Technology Science Information Networks Computing

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New Media Product Design and Development

Lecture 4. Development in AI

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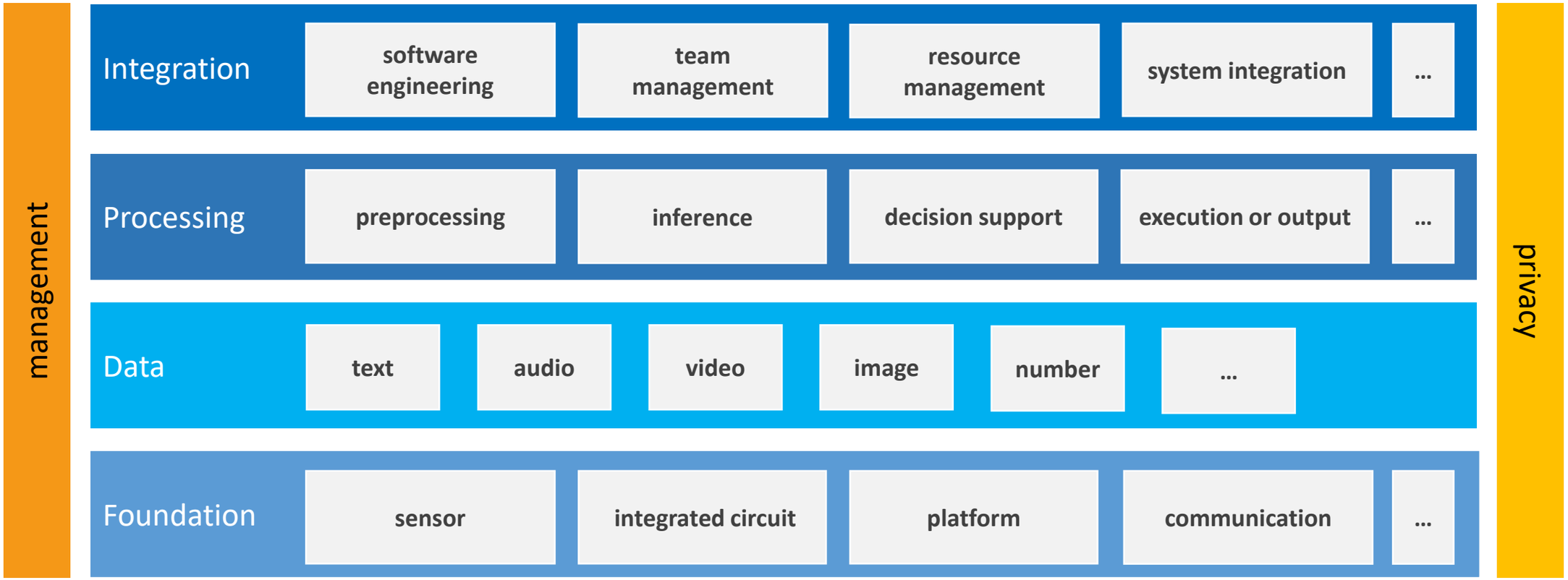
Part 02

