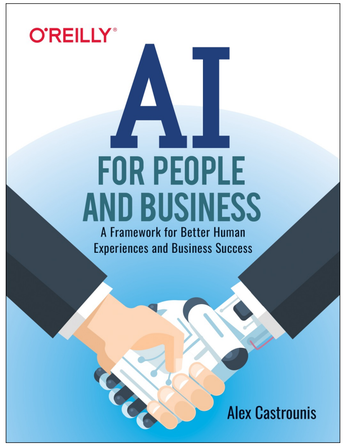
Alex Castrounis



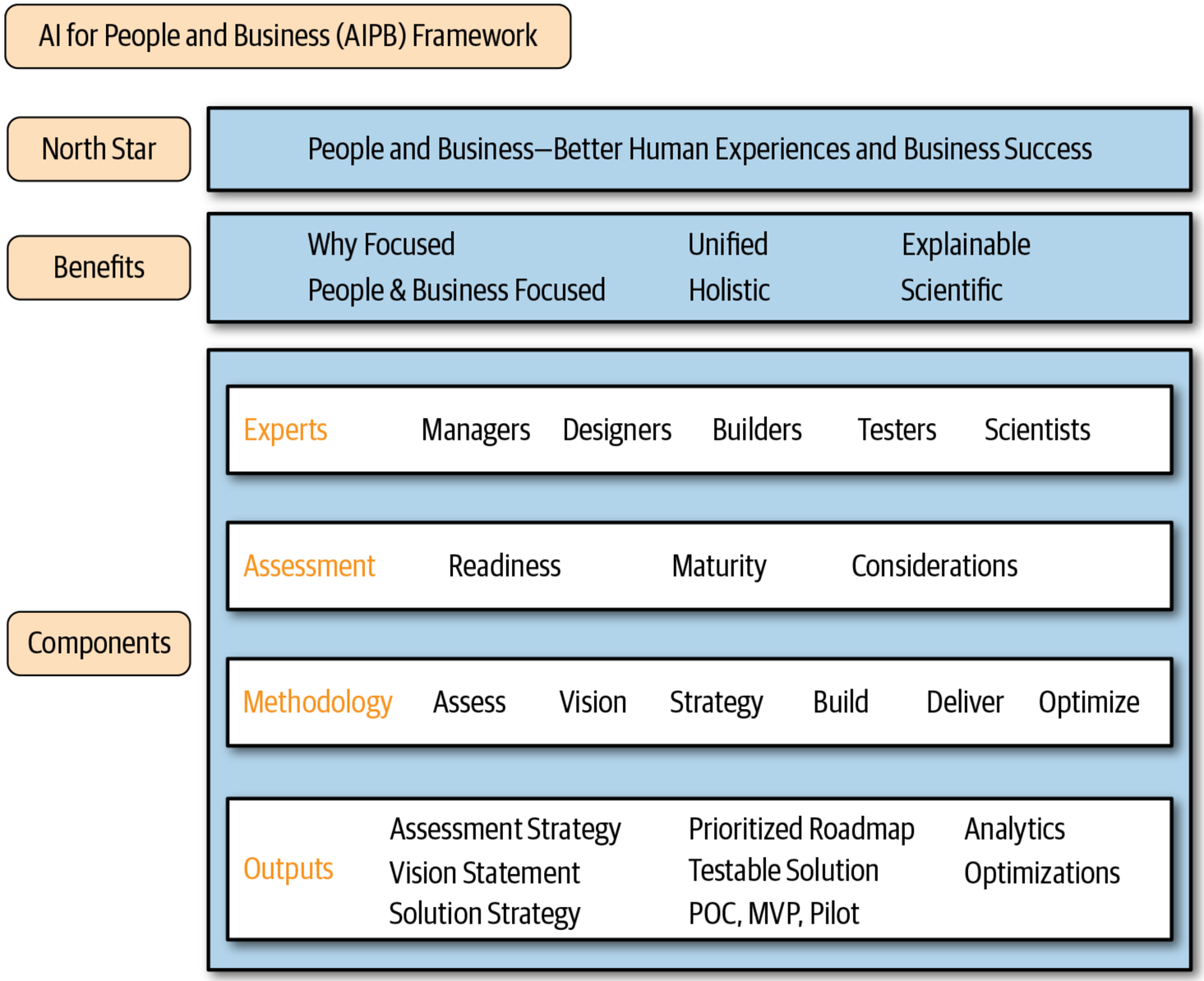
Available on Amazon!

