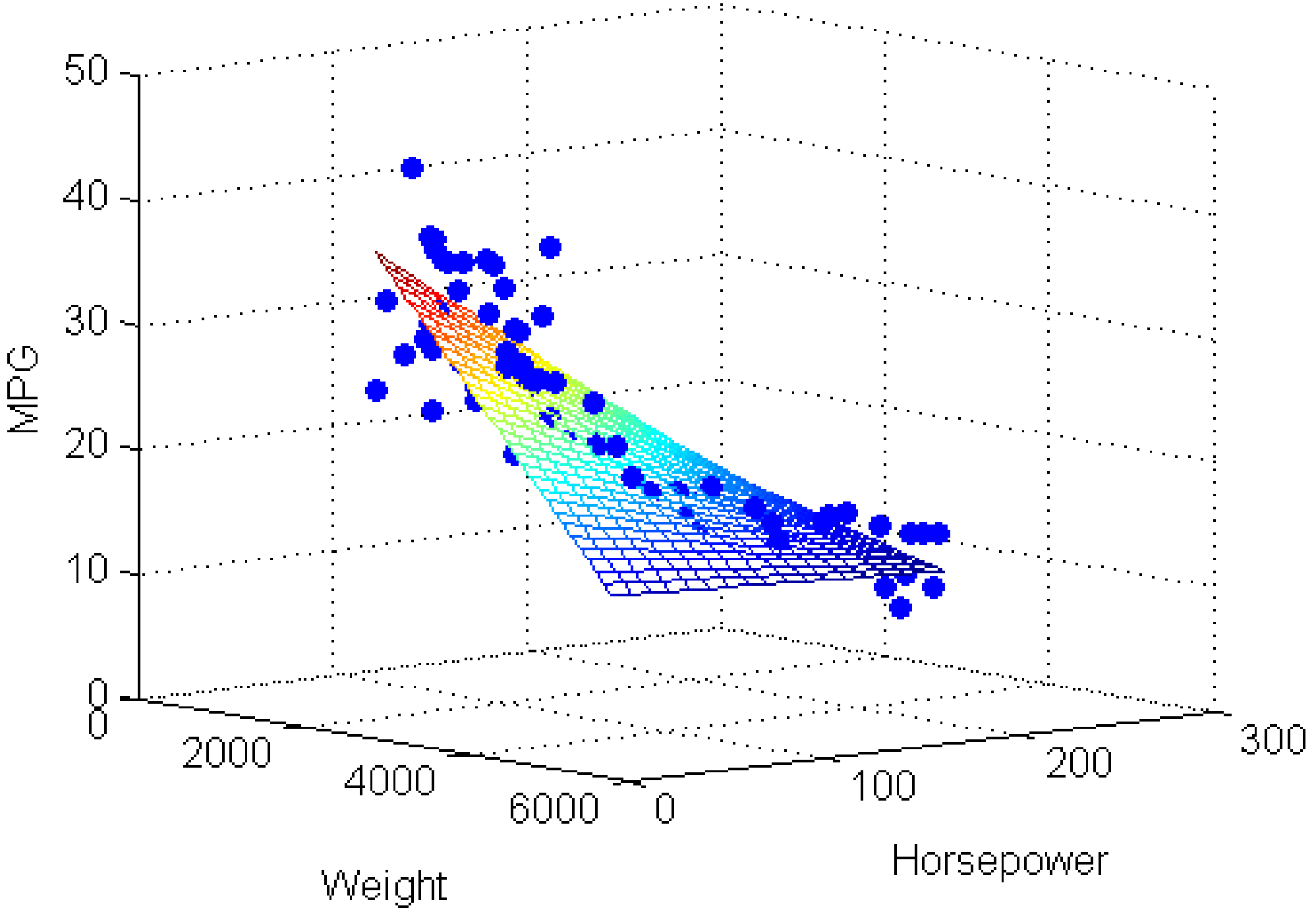


I DON'T TRUST LINEAR REGRESSIONS WHEN IT'S HARDER TO GUESS THE DIRECTION OF THE CORRELATION FROM THE SCATTER PLOT THAN TO FIND NEW CONSTELLATIONS ON IT.


