人工智能对设计的影响
THE IMPACTS OF ARTIFICIAL INTELLIGENCE ON DESIGN

刘瑜
北京大学地球与空间科学学院遥感与地理信息系统研究所教授
北京市海淀区北京大学遥感楼511室，邮编：100871
liuyu@urban.pku.edu.cn

Yu LIU
Professor of Institute of Remote Sensing and Geographic Information System, School of Earth and Space Sciences, Peking University

https://doi.org/10.15302/J-LAF-20180206
采访时间 INTERVIEWED DATE / 2018-01-25
中图分类号 / TP18, TU98
文献标识码 / B

摘要

本次访谈围绕人工智能及其可能的设计应用展开。受访人刘瑜深入浅出地阐述了数据在人工智能领域的作用以及深度学习的边界问题，并就人工智能在现阶段能够发挥的辅助设计功能及其未来发展趋势进行了探讨。刘瑜认为，通过深度学习，人工智能在相对封闭的领域内表现出色，但相比人类充满创造力和伦理性的开放式思维，它仍存在局限，特别是在介于感性和理性之间的设计领域，它无法取代人类设计师进行设计。尽管如此，设计师可以把一些常规的基础性工作交由人工智能去完成，从而在设计创新和用户沟通上投入更多精力。

关键词

人工智能；数据；深度学习；设计；黑箱；白箱

ABSTRACT

This interview centers on Artificial Intelligence and its possible applications in design fields. Yu Liu, the interviewee, explains the role of data in Artificial Intelligence, the boundary for Deep Learning, Artificial Intelligence's function to aid design, and its future development. Liu also discusses how Artificial Intelligence can work within some particular fields, and the creative and ethical limits of Artificial Intelligence, especially in the design fields, which are between sensibility and rationality. Besides, he explains why Artificial Intelligence cannot take the place of human designers. In spite of this, Artificial Intelligence can be used to do repetitive or routine tasks so that designers can put more focus on design innovation and user experience optimization.

KEY WORDS

Artificial Intelligence; Data; Deep Learning; Design; Black Box; White Box

采访 佘依爽　田晓劼　王楠
整理 田晓劼　佘依爽
译 萨拉·雅各布斯　黄延峰
INTERVIEWED BY Yishuang SHE　Xiaojie TIAN　Nancy WANG
EDITED BY Xiaojie TIAN　Yishuang SHE
TRANSLATED BY Sara JACOBS　Yanfeng HUANG

数据在人工智能领域的作用是什么？如果在城市尺度上运用人工智能技术，是否会有超出预期的发现？

刘瑜（以下简称刘）：从早期的初代人工智能到机器学习，再到深度学习，虽然计算机表现出的学习能力越来越强，但其本质上都需要进行数据的采集和分析、模式的寻找和量化，从而将这些数据和模式作为人工智能的“输入”。如果没有“输入”及针对“输入”进行的训练，任务就无法达成。所以，数据的收集和模式的发现是人工智能进行学习的基础。

数据是否有价值取决于其本身是否蕴含新的信息，以及我们如何看待这些数据。借助大数据获得的结论通常与人的常识认知基本相符，可能只在个别方面存在差异，而这些差异正是大数据的价值所在。面对现实世界，人类有其基本的价值判断，并且更倾向于相信自己的判断。如果数据结果完全偏离常识认知，我们通常会质疑数据的质量。更多时候，大数据的作用是对常识认知进行量化或补充。所以，基于数据输入的人工智能在城市尺度上不太可能有颠覆性的发现，但它会填补我们的知识盲点，并量化已有知识，从而帮助我们进行决策。

您认为目前深度学习的边界在哪里？

刘：作为当前人工智能的核心驱动技术，深度学习是基于多个层次的神经网络学习，它擅长提取深度特征。目前，我们对人工智能的训练都是在一个相对封闭的领域内进行的。例如，战胜世界顶级围棋高手李世石的“阿尔法狗”（AlphaGo）即便有超越人类棋手的表现，它的智能性也只体现在围棋这一特定领域，因为数据的输入和算法的训练都是针对围棋规则进行的。目前能够实现的人工智能一般被称为“弱人工智能”，它能够解决特定问题，且执行特定任务的能力往往优于人类，但它没有自主意识。深度学习使得机器能够被应用于众多领域，但它存在边界，即便偶有跳脱出人类常识认知的“创新”，它的智能范围仍仅限于由人类划分的特定领域或知识体系内。