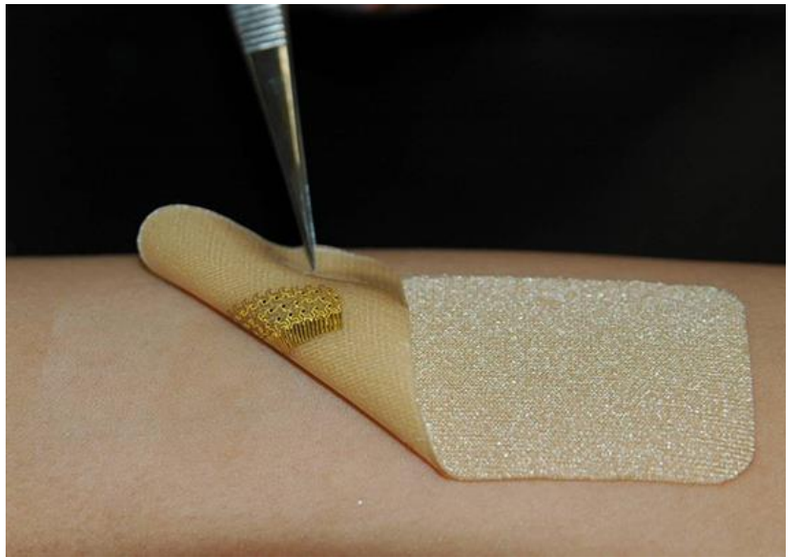
Technologies you must know in AI

AI product system



Foundation 1

Sensor



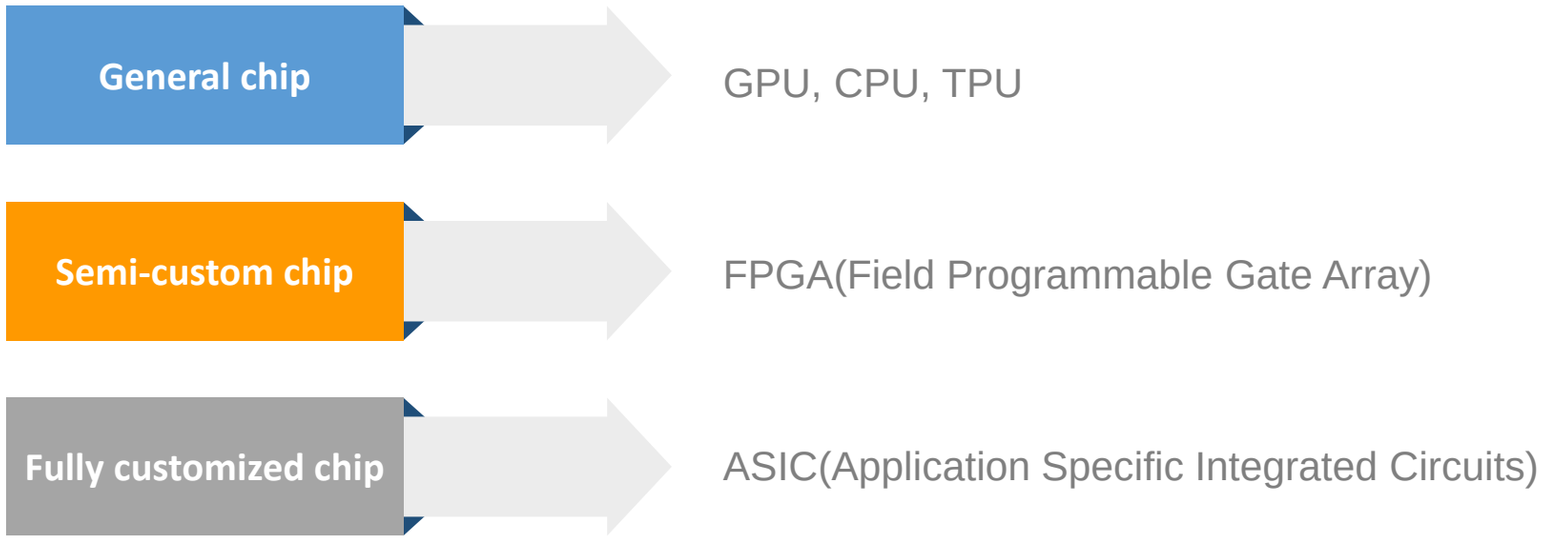
Good Application: Biosensor

Bad Application: Camera-sensor

pressure sensor, humidity sensor, temperature sensor, PH sensor, flow sensor, liquid level sensor, ultrasonic sensor, immersion sensor, illumination sensor, acceleration sensor, displacement sensor, weighing sensor, distance sensor,…

