

Technology Science Information Networks Computing



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New Media Product Design and Development

Lecture 4. Development in AI

Dr. Ting WANG



School of Journalism and Communication
Shanghai International Studies University

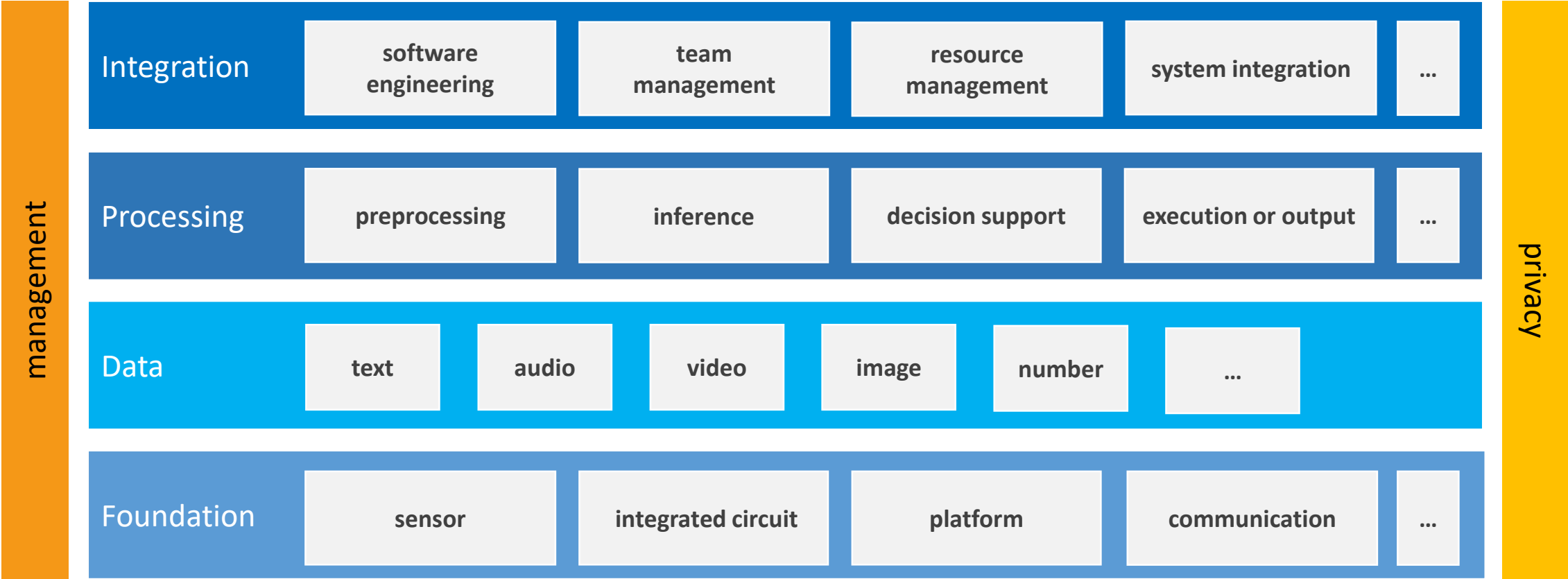


Haina Cognition and Intelligence Research Center
Yangtze Delta Region Institute of Tsinghua University, Zhejiang