Artificial Intelligence

An Overview of AI and Machine Learning

Why of AI®

www.whyofai.com



Why of AI®

What is AI?

Intelligence

Learning, understanding, and the application of the knowledge learned to achieve one or more goals

Artificial Intelligence

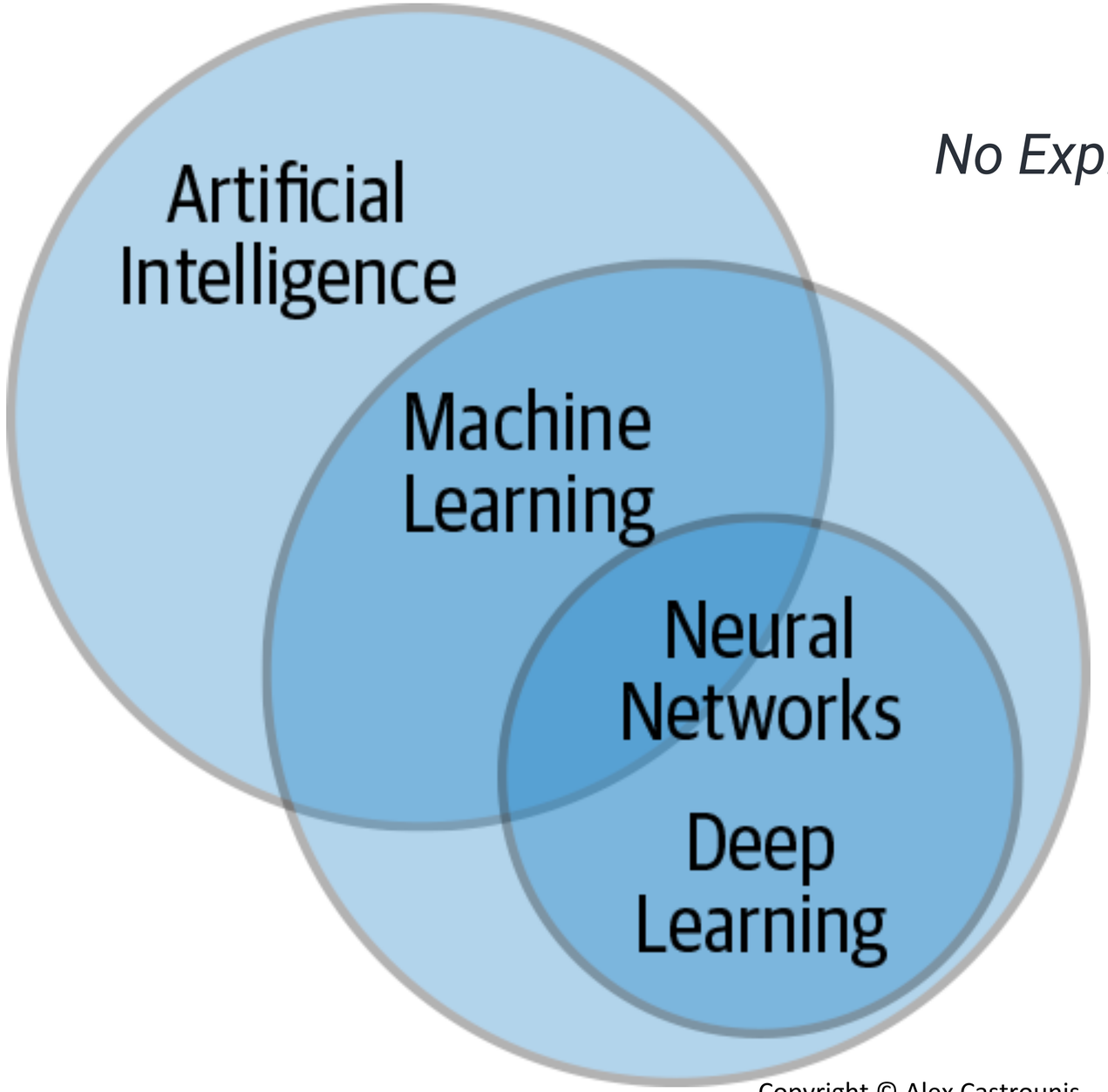
Intelligence exhibited by machines

Also known as cognitive computing

Related Fields

Neuroscience, psychology, philosophy, mathematics, statistics, computer science

Why of AI®



No Explicit Programming

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Artificial Intelligence Concepts

Cognition — *The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.* [1]

Cognitive Functions
Thinking
Attention
Awareness
Mind
Reasoning
Apprehension
Sentient
Remembering
Learning
Perception
Understanding
Comprehension
Consciousness
Sensing
Memory
Intuition
Recognition
Knowledge
Sense
Feeling

[1] *Oxford Dictionary*

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Machine Learning Definition

Non-Technical

Automatically Learn from data, and be able to improve knowledge learned from experience, without explicit programming or domain expertise.