人工智能在现阶段具有哪些辅助设计功能？

刘：设计常介于科学与艺术之间，这意味着它在一定程度上是有规律可循的。例如，景观设计或城市规划都需要布局各个地理要素（如地质、地貌、水文等）之间的关

系。所以，对布局进行抽象并将其形式化，可能是人工智能辅助设计的一个方向。同时，通过对足够多的设计原则和优秀设计案例进行学习，人工智能也可以在很大程度上助力场地分析，甚至生成一些可供遴选的初步方案。此外，设计师完全可以把一些基础性常规工作交由人工智能去完成，从而在设计创新和用户沟通上投入更多精力。

除了辅助设计，人工智能技术还能够处理数量庞大的社会数据。随着未来科技的发展，人类的生产和生活方式可能会发生巨大改变。如何利用人工智能技术进行科学的设计决策，以使公众更好地适应新的环境空间，是设计师应当关注的方向之一。

您认为我们是否有必要为人工智能可能取代人类设计师而担忧?

刘：在历史上，人类被机器超越是常有之事。例如，随着机械时代的到来，人们发现机器的体力和效率远高于人类；在计算机时代，机器的运算速度和准确率超越了人类；经过当代的进一步发展，以“阿尔法狗”为代表的机器人在围棋领域战胜了人类。人们之所以对最后一种超越反应强烈，或许是因为我们视围棋领域为人类智慧的专属。事实上，“阿尔法狗”只是将围棋简化为算法，通过深度学习掌握了更为抽象的概念，但它并没有自我意识与独立思考能力。

相较而言，人类的思维是开放的、无穷尽的，且充满了灵感与创造力。我认为能够被学习或被复制的模式是不具备创造力的。比如人工智能在学习了毕加索的画风之后，可以“画”得很像毕加索，但它永远无法超越毕加索，更不能被称作伟大的艺术家。此外，人不仅能够运算和判断，而且还具有情感和伦理道德观念。在可见的未来，人工智能不可能具备人类的这些特质。设计通常兼具感性和理性，虽然设计本身难以被取代，但其中那些可以根据内在逻辑和规则形成封闭空间的部分，则可以交由人工智能去完成。有了这个帮手，设计师可以有时间和精力去做更多有意义的事，从而发挥更大的创造力。

您认为人工智能未来将朝着怎样的方向发展?

刘：人工智能的发展其实是黑箱和白箱[①]交替发展的过程。以战胜国际象棋世界冠军加里·卡斯帕罗夫的超级计算机“深蓝”为例，我们可以明确其算法是基于穷举搜索，也可以理解其每一步的决策机制，所以当时的人工智能尚处于白箱阶段。而最新发展的以深度学习为基础的人工智能，其运作过程犹如黑箱作业，人们往往无法理解其算法的决策依据，甚至连开发者也难以具体说明其决策机制。未来要想更好地利用人工智能，就必须使黑箱变为白箱，了解其算法和决策依据，只有这样，我们才能更合理地判断是否采纳其所提供的决策建议。

此外，由于深度学习是基于人工神经网络的学习，所以涉及到人工智能和神经生物学的交叉合作和相互促进。也就是说，人类对自身的认识越清晰，越有利于人工智能的发展。所以，我认为今后对人工智能的研究不仅会更加侧重于白箱，而且会更加关注对人类自身的研究，例如探讨人如何思考、人的记忆如何产生等。

人工智能将如何影响我们的未来生活?

刘：人工智能连同其他计算机信息技术将在很大程度上改变我们未来的生活方式，以及人与人之间的沟通模式。技术正以非线性的加速度飞速发展着。30年前的1988年，互联网仍未普及，当时的人们完全无法想象今天的信息技术会有如此惊人的突破，移动互联网、共享单车、电子支付等技术及应用层出不穷。展望30年后的2048年，信息技术发展的量级会更加巨大，人工智能对我们未来生活的影响也难以预测，而增强现实和虚拟现实技术的发展可能会给城市生活带来更多崭新的图景。**LAF**

① 在控制论中，通常把所不知的区域或系统称为“黑箱”，而把全知的区域或系统称为“白箱”。

What is the role of data in the field of Artificial Intelligence (AI)? Will AI discover anything that goes beyond human's expectations at the city scale?

Yu LIU (LIU hereafter): From the early generation of AI to Machine Learning and to Deep Learning of today, the essence of AI has remained the same. AI needs to collect and analyze data, and search for and quantify patterns which then can be used as an input. Tasks cannot be achieved without inputs or training for inputs. Therefore, the collection of data and the induction of patterns are the basis of AI.