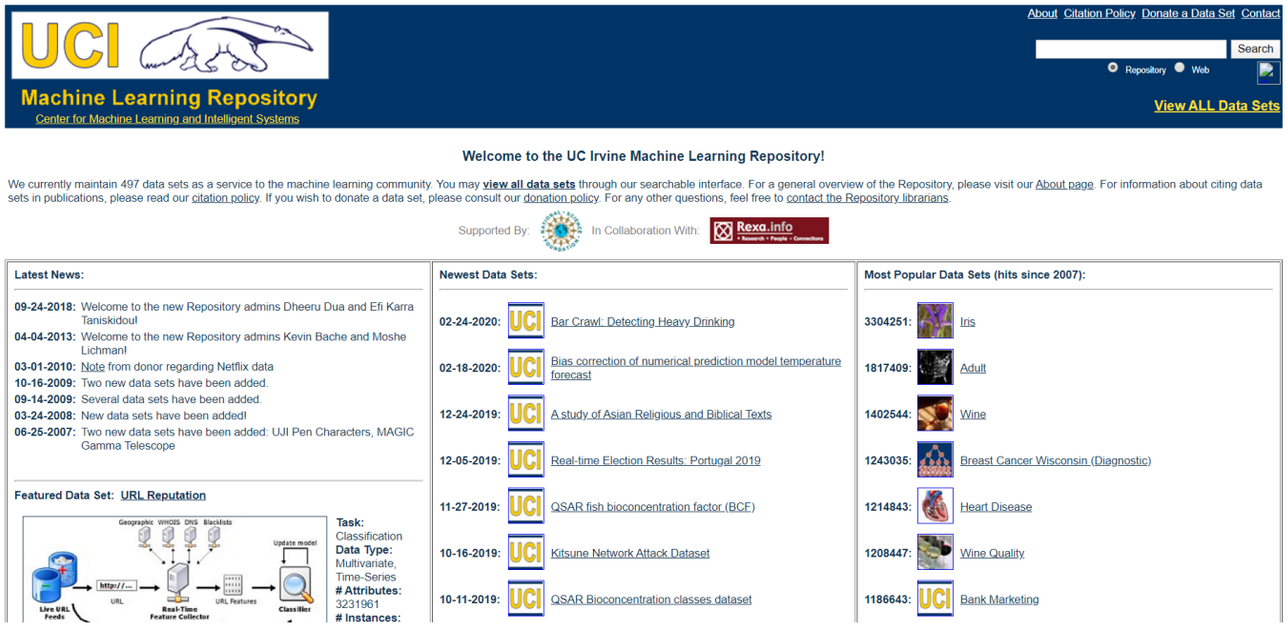
Foundation 2

Integrated circuit

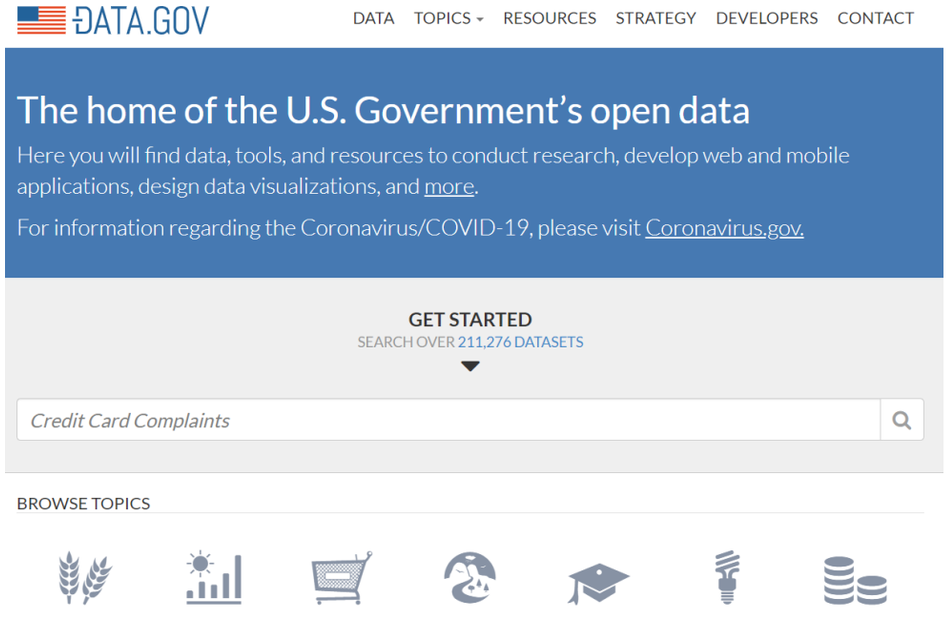


Foundation 3

Data platform



http://archive.ics.uci.edu/ml/index.php

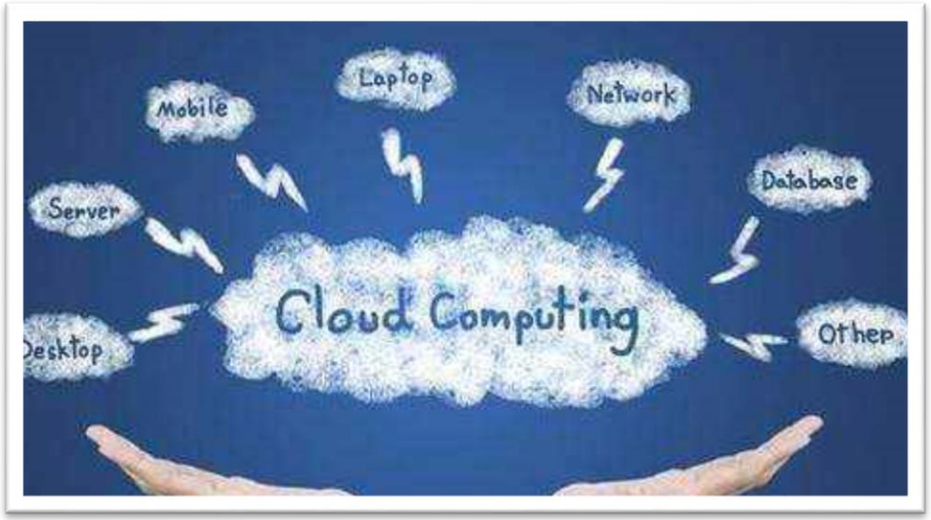


https://www.data.gov/

Foundation 4

Computing platforms

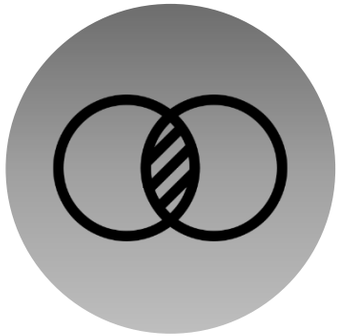
Cloud Computing



Supercomputing
(also, HPC, High Performance Computing)

