Business Horizons (2019) 62, 15—25

商业地平线(2019)62,15ー25



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EXECUTIVE DIGEST

行政摘要

Siri, Siri, in my hand: Who’s the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence

Siri，Siri，在我手中: 谁是世界上最美丽的人? 关于人工智能的解释、插图和含义



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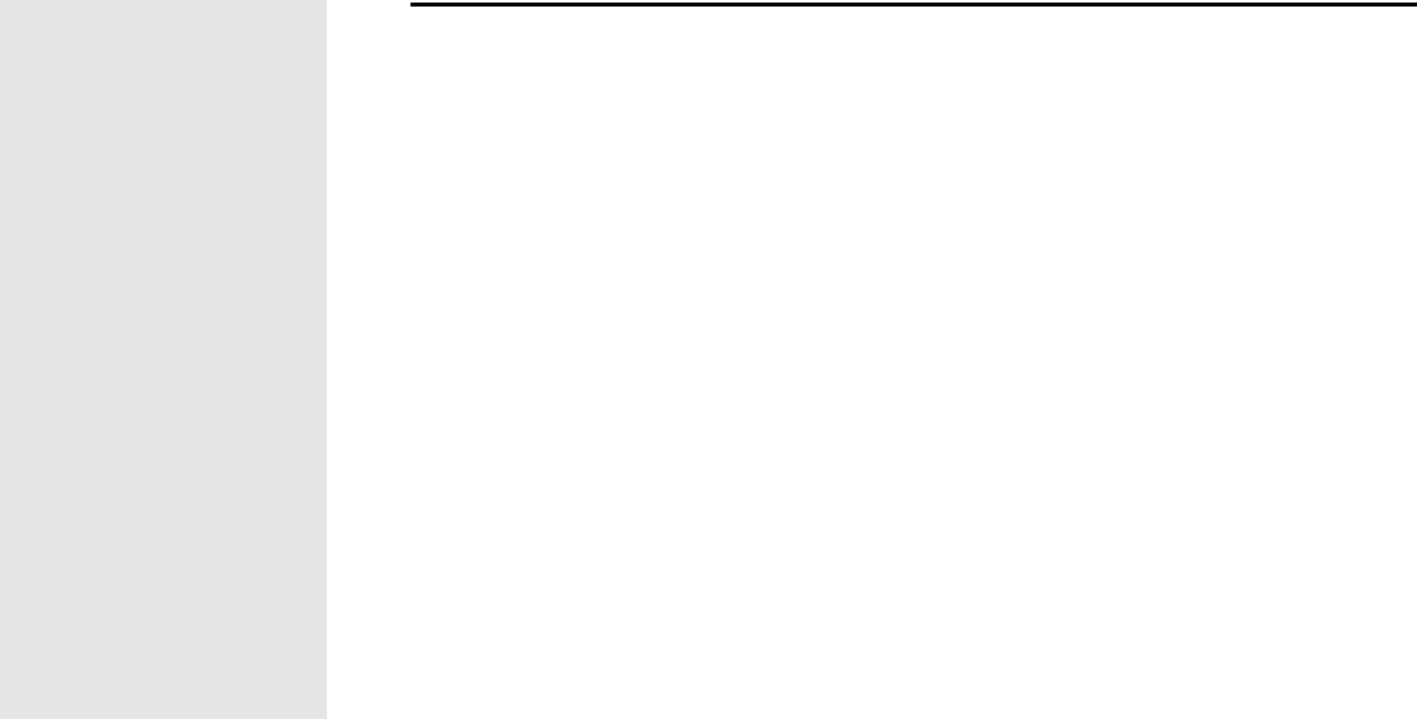
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KEYWORDS

关键词

Artificial intelligence; Big data;

人工智能; 大数据;

Internet of Things; Expert systems; Machine learning; Deep learning

物联网; 专家系统; 机器学习; 深度学习

Abstract Artificial intelligence (AI)–—defined as a system’s ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation–—is a topic in nearly every boardroom and at many dinner tables. Yet, despite this prominence, AI is still a surprisingly fuzzy concept and a lot of questions surrounding it are still open. In this article, we analyze how AI is different from related concepts, such as the Internet of Things and big data, and suggest that AI is not one monolithic term but instead needs to be seen in a more nuanced way. This can either be achieved by looking at AI through the lens of evolutionary stages (artificial narrow intelligence, artificial general intelligence, and artificial super intelligence) or by focusing on different types of AI systems (analytical AI, human-inspired AI, and humanized AI). Based on this classification, we show the potential and risk of AI using a series of case studies regarding universities, corporations, and governments. Finally, we present a framework that helps organizations think about the internal and external implications of AI, which we label the Three C Model of Confidence, Change, and Control.

人工智能(AI)——定义为一个系统正确解释外部数据、从这些数据中学习并通过灵活适应来实现特定目标和任务的能力——是几乎每个会议室和许多餐桌上的一个话题。然而，尽管如此突出，人工智能仍然是一个令人惊讶的模糊概念，围绕它的许多问题仍然是开放的。在本文中，我们分析了人工智能如何不同于相关的概念，如物联网和大数据，并建议人工智能不是一个单一的术语，而是需要在一个更微妙的方式看待。这可以通过从进化阶段(人工狭义智能、人工通用智能和人工超级智能)的角度来看待人工智能，或者通过关注不同类型的人工智能系统(分析型人工智能、人类启发型人工智能和人性化人工智能)来实现。基于这种分类，我们通过一系列关于大学、企业和政府的案例研究来展示 AI 的潜力和风险。最后，我们提出了一个框架，帮助组织思考人工智能的内部和外部影响，我们标签的三 c 模型的信心，变化和控制。

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通讯作者 https://doi.org/10.1016/j.bushor. 2018.08.004



1. Once upon a time, there was a magic mirror . . .

从前，有一面魔镜。

Once upon a time, in a land far, far away, there lived an evil queen who had a magic mirror. This magic mirror knew everything. It knew the faces of all the

很久很久以前，在一个很远很远的地方，住着一个邪恶的皇后，她有一面魔镜。这面魔镜无所不知。它知道所有人的面孔

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16《行政摘要》

people living in her kingdom and could easily tell her every morning that she was the fairest in the land. Knowing how important beauty was for the evil queen, the magic mirror also tweaked her own image slightly to make her look a little bit more beautiful than she actually was in real life. And even when Snow White became more beautiful than her by having “skin as white as snow, lips as red as blood, and hair as black as ebony” ([Grimm, Grimm,](#page1)

生活在她的王国里的人们，每天早上都可以轻松地告诉她，她是这片土地上最美丽的人。魔镜知道美丽对巫后来说是多么的重要，它也稍微调整了一下她自己的形象，使她看起来比实际生活中更美丽一点。即使白雪公主变得比她更漂亮，因为她有“雪白的皮肤，血红的嘴唇，乌黑的头发”(格林，格林,

* [Kliros, 1994](#page1)), the magic mirror was still of help. It told the evil queen where to find Snow White, with whom she lived, and that she fancied red apples. The queen could use this knowledge to her advantage to influence (well, poison) Snow White–—although, as we all know, the story did not exactly end as she had envisioned it.

Kliros，1994) ，魔镜仍然有用。它告诉邪恶的女王在哪里可以找到白雪公主，她和白雪公主住在一起，她喜欢红苹果。女王可以利用这些知识来影响(好吧，毒害)白雪公主——尽管我们都知道，这个故事并没有像她预想的那样结束。

Who would not want to have such a magic mirror? A mirror that shows not your real image but a slightly improved version of it–—similar to the T8 mobile phone developed by the Chinese tech-nology firm Meitu, that uses Magical AI Beautifica-tion to make you look better in selfies. A tool that tracks information from all around the kingdom in real time to tell you every morning what is happening–—similar to the New York startup Data-minr, which monitors the internet and social media applications to help companies take better PR and stock market decisions. A crystal ball that looks deeply into peoples’ souls to tell you which type of fruit (or message) they are best influenced by–

谁不想拥有这样一面魔镜呢？这种镜子不会显示你的真实形象，只是稍微改进了一下——类似于中国科技公司美图(Meitu)开发的 T8手机，这款手机使用了神奇的人工智能美容技术，让你在自拍时看起来更美。这个工具可以实时跟踪来自全国各地的信息，每天早上告诉你发生了什么——类似于纽约的初创公司 Data-minr，它监控互联网和社交媒体应用程序，帮助企业做出更好的公关和股市决策。这个水晶球可以深入人们的灵魂，告诉你哪种水果(或信息)对他们的影响最大

—similar to the British consulting firm Cambridge Analytica, which used information from Facebook

ー类似于英国咨询公司 Cambridge Analytica，它使用 Facebook 的信息

to assess the personality of users and tailor political messages accordingly.

来评估用户的个性，并据此调整政治信息。

Today, we all have–—at least in principle–—access to such devices that are marketed under the broad umbrella of artificial intelligence (AI). AI, or more generally the idea that computers can think like humans, has been discussed in literature for more than half a century–—since the seminal work of computer scientist Alan Turing. Today, first genera-tion AI applications–—those that apply AI only to specific tasks and are generally referred to under the label artificial narrow intelligence (ANI)–—are near ubiquitous. They enabled Facebook to recog-nize faces in images and tag users, they allowed Siri to understand your voice and act accordingly, and they enabled Tesla to develop self-driving cars. In the future, we may see the second generation of AI, artificial general intelligence (AGI), able to reason, plan, and solve problems autonomously for tasks they were never even designed for. And we might possibly see the third generation, artificial super intelligence (ASI), which are truly self-aware and conscious systems that, in a certain way, will make humans redundant. Such systems could apply AI to any area and be capable of scientific creativity, social skills, and general wisdom, which is why some call ASI true artificial intelligence. [Figure 1](#page1) outlines the three stages of AI.