linear
y
x


non-linear
y
x


Discontinuous
y
x


MPG
50
40
30
20
10
0
2000
4000
6000
Weight
0
100
200
300
Horsepower

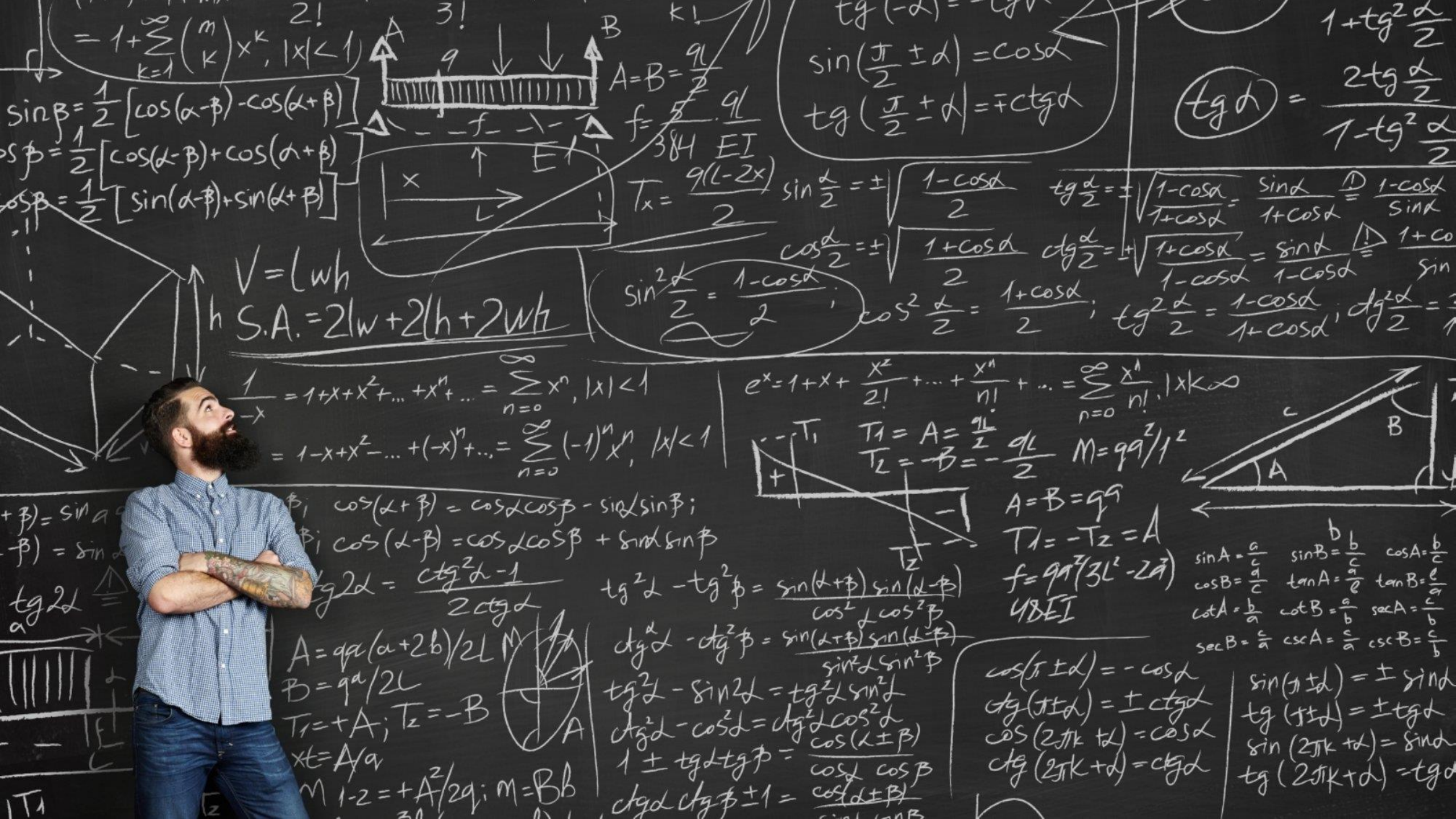