Data

Data quality



Relevancy

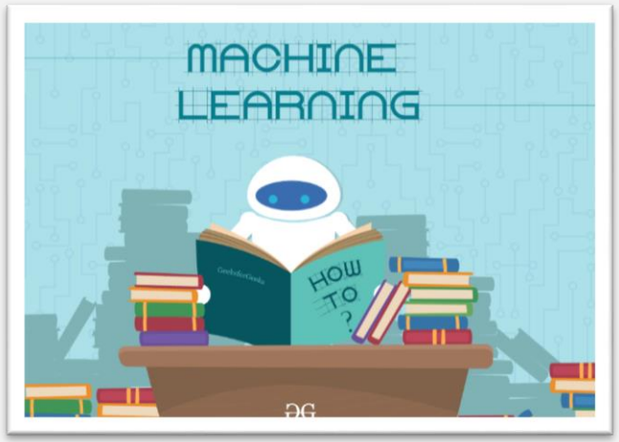
Reliability

Range

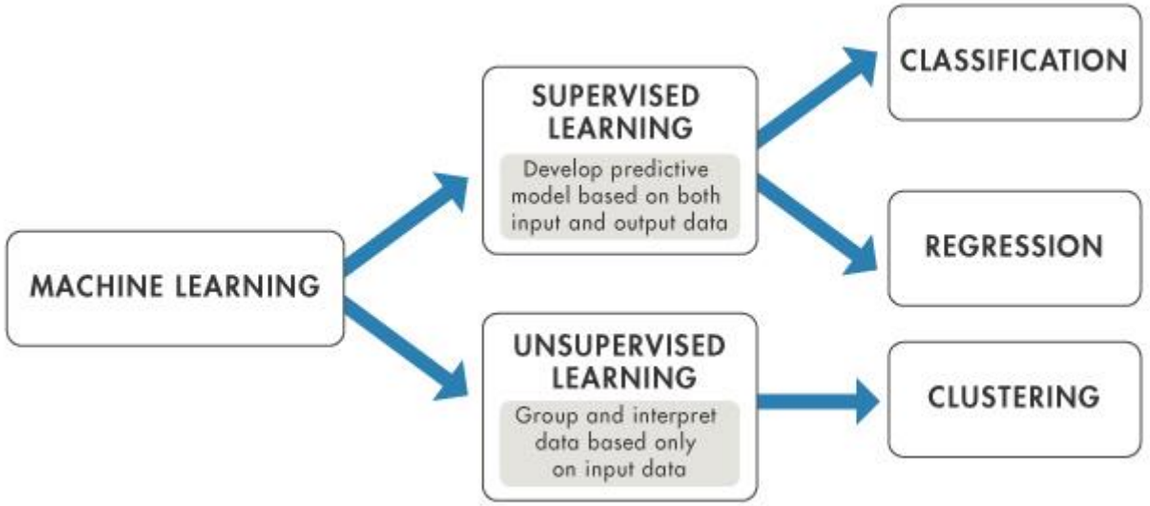
Recency

Processing

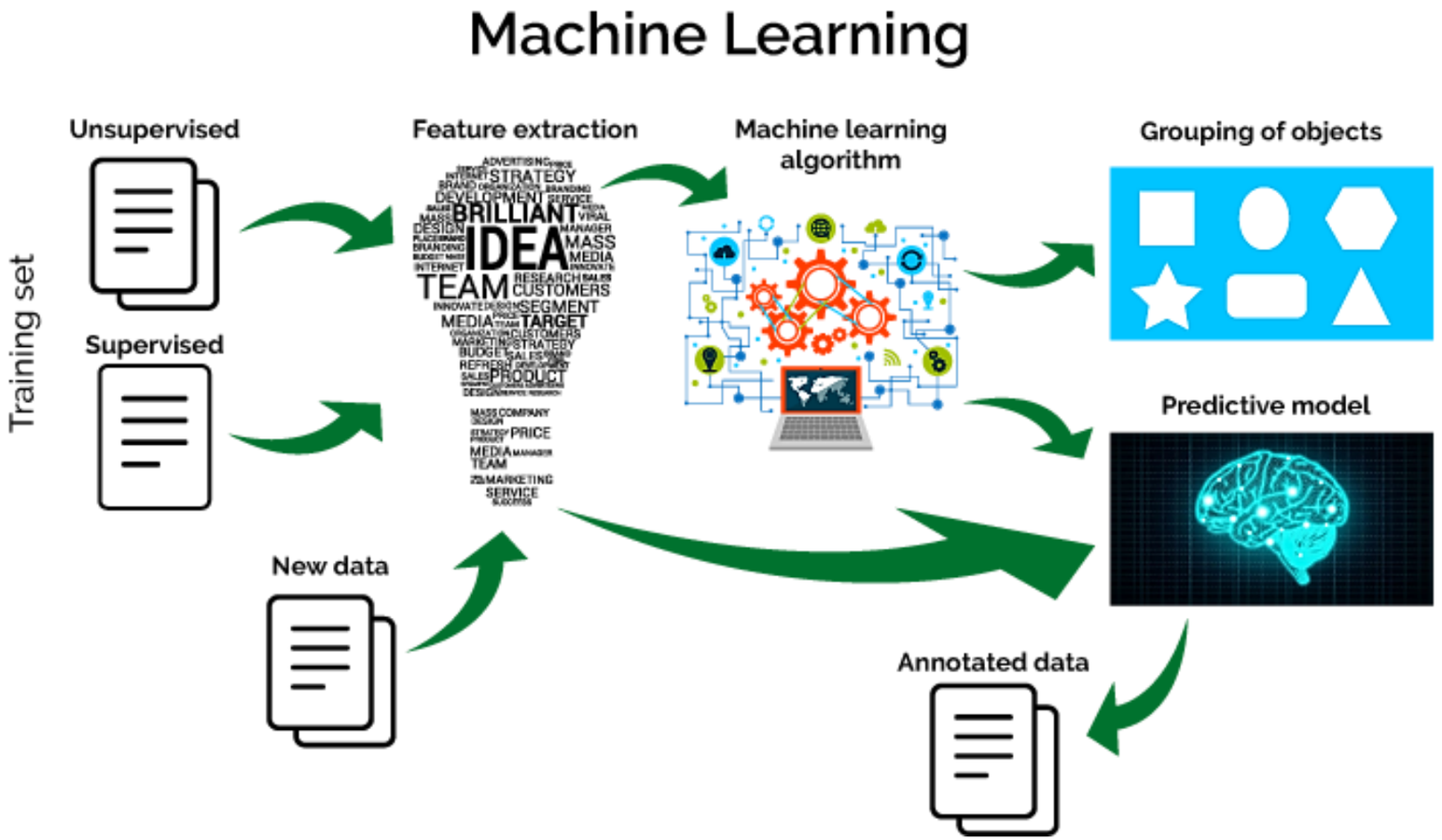
Machine Learning



> Machine learning (ML) is the study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop conventional algorithms to perform the needed tasks.
>
> *--Wikipedia*