Part 02

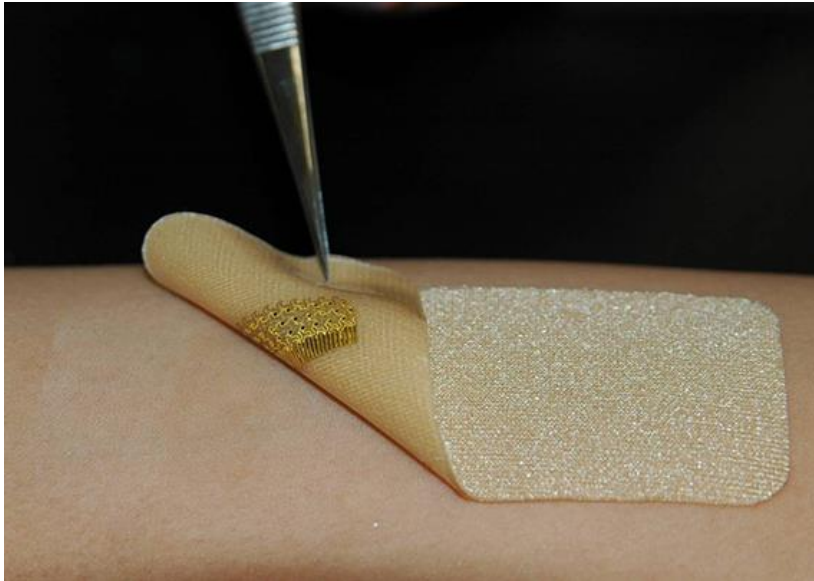
Technologies you
must know in AI

AI product system

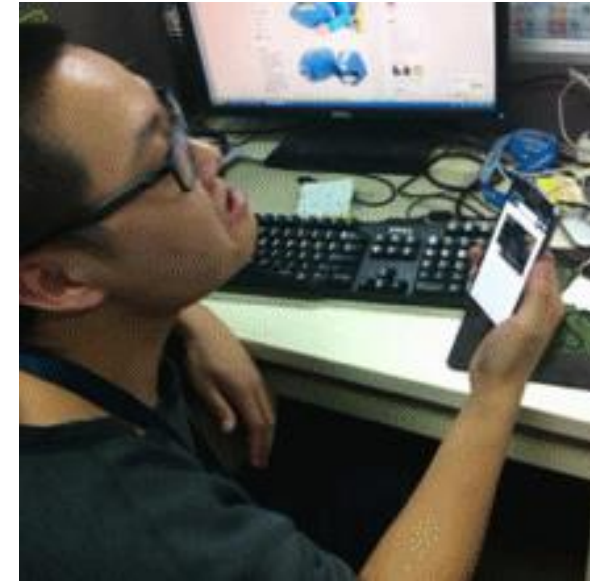


Foundation 1

Sensor



Good Application: Biosensor

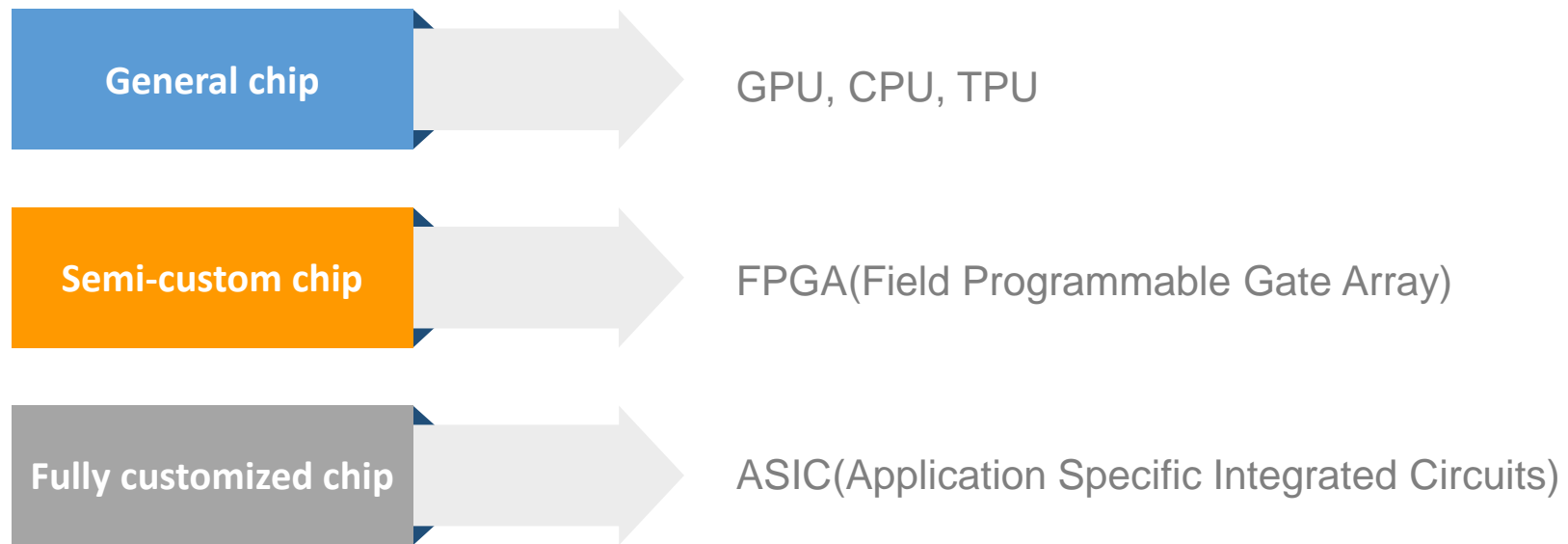


Bad Application: Camera-sensor

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



Machine Learning Repository
Center for Machine Learning and Intelligent Systems

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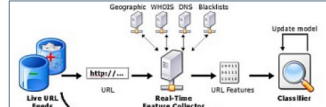
Welcome to the UC Irvine Machine Learning Repository!

