Chapter 20
Artificial Intelligence

20.1 History of AI

20.2 Basics of AI

20.3 Applications of AI in Machine Learning

20.0 Introduction

- The ultimate goal of artificial intelligence is to mimic human-like "cognitive" functions in machine, which can be accomplished through learning algorithms that mimic the human-like learning.
- 人工智能的最终目标是在机器中模仿类似人类的“认知”功能，这可以通过模仿人类学习的学习算法来实现。
- Thus, machine learning is one of the most exciting recent technologies in artificial intelligence as it enables the machines to gain human-like intelligence.
- 因此，机器学习是人工智能中最令人兴奋的最新技术之一，因为它使机器能够获得类似人类的智能。

cognitive a.	认知的	**mimic v.**	模仿
machine learning	机器学习		

20.1 History of AI

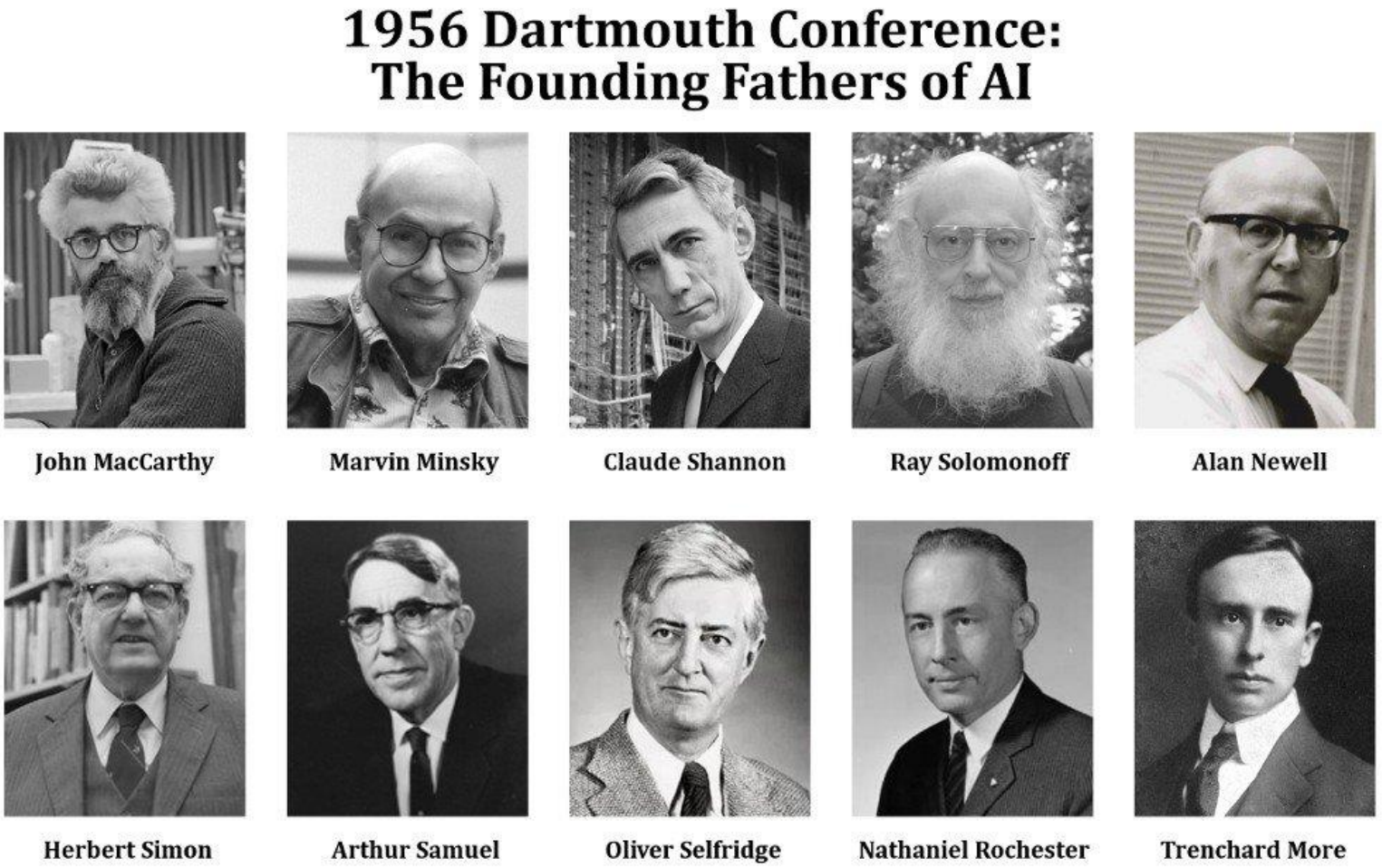
- Artificial intelligence (AI), sometime called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals.
- 人工智能(AI)，有时被称为机器智能，是由机器展示的智能，与人类和其他动物展示的自然智能形成对比。
- Specifically, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".
- 具体来说，“人工智能”一词是指机器模仿人类与其他人类思维相关的“认知”功能，如“学习”和“解决问题”。