Optimization algorithm

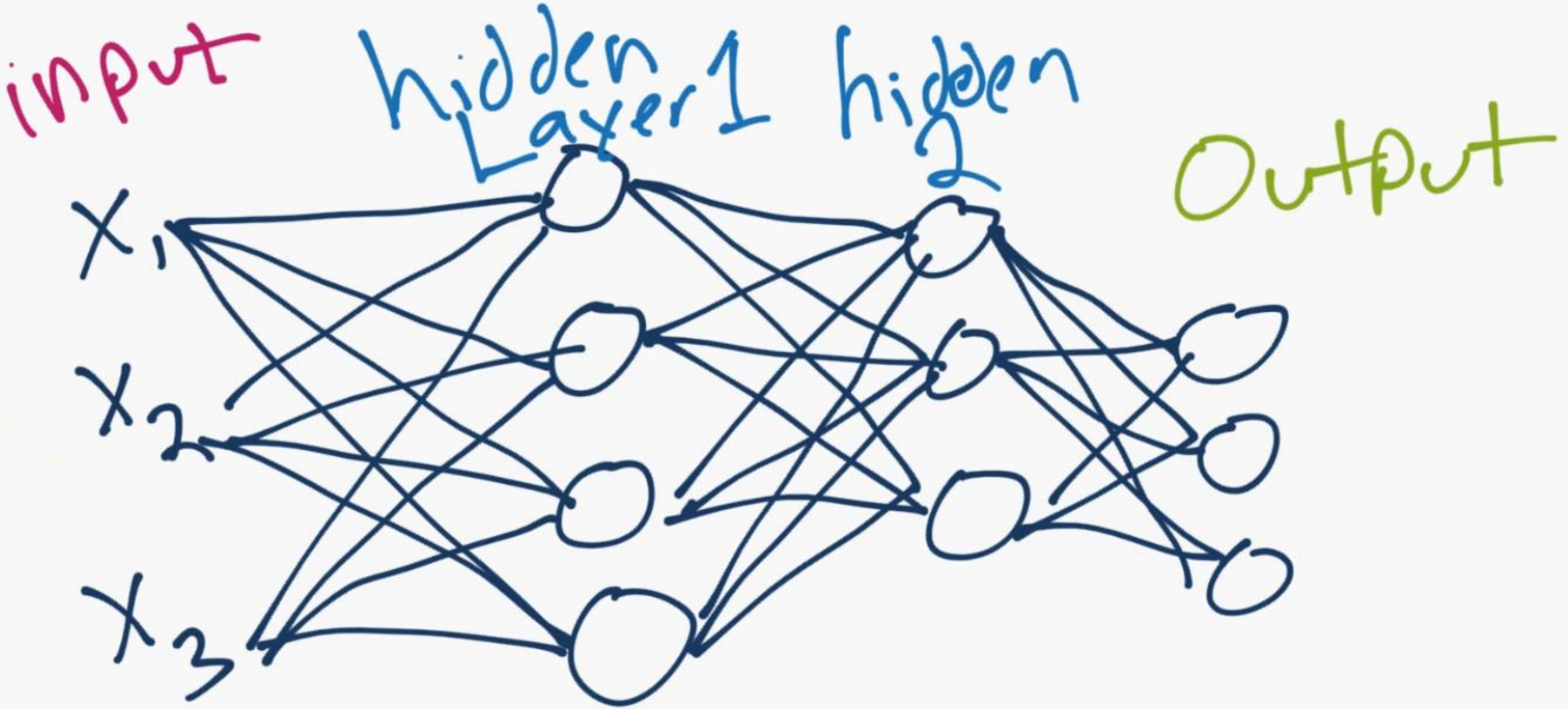
Given $\theta^{(1)}, \ldots, \theta^{(n_u)}$, to learn $x^{(i)}$:

