



人工智能聊天機械人為中學教育帶來的機遇與挑戰

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近來，一款名為ChatGPT的人工智能聊天機器人受到了廣泛的關注。機器學習演算法的發展使得創建更複雜的聊天機器人成為可能，像ChatGPT這類聊天機器人能理解上下文並提供個性化的回復。在可預見的未來，ChatGPT這類人工智能聊天機器人及其相關功能會變得更成熟和普及，不可避免地會為中學教育帶來影響。本文嘗試展示ChatGPT在中學教育上潛在的應用，讓讀者感受人工智能將為中學教育帶來甚麼機遇和挑戰。以下ChatGPT的回答皆於GPT-3.5語言模型。

根據上下文回答提問

教師的學識有限，往往未必能夠準確地回答學生的提問。例如筆者雖然作為物理教師，但在大學時並沒有系統地學習過天文學，所以當學生提出天文學相關的問題時，我可能就難以給出合適的答案。以下我們嘗試和ChatGPT聊聊甚麼是“超新星”。Q指我們輸入的內容，A是ChatGPT的回應。

Q: What is a supernova?

A: A supernova is a powerful explosion that occurs when a star collapses at the end of its life. The explosion releases a huge amount of energy, and is bright enough to outshine an entire galaxy for a short period of time. There are two main types of supernovae: Type I and Type II. Type I supernovae are caused by the collapse of a white dwarf star, while Type II supernovae are caused by the collapse of a massive star. Both types of supernovae are extremely rare events, but when they do occur, they can have a significant impact on the surrounding galaxy.

ChatGPT的回應十分準確，還指出了一種科普書較少提及的Type I超新星爆發。

Q: Why does a star collapse?

A: A star collapses when it is no longer able to generate energy through nuclear fusion, which is the process that it relies on to maintain its internal balance of gravity and pressure.... 省略兩段

ChatGPT此處的回應同樣準確，但對中學生來說卻稍微長了一點，我們於是要求它給出一個短一點的回答。

Q: Could you make your response shorter?

A: Sure! A star collapses when it can no longer generate energy through nuclear fusion to balance the forces of gravity and pressure. This occurs when the star has used up all of its hydrogen fuel and can no longer sustain the process of nuclear fusion. The resulting collapse creates a supernova explosion. The type of supernova depends on the mass of the star: a Type I supernova occurs when a white dwarf star collapses, while a Type II supernova occurs when a massive star collapses.

Q: How massive does a star need to be for it to become a type II supernova?

A: For a star to become a type II supernova, it needs to have a mass that is at least 8x higher than that of the Sun.

Q: Is the Sun not able to become a supernova? What happens to it in the end?

A: The Sun is not massive enough to become a supernova. Eventually, it will use up the hydrogen fuel in its core and begin to cool and

expand, becoming a red giant. It will eventually shed its outer layers, leaving behind a white dwarf.

從上述的對答可見，我們可以像和真人聊天般和ChatGPT進行對答。ChatGPT的話太多時，我們可以要求它說得少一點。我們還可以繼續追問，ChatGPT能夠通過上下文給出答案。

在語言學習上的應用

ChatGPT最令人印象深刻的功能是其能夠根據我們的要求生成文章的主題、要點，甚至寫出整篇文章。我們當然可以將ChatGPT應用在語言教學上，如修改錯誤的語法和改寫文章。

Q: Could you please help me to correct the grammar of this sentence? "Are you want to play football?"

A: Sure! Here is the corrected version: "Do you want to play football?"
In the original sentence, "are" is the present tense form of "to be," but it is being used incorrectly. The correct way to ask if someone wants to do something is to use the base form of the verb, in this case "want." I hope this helps! Let me know if you have any other questions.

不止作出改正，ChatGPT還可以對整個句子、甚至整篇文章作出改寫。圖 1 是一篇中文學校的高一級學生在課堂上撰寫的英文短文（十分鐘準備時間），其中有大量的錯字和病句。當我們讓ChatGPT去改寫此文時，結果是令人震驚的。

Q: Could you improve this paragraph by making corrections and rephrasing it?