20.1 History of AI

- The field of AI was formally founded as an academic discipline in 1956, at a conference at Dartmouth College, in Hanover, New Hampshire, where the term "artificial intelligence" was coined.
- 1956年，在新罕布什尔州汉诺威市达特茅斯学院的一次会议上，人工智能领域作为一门学科正式成立，并在会上创造了“人工智能”一词。

coin v.	创造		

20.1 History of AI



20.1 History of AI

- The field experienced another major winter from 1987 to 1993, coinciding with the collapse of the market for some of the early general-purpose computers, and reduced government funding.
- 1987年至1993年，该领域又经历了一个重要的冬季，与早期通用计算机市场的崩溃和政府资金的减少相吻合。

in part	部分地	**general-purpose**	通用的
coincide with	与…一致		

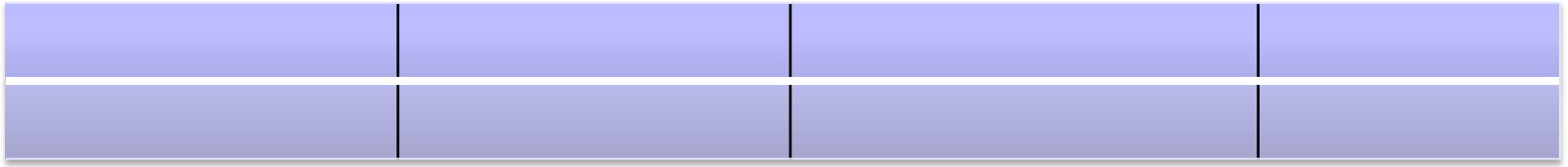
20.1 History of AI

- In the early 1980s, AI research was revived by the commercial success of expert systems, a form of AI program that simulated the knowledge and analytical skills of human experts.
- 20世纪80年代初，人工智能研究因专家系统的商业成功而复兴，专家系统是模拟人类专家知识和分析技能的人工智能程序的一种形式。

expert system	专家系统	**logistics**	物流
data mining	数据挖掘	**medical diagnosis**	医学诊断

20.1 History of AI

- The success was due to increasing computational power, greater emphasis on solving specific problems, new ties between AI and other fields (such as statistics, economics and mathematics), and a commitment by researchers to mathematical methods and scientific standards.
- 这一成功归功于算力的提高、对解决具体问题的更加重视、人工智能与其他领域（如统计学、经济学和数学）之间的新联系，以及研究人员对数学方法和科学标准的承诺。



20.1 History of AI

- Faster computers, algorithmic improvements, and access to large amounts of data enabled advances in machine learning and perception; data-hungry deep learning methods started to dominate accuracy benchmarks around 2012.
- 更快的计算机、算法的改进和对大量数据的使用推动了机器学习和感知的进步；需要大量数据的深度学习方法在2012年左右开始主导精度基准。

perception	感知	**deep learning**	深度学习
accuracy	精度；准确度	**benchmark**	基准

20.1 History of AI

- Until today, AI techniques have experienced a resurgence and become an essential part of the technology industry, helping to solve many challenging problems in computer science.
- 直到今天，人工智能技术已经经历了一次复兴，并成为技术产业的重要组成部分，帮助解决了计算机科学中的许多具有挑战性的问题。

resurgence	**n.　复兴**		

20.1 History of AI

reigning	现任的		

20.1 History of AI

quiz show	智力竞赛		
question answering system		问答系统	

20.1 History of AI

20.1 History of AI

- This marked the completion of a significant milestone in the development of Artificial Intelligence as Go is an extremely complex game, more so than Chess.
- 这标志着人工智能发展的一个重要里程碑的完成，因为围棋是一种极其复杂的游戏，比国际象棋更复杂。

GO	围棋	handicap n.	让步

20.2 Basics of AI

- AI research is defined as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.
- 人工智能研究被定义为对“智能代理”的研究,智能代理是任何能够感知其环境并采取行动以最大限度地实现其目标的设备。

perceive v.	感知		

20.2 Basics of AI

- The traditional problems of AI research include reasoning, knowledge representation, planning, problem solving, learning, natural language processing, perception and the ability to move and manipulate objects.
- 人工智能研究的传统问题包括推理、知识表示、规划、问题解决、学习、自然语言处理、感知以及移动和操纵物体的能力。

reasoning n.	推理		

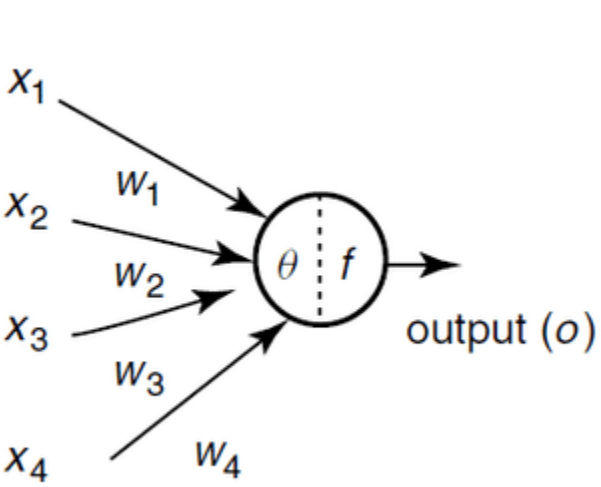
20.2 Basics of AI

- Many tools are used in AI, including versions of search and mathematical optimization, artificial neural networks, and methods based on statistics, probability and economics.
- 人工智能中使用了许多工具，包括不同的搜索和数学优化、人工神经网络以及基于统计学、概率论和经济学的方法。
- The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy and many others.
- 人工智能领域利用了计算机科学、数学、心理学、语言学、哲学和许多其他学科。