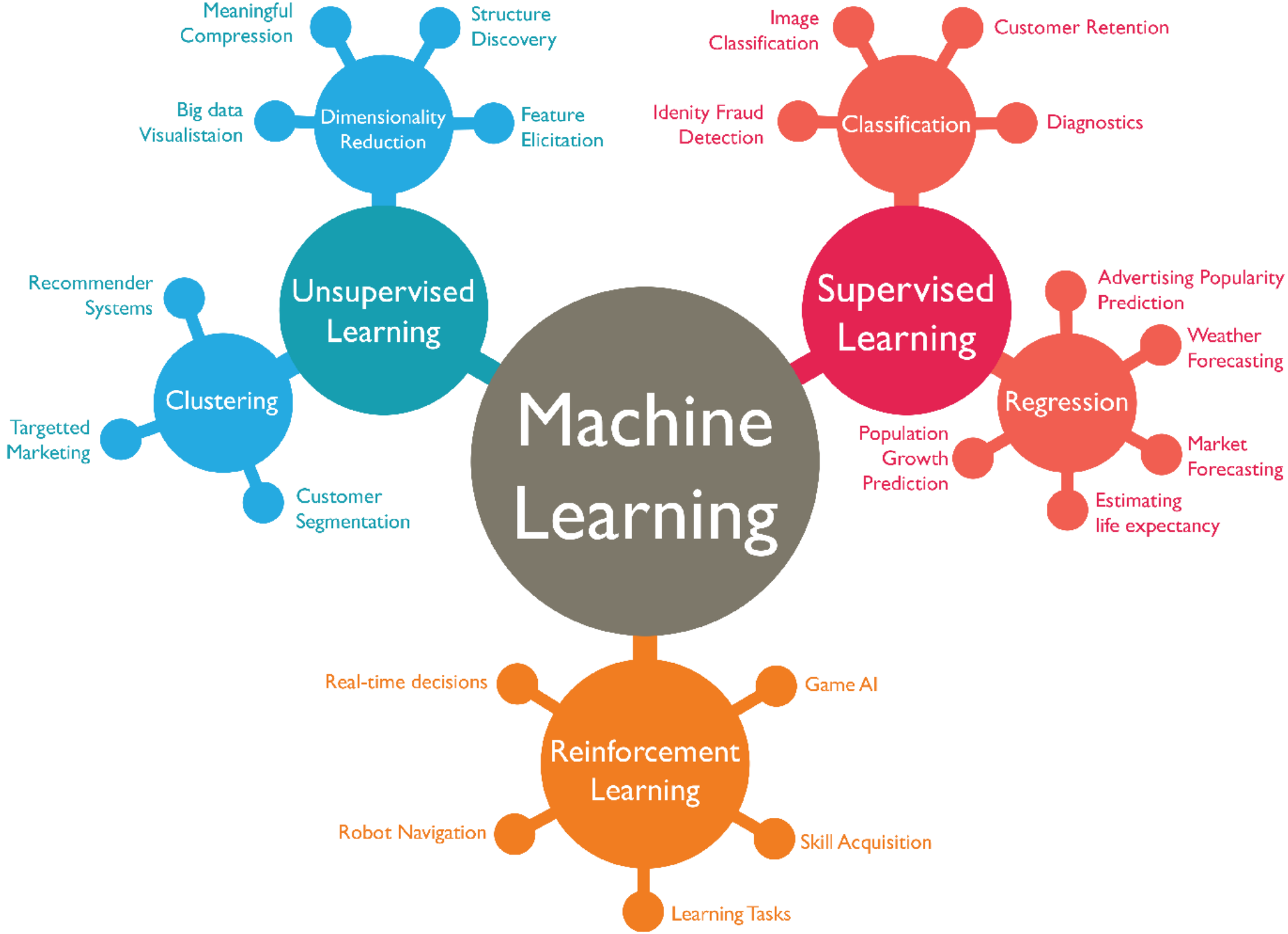
$$\min_{x^{(i)}} \frac{1}{2} \sum_{j:r(i,j)=1} ((\theta^{(j)})^T x^{(i)} - y^{(i,j)})^2 + \frac{\lambda}{2} \sum_