Technical

Machine learning algorithms learn a target function that maps input variables to output variables (mapping function)

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Machine Learning Definition Cont.

Parametric

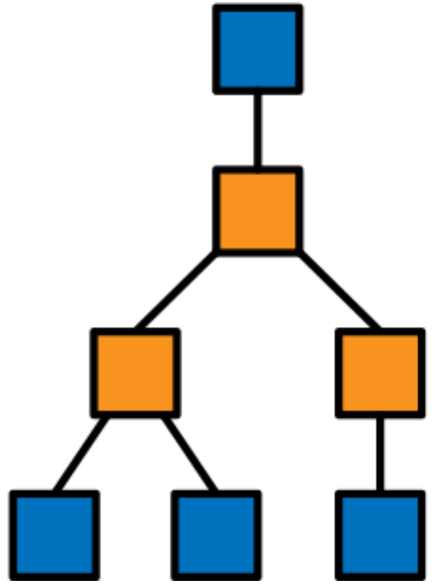
Type of optimization problem
- Assumed model form (params, functions, ...)
- Learn optimal parameters (aka coefficients)

$$Y_i = \beta_0 + \beta_1 X_i$$

Target Param 1 Param 2 Data/Feature

Non-Parametric

No assumed model form



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Data Types

Structured

Date	Open	Vol	...	Close
01/01/18	0.87	10K		1.23
01/02/18	1.23	8K		1.65

Unstructured

Image
Audio
Video
Text

Semi-structured

XML
JSON

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Machine Learning Data

Labeled

Date	Open ($)	Volume (k)	…	Close ($)
01/01/20	0.87	10.7	…	1.23
01/02/20	1.23	8.3	…	1.65

Target

Features + Target

Unlabeled

F Name	Age	Email	…	Zip
Sarah	28	s@…	…	99999
Joe	42	j@…	…	88888

Features Only

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Machine Learning Types

Supervised [Labeled]

Unsupervised [Unlabeled]

Semi-supervised [Both]

Self-supervised [Unlabeled]

Reinforcement

Transfer

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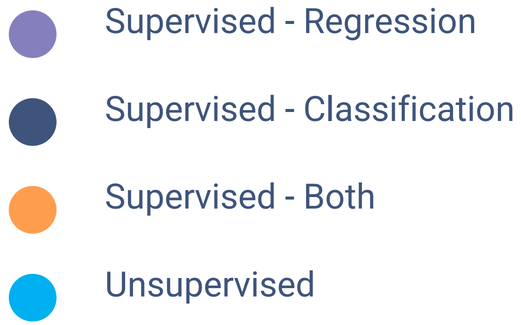
Algorithms



Simple and Multiple Linear Regression

Random Forests

K-Means

Principle Component Analysis (PCA)

Naïve Bayes

Neural Networks

K Nearest Neighbors (KNN)

Hidden Markov Models

Support Vector Machines (SVM)

Decision Trees

Logistic Regression

ExtraTrees

Gaussian Mixture Model

Generalized Linear/Additive Models (GLM/GAM)

