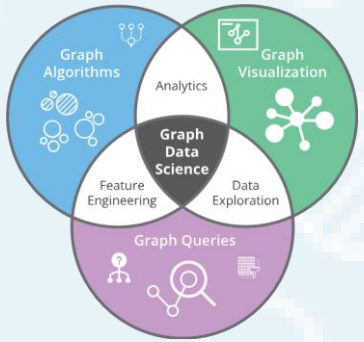

Habib University
shaping futures

CS343 Graph Data Science

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Graph Algorithms to Enhance Machine Learning

Chapter #8, Graph Algorithms, Mark

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Slides are intended to be filled during the lectures. Certain details are intentionally omitted for in-class discussions. These slides are not meant to be used as reading material.

Machine Learning

- Machine learning is a branch of artificial intelligence that enables computers to learn from data without being explicitly programmed
- Machine learning algorithms use mathematical methods to find patterns and make predictions or classifications based on data

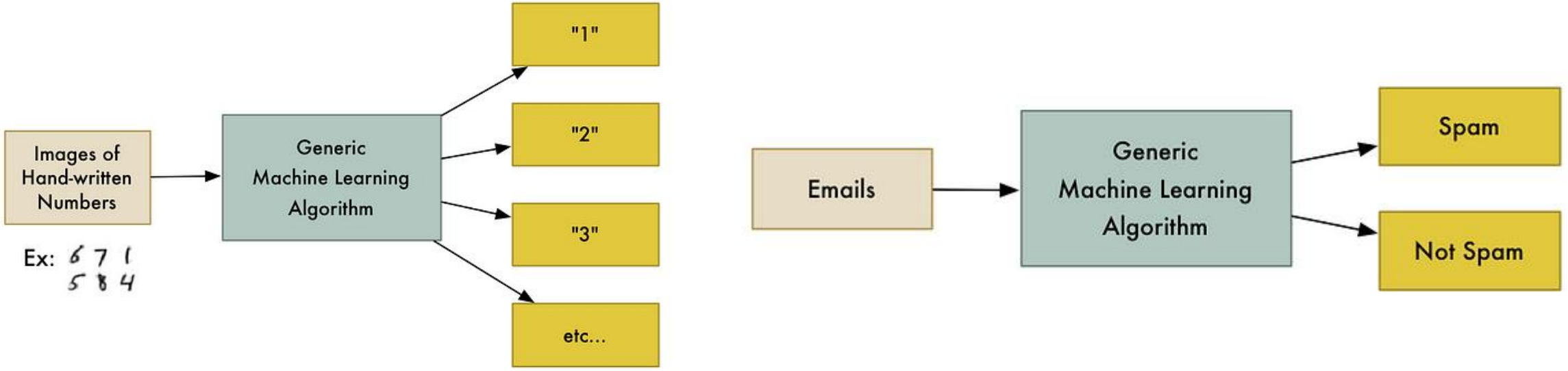
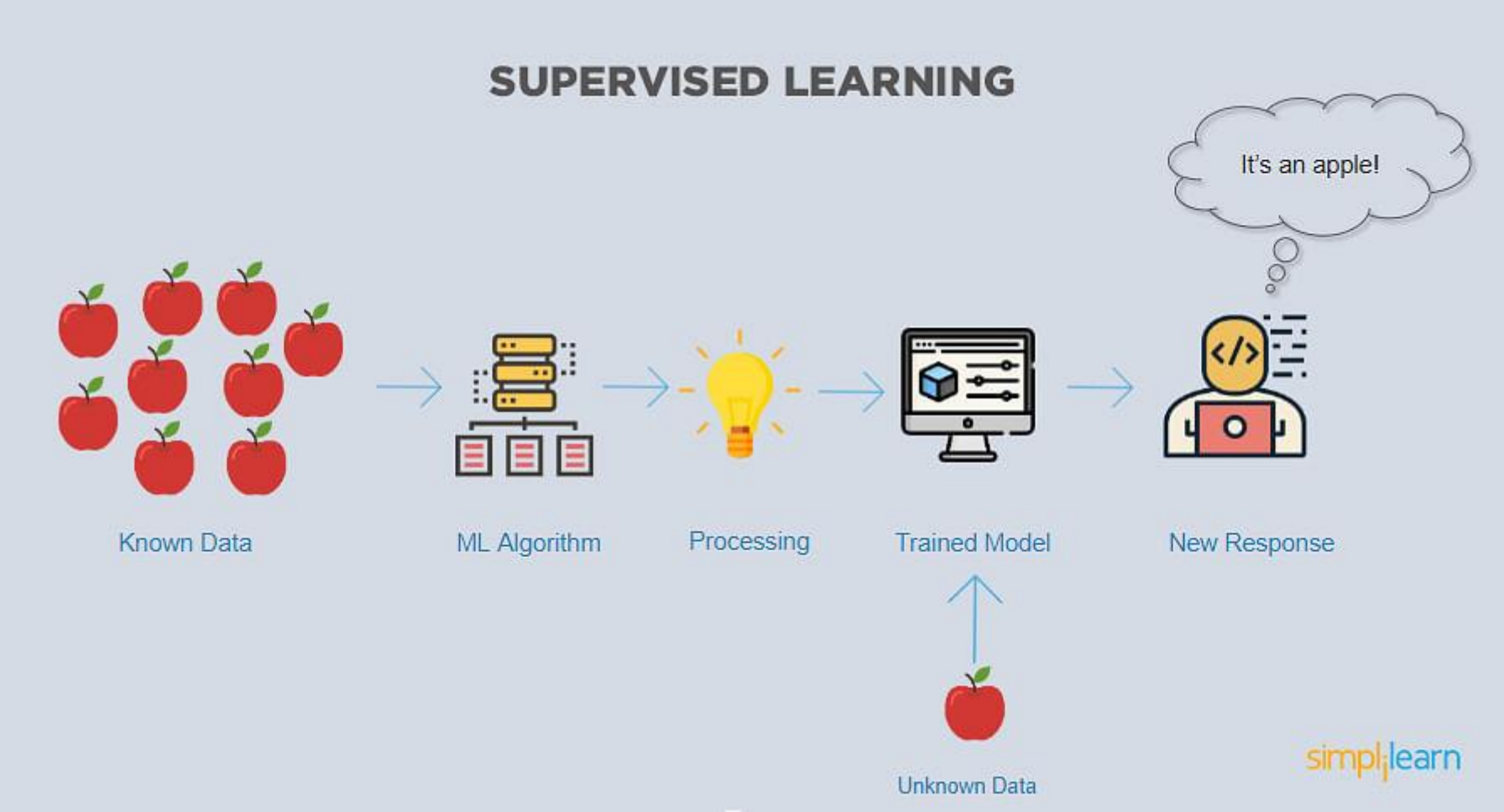