{k=1}^{n} (x_k^{(i)})^2$$

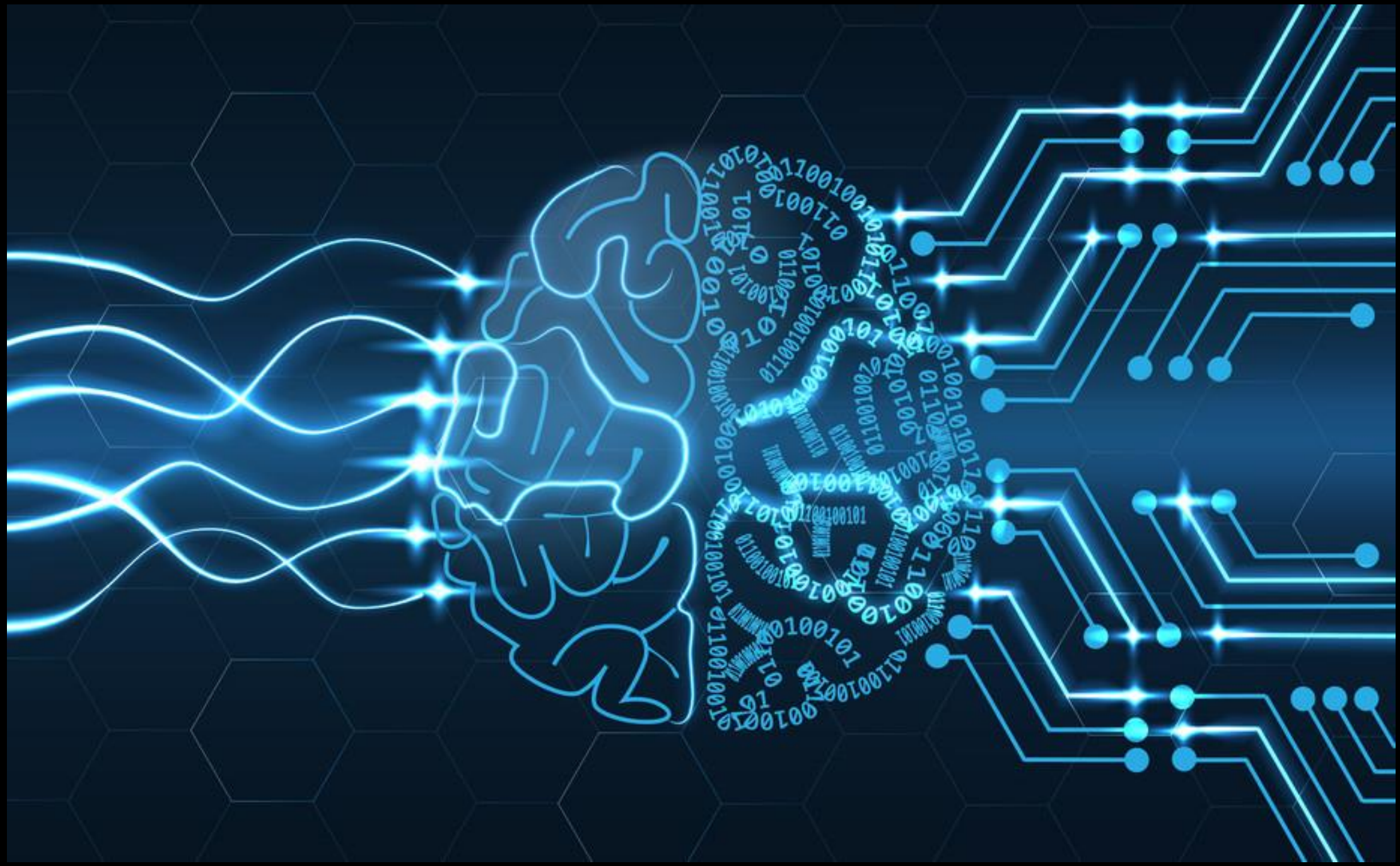
Given $\theta^{(1)}, \ldots, \theta^{(n_u)}$, to learn $x^{(1)}, \ldots, x^{(n_m)}$:

$$\min_{x^{(1)}, \ldots, x^{(n_m)}} \frac{1}{2} \sum_{i=1}^{n_m} \sum_{j:r(i,j)=1} ((\theta^{(j)})^T x^{(i)} - y^{(i,j)})^2 + \frac{\lambda}{2} \sum_{i=1}^{n_m} \sum_{k=1}^{n} (x_k^{(i)})^2$$




input
hidden Layer 1
hidden 2
Output
x_1
x_2
x_3


Machine Learning
Unsupervised Learning
Supervised Learning
Reinforcement Learning
Dimensionality Reduction
Clustering
Classification
Regression
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Recommender Systems
Targetted Marketing
Customer Segmentation
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Advertising Popularity Prediction
Weather Forecasting
Population Growth Prediction
Market Forecasting
Estimating life expectancy
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks



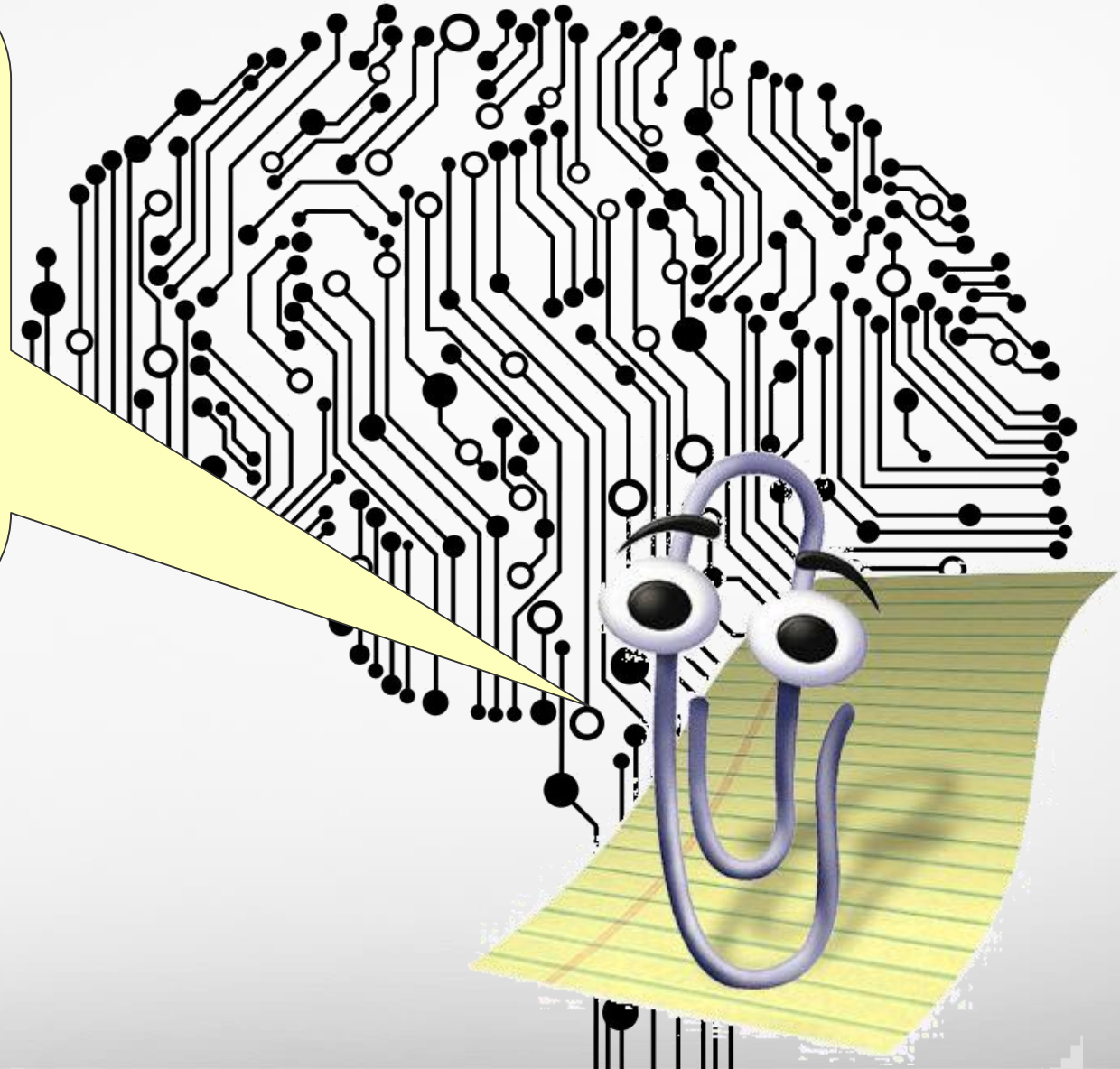
Microsoft

You look like you're trying to build a machine learning algorithm.

Would you like some help?

Yes

No



Microsoft AI

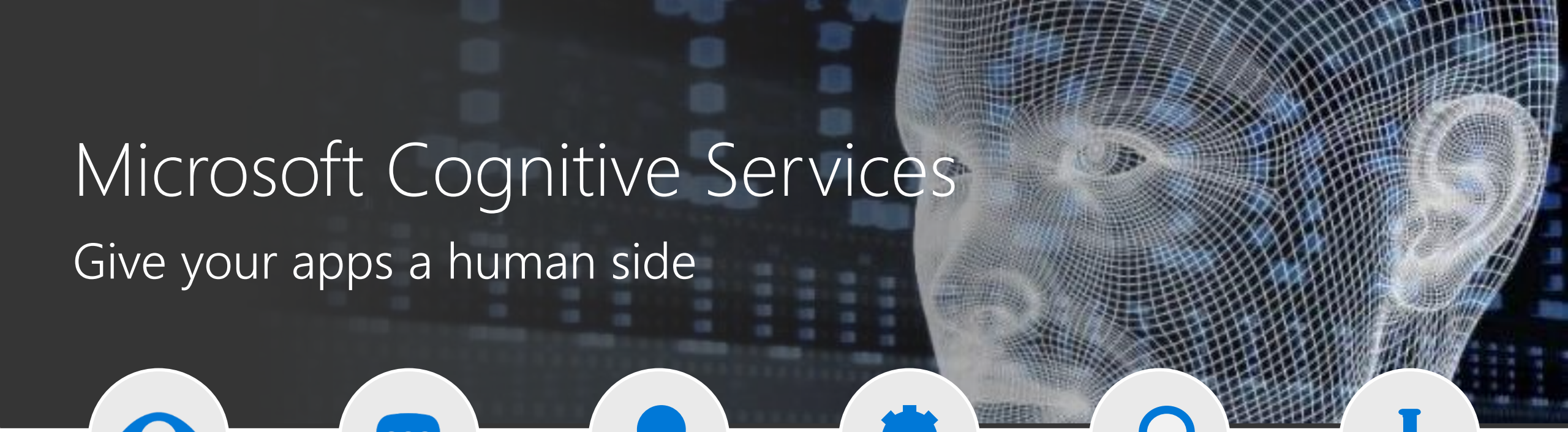
Amplify human ingenuity

Services

Cognitive Services

Bot Framework

Cognitive Toolkit



Microsoft Cognitive Services

Give your apps a human side

Vision

From faces to feelings, allow your apps to understand images and video

Speech

Hear and speak to your users by filtering noise, identifying speakers, and understanding intent