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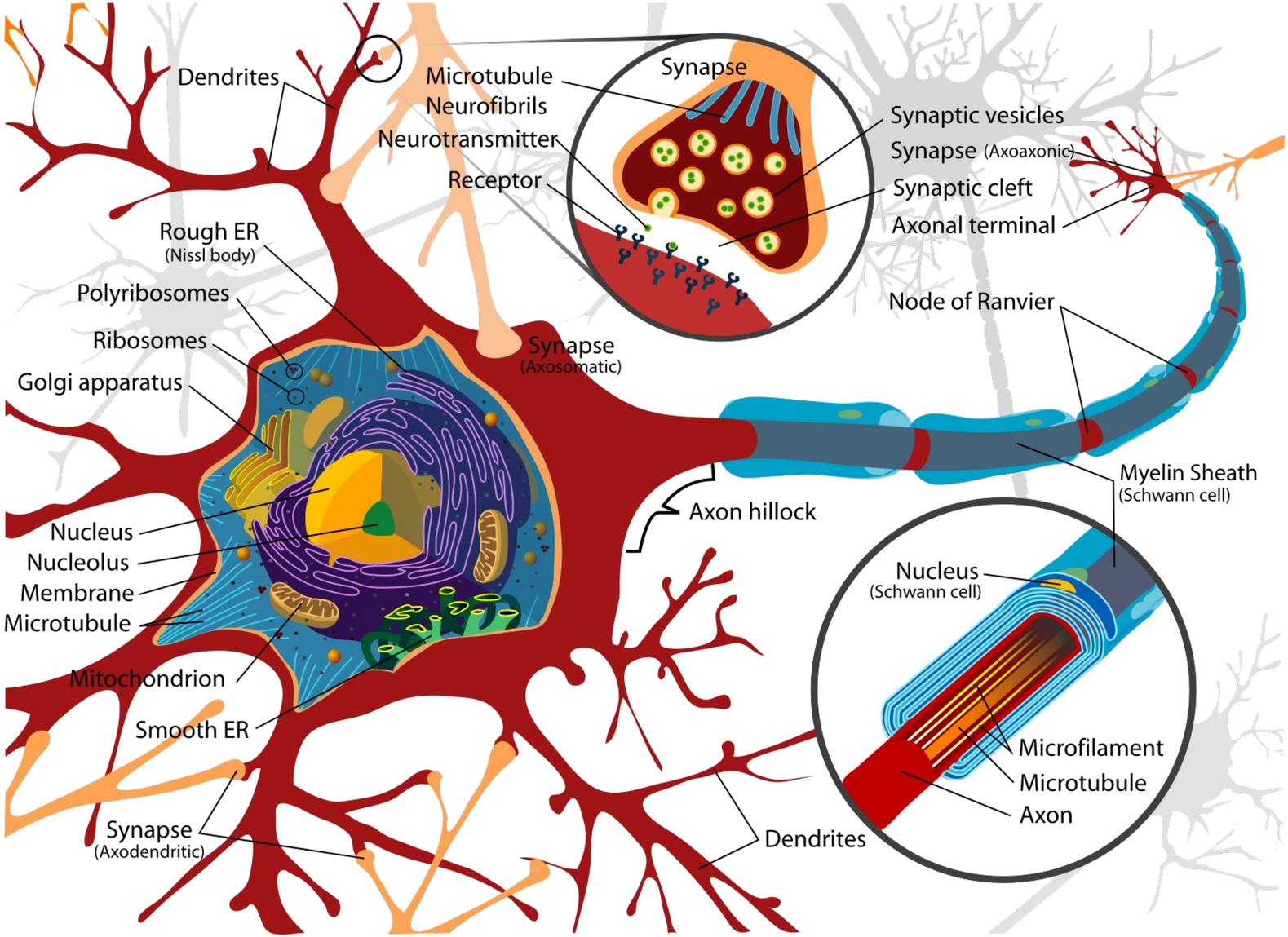

LadyofHats, "Complete neuron cell diagram en.svg," https://commons.wikimedia.org/wiki/File:Complete_neuron_cell_diagram_en.svg