今天，我们所有人——至少在原则上——都可以使用这些在人工智能(AI)这一广泛保护伞下销售的设备。自从计算机科学家阿兰 · 图灵的开创性工作以来，半个多世纪以来，人工智能，或者更广泛地说，计算机可以像人类一样思考的想法，一直在文学作品中被讨论。今天，第一代人工智能应用——那些只应用于特定任务的人工智能，通常被称为人工狭义智能(ANI)——几乎无处不在。它们使 Facebook 能够识别图像中的面孔并标记用户，它们使 Siri 能够理解你的声音并相应地采取行动，它们还使特斯拉能够开发自动驾驶汽车。在未来，我们可能会看到第二代人工智能，人工通用智能(AGI) ，能够自主地推理、计划和解决问题，完成他们从未设计过的任务。我们可能会看到第三代，人工超级智能(ASI) ，这是真正的自我意识和有意识的系统，在某种程度上，将使人类多余。这样的系统可以将人工智能应用到任何领域，具有科学创造力、社会技能和一般智慧，这就是为什么有些人称 ASI 为真正的人工智能。图1概述了人工智能的三个阶段。

In this article, we look more deeply into the concept of artificial intelligence. We start by pro-viding a definition of the term and giving a classifi-cation of the different types of AI, specifically

在这篇文章中，我们更深入地探讨了人工智能的概念。我们首先给出了这个术语的定义，并对不同类型的人工智能进行了分类

Figure 1. Stages of artificial intelligence (AI)

图1. 人工智能的发展阶段



**ASI**

**ASI**

**(Conscious/Self-Aware, Above**

**(有意识/自我意识，上图**

**Human-Level AI)**

**人类级别的人工智能)**

**Artificial Narrow Intelligence**

**人工狭义智能**

**ANI**

**安妮**

**(Weak, Below Human-Level AI)**

**(弱，低于人类水平的 AI)**

* Applies AI only to specific areas

只在特定区域使用人工智能

* Unable to autonomously solve problems in other areas

不能自主解决其他领域的问题

* Outperforms/equals humans in the specific area

在特定领域超越/等同于人类

**Artificial General Intelligence**

**人工通用智能**

**AGI**

**AGI (敏捷)**

**(Strong, Human-Level AI)**

**(强大的，人类水平的 AI)**

* Applies AI to several areas

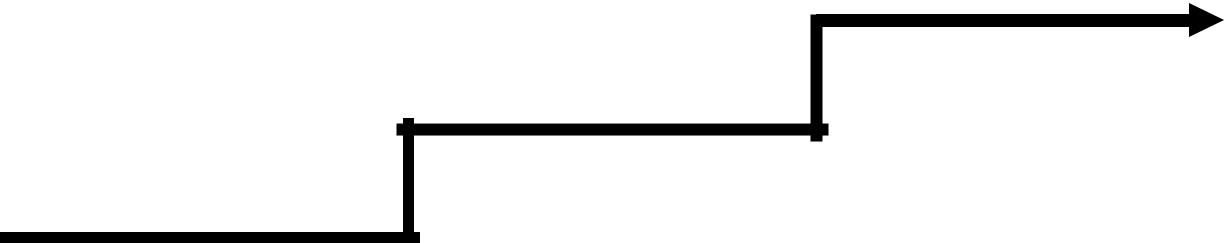
将人工智能应用于多个领域

* Able to autonomously solve problems in other areas

能够自主解决其他领域的问题

* Outperforms/equals humans in several areas

在几个方面超越/平等于人类



* Applies AI to any area

将人工智能应用于任何区域

* Able to solve problems in other areas instantaneously

能够迅速解决其他领域的问题

* Outperforms humans in all areas

在各方面都胜过人类

***Siri develops super-human capabilities such as solving complex mathematical problems instantaneously or writing a best***

***Siri 开发了超人的能力，比如瞬间解决复杂的数学问题或者写出最好的文章***

***Siri evolves into a humanoid robot***

***Siri 进化成一个人形机器人***

***with wide capabilities including***

***具有广泛的功能，包括***

***voice recognition, coffee***

***语音识别，咖啡***

***preparation, and writing skills***

***准备和写作技巧***

***seller in a heart (or clock) beat***

***心跳(或时钟)跳动中的卖家***

***Siri can recognize your voice but***

***Siri 可以识别你的声音，但是***

***cannot perform other tasks like***

***不能执行其他任务，如***



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regarding business use. We then discuss how uni-versities, corporations, and governments are al-ready using AI today, how they can use it in the future, and the specific challenges they have to face in the process. Finally, we provide a structured way to think about the organizational implications of AI both internally and externally, which we label as the Three C Model (Confidence, Change, Control). Our discussion finishes with a brief glimpse into an AI-enabled future and the question of if and where humans will have a place in such a world.

关于商业用途。然后我们讨论大学、企业和政府如何在今天已经准备好使用人工智能，他们将来如何使用它，以及他们在这个过程中必须面对的具体挑战。最后，我们提供了一个结构化的方法来思考人工智能在内部和外部的组织影响，我们称之为三 c 模型(信心，变化，控制)。我们的讨论以对人工智能的未来以及人类在这样一个世界中是否以及在哪里将有一席之地的问题的简短一瞥结束。

1. Interpretations of AI: As white as snow, as red as blood, as black as ebony

人工智能的解释: 像雪一样白，像血一样红，像乌木一样黑

Although articles about AI are abundant in popular and business press in recent years, it is surprisingly difficult to define what AI is and what it is not. Or, to put it differently, there are about as many different definitions of AI as there are ways to describe Snow White’s beauty, depending on whether one focuses on her white skin, red lips, or black hair. To some extent, this is related to the problem of defining intelligence itself, which is not an easy task. More-over, the field of AI is moving so fast that what used to be considered as intelligent behavior exhibited by machines 5 years ago is now considered barely noteworthy. We therefore start our analysis by pro-viding a definition of what we mean by AI in this article, followed by a classification of three main types of AI based on this definition.

尽管近年来关于人工智能的文章在流行和商业媒体上很多，但是人工智能到底是什么和不是什么却是令人惊讶的难以定义。或者换句话说，人工智能的不同定义和描述白雪公主美丽的方式一样多，取决于人们是关注她的白皮肤、红嘴唇还是黑头发。在某种程度上，这与定义智力本身的问题有关，而这并不是一件容易的事情。此外，人工智能领域的发展如此之快，以至于5年前被认为是机器表现出来的智能行为现在几乎不值一提。因此，我们在本文中首先给出人工智能的定义，然后在此定义的基础上对人工智能的三种主要类型进行分类。

2.1. Definition

2.1定义

1. common way to define artificial intelligence is to do so by referencing human intelligence, which can be seen as the “biopsychological potential to pro-cess information . . . to solve problems or create products that are of value in a culture” ([Gardner,](#page1) [1999](#page1), pp. 33—34). In 1955, the Dartmouth Research Project defined AI as the problem of “making a machine behave in ways that would be called intel-ligent if a human were so behaving” ([McCarthy,](#page1) [Minsky, Rochester, & Shannon, 1955](#page1)). In a similar manner, cognitive scientist Marvin Minsky consid-ered AI as “the science of making machines do things that would require intelligence if done by men” ([Minsky, 1968](#page1), p. v). For the purpose of this article, we follow this general line of thinking but aim to be more specific regarding the way in which AI achieves this goal. Specifically, we define AI as a system’s ability to interpret external data correctly, to learn from such data, and to use those learnings

定义人工智能的常用方法是参考人类智能，人类智能可以被视为“处理信息的生物心理学潜力... ... 用于解决问题或创造在文化中有价值的产品”(Gardner，1999，第33ー34页)。1955年，达特茅斯研究项目将人工智能定义为“如果一个人类能够如此行事，那么让一台机器以所谓的英特尔智能的方式行事”(McCarthy，Minsky，Rochester，& Shannon，1955)。以类似的方式，认知科学家 Marvin Minsky 认为人工智能是“让机器做需要智能的事情的科学”(Minsky，1968，p. v)。为了本文的目的，我们遵循这个一般的思路，但目标是更具体的方式，人工智能实现这一目标。具体来说，我们将 AI 定义为一个系统正确解释外部数据、从这些数据中学习和使用这些学习的能力

to achieve specific goals and tasks through flexible adaptation.

通过灵活的适应来实现特定的目标和任务。

Looking at this definition, it is obvious how AI differs from related concepts such as the Internet of Things (IoT) and big data. The IoT ([Krotov, 2017](#page1); [Saarikko, Westergren, & Blomquist, 2017](#page1)), which describes the idea that devices around us are equipped with sensors and software to collect and exchange data, can be seen as one specific way of obtaining the external data required as an input for AI. The IoT is one input toward big data ([Lee, 2017](#page1)), which describes data sets character-ized by huge amounts (volume) of frequently up-dated data (velocity) in various formats, such as numeric, textual, or images/videos (variety). Big data is, however, broader than the IoT since it also includes data collected through other means, such as (mobile) social media applications ([Kaplan, 2012;](#page1) [Kaplan & Haenlein, 2010](#page1)) or a firm’s internal data-base.

看看这个定义，很明显人工智能与物联网(IoT)和大数据等相关概念有何不同。物联网(The IoT)(Krotov，2017; Saarikko，Westergren，& Blomquist，2017)描述了我们周围的设备配备传感器和软件来收集和交换数据的想法，可以被看作是获取作为人工智能输入所需的外部数据的一种具体方式。物联网是对大数据的一种输入(Lee，2017) ，它描述了以各种格式(如数字、文本或图像/视频(多样性)的大量(体积)频繁更新的数据(速度)为特征的数据集。然而，大数据比物联网更广泛，因为它还包括通过其他方式收集的数据，如(移动)社交媒体应用程序(卡普兰，2012; Kaplan & Haenlein，2010)或公司的内部数据库。

AI uses external information obtained through IoT or other big data sources as an input for identi-fying underlying rules and patterns by relying on approaches from machine learning, which, broadly speaking, describes methods that help computers learn without being explicitly programmed. These methods can be relatively simple (think of the regression analysis you learned during your MBA) or eye-wateringly complex (such as deep neural networks, which form the basis of deep learning tools like Google’s DeepMind). Machine learning is an essential part of AI, but AI is broader than machine learning since it also covers a system’s ability to perceive data (e.g., natural language processing or voice/image recognition) or to con-trol, move, and manipulate objects based on learned information be it a robot or another con-nected device.