Data processing in ML



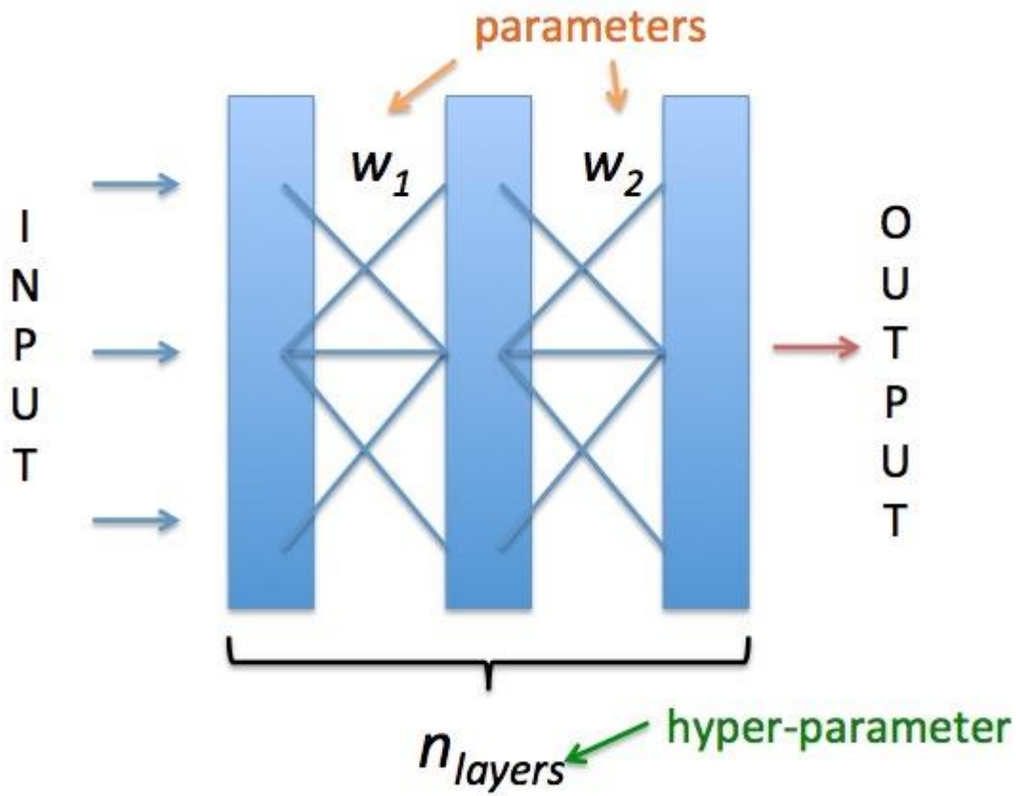
Principle of ML

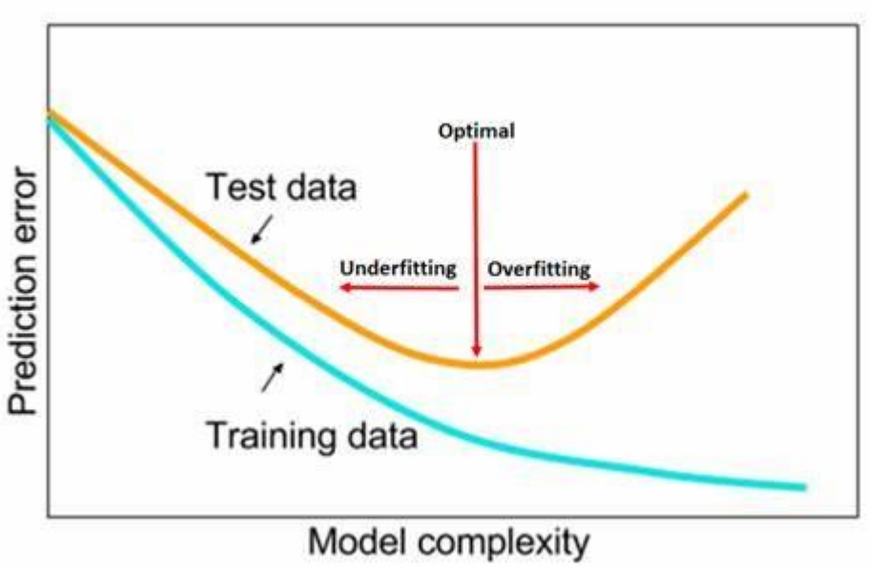
Step 1: Training

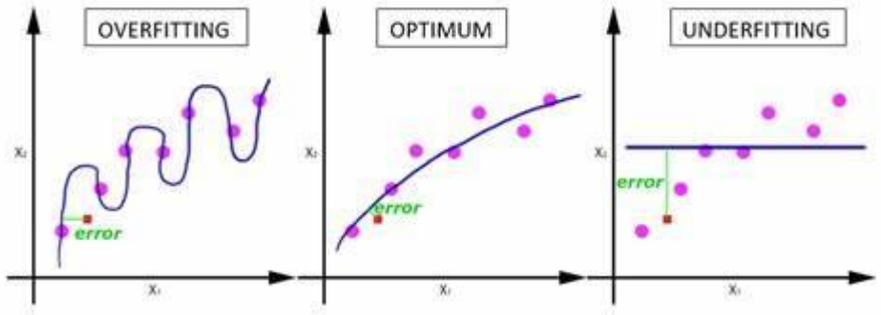
Know: Input and Output, Unknown: Parameters

Step 2: Prediction

Know: Input and Parameters, Unknown: Output







ML algorithms a product manager must know 1

监督学习类

(1) 人工神经网络（Artificial Neural Network）类：

- **反向传播（Backpropagation）**
- **多层感知器（Multilayer Perceptron）**
- **卷积神经网络（Convolutional Neural Network）**
- 自动编码器（Autoencoder）
- 玻尔兹曼机（Boltzmann Machine）
- Hopfield 网络（Hopfield Network）
- 径向基函数网络（Radial Basis Function Network，RBFN）
- 受限玻尔兹曼机（Restricted Boltzmann Machine）
- 回归神经网络（Recurrent Neural Network，RNN）
- 自组织映射（Selforganizing Map，SOM）
- 尖峰神经网络（Spiking Neural Network）