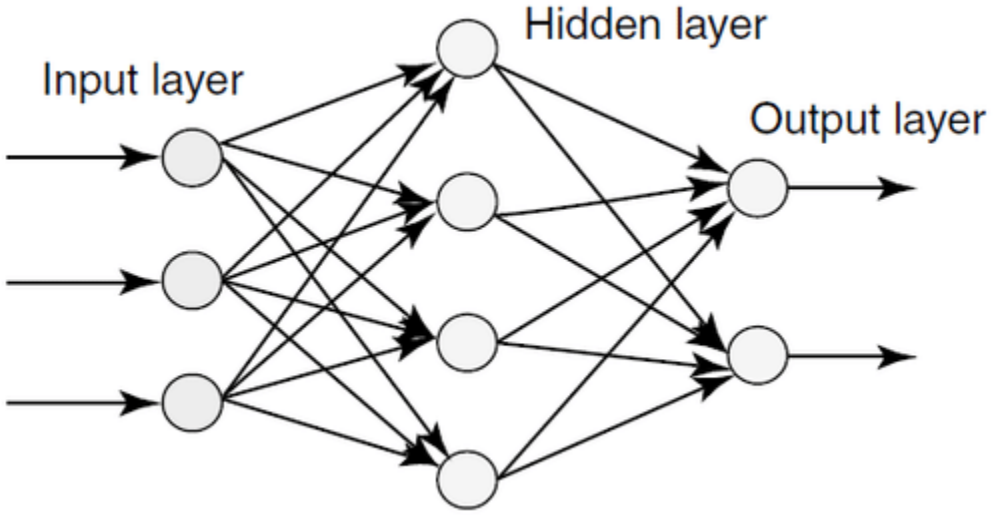
optimization	优化	**artificial neural network**	人工神经网络
versions of	不同的	**draw upon**	利用

20.2 Basics of AI

artificial neural network



neuron



neuron	神经元	**input layer**	输入层
hidden layer	隐藏层	**output layer**	输出层

20.2 Basics of AI

- AI must have access to objects, categories, properties and relations between all of them to implement knowledge engineering.
- 人工智能必须能够访问对象、类别、属性以及它们之间的关系，才能实施知识工程。
- Initiating common sense, reasoning and problem-solving power in machines is a difficult and tedious task.
- 在机器中激发常识、推理和解决问题的能力是一项艰巨而乏味的任务。

react	反应	**abundant**	大量的；充裕的
tedious	乏味的		

20.2 Basics of AI

- It investigates how computer agents can improve their perception, cognition, and action with data, knowledge, experience, and interaction.
- 它(机器学习)研究了计算机代理如何通过数据、知识、经验和交互来改善它们的感知、认知和行为 。

agent	代理	cognition n.	认知

20.2 Basics of AI

- Machine learning utilizes a variety of techniques to intelligently handle large and complex amounts of information build upon foundations in many disciplines, including statistics, knowledge representation, databases, causal inference, computer systems, machine vision, natural language processing and so on.
- 机器学习利用各种技术，在许多学科的基础上智能地处理大量复杂的信息，这些学科包括统计学、知识表示、数据库、因果推理、计算机系统、机器视觉、自然语言处理等。

causal inference	因果推理	**machine vision**	机器视觉
discipline	学科	**build upon**	建立在

20.2 Basics of AI

- Machine perception deals with the capability to use sensory inputs to deduce the different aspects of the world. For example, computer vision is the power to analyze visual inputs with a few sub-problems such as facial, object and gesture recognition..
- 机器感知涉及使用感官输入来推断世界不同方面的能力。例如，计算机视觉是一种分析视觉输入的能力，它包含一些子问题，如面部、物体和姿态识别。

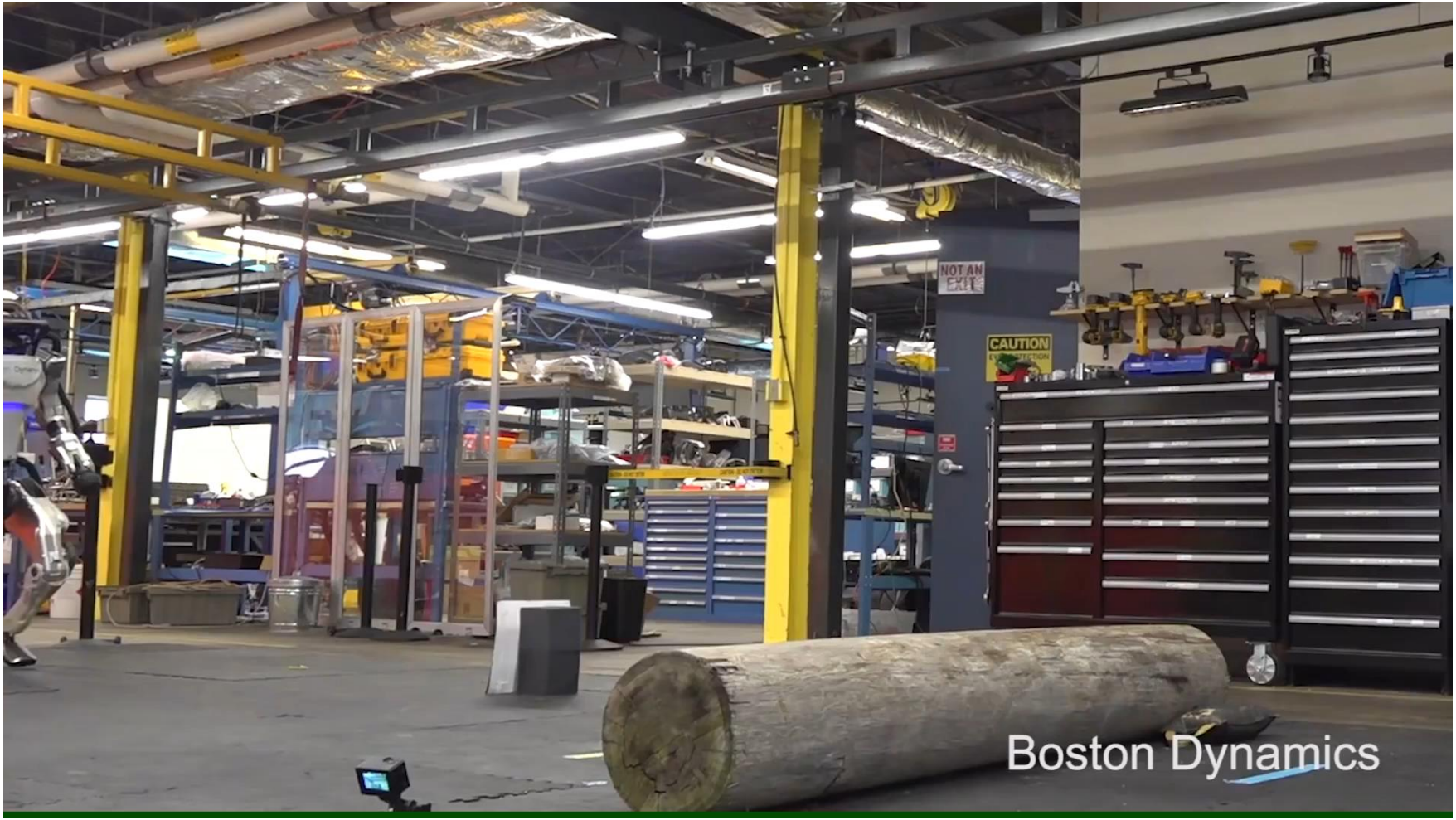
sensory	感觉的;感官的	**deduce v.**	推论;推断
computer vision	计算机视觉		