人工智能利用通过物联网或其他大数据源获得的外部信息作为输入，依靠机器学习的方法来识别潜在的规则和模式。这些方法可以相对简单(想想你在 MBA 课程中学到的回归分析) ，也可以非常复杂(比如构成谷歌 DeepMind 等深度学习工具基础的深度神经网络)。机器学习是人工智能的一个重要组成部分，但人工智能比机器学习更广泛，因为它也包括系统感知数据(例如自然语言处理或语音/图像识别)的能力，或者根据所学到的信息控制、移动和操纵物体的能力，无论是机器人还是其他连接的设备。

2.2. Classification

2.2分类

To classify different types of AI, specifically regard-ing their business use, we borrow from the manage-ment literature and specifically studies investigating the skills shared by successful manag-ers and employees with above-average perfor-mance (e.g., [Boyatzis, 2008; Hopkins & Bilimoria,](#page1) [2008](#page1); [Luthans, Welsh, & Taylor, 1988](#page1); [McClelland &](#page1) [Boyatzis 1982; Stubbs Koman & Wolff, 2008](#page1)). This literature generally claimed that outstanding performance is strongly related to the presence of three skills or types of competencies: cognitive intelligence (e.g., competencies related to pattern recognition and systematic thinking), emotional intelligence (e.g., adaptability, self-confidence, emotional self-awareness, achieve-

为了对不同类型的人工智能进行分类，特别是考虑到它们的商业用途，我们借鉴了管理文献，并特别研究了成功的管理者和绩效高于平均水平的员工共享的技能(例如，Boyatzis，2008; Hopkins & Bilimoria，2008; Luthans，Welsh，& Taylor，1988; McClelland & Boyatzis，1982; Stubbs Koman & Wolff，2008)。这些文献一般认为，杰出的表现与三种技能或能力的存在密切相关: 认知智力(例如，与模式识别和系统思考有关的能力) ，情绪智力(例如，适应性，自信，情绪自我意识，达到 -

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| Figure 2. Types of AI systems 图2人工智能系统的类型 | |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  | Expert 专家 | Analytical 分析型 | Human- 人类 | Humanized 人性化 | Human 人类 |  |
|  |  | Systems 系统 | AI 人工智能 | Inspired AI 启发人工智能 | AI 人工智能 | Beings 生物 |  |
|  |  |  |  |  |  |  |  |
|  | Cognitive Intelligence 认知智能 |  |  |  |  |  |  |
|  | Emotional Intelligence 情商 |  |  |  |  |  |  |
|  | Social Intelligence 社会智力 |  |  |  |  |  |  |
|  | Artistic Creativity 艺术创造力 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  | Supervised Learning, Unsupervised Learning, 监督式学习，非监督式学习, | | |  |  |
|  |  |  |  | Reinforcement Learning 强化学习 | |  |  |
|  |  |  |  |  |  |  |  |

ment orientation), and social intelligence (e.g., empathy, teamwork, inspirational leadership). [Fig-ure 2](#page1) outlines the types of AI systems.

图2概述了人工智能系统的类型。

While the use of cognitive intelligence to classify AI seems straightforward, the applicability of emo-tional and social intelligence requires some expla-nation. The mainstream view in psychology is that intelligence is generally innate (i.e., a characteris-tic that individuals are born with rather than some-thing that can be learned). Still, emotional and social intelligence are related to specific emotional and social skills and it is these skills that individuals can learn and that AI systems can mimic. While machines and AI systems can obviously not experi-ence emotions themselves, they can be trained to recognize them (e.g., through the analysis of facial micro-expressions) and then adapt their reactions accordingly.

虽然使用认知智能来分类人工智能看起来很简单，但是情绪智能和社会智能的适用性需要一些解释。心理学的主流观点是，智力通常是与生俱来的(也就是说，一种个体与生俱来的特征，而不是某种可以学习的东西)。尽管如此，情商和社交智力与特定的情商和社交技能有关，正是这些技能，个人可以学习，人工智能系统可以模仿。虽然机器和人工智能系统显然不能自己体验情绪，但它们可以通过训练来识别情绪(例如，通过分析面部微表情) ，然后相应地调整其反应。

Before discussing AI systems, it is important to highlight that expert systems–—collections of rules programmed by humans in form of if-then state-ments–—are not part of AI since they lack the ability to learn autonomously from external data. In fact, expert systems represent a different approach al-together since they assume that human intelligence can be formalized through rules and hence recon-structed in a top-down approach (also called sym-bolic or knowledge-based approach). If an expert system were programmed to recognize a human face, then it would check for a list of criteria (e.g., the presence of certain shapes, of a nose, of two eyes) before making a judgment based on embedded rules. Such systems tend to perform poorly during tasks that depend on complex forms of human intelligence, which are implicit and can-not be transferred easily to simple rules. That is not to say that expert systems are not useful. IBM’s famous Deep Blue chess-playing algorithm, which beat Garry Kasparov in the late 1990s, was not AI but an expert system. Expert systems like Deep Blue have been key drivers in making AI (or what is sometimes believed to be AI) more prominent among the general public.

在讨论人工智能系统之前，必须强调指出，专家系统——人类编程规则的集合，其形式为 if-then 状态——不是人工智能的一部分，因为它们缺乏从外部数据中自主学习的能力。事实上，专家系统总体上代表了一种不同的方法，因为它们假定人类智能可以通过规则形式化，从而以自上而下的方法(也称为符号化或基于知识的方法)进行重新构造。如果一个专家系统被编程来识别一张人脸，那么在根据嵌入的规则做出判断之前，它会检查一系列标准(例如，是否存在某些形状，鼻子，两只眼睛)。这种系统在执行依赖于复杂形式的人类智能的任务时往往表现不佳，这种智能是隐含的，不能轻易转换为简单的规则。这并不是说专家系统没有用处。IBM 著名的深蓝国际象棋算法在20世纪90年代末击败了 Garry Kasparov，它不是人工智能，而是一个专家系统。像深蓝这样的专家系统是使人工智能(或者有时被认为是人工智能)在普通大众中更加突出的关键驱动因素。

Real AI as defined above uses a bottom-up ap-proach (also called connectionist or behavior-based

上面定义的真实人工智能使用了一种自下而上的方法(也称为连接主义或基于行为的方法)

approach) by imitating the brain’s structure (e.g., through neural networks) and using vast amounts of data to derive knowledge autonomously. This is similar to how a child would learn to recog-nize a face–—not by applying rules formalized by his/ her parents but by seeing hundreds of thousands of faces and, at some point, being able to recognize what is a face and what is a broom. This allows dealing with tasks vastly more complex than what could be handled through expert systems. For ex-ample, while chess can be formalized through rules, the Chinese board game Go cannot. Therefore it was never possible to build an expert system able to beat a human Go player. Yet a deep neural network can be trained to play Go simply by observing a very large number of games played by humans.

通过模仿大脑的结构(例如，通过神经网络)和使用大量的数据来自主地获取知识。这类似于一个孩子如何学会认出一张脸——不是通过应用他/她父母制定的规则，而是通过看到成千上万张脸，并在某个时候能够认出什么是脸，什么是扫帚。这使得处理比专家系统更复杂的任务成为可能。例如，虽然国际象棋可以通过规则形式化，但中国的棋盘游戏围棋却不能。因此，建立一个能够打败人类围棋玩家的专家系统是不可能的。然而，一个深层神经网络可以通过观察大量人类下的棋来训练自己下围棋。

Based on these three types of competencies, we classify AI systems into three groups (see [Figure 2](#page1)):

基于这三种类型的能力，我们将人工智能系统分为三组(见图2) :

1. Analytical AI has only characteristics consistent with cognitive intelligence. These AI systems gen-erate a cognitive representation of the world and use learning based on past experience to inform future decisions. Most AI systems used by firms today fall into this group and examples include systems used for fraud detection in financial ser-vices, image recognition, or self-driving cars.

分析型人工智能只具有与认知智能相一致的特征。这些人工智能系统产生世界的认知表征，并使用基于过去经验的学习来为未来决策提供信息。如今企业使用的大多数人工智能系统都属于这一类，例如用于金融服务、图像识别或自动驾驶汽车欺诈检测的系统。

1. Human-Inspired AI has elements from cognitive as well as emotional intelligence. These systems can, in addition to cognitive elements, under-stand human emotions and consider them in their decision making. Affectiva, an AI company founded by MIT, uses advanced vision systems to recognize emotions like joy, surprise, and anger at the same level (and frequently better) as humans. Companies can use such systems to recognize emotions during customer interac-tions or while recruiting new employees. We talk about more examples in the following section.

受人类启发的人工智能包含了认知和情感智能的元素。除了认知元素，这些系统还能理解人类的情感，并在做决策时考虑到它们。由麻省理工学院创立的人工智能公司 Affectiva 使用先进的视觉系统来识别像喜悦、惊讶和愤怒这样的情绪，这些情绪与人类处于同一水平(通常更好)。公司可以使用这种系统来识别客户互动或招聘新员工时的情绪。我们将在下一节讨论更多的例子。

1. Humanized AI shows characteristics of all types of competencies (i.e., cognitive, emotional, and social intelligence). Such systems, which would be able to be self-conscious and self-aware in

人性化的人工智能显示了所有类型的能力(即认知、情感和社会智能)的特征。这样的系统，将能够自我意识和自我意识

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their interactions with others, are not available yet. While progress has been made in recognizing and mimicking human activities, building AI sys-tems that actually experience the world in a fundamental way are a project for the (poten-tially distant) future.

他们与其他人的互动，目前还不可用。虽然在识别和模仿人类活动方面已经取得了进展，但建立真正以基本方式体验世界的人工智能系统是一个面向(可能很遥远)未来的项目。

As highlighted in our definition of AI stated above, a defining element of all those systems is the ability to learn from past data. For this, there are three broad types of learning processes: supervised learning, unsupervised learning, and reinforcement learning.