(2) 贝叶斯（Bayesian）类：

- **朴素贝叶斯（Naive Bayes）**
- **贝叶斯网络（Bayesian Network，BN）**
- 高斯贝叶斯（Gaussian Naive Bayes）
- 多项朴素贝叶斯（Multinomial Naive Bayes）
- 平均一依赖性评估（Averaged One-Dependence Estimators，AODE）
- 贝叶斯信念网络（Bayesian Belief Network，BBN）

(3) 决策树（Decision Tree）类：

- **分类和回归树（Classification and Regression Tree，CART）**
- **随机森林（Random Forest）**
- **C4.5算法（C4.5 Algorithm）**
- C5.0 算法（C5.0 Algorithm）
- 迭代Dichotomiser 3（Iterative Dichotomiser 3，ID3）
- 卡方自动交互检测（Chi-squared
- Automatic Interaction Detection，CHAID）
- 决策残端（Decision Stump）
- ID3算法（ID3 Algorithm）
- SLIQ（Supervised Learning in Quest）

(4) 线性分类器（Linear Classifier）类：

- **Fisher 的线性判别（Fisher’s Linear Discriminant）**
- **线性回归（Linear Regression）**
- **朴素贝叶斯分类器（Naive Bayes Classifier）**
- **感知（Perception）**
- **支持向量机（Support Vector Machine）**
- 逻辑回归（Logistic Regression）
- 多项逻辑回归（Multinomial Logistic Regression）

ML algorithms a product manager must know 2

无监督学习类

(1) 人工神经网络（Artificial Neural Network）类：

- 生成对抗网络（Generative Adversarial Networks，GAN）
- **前馈神经网络（Feedforward Neural Network)**
- 逻辑学习机（Logic Learning Machine）
- 自组织映射（Self-organizing Map）