Image Credit: Adam Geitgey

Types of Machine Learning

- Supervised
- Unsupervised
- Reinforcement

Supervised Learning



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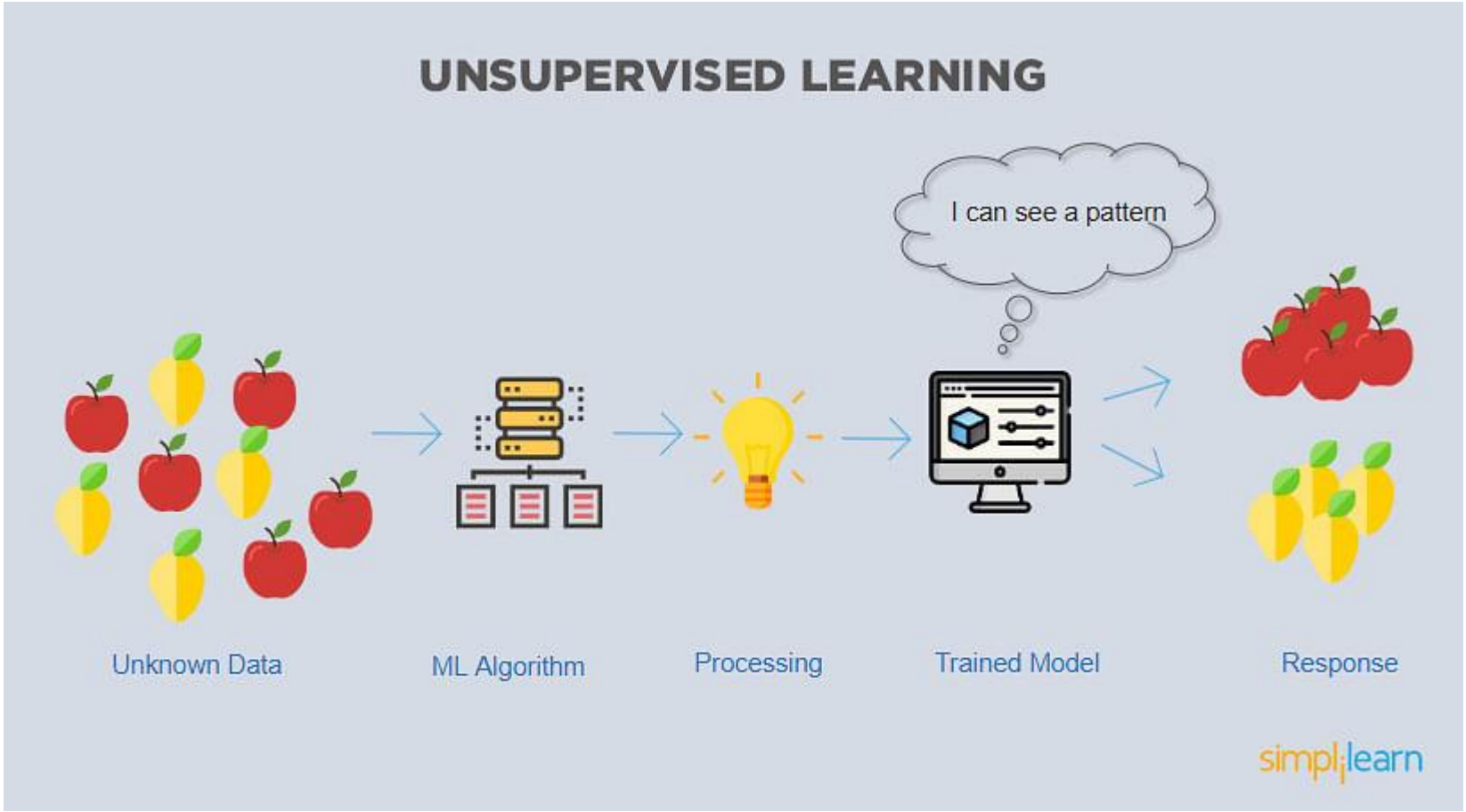
Unsupervised Learning