正如我们在上述对人工智能的定义中所强调的，所有这些系统的一个决定性因素是从过去的数据中学习的能力。为此，有三大类学习过程: 监督式学习、非监督式学习和强化学习。

1. Supervised learning methods map a given set of inputs to a given set of (labeled) outputs. They are usually the least scary for managers since supervised learning include methods many may be familiar with (at least in principle) from Statistics 101, such as linear regression or clas-sification trees. That being said, more complex methods like neural networks also fall into this group. An example of supervised learning is to use a large database of labeled images to sepa-rate between those images showing a Chihuahua and those showing a muffin.

监督式学习方法将给定的输入集映射到给定的(标记的)输出集。它们通常对管理者来说是最不可怕的，因为监督式学习包括许多人可能熟悉的(至少在原则上)来自《统计学101》的方法，比如线性回归或类别分类树。也就是说，像神经网络这样更复杂的方法也属于这一类。监督式学习的一个例子是，使用一个有标签的大型图像数据库，将显示吉娃娃的图像与显示松饼的图像分开。

1. In unsupervised learning, the inputs are labeled but not the outputs. This means that the algorithm needs to infer the underlying structure from the data itself. Cluster analysis, which aims at group-ing elements in similar categories but where nei-ther the structure of those clusters nor their number is known in advance, falls into this group. Since the output is derived by the algorithm itself, it is not possible to assess the accuracy or correct-ness of the resulting output. Users therefore need to place greater trust and confidence into the AI system and that can make managers uncomfort-able. Speech recognition–—made familiar with Apple’s Siri or Amazon’s Alexa–—can be conducted using unsupervised learning.

在非监督式学习中，输入被标记，而输出却不被标记。这意味着算法需要从数据本身推断出潜在的结构。聚类分析就属于这一类。聚类分析的目的是对相似类别中的元素进行分组，但是这些聚类的结构和数据聚类的数量都不是事先知道的。由于输出是由算法本身导出的，因此不可能评估结果输出的准确性或正确性。因此，用户需要给人工智能系统更大的信任和信心，这会让管理者感到不舒服。语音识别——熟悉苹果(Apple)的 Siri 或亚马逊(Amazon)的 Alexa ——可以使用非监督式学习进行。

1. In reinforcement learning, the system receives an output variable to be maximized and a series of decisions that can be taken to impact the output. Think, for example, of an AI system that aims to learn playing Pac-Man, simply by knowing that Pac-Man can move up, down, left and right and that the objective is to maximize the score ob-tained in the game. Software giant Microsoft uses reinforcement learning to select headlines on MSN.com by rewarding the system with a higher score when more visitors click on a given link.

在强化学习中，系统接收一个要求最大化的输出变量和一系列可以影响输出的决策。例如，想想一个旨在学习玩吃豆人的人工智能系统，只需要知道吃豆人可以上下左右移动，目标是最大化在游戏中获得的分数。软件巨头微软使用强化学习来选择 msn 上的标题，当更多的访问者点击一个给定的链接时，系统会给予更高的分数。

Looking at AI this way raises the question of whether there are any skills that remain characteristic for

以这种方式看待人工智能提出了一个问题: 是否有任何技能仍然是特色的

humans and out of reach of AI. This question is difficult to answer given the tremendous progress AI has experienced over the past decade. Still, it seems likely that humans will always have the upper hand where artistic creativity is concerned. Funda-mentally, AI is based on pattern recognition or curve fitting (i.e., finding a relationship that explains an existing set of data points), while “creativity is intelligence having fun” as Albert Einstein put it. At this stage, it seems unlikely that AI systems will be able to solve truly creative tasks. That being said, the entertainment company Botnik Studios recently used AI to write a three-page chapter with the title “Harry Potter and the Portrait of What Looked Like a Large Pile of Ash” after training their AI system on all seven of the popular fantasy novels. So the borders are certainly quite fluid in that respect.

人类和人工智能无法触及的地方。这个问题很难回答，因为人工智能在过去十年中经历了巨大的进步。尽管如此，在艺术创造力方面，人类似乎总是占据上风。在精神上，人工智能是基于模式识别或曲线拟合(即找到一个关系，解释一组现有的数据点) ，而“创造力是智力的乐趣” ，正如爱因斯坦所说。在这个阶段，人工智能系统似乎不太可能解决真正的创造性任务。话虽如此，娱乐公司 Botnik Studios 最近在将他们的人工智能系统训练为所有七部流行奇幻小说之后，使用人工智能写了一个三页的章节，题目是“哈利波特和看起来像一大堆灰烬的肖像”。因此，在这方面，边界无疑是相当不稳定的。

1. Illustrations of AI: Appl(e)ications in universities, corporations, and governments

人工智能的插图: 大学、企业和政府的应用程序(e)

Building on our classification of AI into analytical AI, human-inspired AI, and humanized AI, we look to three industries: universities, corporations, and governments. Specifically, we dive into how AI is already shaping them and what future trends can be expected in years to come (see [Table 1](#page1)). Like in the case of Snow White, we will see the world is rarely as simple as we would like it to be. For every sweet side of the red apple that provides wonderful op-portunities, there is also a poisoned side that rep-resents very real risks.

在我们将人工智能分为分析型人工智能、人类启发型人工智能和人性化人工智能的基础上，我们着眼于三个行业: 大学、企业和政府。具体来说，我们深入研究人工智能如何已经塑造了它们，以及未来几年可以预期的趋势(见表1)。就像白雪公主一样，我们将看到世界很少像我们希望的那样简单。红苹果的甜美一面提供了绝佳的行动机会，但也有有毒的一面代表着非常真实的风险。

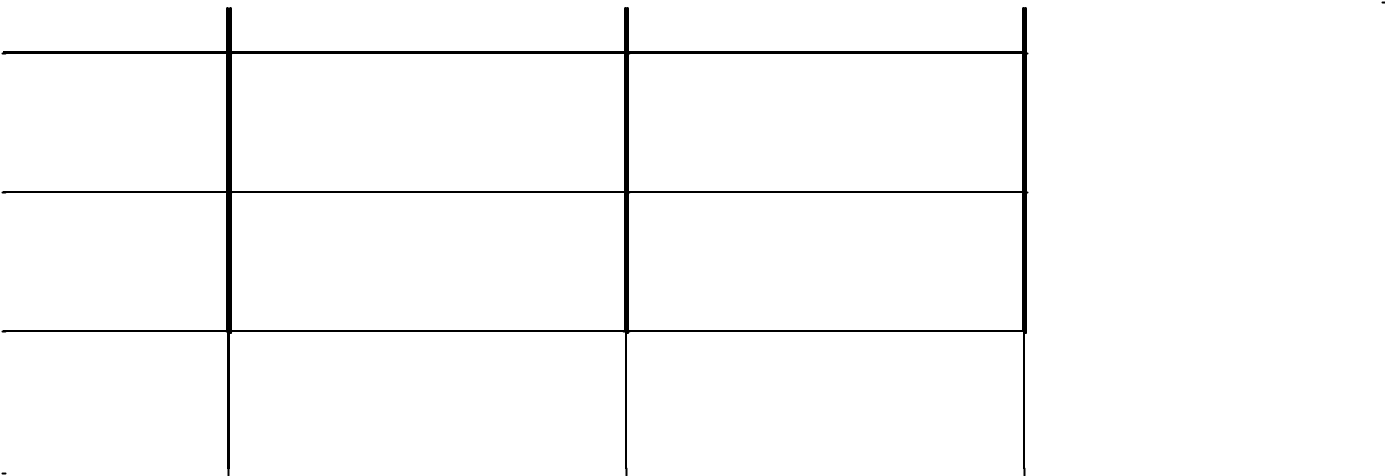
3.1. Universities

3.1大学

Many of the most significant advances in artificial intelligence have their origin in a university context and given the technical nature of AI, this tendency is most likely to go on in the future. The term AI itself was coined at a workshop at Dartmouth Col-lege in 1956, organized by the computer scientist John McCarthy who later became a professor at Stanford. DeepMind, a British AI company acquired by Google in 2014, was created by three scientists, two of which met while working at University Col-lege London. In 2015, DeepMind developed Alpha-Go–—the first computer Go program to defeat a human professional Go player. It is therefore natural to start our analysis of the practical applications of AI in an academic context to answer the question of whether universities may have sown the seeds of their own destruction by their research on AI,

人工智能的许多最重要的进步都起源于大学环境，鉴于人工智能的技术性质，这种趋势在未来很可能会继续下去。人工智能这个词是在1956年达特茅斯学院的一个研讨会上创造出来的，由计算机科学家约翰 · 麦卡锡组织，他后来成为了斯坦福大学的一名教授。DeepMind 是一家英国人工智能公司，于2014年被谷歌(Google)收购。该公司由三位科学家创立，其中两位是在伦敦大学学院(University col-college London)工作时相识的。2015年，DeepMind 开发了 Alpha-Go ——第一个击败人类职业棋手的电脑围棋程序。因此，我们自然要从学术角度开始分析人工智能的实际应用，以回答这样一个问题: 大学对人工智能的研究是否已经播下了自我毁灭的种子,

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|  | Table 1. Illustrations of AI applications within specific sectors 表1. 特定行业的人工智能应用示例 | | |  |  |
|  |  | Analytical AI 分析型人工智能 | Human-Inspired AI 人工智能 | Humanized AI 人性化的人工智能 |  |
|  | Universities 大学 | Virtual teaching assistants 虚拟教学助理 | AI-based career services 以人工智能为基础的就业服务 | Robo-teachers animating a 机器人-教师动画 |  |
|  |  | able to answer student 能回答学生的问题 | able to identify emotions to 能够识别情绪 | student group by acting as 学生团体扮演 | |
|  |  | questions and tailor 问题和量身定做 | improve interview 提高面试质量 | moderator and sparring 主持人和陪练 | |
|  |  | reactions to individual data 对个人数据的反应 | techniques of students 学生的技能 | partners 合伙人 |  |
|  | Corporations 企业 | Robo-advisors leveraging 机器人顾问 | Stores identifying unhappy 不开心的商店 | Virtual agents dealing with 虚拟代理处理 | |
|  |  | automation and AI 自动化和人工智能 | shoppers via facial 购物者通过面部护理 | customer complaints and 顾客投诉和 | |
|  |  | algorithms to manage client 管理客户端的算法 | recognition at checkouts to 付款时的识别 | addressing concerns of 关注的问题 | |
|  |  | portfolios 投资组合 | trigger remedial actions 触发补救行动 | unhappy customers 不满意的顾客 |  |
|  | Governments 政府 | Automation systems to set 设置自动化系统 | Virtual army recruiters 虚拟征兵人员 | AI systems able to 人工智能系统 | |
|  |  | the brightness of ... 的亮度 | interviewing and selecting 面试和选拔 | psychologically train 心理训练 | |
|  |  | streetlights based on traffic 基于交通的路灯 | candidates based on 候选人基于 | soldiers before entering a 士，然后才能进入 | |
|  |  | and pedestrian movements 以及行人的活动 | emotional cues 情绪线索 | war zone 战区 | |
|  |  |  |  |  |  |



similar to the spirits cited by Goethe’s “The Sorcer-er’s Apprentice” or the poisoned side of the red apple of the evil queen.