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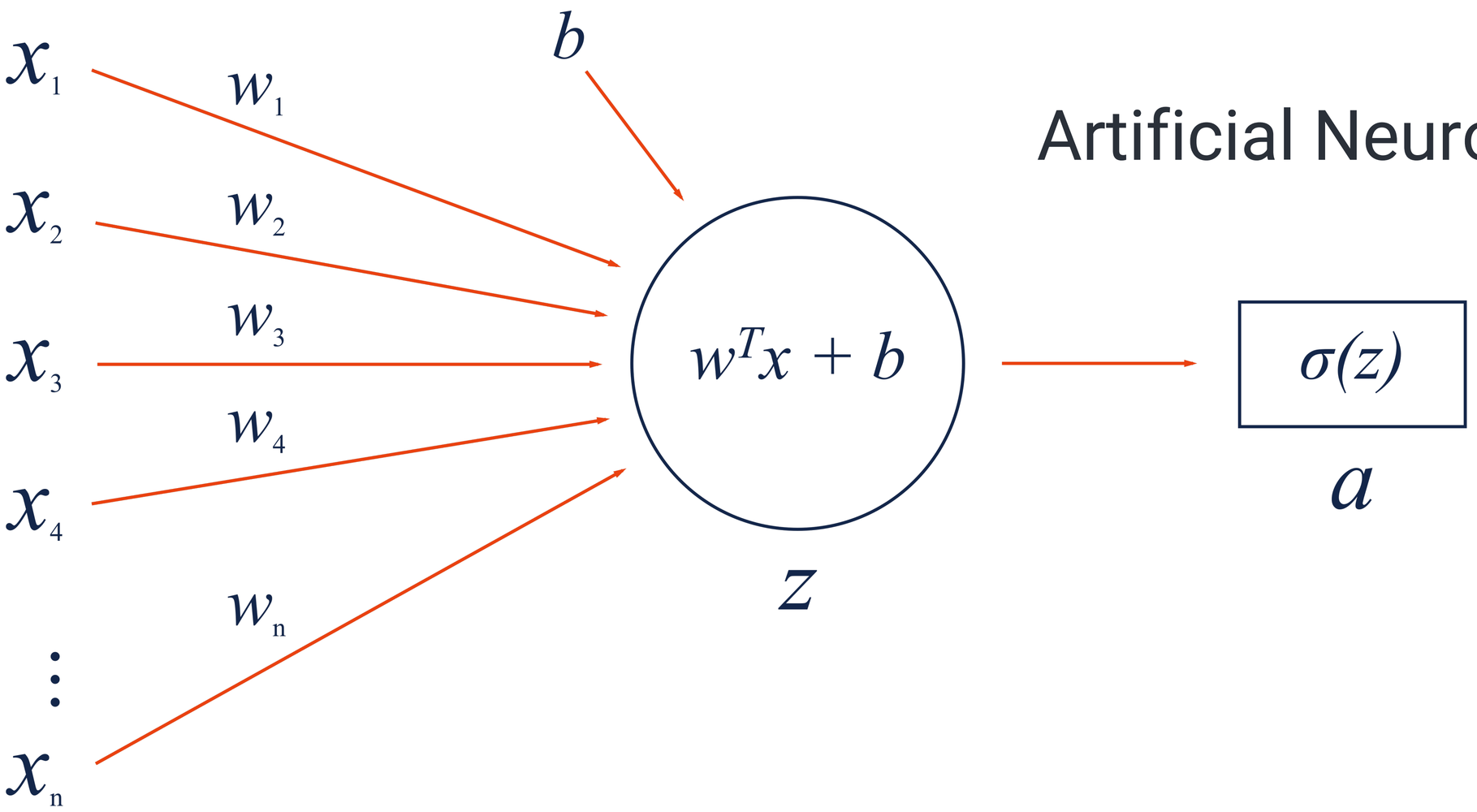
Artificial Neurons



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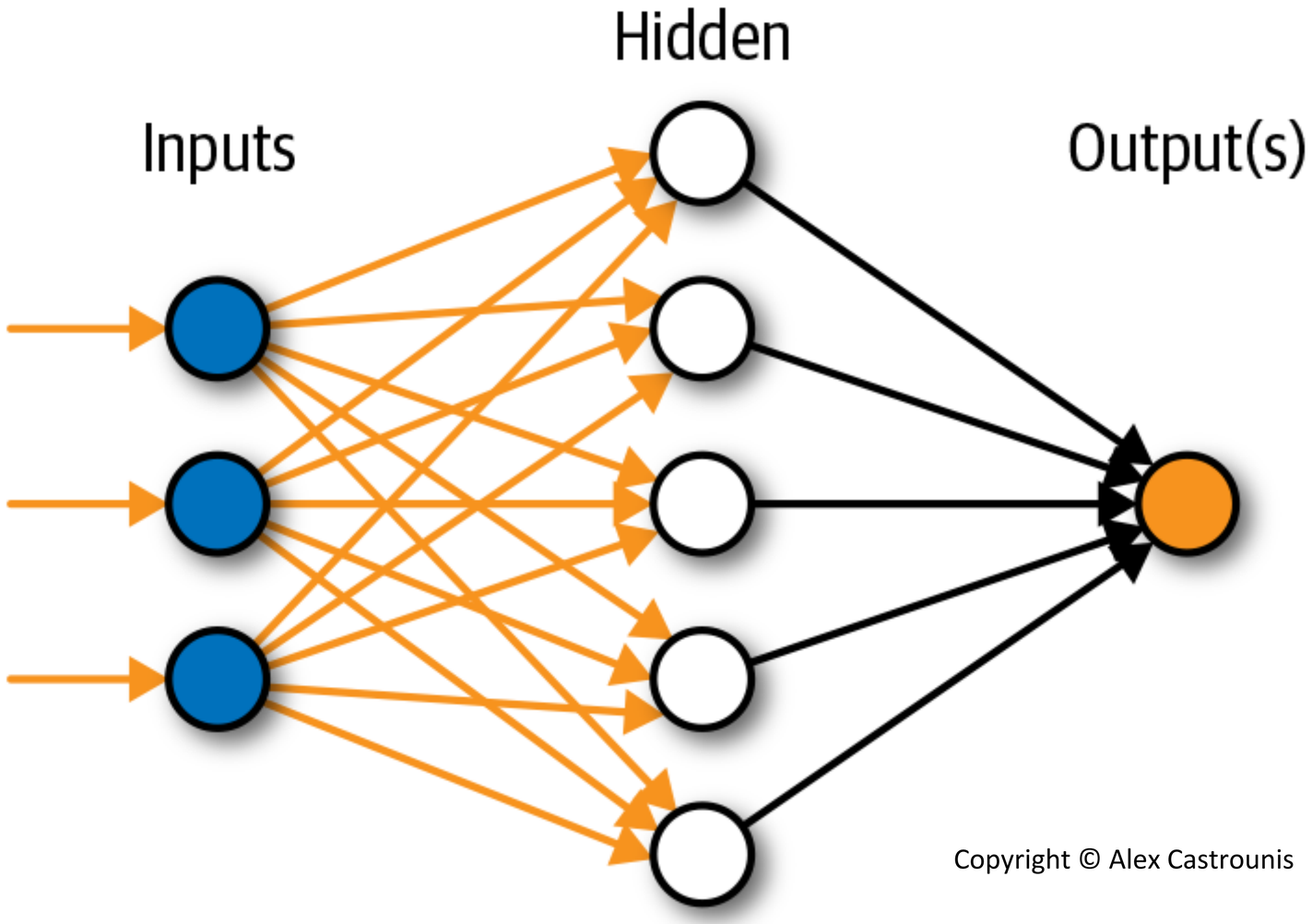
Artificial Neural Network