20.2 Basics of AI

- Robotics is a field of engineering focused on the design and manufacturing of robots. Robots require intelligence to handle tasks such as object manipulation and navigation, along with sub-problems of localization, motion planning and mapping.
- 机器人学是一个专注于机器人设计和制造的工程领域。机器人需要智能来处理诸如物体操纵和导航等任务，以及定位、运动规划和映射等子问题。

robotics	机器人学	localization	定位

20.2 Basics of AI



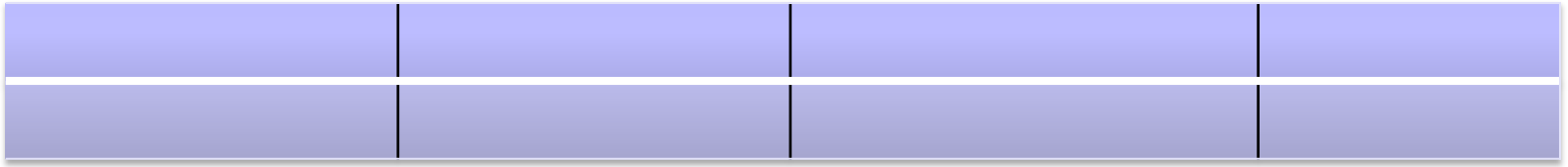
20.3 Applications of AI in ML

- More specifically, AI perceives environment and takes actions through AI program and machine learning focuses on the development of computer programs that can teach themselves to grow and change when exposed to new data.
- 更具体地说，人工智能通过人工智能程序感知环境并采取行动，机器学习专注于计算机程序的开发，这些程序可以教会自己在接触新数据时发展和改变。

explicit programming		显式编程	

20.3 Applications of AI in ML

- A more formal definition was given by Tom Mitchell as a computer program is said to learn from experience (E) with respect to some task (T) and some performance measure (P), if its performance on T, as measured by P, improves with E then the program is called a machine learning program.
- Tom Mitchell给出了一个更为正式的定义，对于某些任务（T）和某些性能度量（P），如果一个计算机程序在T上的性能（由P度量）随着经验（E）的提高而提高，称这个程序从经验中学习，则该程序是机器学习程序。



20.3 Applications of AI in ML

- In general, mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science which often referred to as computational learning theory.
- 一般来说，机器学习算法及其性能的数学分析是理论计算机科学的一个定义明确的分支，通常被称为计算学习理论。