类似于歌德的《巫师的学徒》中提到的精灵，或者是邪恶女王红苹果中毒的一面。

Analytical AI applications are already starting to transform the profession of faculty members. Georgia Tech uses an AI-based virtual teaching as-sistant called Jill Watson to answer student ques-tions. The performance of the system is so remarkable that many students only realized that Jill Watson is not human after they were told. Other universities, like the Technical University of Berlin and Carnegie Mellon, similarly tested the use of chatbots to streamline teaching and learning. But the AI revolution does not stop at teaching alone. The British RELX Group, owner of Elsevier and LexisNexis, uses AI for automating systematic aca-demic literature reviews or for supporting the re-view process through checks for plagiarism or misuse of statistics. In a research context, AI is particularly useful for projects that aim to combine ideas across scientific boundaries and that, by con-sequence, require knowledge of many different literature streams that may be difficult to process by humans.

人工智能分析应用程序已经开始改变教师的职业。佐治亚理工学院使用一个基于人工智能的虚拟教学作为助手，名为吉尔 · 沃森(Jill Watson)来回答学生的问题。该系统的性能是如此显著，以至于许多学生在被告知 Jill Watson 不是人类后才意识到。其他大学，如柏林技术大学和卡内基梅隆大学，同样测试了聊天机器人的使用，以简化教学和学习。但是人工智能革命并不仅仅停留在教学上。Elsevier 和 LexisNexis 的所有者——英国 RELX 集团，使用人工智能来自动化系统的学术文献评论，或者通过检查剽窃或统计误用来支持评论过程。在研究背景下，人工智能对于那些旨在跨越科学界限结合思想的项目特别有用，因此，需要了解许多人类可能难以处理的不同文献流。

Human-inspired AI brings all of this to the next level. In an online learning context ([Kaplan &](#page1) [Haenlein, 2016](#page1)), universities could use AI to test whether students pay attention during a virtual class by analyzing facial impressions collected through a webcam. In a traditional setting, systems like RENEE (named for retain, engage, notify, and enablement engine), developed by U.S.-based Cam-pus Management Corporation, can automatically launch interventions based on student profiles, best practices, and other inputs. RENEE might in the future be able to read student emotions like sadness or fear, allowing faculty and staff to identify the most effective coaching strategies or to spot cheat-ing in exams. All these systems will help faculty

受人类启发的人工智能将所有这些都提升到了一个新的水平。在在线学习背景下(Kaplan & Haenlein，2016) ，大学可以通过分析网络摄像头收集的面部表情来测试学生在虚拟课堂上是否集中注意力。在传统环境中，美国 Cam-pus Management Corporation 开发的 RENEE (命名为 retain，engage，notify，and enablement engine)等系统可以根据学生个人资料、最佳实践和其他输入自动启动干预措施。RENEE 将来也许能够读懂学生的情绪，比如悲伤或者恐惧，这样教职员工就能够确定最有效的辅导策略，或者发现考试中的作弊行为。所有这些系统都将帮助教师

outsource tedious tasks such as grading and re-sponding to repetitive student questions. This leaves professors, in principle, more time for their core competence of coaching, moderating, and facilitating discussions ([Kaplan, 2018](#page1)). Until, of course, the next generation of humanized AI appli-cations will take care of those tasks as well.

将单调乏味的任务外包出去，例如评分和回答重复的学生问题。这使得教授原则上有更多的时间用于他们的核心能力，指导，主持和促进讨论(Kaplan，2018)。当然，直到下一代人性化人工智能应用程序也将负责这些任务。

Whether this will ever be the case depends on this fundamental question: Will students prefer to be educated by smart machines or by human pro-fessors? The fact that AI systems are cheaper than highly paid faculty members, at least in the long run, makes them preferable from the perspective of university deans who struggle for funding. But are they really the better choice if education becomes less personal? Universities need to make a conscious decision in this context and prepare themselves for the rise of AI. This will also allow them to better prepare their students for a workplace in which AI will become increasingly prominent. In this context, some researchers suggest that universities should introduce a course on artificial intelligence and humanity to answer questions of equity, ethics, privacy, and data ownership, which are of relevance in this context ([Keating & Nourbakhsh, 2018](#page1), p. 32).

这种情况是否会发生取决于一个基本的问题: 学生更愿意接受智能机器的教育还是人类教授的教育？事实上，至少从长远来看，人工智能系统比高薪教职员工便宜，这使得他们更受那些为资金而挣扎的大学院长们的青睐。但是，如果教育变得不那么个人化，它们真的是更好的选择吗？在这种情况下，大学需要有意识地做出决定，为人工智能的兴起做好准备。这也将使他们能够更好地为他们的学生准备一个工作场所，在那里人工智能将变得越来越突出。在这种背景下，一些研究人员建议大学应该开设人工智能和人性课程，以回答公平、道德、隐私和数据所有权的问题，这些问题在这种背景下是相关的(Keating & Nourbakhsh，2018，第32页)。

3.2. Corporations

3.2. 法团

Looking at corporations, AI has already started to impact every single element of a firm’s value chain and, in the process, transform industries in a fundamental manner, especially service industries ([Huang & Rust, 2018](#page1)). Analytical AI applications are used in human resource management to help with the screening of CVs and selection of candidates in the form of advanced application tracking systems (ATS). In marketing and sales, AI is used to allow for better targeting and personalized communication. AI systems can identify thousands of psychotypes

看看企业，人工智能已经开始影响企业价值链的每一个单一元素，在这个过程中，从根本上改变行业，特别是服务行业(Huang & Rust，2018)。人工智能分析应用程序用于人力资源管理，以先进的应用程序跟踪系统(ATS)的形式帮助筛选简历和挑选候选人。在市场营销和销售中，人工智能被用来实现更好的针对性和个性化的沟通。人工智能系统可以识别成千上万的心理类型

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([Kosinski, Stillwell, & Graepel, 2013](#page1)) and create messages that resonate well with their preferences, leading to tens of thousands of variations of the same message used every day. In customer service, AI can be applied in the form of chatbots that can generate automatic responses to inquires sent through social media channels or emails. Modern versions like Google Duplex are even able to con-duct phone calls that are difficult to distinguish from conversations with a human counterpart.

(Kosinski，Stillwell，& Graepel，2013) ，并创建与他们的偏好产生良好共鸣的信息，导致每天使用同一信息的成千上万种变体。在客户服务中，人工智能可以以聊天机器人的形式应用，聊天机器人可以对通过社交媒体渠道或电子邮件发送的询问产生自动回应。像 Google Duplex 这样的现代版本甚至可以进行电话通话，这种通话很难与人类对话区分开来。

Looking at industry effects, the financial services sector has seen the rise of financial technology (fintech) startups which have revolutionized asset management through the creation of robo-advisors and the analysis of financial transaction data (e.g., by spotting early signs of dementia reflected in erratic account movements). In retailing, AI is used for inventory management with the holy grail being Amazon’s anticipatory shipping patent that deals with sending items to customers before they even ordered them. In the entertainment sector, AI has been used by newspapers like The Los Angeles Times to automatically write articles. In the near future, AI will go beyond written text and create artificial videos in which the moving picture of a person can be overlaid to any text the author desires ([Suwajanakorn, Seitz, & Kemelmacher-Shlizerman, 2017](#page1)). This will give the idea of fake news an entirely new dimension.

从行业效应来看，金融服务部门已经看到金融技术(金融科技)初创公司的崛起，这些公司通过创建机器人顾问和分析金融交易数据(例如，通过发现反映在不稳定的账户变动中的痴呆症早期迹象) ，使资产管理发生了革命性变化。在零售业，人工智能被用于库存管理，而亚马逊的预期运输专利就是圣杯，专门处理在顾客订购商品之前将商品发送给顾客的问题。在娱乐领域，人工智能已经被洛杉矶时报等报纸用来自动撰写文章。在不久的将来，人工智能将超越书面文本，创建人工视频，其中一个人的动态图片可以叠加到作者希望的任何文本(Suwajanakorn，Seitz，& Kemelmacher-Shlizerman，2017)。这将为假新闻的概念提供一个全新的维度。

Human-inspired AI allows companies like Wal-mart to identify unhappy and frustrated customers by applying facial recognition techniques to people queuing up at checkouts, thus enabling interven-tion by either opening new cashiers or proposing snacks and drinks to customers. The same tools can be used to automatically detect fraud and theft orders of magnitude more efficiently than a tradi-tional store detective could. Online firms like Net-flix, Spotify, and Pandora already use AI to provide personalized recommendations for music and mov-ies. In the future, an analysis of your past choices combined with facial recognition through your phone’s camera (think iPhone X) allows those firms to also detect your current mood and propose matching entertainment content. Alternatively, standalone applications like Replika, your AI friend developed by the San Francisco-based Luka Inc., allows you to build a diary and, in a way, acts like an AI-enabled therapist. This will likely be a major threat to online therapy providers like BetterHelp or Talkspace.