We currently maintain 497 data sets as a service to the machine learning community. You may [view all data sets](#) through our searchable interface. For a general overview of the Repository, please visit our [About page](#). For information about citing data sets in publications, please read our [citation policy](#). If you wish to donate a data set, please consult our [donation policy](#). For any other questions, feel free to [contact the Repository librarians](#).

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Latest News:	Newest Data Sets:	Most Popular Data Sets (hits since 2007):
<p>09-24-2018: Welcome to the new Repository admins Dheeru Dua and Efi Karra Taniskidou!</p> <p>04-04-2013: Welcome to the new Repository admins Kevin Bache and Moshe Lichman!</p> <p>03-01-2010: Note from donor regarding Netflix data</p> <p>10-16-2009: Two new data sets have been added.</p> <p>09-14-2009: Several data sets have been added.</p> <p>03-24-2008: New data sets have been added!</p> <p>06-26-2007: Two new data sets have been added: UJI Pen Characters, MAGIC Gamma Telescope</p>	<p>02-24-2020:  Bar Crawl: Detecting Heavy Drinking</p> <p>02-18-2020:  Bias correction of numerical prediction model temperature forecast</p> <p>12-24-2019:  A study of Asian Religious and Biblical Texts</p> <p>12-05-2019:  Real-time Election Results: Portugal 2019</p> <p>11-27-2019:  QSAR fish bioconcentration factor (BCF)</p> <p>10-16-2019:  Kitsune Network Attack Dataset</p> <p>10-11-2019:  QSAR Bioconcentration classes dataset</p>	<p>3304251:  Iris</p> <p>1817409:  Adult</p> <p>1402544:  Wine</p> <p>1243036:  Breast Cancer Wisconsin (Diagnostic)</p> <p>1214843:  Heart Disease</p> <p>1208447:  Wine Quality</p> <p>1186643:  Bank Marketing</p>

Featured Data Set: URL Reputation



Task: Classification
Data Type: Multivariate, Time-Series
Attributes: 3231961
Instances:

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



DATA TOPICS ▾ RESOURCES STRATEGY DEVELOPERS CONTACT

The home of the U.S. Government's open data

Here you will find data, tools, and resources to conduct research, develop web and mobile applications, design data visualizations, and [more](#).

For information regarding the Coronavirus/COVID-19, please visit [Coronavirus.gov](#).