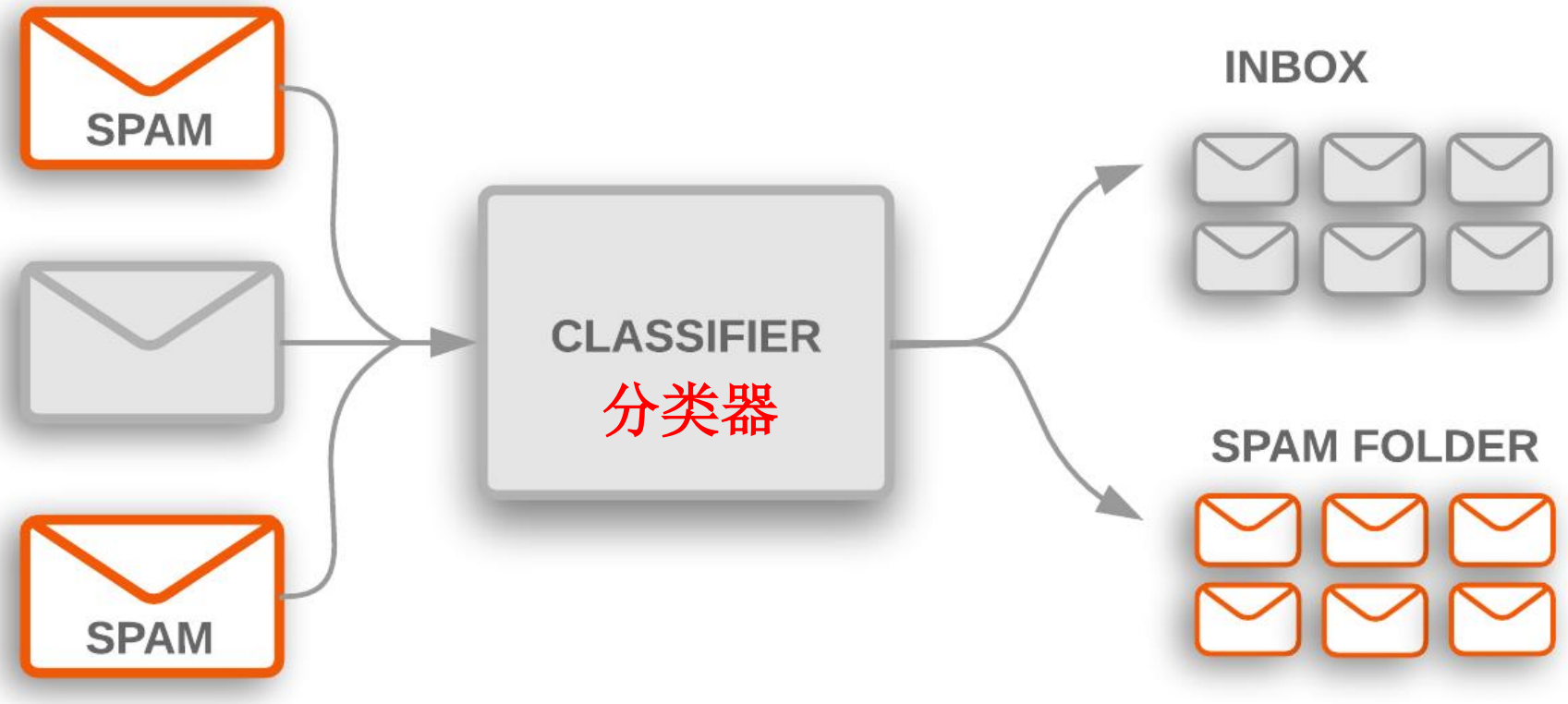
a diverse array of	各种各样的		

20.3 Applications of AI in ML

- A data set of houses of particular size with actual prices is given, then the regression algorithm is to produce more of these right answers for new houses.
- 给出了具有实际价格的特定规模房屋的数据集，然后回归算法将为新房屋生成更多这些正确答案(价格)。

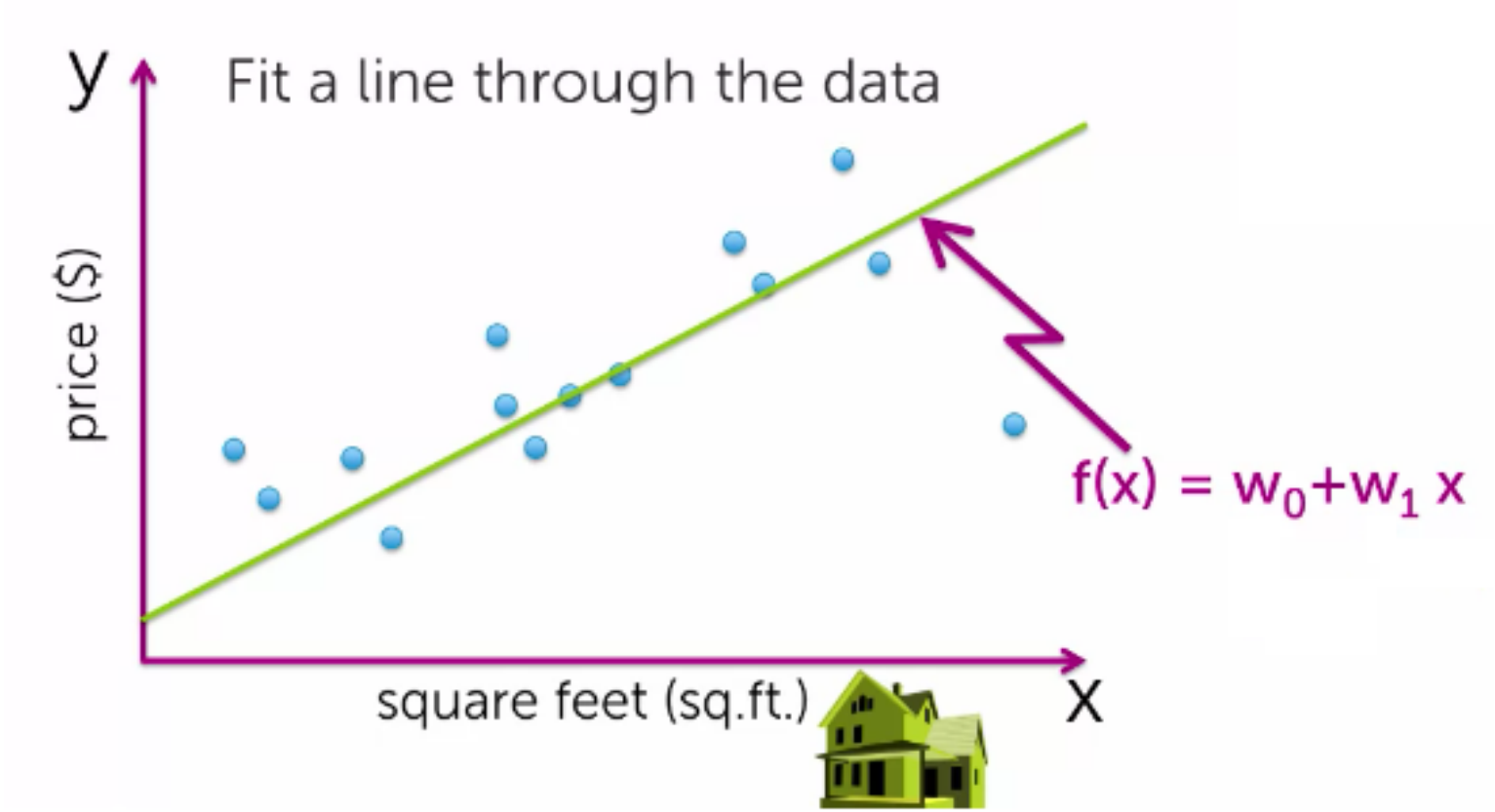
supervised learning	监督学习	**labeled a.**	有标记的
regression	回归	**error**	误差
classification	分类		