人工智能让像沃尔玛这样的公司能够通过将面部识别技术应用到排队结账的人身上来识别不开心和沮丧的顾客，从而通过开设新的收银员或向顾客提供零食和饮料来实现干预。相同的工具可以被用来自动检测欺诈和数量级的盗窃比传统的商店侦探可以更有效率。像 Net-flix、 Spotify 和 Pandora 这样的在线公司已经使用人工智能为音乐和电影提供个性化的推荐。在未来，通过分析你过去的选择，结合通过手机摄像头(比如 iPhone x)进行面部识别，这些公司也可以检测你当前的情绪，并提出匹配的娱乐内容。或者，像旧金山 Luka 公司开发的 Replika 这样的独立应用程序，允许你构建日记，在某种程度上，它就像一个人工智能治疗师。这对于像 BetterHelp 或 Talkspace 这样的在线治疗提供商来说可能是一个主要的威胁。

The combination of human-inspired AI and robot-ics is also where we can get a first glimpse into the world of humanized AI. In 1964, Joseph Weizen-baum from MIT created the first natural language processing computer program called ELIZA. The

人工智能和机器人技术的结合也是我们第一次看到人性化人工智能世界的地方。1964年，麻省理工学院的 Joseph Weizen-baum 创造了第一个自然语言处理计算机程序 ELIZA。他说

idea was to generate a program that can pass the Turing test: If a person cannot distinguish whether he/she is talking to a human or a machine, the machine exhibits intelligent behavior ([Turing,](#page1) [1950](#page1)). Today ELIZA has evolved into Sophia, an AI-inspired robot developed by David Hanson that is so convincing Saudi Arabia granted it citizenship in 2017. Such tools are more than a PR stunt–—Sophia is a highly demanded speaker and generated press coverage reaching 10 billion readers in 2017. These robots can serve as buddies for senior citizens who live alone and, broadly speaking, revolutionize the field of elderly care.

如果一个人不能区分他/她是在和人说话还是和机器说话，机器就会展现出智能行为(图灵，1950)。今天，ELIZA 已经进化成了 Sophia，一个由 David Hanson 开发的受人工智能启发的机器人，这个机器人在2017年被沙特阿拉伯授予了公民身份。这些工具不仅仅是一个公关噱头——索菲娅是一个受到高度追捧的演讲者，并且在2017年产生了100亿读者的新闻报道。这些机器人可以作为独居老年人的伙伴，从广义上说，它们彻底改变了老年人护理领域。

3.3. Governments

3.3. 政府

Sophia’s citizenship status naturally leads to the question of how AI should and could impact govern-ments, both directly and indirectly. Like universi-ties and corporations, governments can use AI to make tasks more efficient and it is in this context where the concept of the good vs. bad side of the red apple becomes most obvious. The City of Jack-sonville uses analytical AI to manage intelligent streetlights which decide on the brightness of each lamp depending on traffic and pedestrian move-ments collected by street cams. Another example is the Southern Nevada Health District, which uses AI combined with information from Twitter to de-cide which restaurants to visit for health inspec-tions. A combination of natural language processing and geotagging helps to spot places where custom-ers report food poisoning and identify those estab-lishments for inspection. In an experiment conducted in Las Vegas, this approach resulted in more demerits and citations, which ultimately could lead to 9,000 fewer cases of food poisoning and over 500 fewer hospitalizations per year.

索菲娅的公民身份自然引出了人工智能如何直接和间接影响政府的问题。像大学和企业一样，政府可以使用人工智能来提高任务的效率，正是在这种背景下，红苹果好坏两面的概念变得最为明显。杰克-桑维尔市使用分析人工智能来管理智能路灯，智能路灯根据街道摄像头收集的交通和行人动向来决定每盏路灯的亮度。另一个例子是南内华达健康区，它使用人工智能结合 Twitter 的信息来决定去哪家餐馆进行健康检查。自然语言处理和地理标签的结合有助于发现顾客报告食物中毒的地方，并确定那些需要检查的餐馆。在拉斯维加斯进行的一项实验中，这种方法导致了更多的缺点和引用，最终可能导致每年减少9000例食物中毒病例和500多例住院病例。

In the same vein, human-inspired AI is apparently used by the U.S. Army in the recruitment of future soldiers through an advanced SGT Star AI system that is rumored to be able to recognize emotions. SGT Star is an interactive virtual agent that applies AI to respond to questions, review qualifications, and assign selected candidates to actual human recruiters. SGT Star does the workload of more than 50 recruiters with a 94% accuracy rate and boosted engagement time for applicants from 4 minutes to over 10 minutes. Of course, another way to lever-age the power of AI in a military context is to rely on AI-enabled robotic soldiers. This is, unfortunately, not a science fiction idea but becoming a reality. In 2013, over 100 researchers, security experts, and company leaders wrote an open letter to the UN asking to ban AI-enabled robots in war. Automatic systems, including drones, missiles, and machine

同样，人工智能显然被美国陆军用来招募未来的士兵，通过一个先进的中士 Star 人工智能系统，据说这个系统能够识别情绪。SGT Star 是一个交互式虚拟代理，它应用人工智能来回答问题，审查资格，并将选定的候选人分配给真正的人类招募者。SGT Star 以94% 的准确率完成超过50名招聘人员的工作量，并将应聘者的参与时间从4分钟提高到10分钟以上。当然，在军事环境中利用人工智能的另一种方法是依靠人工智能的机器人士兵。不幸的是，这不是科幻小说里的想法，而是成为了现实。2013年，超过100名研究人员、安全专家和公司领导人给联合国写了一封公开信，要求禁止战争中使用人工智能机器人。自动化系统，包括无人机、导弹和机器

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guns, can lead to a level of escalation that older readers may remember from the 1983 movie War Games.

年长的读者可能还记得1983年的电影《战争游戏》。

A natural question arises when combining AI and governments: Where does improvement end and an Orwellian surveillance state begin? China has pro-posed a social credit system that combines mass surveillance, big data analytics, and AI to reward the trustworthy and punish the disobedient. In the proposed initiative, punishment for undesirable be-havior can include flight bans and restriction relat-ed to private schools access, real estate purchases, or even taking a holiday. In Shenzhen, authorities already use facial recognition systems to crackdown on crimes like jaywalking; in Xiamen, users receive mobile phone messages when they are calling citi-zens with low social credit scores ([Xu & Xiao, 2018](#page1)).

当人工智能和政府结合在一起时，一个自然而然的问题就出现了: 改进在哪里结束，一个奥威尔式的监视国家从哪里开始？中国提议建立一个社会信用体系，将大规模监控、大数据分析和人工智能结合起来，奖励值得信赖的人，惩罚不服从的人。在这项提议中，对不良行为的惩罚可以包括禁止飞行和限制私立学校入学、购买房地产，甚至休假。在深圳，当局已经使用面部识别系统来打击乱穿马路等犯罪行为; 在厦门，当用户打电话给社会信用评分较低的花旗居民时，他们会收到手机短信(Xu & Xiao，2018)。

The examples bring up the question of regulation and the need for government intervention in the domain of AI, especially when reaching humanized AI. While some voices argue for immediate and proactive regulation on a national and international level given the quick progress of AI–—though it may otherwise be too late–—others are concerned that regulation could slow down AI development and limit innovation. The middle ground is to develop common norms instead of trying to regulate tech-nology itself, similar to the consumer and safety testing done for physical products. Such norms could include requirements for the testing and transparency of algorithms, possibly in combination with some form of warranty. This would also allow for regulations to remain stable and eliminate the need for constant updates in response to technological advances. This proposal is complicat-ed by the idea of what AI is and what it can do. AI is itself a moving target and more an issue of inter-pretation than definition. Should AI be vaguely defined for legal purposes with the risk that every-thing could count as AI, or defined narrowly, focusing only on certain aspects? Or perhaps no

这些例子提出了人工智能领域的监管问题和政府干预的必要性，特别是在达到人性化人工智能的时候。鉴于人工智能的迅速发展，一些人主张在国家和国际层面立即进行积极的监管——尽管否则可能为时已晚——另一些人则担心，监管可能会减缓人工智能的发展并限制创新。中间立场是发展共同的规范，而不是试图规范技术本身，类似于消费者和实体产品的安全测试。这样的规范可以包括对测试和算法透明度的要求，可能还包括某种形式的保修。这也将允许法规保持稳定，并消除随着技术进步而不断更新的需要。这个提议因为人工智能是什么以及它能做什么而变得复杂。人工智能本身就是一个移动的目标，更多的是一个解释问题，而不是定义问题。人工智能是否应该为了法律目的而含糊地定义，其风险在于，任何事物都可以被视为人工智能，或者定义狭隘，只关注某些方面？或许不应该

definition is better in the hope that we know it when we see it, following the approach of Supreme Court Justice Potter Stewart when describing his threshold test for obscenity ([Jacobellis v. Ohio,](#page1) [1964](#page1)).

最高法院大法官波特 · 斯图尔特(Potter Stewart)在描述他对淫秽的门槛测试(雅格碧利斯诉俄亥俄州案，1964)时所采用的方法，希望我们在看到它的时候就能知道它的含义。

1. Implications of AI: Are you afraid of poison?

人工智能的含义: 你害怕毒药吗？

The above examples illustrate that AI will have implications for any kind of organization, both in-ternally and externally. Internally, AI will allow a multitude of tasks to be conducted faster, better, and at lower cost. In the medium term, this will not only affect simple tasks but also more complex ones; even knowledge-heavy industries like consult-ing, financial services, and law will see major changes. Externally, it will impact the relationship between firms and their customers, other firms, and with society at large.