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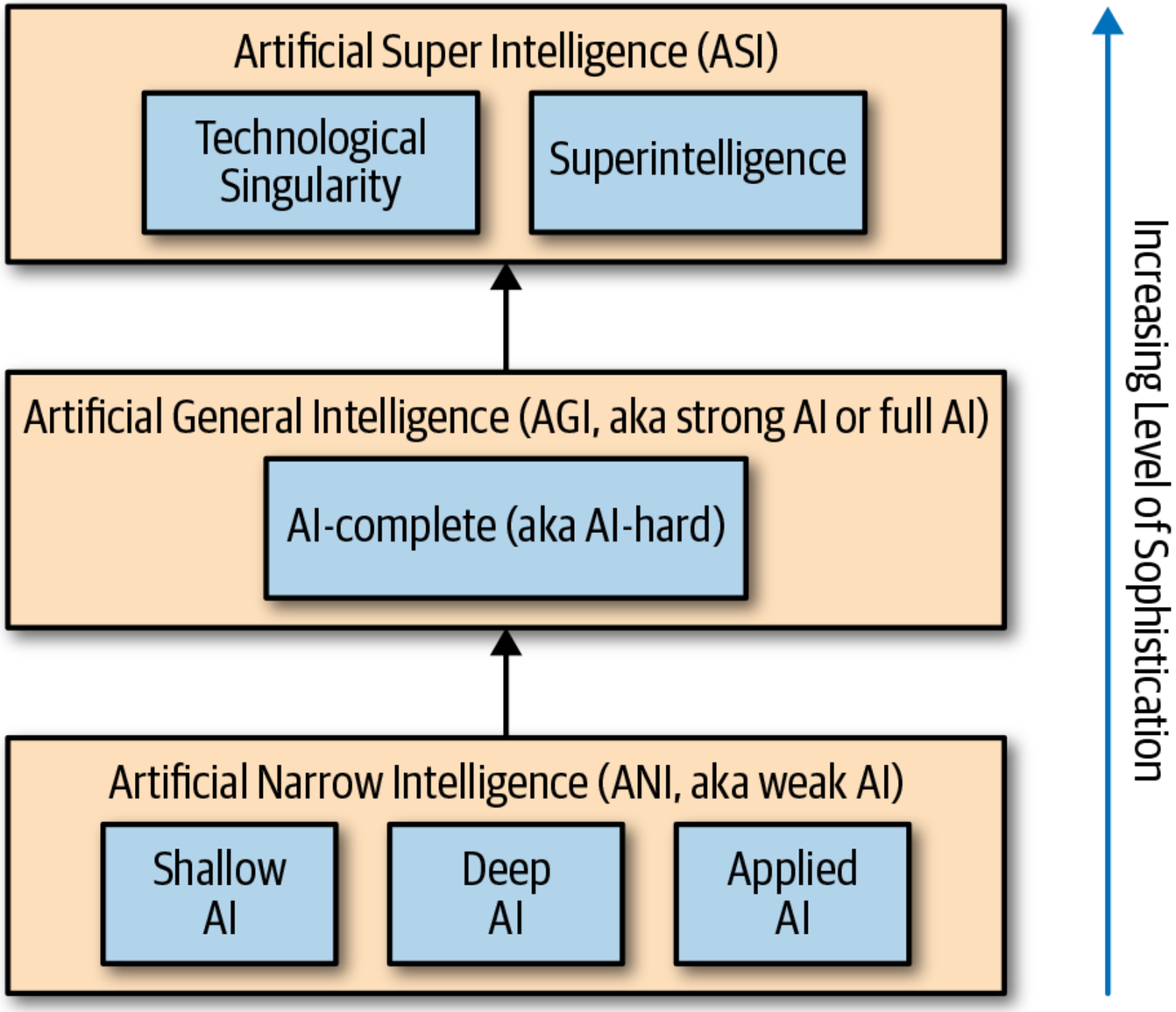