GET STARTED

SEARCH OVER 211,276 DATASETS

▼

Q

BROWSE TOPICS

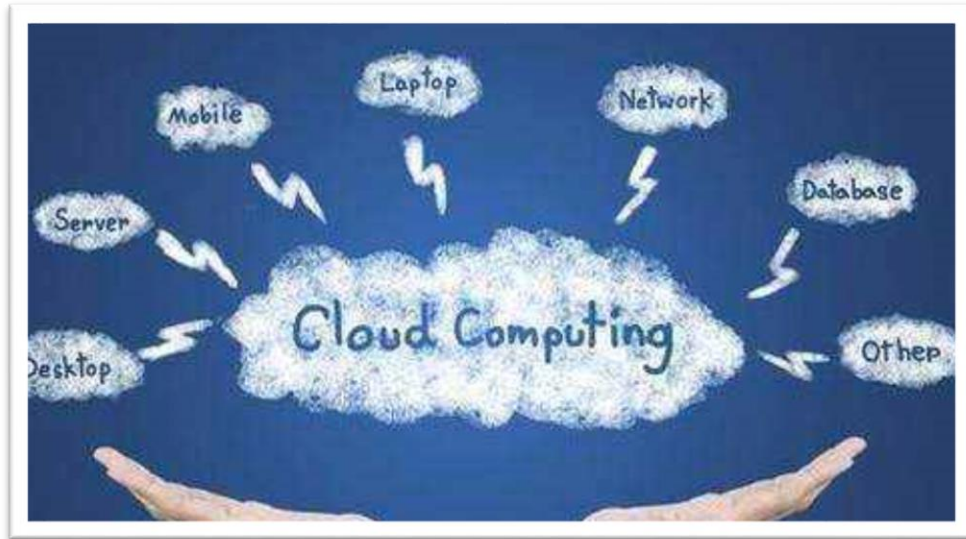


<https://www.data.gov/>

Foundation 4

Computing platforms

Cloud Computing



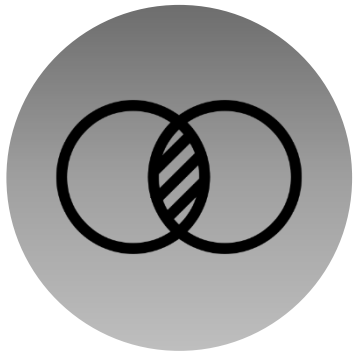
Supercomputing

(also, HPC, High Performance Computing)