上面的例子说明了人工智能会对任何类型的组织产生影响，无论是内部的还是外部的。在内部，人工智能将允许大量的任务以更快、更好和更低的成本进行。从中期来看，这不仅会影响到简单的任务，也会影响到更复杂的任务; 即使是咨询、金融服务和法律等知识密集型行业也会发生重大变化。从外部来看，它将影响企业与其客户、其他企业以及整个社会之间的关系。

To help organizations prepare for this future, we look more closely at three common traits that are of relevance both internally and externally: confidence, change, and control–—the three Cs of the organizational implications of AI (see [Table 2](#page1)). Like when Snow White decided to trust the evil queen by biting into the red apple, managers will have to be trusted in their ability to manage and consumers will have to put confidence in the company to not misuse their data in any way. In the fairytale, Snow White would admittedly have done better not to put confidence in the queen. In real life, there will have to be certain control mechanisms to protect from damage, internally by controlling the machines and externally through the State controlling the corporations and institutions implementing AI. Finally, change will be ever present, be it change in employees’ job descriptions or the rapid change of copying external competitors.

为了帮助组织为未来做好准备，我们更密切地关注与内部和外部相关的三个共同特征: 信心、变化和控制——人工智能对组织的影响的三个 c (见表2)。就像白雪公主决定通过咬红苹果来信任邪恶的皇后一样，管理者必须相信他们的管理能力，消费者必须相信公司不会以任何方式滥用他们的数据。在童话故事中，白雪公主无疑会做得更好，不要相信女王。在现实生活中，必须有一定的控制机制，通过对机器的内部控制和通过国家对执行人工智能的公司和机构的外部控制来防止损害。最后，变化将永远存在，无论是员工工作描述的变化，还是模仿外部竞争者的快速变化。

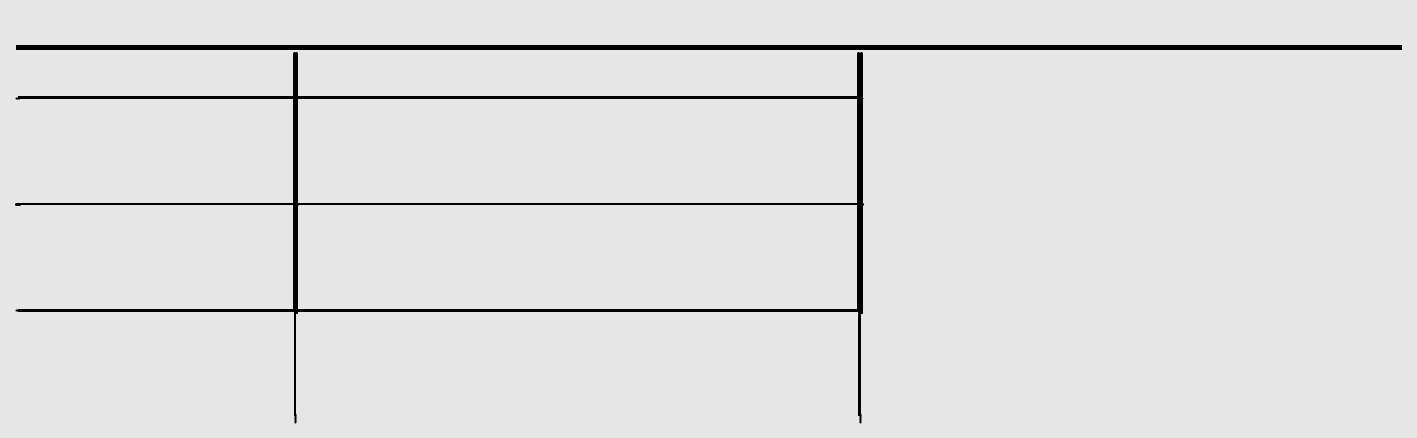


Table 2. The three Cs of organizational implications of AI

表2。人工智能对组织的影响

|  |  |  |
| --- | --- | --- |
|  | Internal 内部的 | External 外部 |
|  |  |  |
| Confidence 自信 | Managers need to exude confidence with 管理者需要对... ... 表现出信心 | Consumers need to put confidence in the 消费者需要把信心放在 |
|  | respect to their employees in a fast- 对员工的尊重 | abilities and recommendations of an 的能力及建议 |
|  | evolving work environment 发展中的工作环境 | organization’s AI systems 机构的人工智能系统 |
| Change 改变 | Employees need to constantly change and 员工需要不断地改变 | Competitors need to be monitored and 竞争对手需要被监控 |
|  | adapt their functions and skills through 使他们的职能和技能通过 | outperformed permanently by use of better 用更好的工具，永久性地超越 |
|  | lifelong learning 终身学习 | hardware or data 硬件或数据 |
| Control 控制室 | Machines need to be controlled to avoid 机器需要被控制以避免 | States need to control the ecosystem of 国家需要控制 |
|  | autonomous decisions and implicit biases 自主决策和隐性偏见 | managers, employees, machines, 经理，员工，机器, |
|  |  | consumers, and competitors 消费者和竞争者 |

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4.1. Internal

4.1内部

4.1.1. Managers

4.1.1经理

Managers need to adopt a leadership style that engenders confidence from employees at a time when AI will fundamentally transform the work-place in unprecedented ways. Several leadership skills will be essential, including enabling an open dialogue; proficiency in healthy conflict resolution; and human, ethical, open, and transparent man-agement. Actions taken by such managers start with the smallest of changes. Instead of AI, IBM decided to use the terms cognitive computing and augment-ed intelligence to signal that systems are designed to make employees more efficient, not to replace them. But they do have a much further reach. Managers in the future need to be experts in assess-ing skills to identify the best position of each em-ployee in a hybrid system of people and AI. And they need to become creative innovators in order to emphasize the types of intelligence AI will not be able to replace. Managers will need to act as em-pathetic mentors and data-driven decision makers.

在人工智能将以前所未有的方式从根本上改变工作场所的时候，管理者需要采用一种能够激发员工信心的领导风格。几项领导技能将是必不可少的，包括促成公开对话; 熟练处理健康的冲突; 以及人性化、道德化、开放和透明的管理。这样的管理者所采取的行动从最小的改变开始。IBM 没有使用人工智能，而是决定使用认知计算和增强智能这两个术语来表明系统的设计是为了提高员工的效率，而不是取代他们。但是他们确实有更深远的影响力。未来的管理者需要成为评估技能的专家，以确定每个雇员在人和人工智能混合系统中的最佳位置。他们需要成为创造性的创新者，以强调人工智能无法取代的智能类型。管理者需要充当有同情心的导师和数据驱动的决策者。

4.1.2. Employees

4.1.2雇员

AI will lead to a constant change in the type of work conducted by employees. While it is unlikely that AI will be able to replace entire jobs completely, there will be more and more tasks that will be outsourced to AI and employees will have to adapt. Combining the rapid speed of AI development with the increas-ing lifespan of humans (and employees) gives the concepts of lifelong learning and career flexibility a whole new meaning ([Pucciarelli & Kaplan, 2016](#page1)). In such a world, employees will have to constantly develop new skills to complement advances in AI technology. Entrepreneurs, innovators, creators, and generally people who are keen on taking on new challenges and opportunities will be of increas-ing importance. The necessary training can be fi-nanced by firms themselves (e.g., telecom giant AT&T spends $30 million annually to reimburse em-ployees for the cost of training in digital skills) or provided by outside entities such as trade unions, especially for smaller firms where in-house training may not be efficient.

人工智能将导致员工工作类型的不断变化。虽然人工智能不太可能完全取代整个工作岗位，但将有越来越多的任务外包给人工智能，员工将不得不适应。人工智能的快速发展与人类(和员工)寿命的增长相结合，赋予了终身学习和职业灵活性的概念一个全新的含义(Pucciarelli & Kaplan，2016)。在这样一个世界里，员工将不得不不断发展新的技能来补充人工智能技术的进步。企业家、创新者、创造者，以及那些热衷于迎接新挑战和新机遇的普通人将变得越来越重要。必要的培训可以由公司自己提供资金(例如，电信巨头 at & t 每年花费3000万美元补偿雇员的数字技能培训费用) ，也可以由外部实体(例如工会)提供，特别是对于内部培训可能效率不高的小公司。

4.1.3. Machines

4.1.3. 机器

Machines and AI systems, first and foremost, require control by humans. Even the smartest AI systems can make very stupid mistakes. Look at the systems powering self-driving cars. Tesla’s autopilot con-fused a white truck with a cloud in the sky and Uber’s self-driving car did not recognize a pedestri-an in Arizona. And these mistakes do not account for

机器和人工智能系统，首先也是最重要的，需要人类的控制。即使是最聪明的人工智能系统也会犯非常愚蠢的错误。看看给自动驾驶汽车提供动力的系统。特斯拉的自动驾驶汽车把一辆白色卡车和天空中的一朵云混淆了，而优步的自动驾驶汽车在亚利桑那州认不出一个行人。这些错误并不能解释

the fact that AI systems can be deliberately hacked, similar to the way a computer virus or random ware can take ownership of a PC. Even when leaving all those concerns aside, AI systems are only as smart as the data used to train them since they are, in their essence, nothing more than fancy curve-fitting machines. Using AI to support a court ruling can be highly problematic if past rulings show bias toward certain groups since those biases get formalized and engrained, which makes them even more difficult to spot and fight against.

事实上，人工智能系统可以被蓄意攻击，类似于计算机病毒或随机软件可以取得个人电脑的所有权。即使撇开所有这些问题不谈，人工智能系统也只是和用来训练它们的数据一样聪明，因为从本质上讲，它们只不过是花哨的曲线拟合机器。如果过去的裁决显示出对某些群体的偏见，那么利用人工智能来支持法院的裁决就会产生很大的问题，因为这些偏见已经形成并根深蒂固，这使得它们更加难以发现和反对。

4.2. External

4.2外部

4.2.1. Consumers

4.2.1消费者

Any AI system implemented by firms is only useful if consumers accept it in one way or another. This specifically means that consumers need to put con-fidence into the recommendations provided by AI and the use of their personal data. While AI systems are already capable of diagnosing X-ray images as proficiently as, or even better than, most physi-cians, most consumers would have a difficult time trusting the verdict of a machine. A new stream of AI research called explainable AI focuses on extract-ing rules ex-post so that humans can at least get a rudimentary understanding of the working of AI systems. A necessary precondition to this confi-dence, besides better explanation, is that firms do not overpromise on the potential of AI. It is well known from service research that consumers judge the quality of a service based on the gap between their expectations and reality ([Parasuraman,](#page1) [Zeithaml, & Berry, 1985](#page1)). All of us who have tried to speak casually with their Amazon Alexa, Google Home, or Apple Siri will know that the frictionless expectations created by the advertising for those products rarely match reality.