Language

Process text and learn how to recognize what users want

Knowledge

Tap into rich knowledge amassed from the web, academia, or your own data

Search

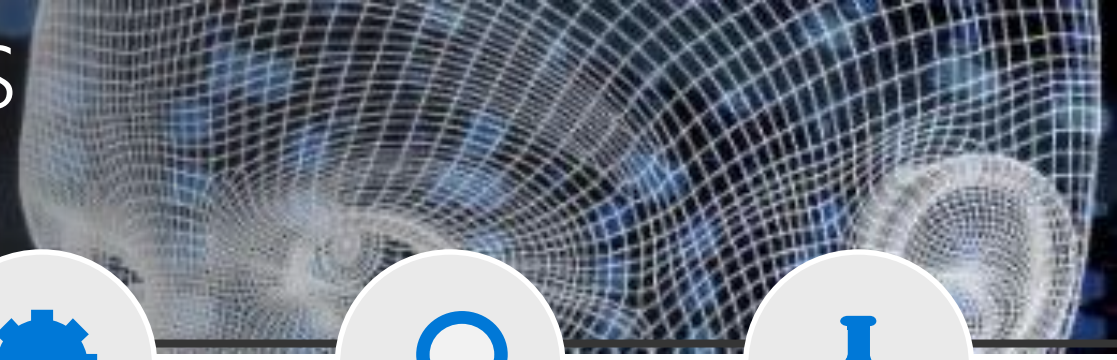
Access billions of web pages, images, videos, and news with the power of Bing APIs

Labs

An early look at emerging Cognitive Services technologies: discover, try & give feedback on new technologies before general availability

Microsoft Cognitive Services

Give your apps a human side



Vision

- Computer Vision
- Content Moderator
- Emotion
- Face
- Video
- Video Indexer
- Custom Vision Service

Speech

- Bing Speech
- Speaker Recognition
- Custom Speech Service

Language

- Bing Spell Check
- Language Understanding
- Linguistic Analysis
- Translator Text & Speech
- Web Language Model
- Text Analytics

Knowledge

- Academic Knowledge
- Entity Linking
- Knowledge Exploration
- Recommendations
- QnA Maker
- Custom Decision Service

Search

- Bing Autosuggest
- Bing Image Search
- Bing News Search
- Bing Video Search
- Bing Web Search
- Bing Custom Search

Labs

- Project Prague (gesture)
- Cuzco (events)
- Johannesburg (routing)
- Nanjing (Isochrones)
- Abu Dhabi (distance matrix)
- Wollongong (location)
- Enduring Freedom

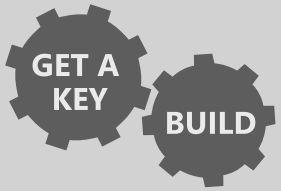
(just kidding ☺)

Why Microsoft Cognitive Services ?

Easy

Roll your own with REST APIs

Simple to add: just a few lines of code required



Flexible

Make the same API code call on iOS, Android, and Windows

Integrate into the language and platform of your choice

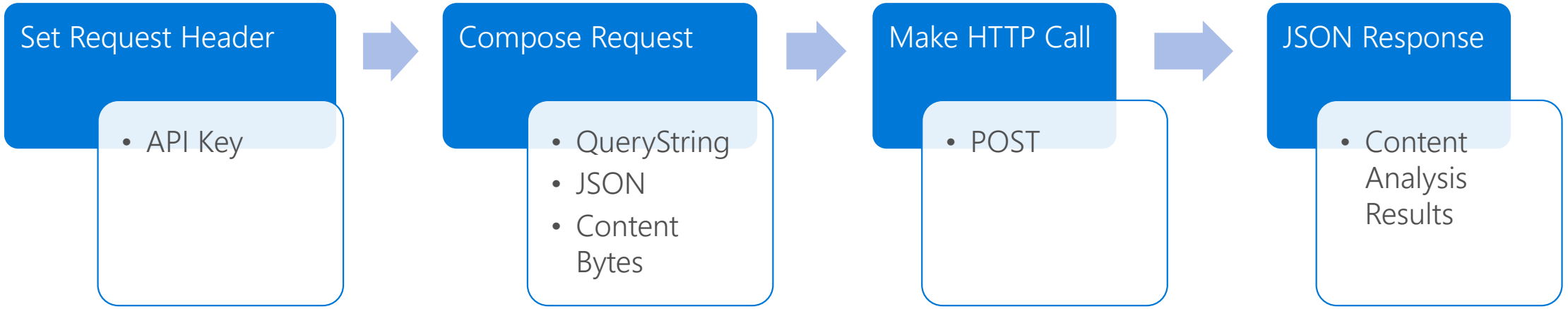
Bring your own data for your custom experience