20.3 Applications of AI in ML



Classification

20.3 Applications of AI in ML



Regression

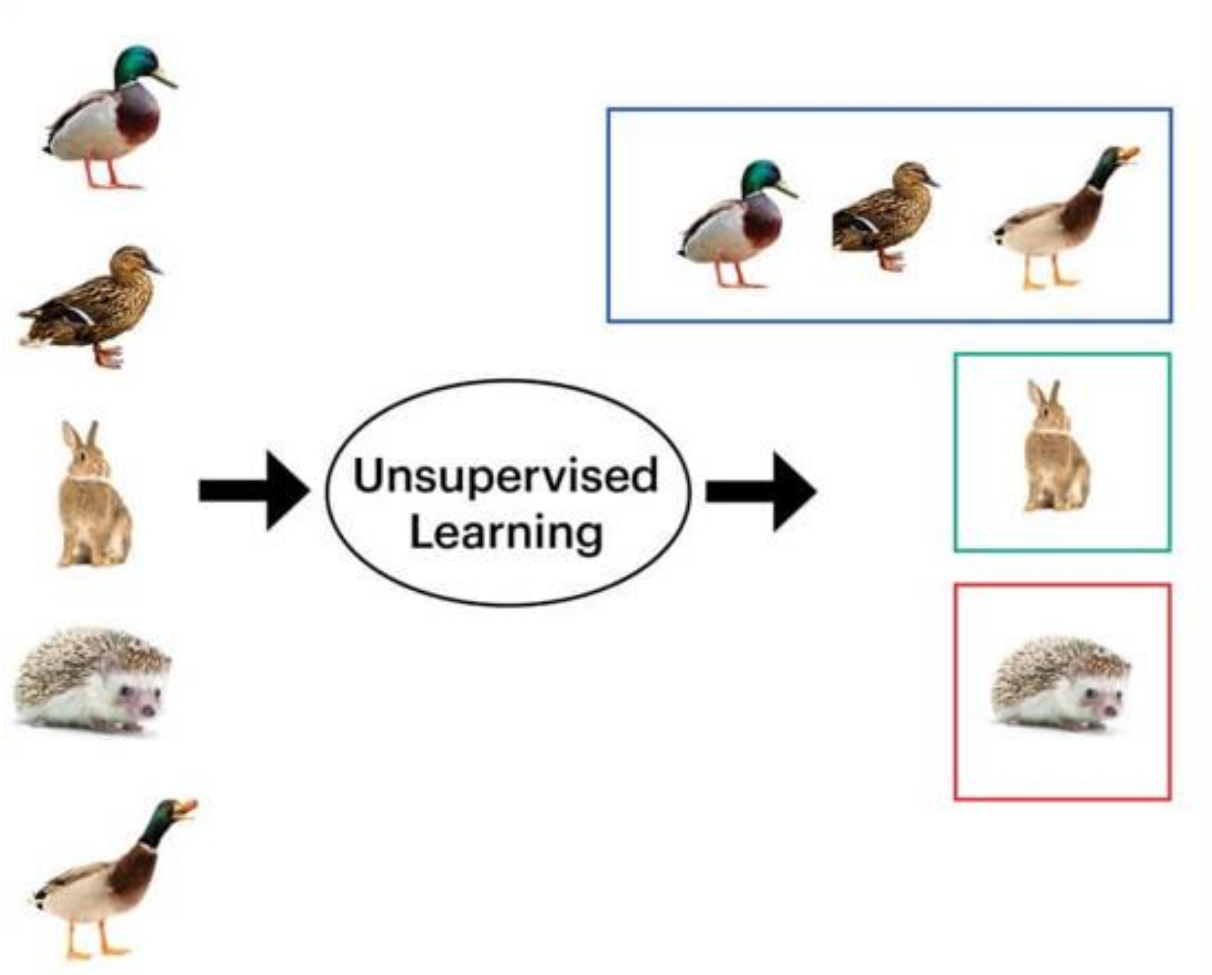
20.3 Applications of AI in ML

- Unsupervised learning is termed as learned by its own that discoveries and adopts the pattern based on the input.
- 无监督学习被称为自主学习，它根据输入发现并采用模式。

- In this learning, the data are divided into different clusters and hence the learning is called a clustering algorithm.
- 在这种学习中，数据被分成不同的聚类，因此这种学习被称为聚类算法。