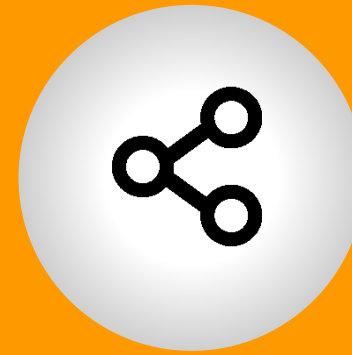
Data

Data quality



“

Relevancy



“

Reliability



“

Range

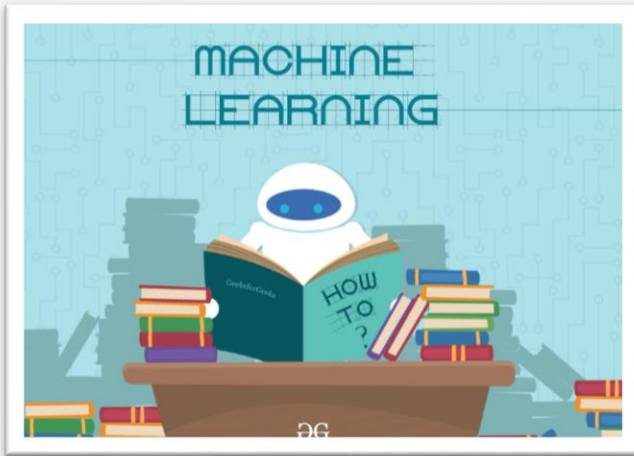


“

Recency

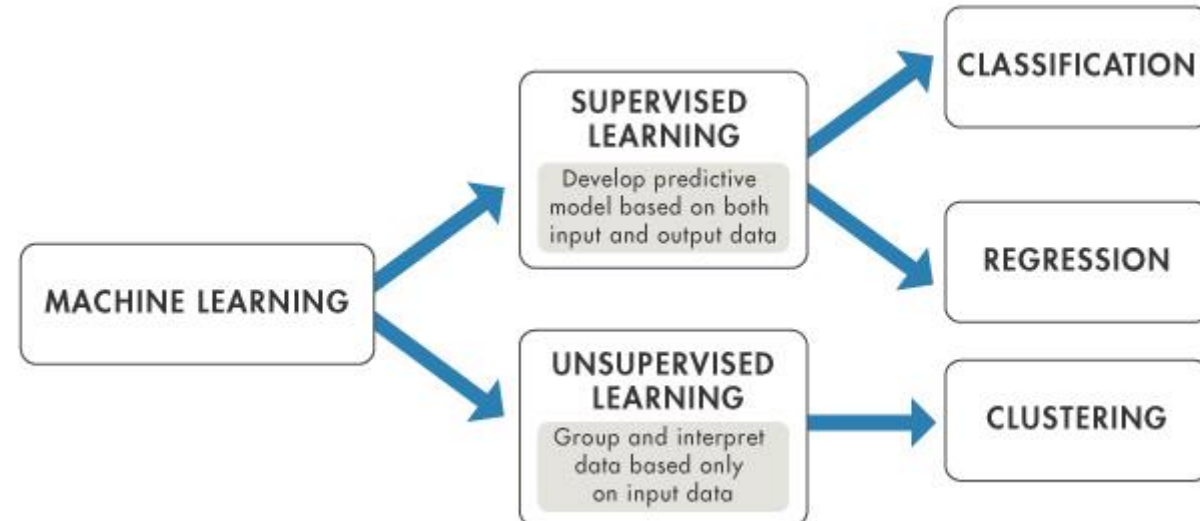
Processing

Machine Learning

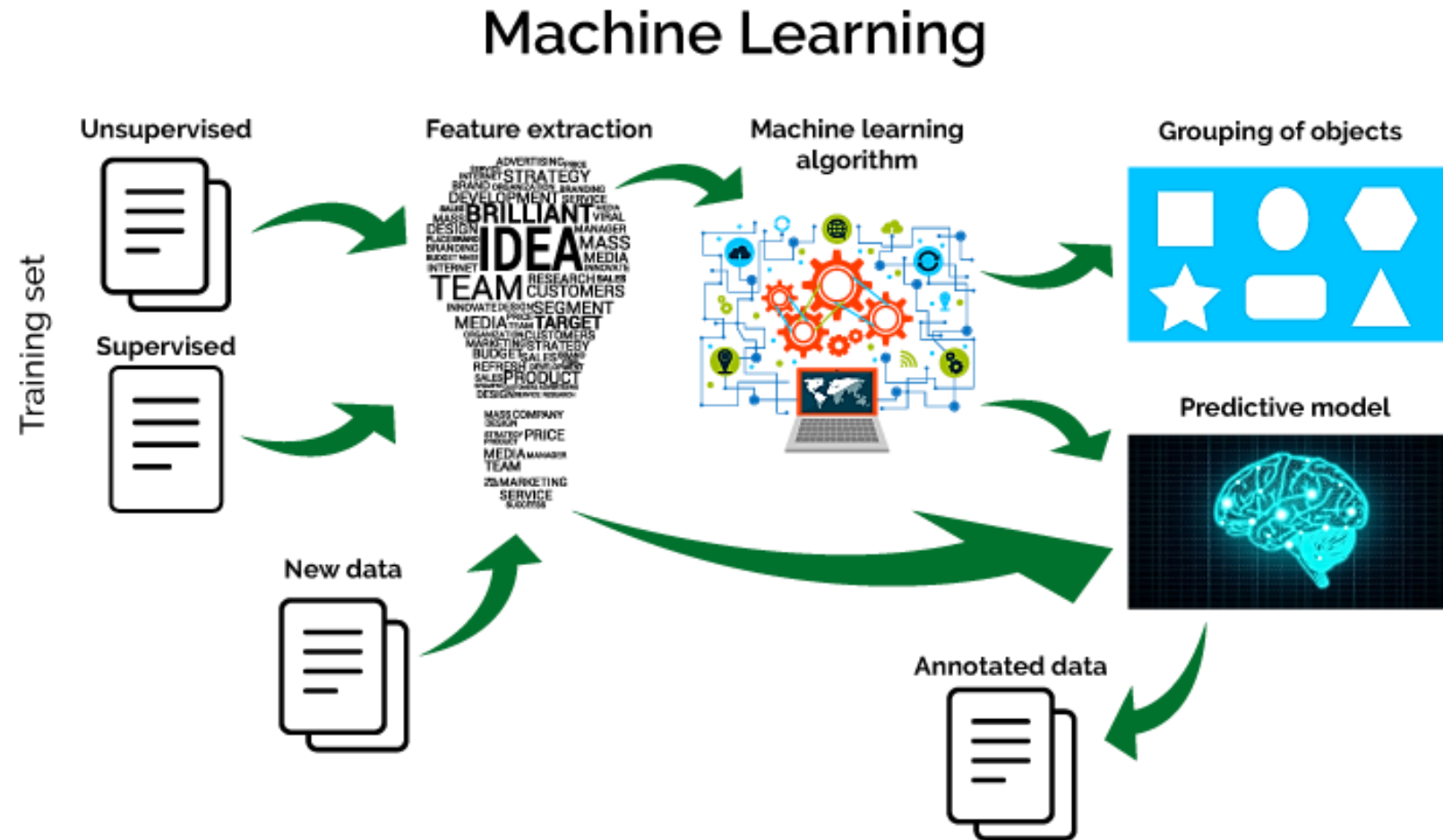


“ Machine learning (ML) is the study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions 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