Tested

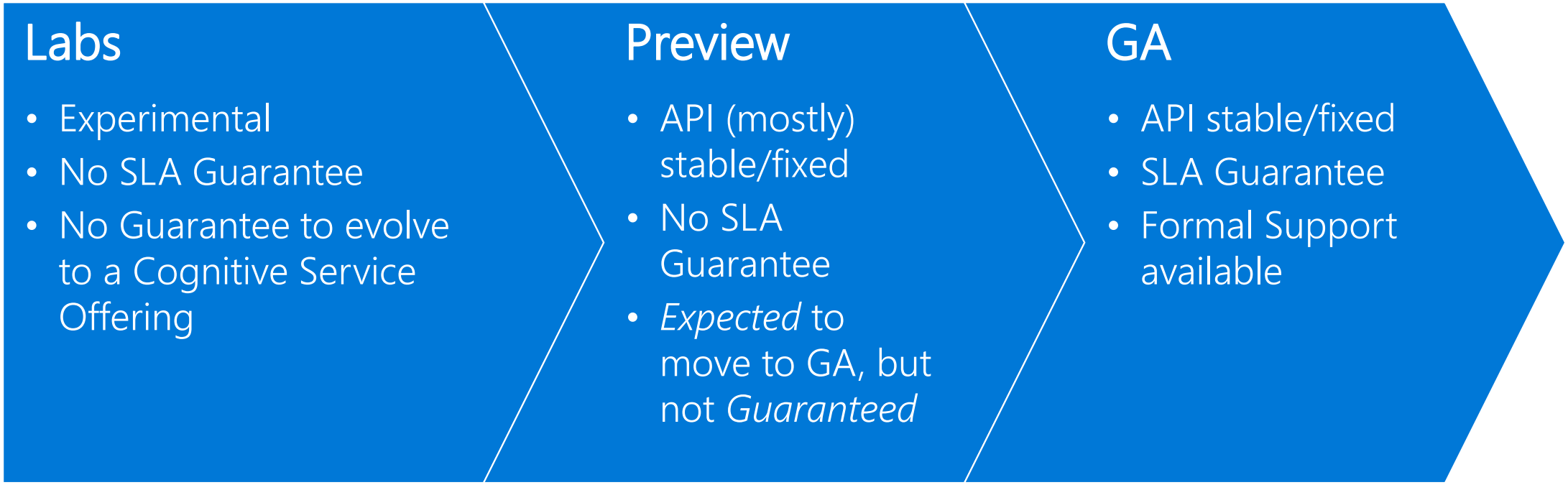
Built by experts in their field from Microsoft Research, Bing, and Azure Machine Learning

Quality documentation, sample code, and community support

Typical Interaction Paradigm



Lifecycle of a Cognitive Service Offering

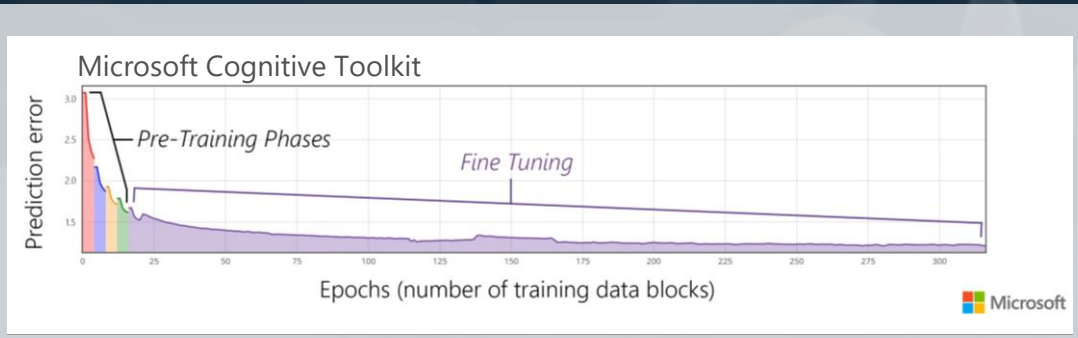


Cognitive Toolkit

https://github.com/Microsoft/CNTK
https://docs.microsoft.com/en-us/cognitive-toolkit/

Unlock deeper learning

A free, easy-to-use, open-source toolkit that trains deep learning algorithms to learn like the human brain.



Exploring Cognitive Services

http://azure.com/cognitive

IN CS, IT CAN BE HARD TO EXPLAIN THE DIFFERENCE BETWEEN THE EASY AND THE VIRTUALLY IMPOSSIBLE.