unsupervised learning	无监督学习	**pattern**	模式
cluster n.	聚类		

20.3 Applications of AI in ML

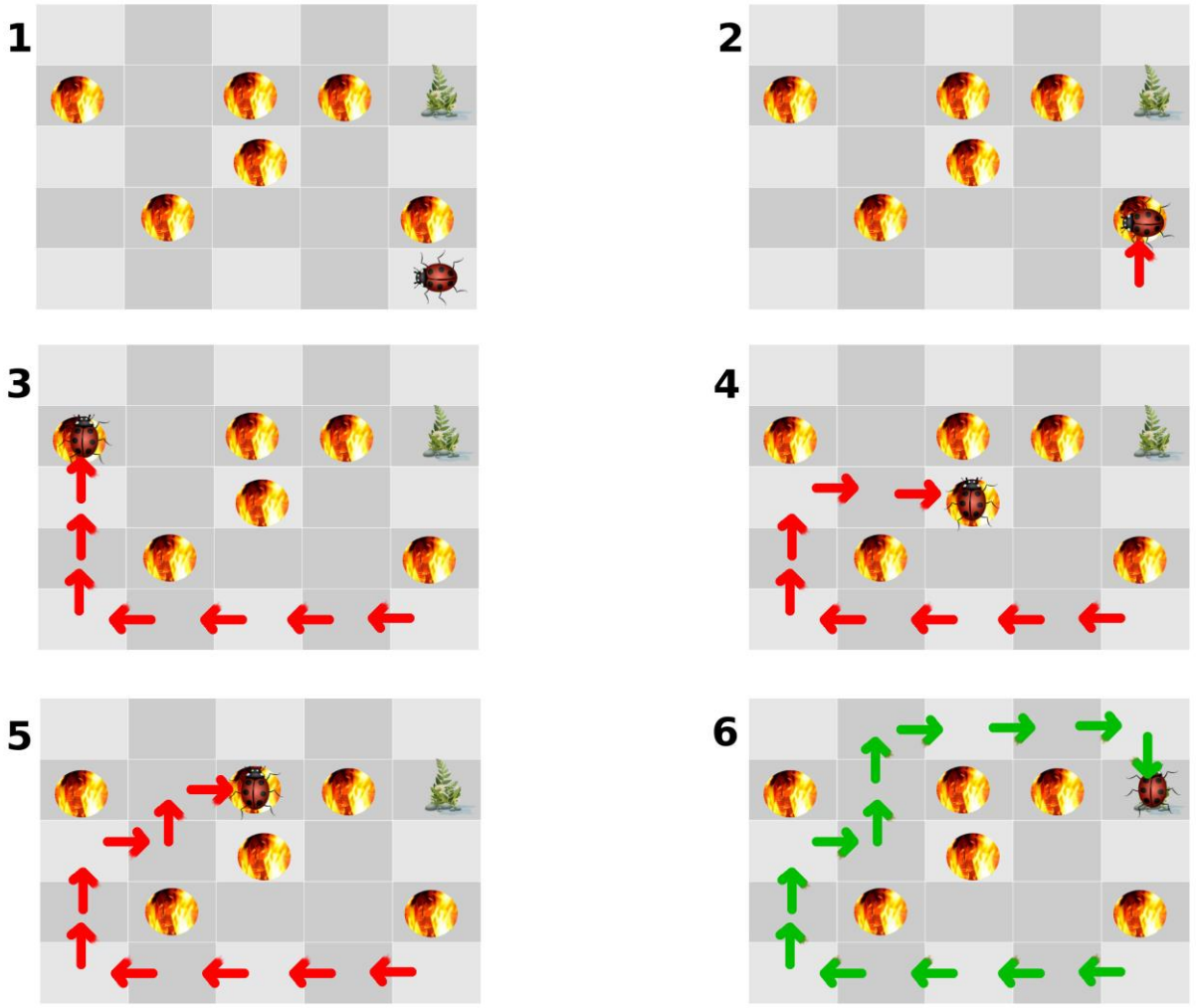


20.3 Applications of AI in ML

- Reinforcement learning is based on output with how an agent ought to take actions in an environment so as to maximize some notion of long-term reward.
- 强化学习是基于输出的，即代理应该如何在环境中采取行动，以便最大化长期回报。
- Reinforcement learning differs from the supervised learning problem in that correct input/output pairs are never presented, nor sub-optimal actions explicitly corrected.
- 强化学习与监督学习问题的不同之处在于，不会出现正确的输入/输出对，也不会明确纠正次优操作。

reinforcement learning	强化学习	**agent**	代理
sub-optimal	次优的		

20.3 Applications of AI in ML



reinforcement learning

20.3 Applications of AI in ML

- Recommender systems can be defined as a learning technique by virtue of which online user can customize their sites to meet customer's tastes.
- 推荐系统可以定义为一种学习技术，凭借这种技术，在线用户可以定制他们的网站以满足客户的口味。
- Online users can get a rating of a product or/ and related items when he/she is searching items because of the existing recommender system.
- 因为现有的推荐系统，在线用户在搜索商品时可以获得商品或相关商品的评价。