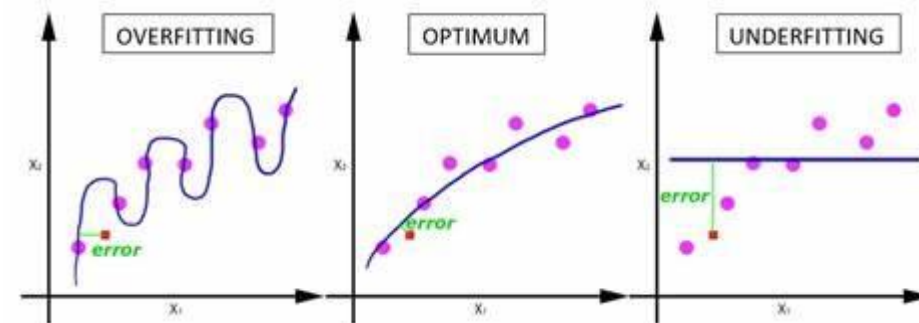
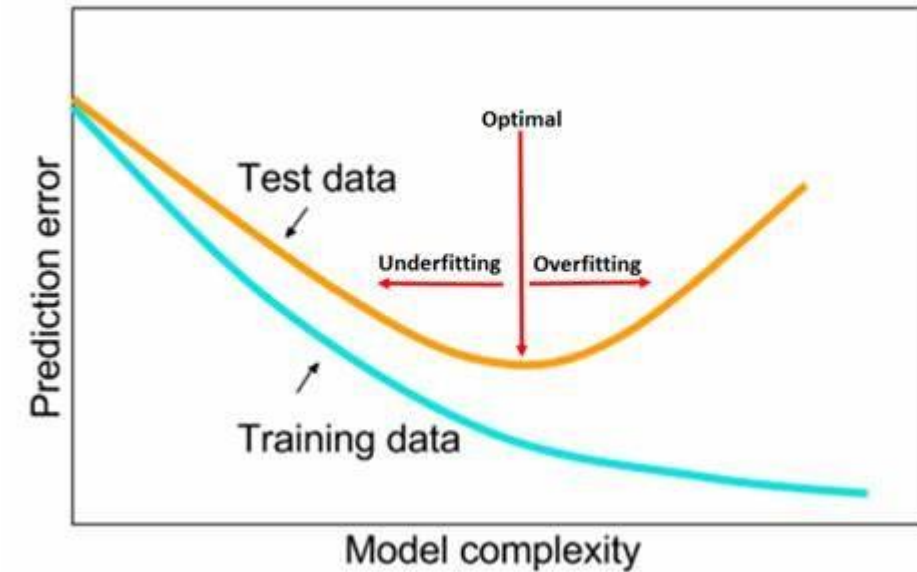
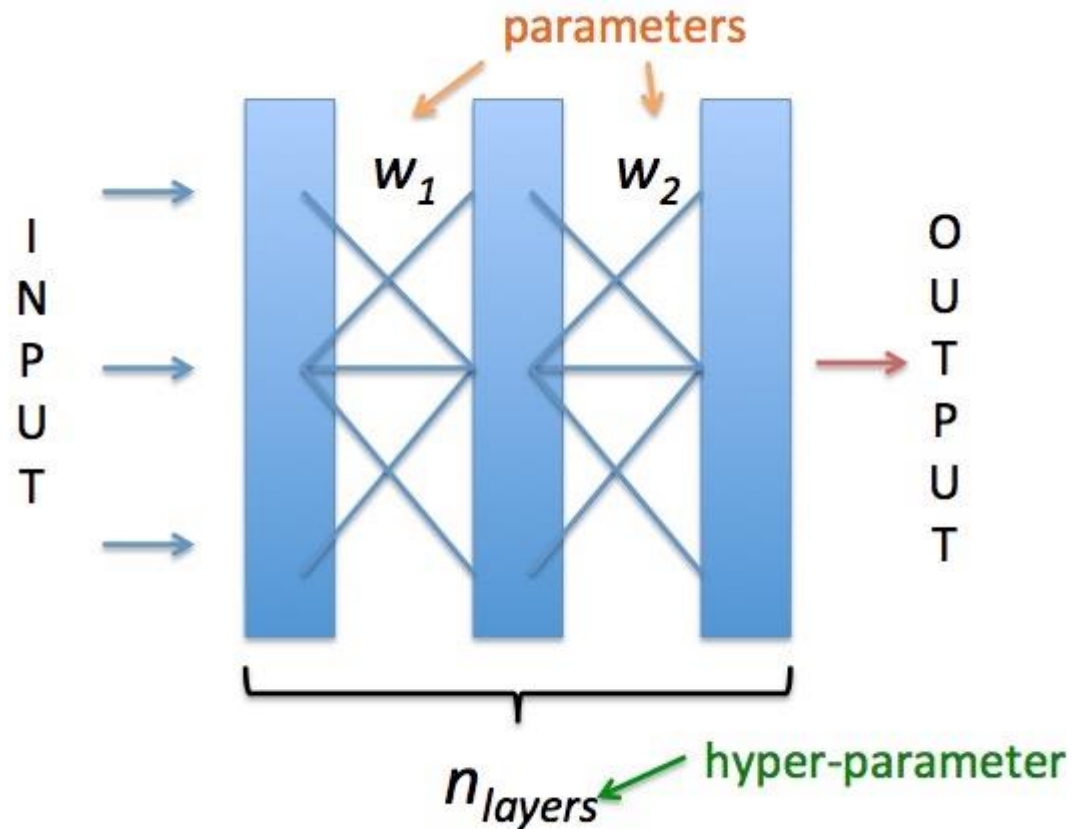
Principle of ML