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Reinforcement Learning

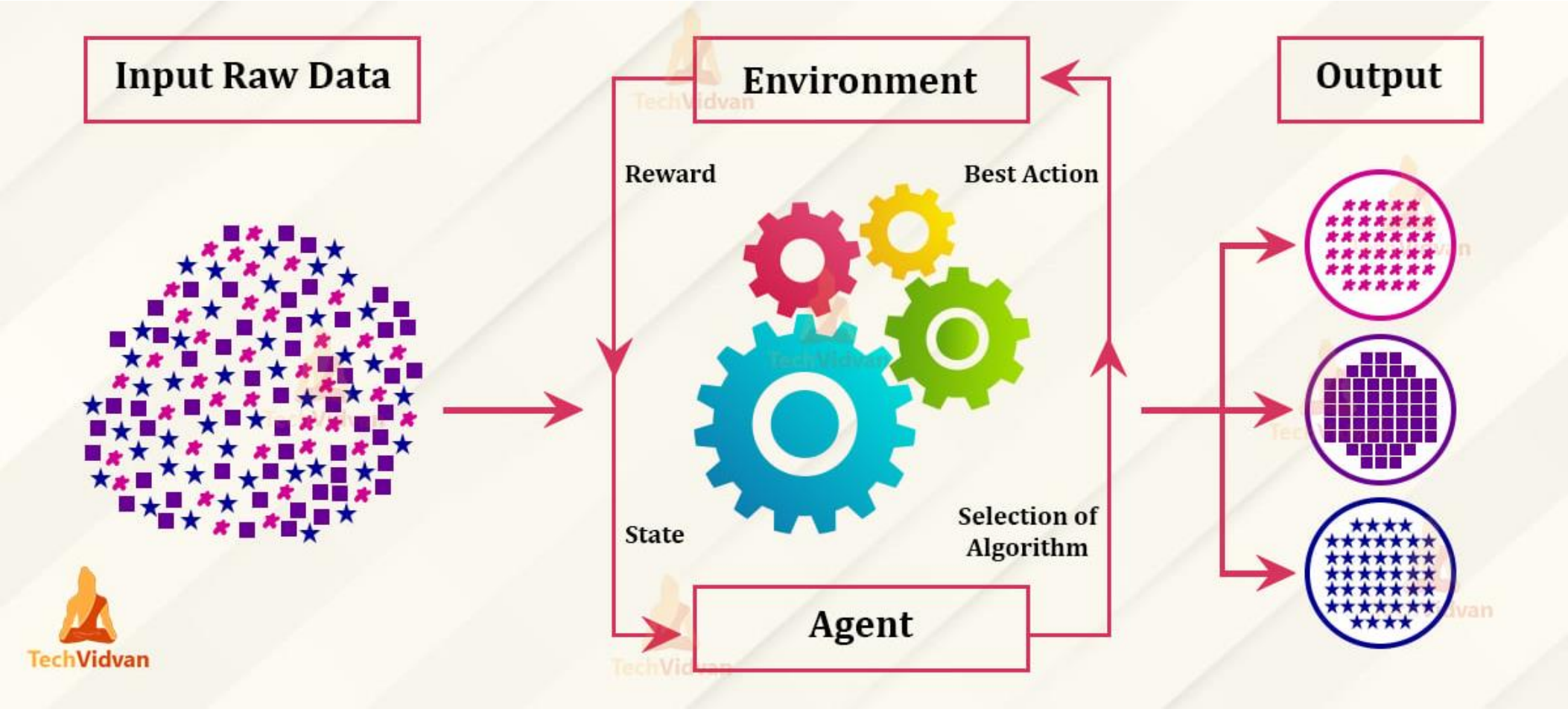

Image Credit: Tech Vidan

Machine Learning Pipeline

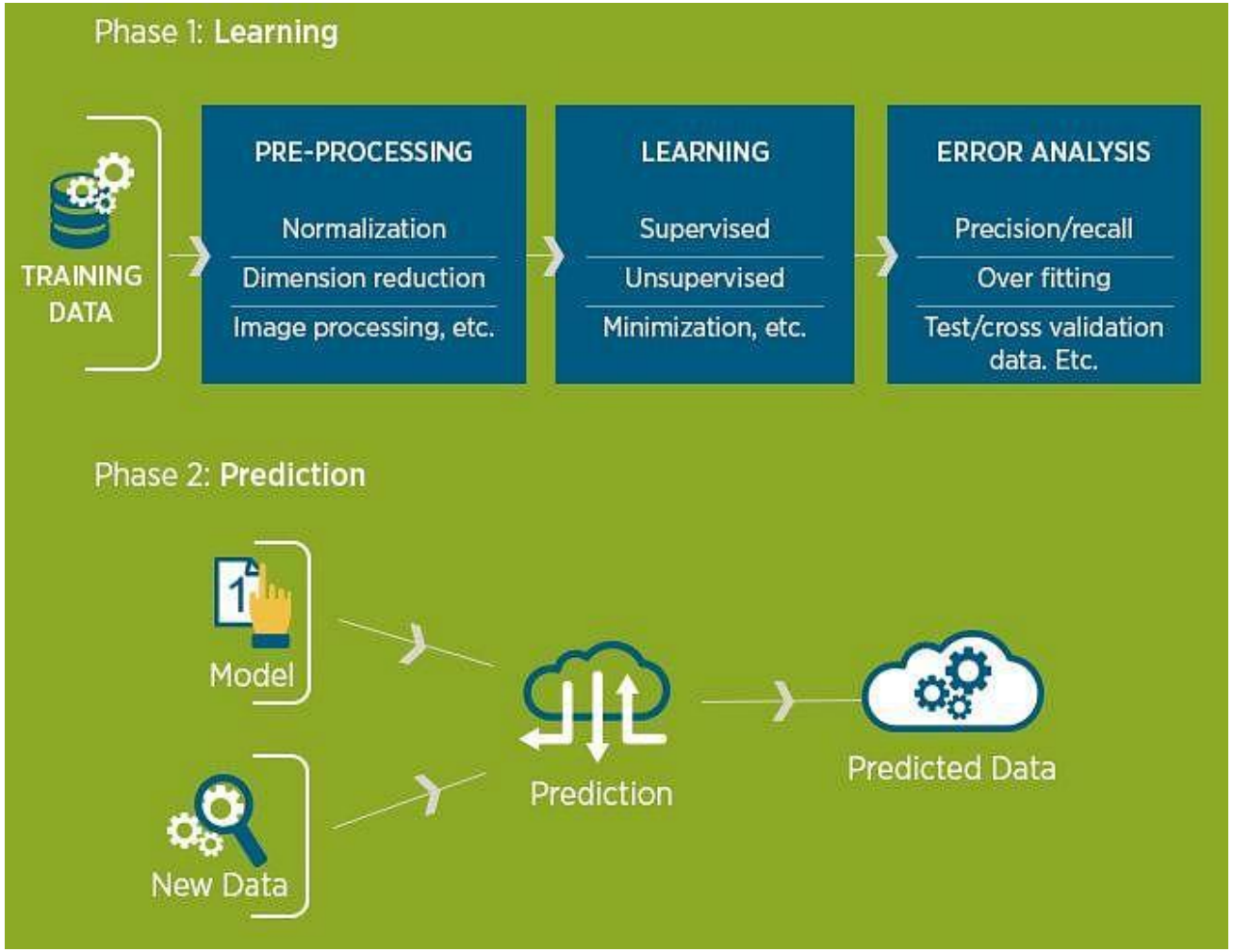

Image Credit: Simple Learn

Feature Extraction

- Transforming raw data into a format that is suitable for analysis and model building.
- Simplifies complex data by extracting meaningful patterns.
- Reduces dimensionality, making the data more manageable and improving computational efficiency.
- Enhances model performance by focusing on important characteristics of the data.

- **Feature selection** is the process of determining the subset of extracted features that are most important or influential to a target goal.
  - Selects the most relevant features based on criteria such as correlation, significance, or importance scores.

Connected Features

- Features extracted from the structure of the data.
- Graph-local queries based on parts of the graph surrounding a node
- Graph-global queries that use graph algorithms to identify predictive elements

- Graph for feature selection?
  - What if map features to nodes in a graph, create relationships based on similar features, and then compute the centrality of features.
  - K. Henni, N. Mezghani, C. Gouin-Vallerand, Unsupervised graph-based feature selection via subspace and pagerank centrality, Expert Systems with Applications, Volume 114, 2018,