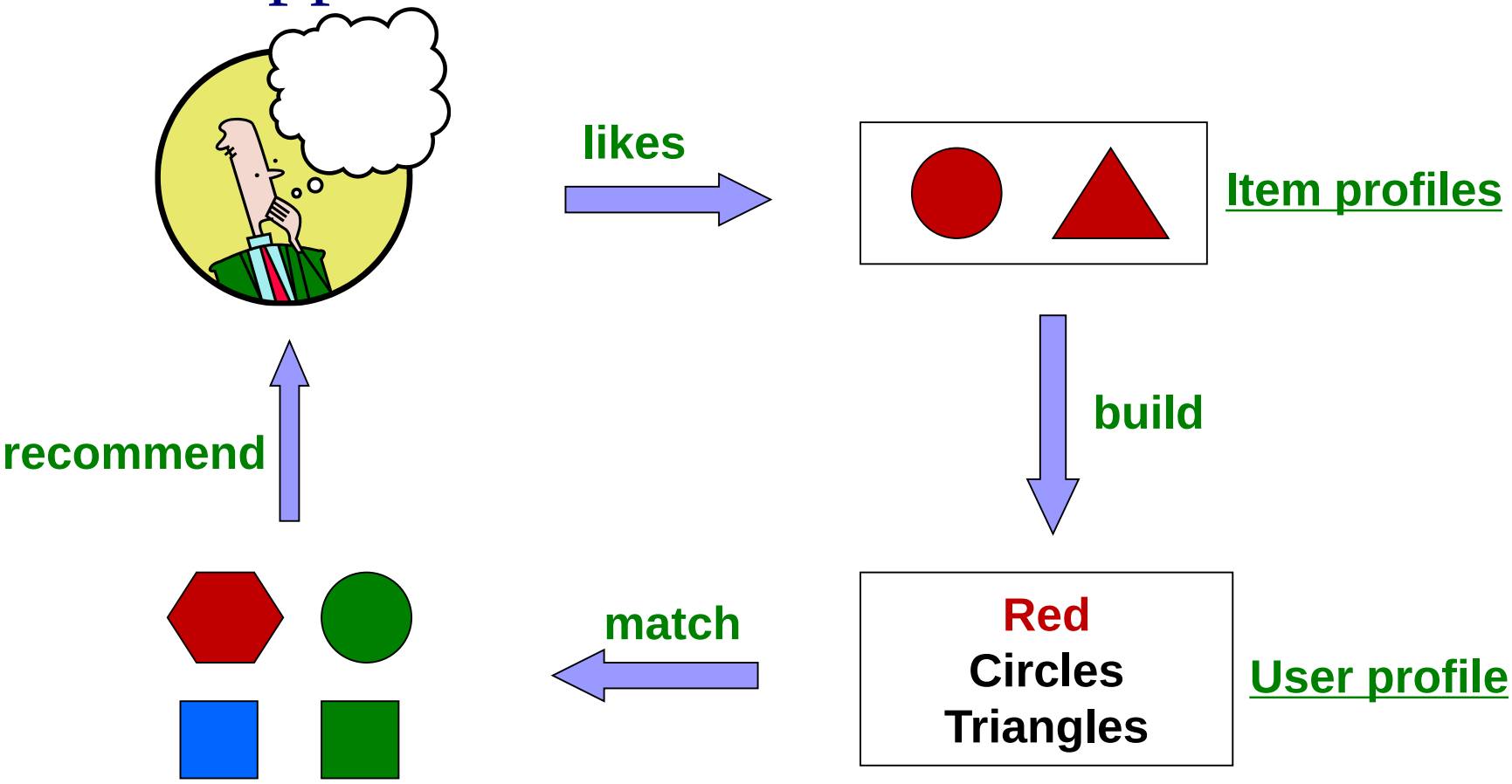
recommender system	推荐系统	**by virtue of**	凭借，依靠

20.3 Applications of AI in ML

- There are mainly two approaches: content based recommendation and collaborative recommendation, which help the user for obtaining and mining data, making intelligent and novel recommendations.
- 主要有两种方法：基于内容的推荐和协同推荐，帮助用户获取和挖掘数据，做出智能新颖的推荐。

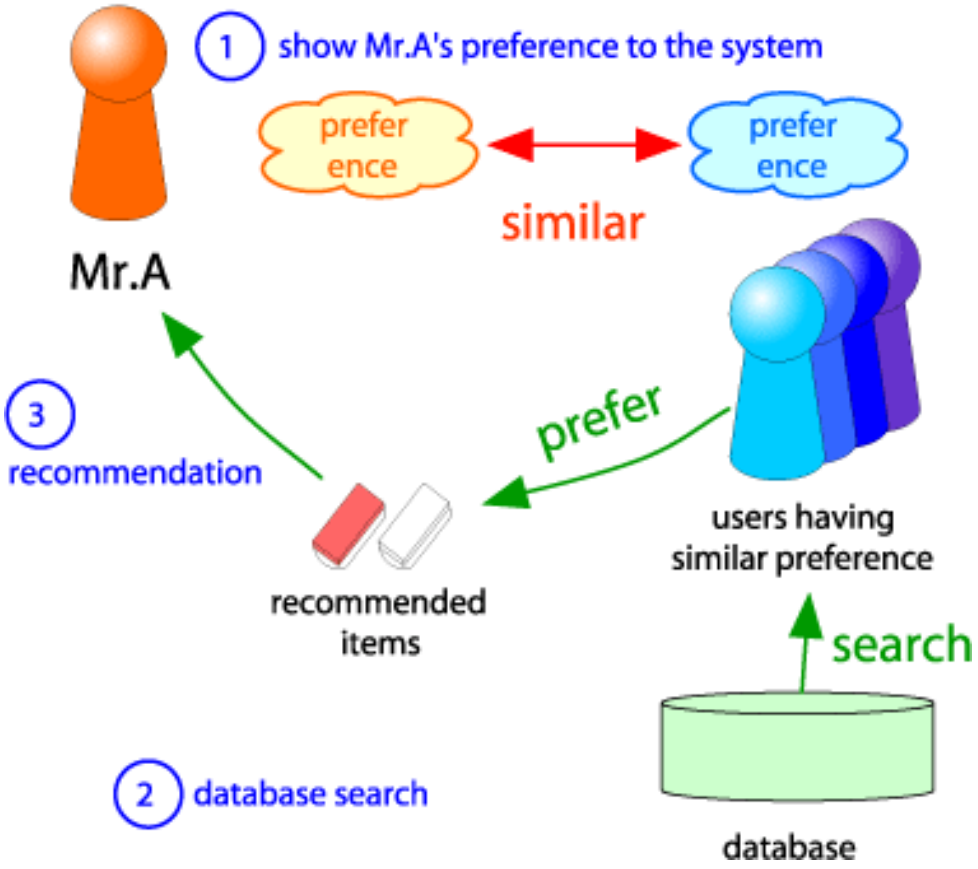
collaborative	v. 协同的	e-commerce	电子商务

20.3 Applications of AI in ML



content based recommendation

20.3 Applications of AI in ML



collaborative recommendation