任何企业实施的人工智能系统只有在消费者以这样或那样的方式接受它时才有用。这意味着消费者需要对人工智能提供的建议和个人数据的使用充满信心。虽然人工智能系统已经能够像大多数医生一样熟练甚至比他们更好地诊断 x 光图像，但是大多数消费者很难相信机器的诊断结果。一个新的人工智能研究领域称为可解释人工智能，其重点是事后提取规则，这样人类至少可以对人工智能系统的工作有一个初步的了解。这种自信的一个必要前提，除了更好的解释之外，就是企业不要过度承诺人工智能的潜力。众所周知，服务研究表明，消费者根据他们的期望和现实之间的差距来判断服务的质量(Parasuraman，Zeithaml，& Berry，1985)。我们所有试图与亚马逊 Alexa、谷歌家居或苹果 Siri 随意交谈的人都会知道，这些产品的广告所创造的无摩擦期望很少与现实相符。

4.2.2. Competitors

4.2.2竞争者

In the world of AI, firms will continually be chal-lenged to establish a long-lasting competitive ad-vantage. Since the basic mathematical concepts underlying AI are widely known–—and often avail-able to everyone–—there are only two ways firms can outperform their competition: through faster hard-ware or more data. In terms of hardware, chip designers are already working on developing new types of CPUs that embed basic AI tools such as neural nets on the hardware (chip) level instead of programming them into a general purpose system. Looking at data, there will likely be a consolidation toward few large firms that acquire more and more data, which leads to better AI systems and even more data in a self-fueling spiral of growth. In such a world, firms need to constantly change to adapt to

在人工智能的世界里，企业将不断受到挑战，以建立持久的竞争优势。由于人工智能背后的基本数学概念广为人知——而且通常对每个人都有用——企业只有两种方式可以胜过竞争对手: 通过更快的硬件或更多的数据。在硬件方面，芯片设计者已经在开发新型的中央处理器，将神经网络等基本人工智能工具嵌入到硬件(芯片)层面，而不是将它们编程为通用系统。从数据来看，可能会出现一种整合趋势，即只有少数几家大公司能获得越来越多的数据，这将导致更好的人工智能系统，甚至在自我推动的螺旋式增长中获得更多的数据。在这样一个世界里，企业需要不断地改变以适应

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evolutions in performance among existing compet-itors as well as the emergence of new firms.

现有竞争对手的业绩演变以及新公司的出现。

4.2.3. States

4.2.3州

Similar to the idea that AI systems need to be controlled to avoid making stupid mistakes, the whole ecosystem of managers, employees, ma-chines, consumers, and competitors requires close monitoring from the side of the State, as already mentioned. There is a need for rules, legislation, and control to avoid AI getting out of hand. This can include the requirement to spend a certain percent-age of revenue in training to prepare employees for upcoming challenges. It also may consist of artifi-cially constraining the competition between ma-chines and humans. In France, a law exists that limits access to the IT self-service systems of public administration bodies after working hours.

与需要控制人工智能系统以避免犯愚蠢错误的观点类似，如前所述，管理者、员工、机器、消费者和竞争对手的整个生态系统都需要政府的密切监控。我们需要规则、立法和控制来避免人工智能失控。这可以包括要求花费一定百分比的收入用于培训，让员工为即将到来的挑战做好准备。它也可能包括人为地限制机器和人类之间的竞争。在法国，有一项法律限制公共行政机构在下班后访问 IT 自助服务系统。

A central issue in this context is thetopic of privacy and data protection. In the near future, we will face a wide range of dilemmas that require balancing social advances in the name of AI and fundamental privacy rights. The European Union recently made a signifi-cant step in legislating this question by introducing the General Data Protection Regulation (GDPR). While such rules clearly protect consumers, they also mean that the EU will unlikely be able to challenge the U.S. or China in AI dominance anytime soon. This puts States in the complex position to decide how much privacy can and shouldbesacrificed on the altar of economic growth. Different countries are already making different decisions in this respect and those decisions will likely shape AI trends in years and even decades to come.

这方面的一个核心问题是隐私和数据保护。在不久的将来，我们将面临一系列的困境，需要以人工智能的名义平衡社会进步和基本隐私权。欧盟最近通过引入一般数据保护条例(GDPR) ，在这个问题的立法上迈出了重要的一步。虽然这样的规则明确保护消费者，但它们也意味着欧盟不太可能在短期内挑战美国或中国在人工智能领域的主导地位。这使得各国处于一个复杂的位置来决定在经济增长的祭坛上能够以及应该牺牲多少隐私。不同的国家已经在这方面做出了不同的决定，这些决定可能会在未来几年甚至几十年左右人工智能的发展趋势。

5. And they lived happily ever after

很想和你在一起

Years ago, [Holloway and Hand (1988](#page1), p. 70) pub-lished an article in Business Horizons on artificial intelligence that started as follows: “Artificial in-telligence is no longer an academic term, but a reality. And, in some companies, it seems that the AI system has replaced the human as the busi-ness and ethical decision maker.” Today, we know that this statement was probably a bit premature. But the revolution Holloway and Hand predicted did happen eventually and it comes with a series of questions that will need to be answered.

几年前，Holloway 和 Hand (1988，第70页)在《商业视野》上发表了一篇关于人工智能的文章，文章开头如下: “人工智能不再是一个学术术语，而是一个现实。而且，在一些公司，似乎人工智能系统已经取代人类成为商业和道德决策者。”今天，我们知道这种说法可能有点为时过早。但是 Holloway 和 Hand 预言的革命最终还是发生了，并且伴随着一系列需要回答的问题。

One question deals with the third generation of AI–—artificial super intelligence (ASI)–—and whether this is something to aim for or to avoid. Technically, even a standard microprocessor available for $200 today runs at 10 million times the speed as a human neuron and computers can memorize more pieces of information in 1 second than a human could in a

有一个问题涉及到第三代人工智能——人工超级智能(ASI)——以及这是否是我们应该追求的目标或应该避免的。从技术上来说，即使是一个标准的微处理器现在售价200美元，其运行速度也是人类神经元的1000万倍，计算机在1秒钟内记忆的信息比人类在1秒钟内记忆的信息还要多

lifetime. So it seems clear that a system with true ASI would easily be able to outperform humans. Yet, what is often forgotten is that humans are used to thinking on a human level while an ASI system would think on an ASI level. Just as humans can never truly understand how chimpanzees think, despite the fact that they share 99% of our DNA, we will not be able to understand how an ASI system thinks. This limits our ability to control such systems, which again makes them appear more dangerous than useful.

一辈子。所以很明显，一个真正拥有 ASI 的系统很容易就能超越人类。然而，人们常常忘记的是，人类习惯于从人类的角度思考，而 ASI 系统则习惯于从 ASI 的角度思考。正如人类永远无法真正理解黑猩猩是如何思考的，尽管它们拥有我们99% 的 DNA，我们也无法理解 ASI 系统是如何思考的。这限制了我们控制这些系统的能力，这再次使它们看起来更加危险而不是有用。

Another issue deals with the displacement of the human workforce by machines. Most jobs consist of a series of tasks and not all of them can easily be conducted by AI. While a neural network can easily beat the best players in Go, it has a much harder time assembling an IKEA chair–—a fact labeled as the Kamprad test in analogy to the well-known afore-mentioned Turing test. The vast abilities of AI com-bined with the increasing availability of data makes it likely that the shift to AI has a more fundamental impact on workforce in general than the Industrial Revolution from 1820—1840. This leads to a series of questions, starting from the idea of a universal basic income to fundamental issues that philosophy and religion will need to deal with, namely how humans can find purpose in life when all their work is conducted by machines.

另一个问题是人类劳动力被机器取代。大多数工作由一系列的任务组成，并不是所有的工作都可以轻易地由人工智能来完成。虽然神经网络可以轻易击败围棋中最好的棋手，但组装宜家(IKEA)的椅子要困难得多——这个事实被称为坎普拉德测试(Kamprad test) ，类似于前面提到的著名的图灵测试(Turing test)。人工智能的巨大能力，加上数据的日益普及，使得人工智能对劳动力的影响可能比1820ー1840年的工业革命更为根本。这导致了一系列问题，从普遍基本收入的概念开始，到哲学和宗教需要处理的基本问题，即当人类所有的工作都由机器进行时，人类如何才能找到生活的目标。

Given all those challenges and open questions, it is not surprising that the views on AI range from outright alarmist as expressed by Elon Musk to euphoric like the vision of futurist Ray Kurzweil. Recently deceased theoretical physicist Stephen Hawking called AI “either the best, or the worst thing, ever happen to humanity” ([Herm, 2016](#page1)). This brings us back to Snow White who, at the end, had a happy ending with Prince Charming, even after being temporarily poisoned by the apple. We just have to hope that humanity will not end up stuck in a glass coffin made out of the illusion of AI conve-nience and that one day, even if it’s only at the last moment, some prince–—or princess!–—will come.

考虑到所有这些挑战和开放性的问题，人们对人工智能的看法从埃隆•马斯克(Elon Musk)所表达的彻头彻尾的危言耸听，到未来学家雷•库兹韦尔(Ray Kurzweil)所描绘的乐观情绪，不足为奇。最近去世的理论物理学家斯蒂芬 · 霍金称人工智能“要么是人类历史上发生的最好的事情，要么是最糟糕的事情”(Herm，2016)。这又把我们带回到了白雪公主，她最终和白马王子有了一个美好的结局，即使是在暂时被苹果毒害之后。我们只能希望人类不会最终被困在一个由人工智能幻想制造的玻璃棺材里，希望有一天，哪怕只是在最后一刻，某个王子或公主！会来的。

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