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)**

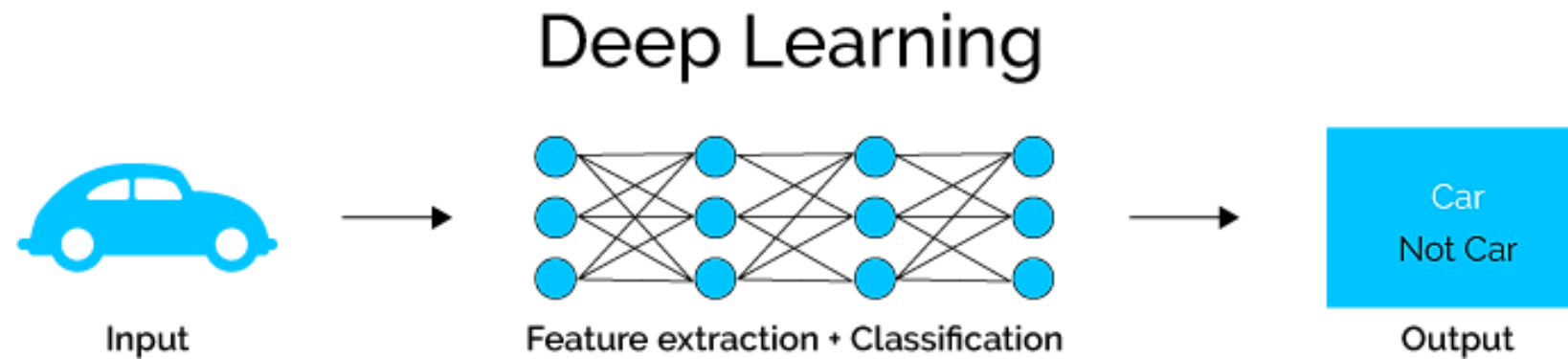
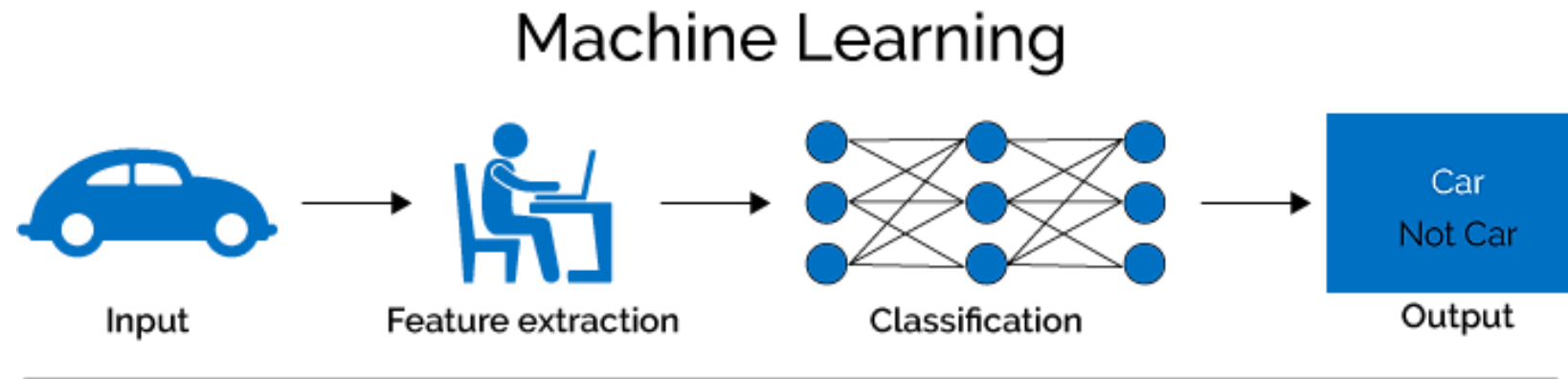
(4) 聚类分析 (Cluster analysis) :