(2) 关联规则学习（Association Rule Learning）类：

- **先验算法（Apriori Algorithm)**
- Eclat算法（Eclat Algorithm）
- **FP-Growth算法**

(3) 分层聚类（Hierarchical Clustering）：

- 单连锁聚类（Single-linkage Clustering）
- **概念聚类（Conceptual Clustering)**

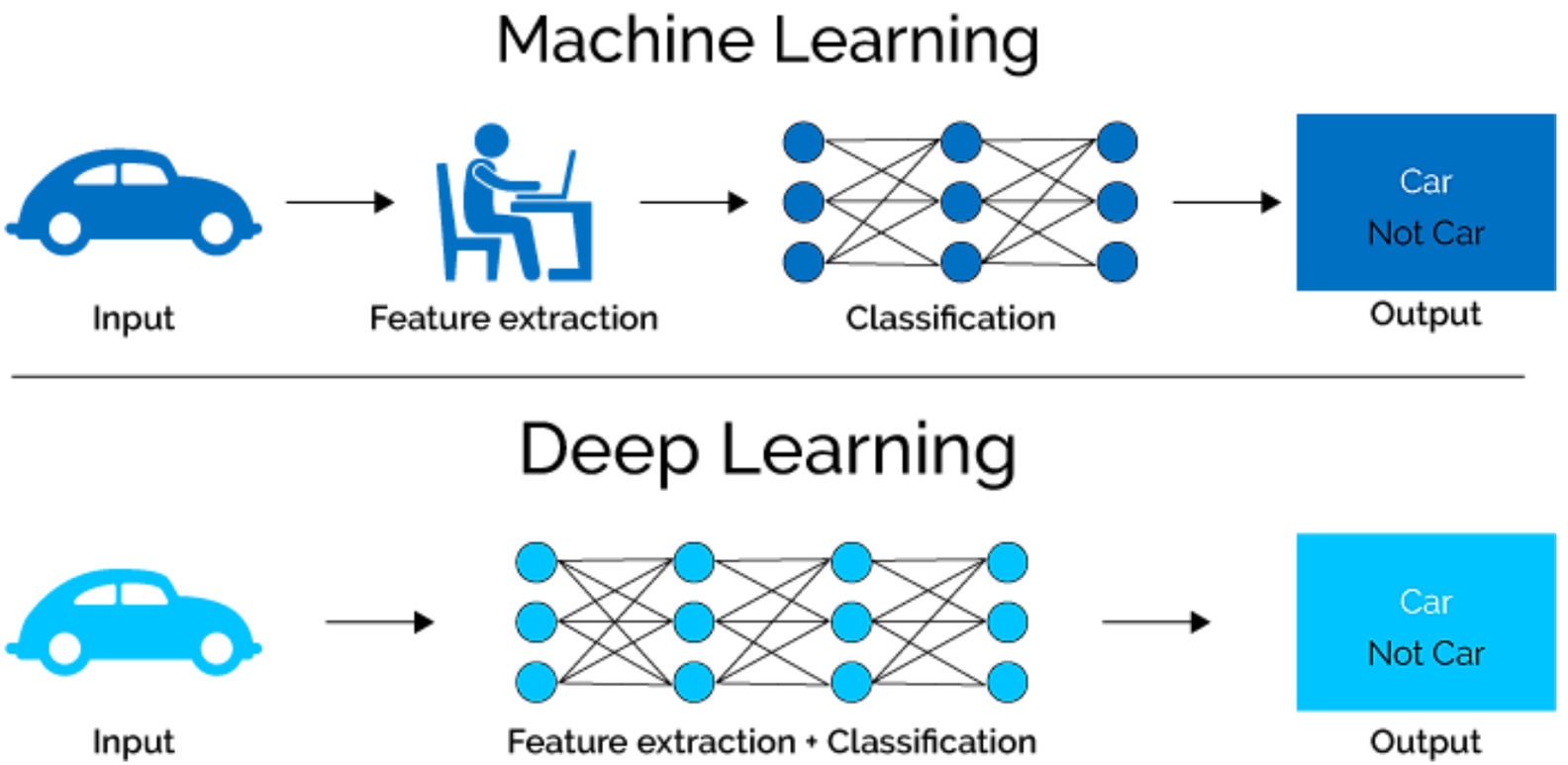
(4) 聚类分析（Cluster analysis）：

- BIRCH 算法
- DBSCAN 算法
- 期望最大化（Expectation-maximization，EM）
- 模糊聚类（Fuzzy Clustering）
- **K-means算法**
- K-medians聚类
- 均值漂移算法（Mean-shift）
- OPTICS算法

(5) 异常检测（Anomaly detection）类：

- **K最近邻（K-nearest Neighbor，KNN）算法**
- 局部异常因子算法（Local Outlier Factor，LOF）

Deep Learning, a product manager must know

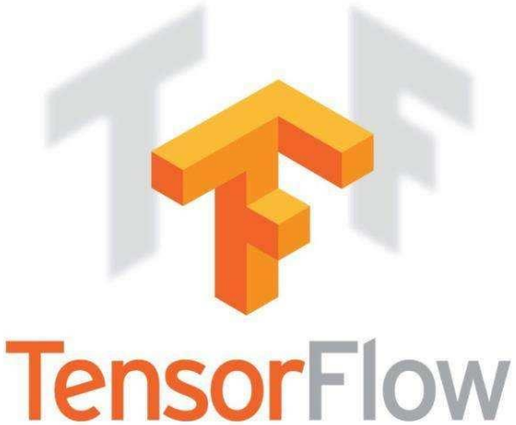


Elements for algorithm selection

Step 1: What is your question?

Step 2: Three elements:

ML development platforms a product manager must know



Caffe

Usage of machine learning

With the rise in big data,