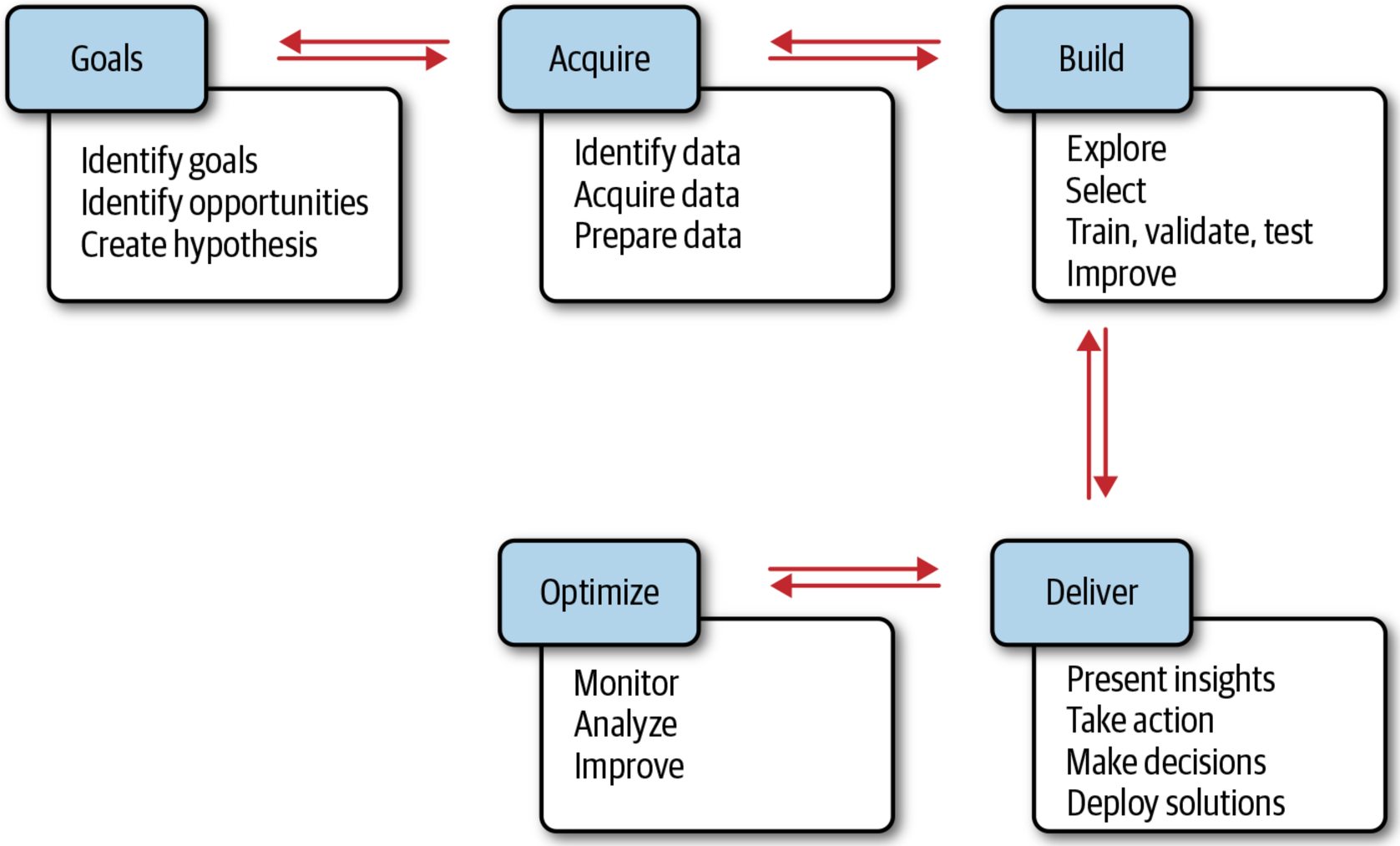
AI Categories and Relationships