The value of data depends on whether the data itself contains new information and how we then use that data. The conclusions reached from big data are consistent with human cognition, except for the slight differences that reveal the value of big data. As humans are more inclined to believe in their own judgments, if the data results seem unrealistic, we tend to think there is a problem with data quality. More often, big data helps quantify our cognition and supplement our knowledge. Therefore, AI based on data input is not likely to lead to surprising discoveries, but rather it supplements our knowledge of blind spots and quantifies existing knowledge to aid in decision-making.

Where do you think the boundary for Deep Learning is currently?

LIU: As the key driver of AI, Deep Learning is based on multiple levels of neural networks that can extract in-depth features. Currently, AI training is relatively delimited. For example, even if the AI program AlphaGo defeated the world's top professional Go player, Lee Sedol, its intelligence is only in the specific field of Go Game, since its data input and training is only for the game rules. What we can achieve now is called "Narrow AI," which can be used to solve given problems and tasks without self-awareness of problem-finding or learning. Although with Deep Learning machines can perform excellently in many fields, and even go far beyond our expectations sometimes, the good use of AI is limited within a few particular domains or knowledge systems, due to the boundaries of the related input and training.

In which ways can the current AI technology aid design?

LIU: Design is always between science and art and it follows rules. For example, in the fields of landscape design and urban planning, we need to clarify the relationships between various geographical elements such as geology, landform, and hydrology. Abstracting the layout of these elements and then formalizing it may be a direction of AI-aided design. In the future, AI may help designers do site analysis, or even develop preliminary plans through the input of relevant design principles and sufficient design cases. In addition, designers could hand over repetitive or routine tasks to AI, which allows human designers to pay more attention to design innovation and user experience optimization.

AI is also able to process a large amount of social data. With the development of science and technology, human life will change dramatically. One of the research directions that designers should be concerned with is how to use AI technologies to help designers work more scientifically to better adapt design plans to contemporary changes in urban life.

How do you look at the anxiety about AI as a substitute for human designers?

① In cybernetics, the unknown area or system is often referred to as black box, while the fully known area or system is called the white box.

LIU: Historically, human beings have long been outdone by machines. Since the machine age, they have been used to perform human functions at higher rates of strength and efficiency. Today, computers can do better jobs than humans in many fields, even at playing Go! We over react to this type of information because we believe that activities like playing Go are a privilege of human intelligence. But, in fact, AlphaGo just simplifies the Go Game to an algorithm, and it still has no self-awareness or capacity of thinking.

In contrast, human thinking is open, endless, and full of inspiration and creativity. AI could learn to paint like Picasso, but it will never surpass Picasso or be a great artist. Humans are rich with emotion and ethic, while AI does not and would not have these characteristics in the foreseeable future. Design is difficult to be replaced since it works between sensibility and rationality. However, AI can do basic work. With AI's help, human designers could save time and energy to do more meaningful things and develop their creativity.

What do you think is the future of AI?

LIU: The development of AI is actually an alternate development process of black box and white box①. To take supercomputer "Deep Blue" which defeated world chess champion Garry Kasparov as an example, we know its algorithm is based on exhaustive search, and its decision-making mechanism is understandable. Therefore, AI was in the stage of white box at that time. Today, the latest development of AI is based on Deep Learning and its operation process is like a black box operation as people often cannot understand the decision-making basis of the algorithm or even developers have a hard time understanding specific decision-making mechanisms. To make better use of AI in the future, we must understand AI algorithms — turning it from the black box to a white box — as the basis for decision-making. Only in this way can we decide more rationally whether to accept the results of AI algorithms or not.

Deep Learning is based on the study of artificial neural networks, and there has been a lot of collaborations and mutual promotion between AI and neurobiology. The more humans know about themselves, the more conducive to the development of AI. In the next few years, the study of AI will pay more attention to the research of human cognition to explore how we think and how memory is generated.

How will AI affect our lives in the future?

LIU: AI, along with other computer information technologies, will greatly change our lifestyle and communication patterns in the future. The development of technology is accelerating nonlinearly. Thirty years ago, it would have been impossible to imagine that information technology would make such amazing break throughs like nowadays. At that time, the Internet was not yet popular, certainly no mobile internet, shared bicycles, or electronic payments. Looking forward 30 years later, the magnitude of information technology development will be even greater, the impact of AI on our future is unpredictable, and the development of augmented reality and virtual reality may bring a new picture to our city life. **LAF**