machine learning has become a key technique for solving problems in areas, such as:

01 **Computational finance**
credit scoring and algorithmic trading

02 **Image processing and computer vision**
face recognition, motion detection, and object detection

03 **Computational biology**
tumor detection, drug discovery, and DNA sequencing

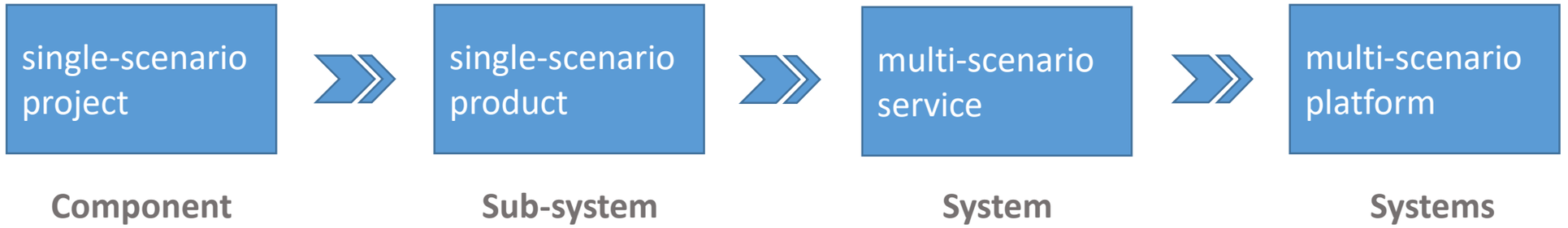
04 **Energy production**
price and load forecasting

05 **Manufacturing**
Automotive, aerospace, and predictive maintenance

06 **Natural language processing**
voice recognition applications, and public opinion mining

Integration and management 1

From single-scenario to multi-scenario



Integration and management 2

security

privacy

ethics and morality

Question:

What is your opinion about face recognition?

New Media Product Design and Development

Lecture 4-2. The End

THANK YOU

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