- 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)

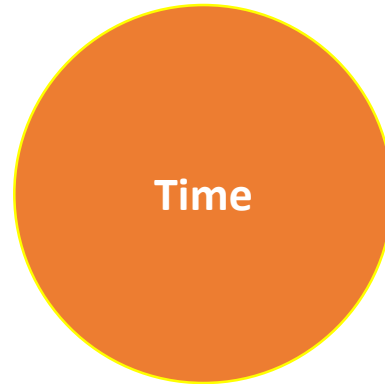
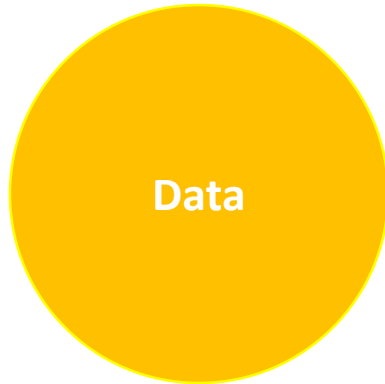
Deep Learning, a product manager must know



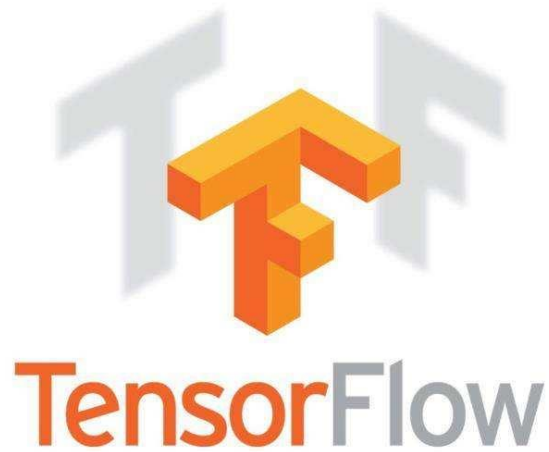
Elements for algorithm selection

Step 1: What is your question?

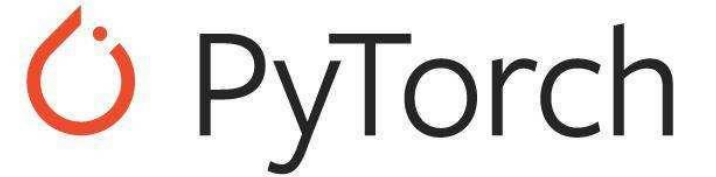
Step 2: Three elements:



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

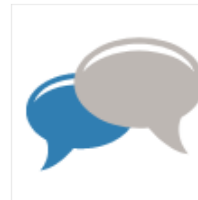
Automotive, aerospace,
and predictive
maintenance



06

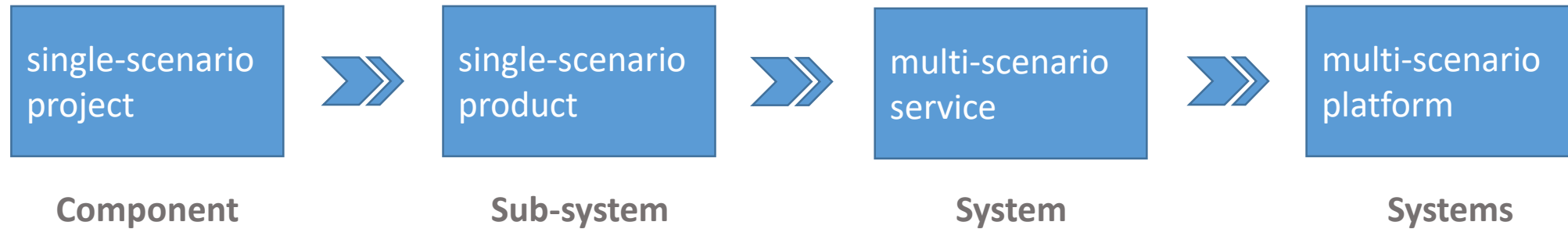
Natural language processing

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

Dr. Ting WANG



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