GABDO AI Process Model



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Why of AI®

Tradeoffs and Considerations

Model
- Overfitting vs underfitting (bias/variance)
- Performance vs interpretability/explainability (black box)
- Complexity vs simplicity (parsimony)

Data and features
- Representative and balanced
- Adequate quantity, depth, and completeness
- Intractability (data, algorithm, feature engineering)

(non-exhaustive)

Performance
- Error tradeoffs

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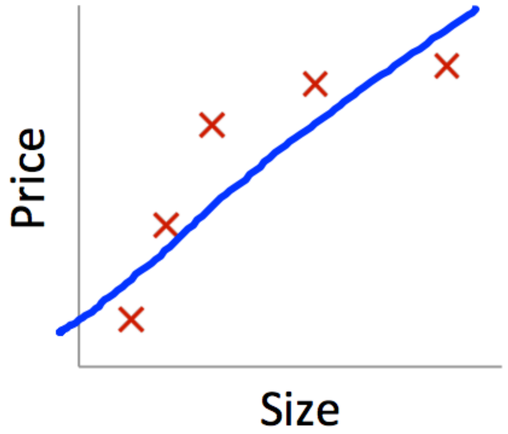
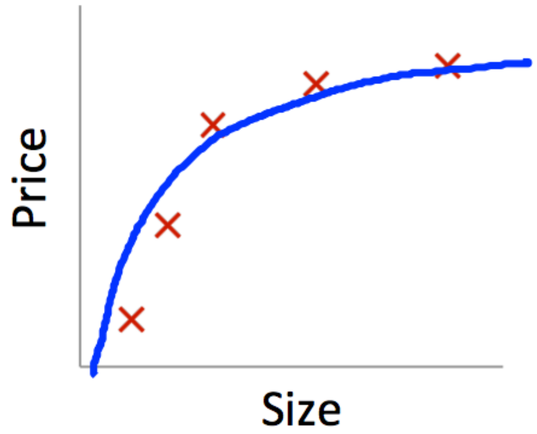
Overfitting vs Underfitting



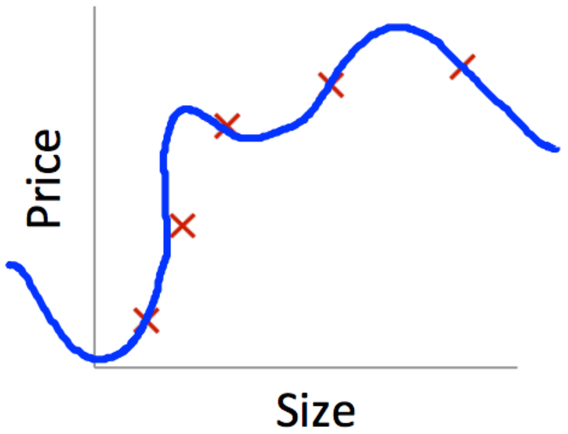
$\theta_0 + \theta_1 x$

High bias
(underfit)



$\theta_0 + \theta_1 x + \theta_2 x^2$

"Just right"



$\theta_0 + \theta_1 x + \theta_2 x^2 + \theta_3 x^3 + \theta_4 x^4$

High variance
(overfit)

Image Credit: Andrew Ng's Coursera Machine Learning course

Why of AI®

Summary and Next Steps

- Artificial intelligence and machine learning are
  - Incredibly powerful fields that can drive innovation and the creation of amazing new products and services
  - Fields that can benefit both businesses and customers alike
  - Going to become more ubiquitous and important over time
  - Important to understand, even if at a high level only
- Continue learning about AI
  - Artificial Intelligence: AI For Business
  - Artificial Intelligence: Real-World Applications

Why of AI®

Thank You!

youtube.com/whyofai

whyofai.com/newsletter

Available on Amazon