"I will never forget my middle school when I happen. In this years I am recognize some new friends. I have a one better friends. We always go home and play together, we are good feeling. But have a one day, I saw he was bulling by some people, I am feel heartache, but I am not help him, because I am feel secard, I am run always go home. At second day, I am go to school, and I discove he haven't go to school, soon teacher told us he transfer soon. I am not contact with he. In this time, I am very regret I am not help him. I am not save our friendship. In now, I will never forget his despair and helplessness eyes."

A: I will never forget my middle school days when I was there. During this time, I made some new friends, one of whom was my best friend. We would often go home

and play together, it was a great feeling. But one day, I saw him being bullied by some people, it broke my heart and I felt scared, so I ran home. The next day, I found out he hadn't gone to school and soon the teacher told us he had been transferred. I never contacted him again. I regret not being able to help him and save our friendship. To this day, I can never forget his despairing and helpless eyes.

ChatGPT竟然能夠在保留原文每一句意思的情況下改寫了這篇錯誤百出的文章，令其在英文用字和文法上變得完全正確。ChatGPT還能夠做翻譯，可輕易地根據中文文章生成用老練且文法正確的英文文章。

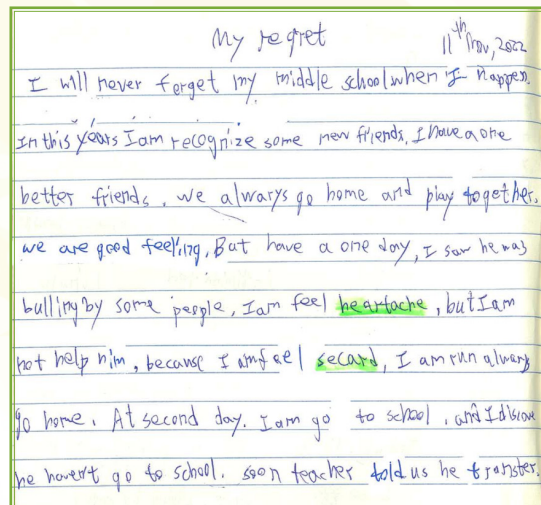


圖 1：學生在課堂上寫的英文作文練習

撰寫總結

我們可以用ChatGPT對文章進行總結。例如，教師常要求學生閱讀指定的名著並撰寫閱讀報告，此時正適合使用ChatGPT去完成。以下是一些參考的提問方法，ChatGPT的回答省略。

- 寫一篇《三國演義》的讀後感。
- 寫一篇《三國演義》中關於劉備的故事的讀後感。
- 寫一篇《三國演義》中關於黃巾之亂的故事的讀後感。

此外，我們可以嘗試用ChatGPT對一本較專業的書(Felder & Brent, 2016)進行總結並提出追問，看看會有甚麼結果。

Q: Please summarize Felder and Brent's book "Teaching and Learning STEM: A Practical Guide"

A: "Teaching and Learning STEM: A Practical Guide" is a book written by Felder and Brent that aims to provide practical strategies and techniques for teaching science, technology, engineering, and mathematics (STEM) courses effectively... 省略約 60 字。

Q: What is the most important insight of that book?

A: One of the most important insights of "Teaching and Learning STEM: A Practical Guide" is the importance of using active learning and problem-based approaches in the classroom. According to the authors, these approaches can be more effective at engaging students and promoting deeper understanding than traditional lectures... 省略約 100 字。

Q: Do any research studies support the effectiveness of using active learning approaches in the classroom?

A: 略省約 60 字 ...Studies have found that active learning approaches can lead to improved student outcomes, including increased test scores, higher grades, and better retention of course material. For example, a meta-analysis of 225 studies found that students in active learning classrooms had higher grades and were more likely to pass their courses than students in traditional lecture-based classrooms. Another study found that students who participated in active learning activities had significantly higher test scores than students who received traditional lectures... 省略約 80 字。

Q: Could you provide the reference for the mentioned meta-analysis?

A: There are many meta-analyses that have been conducted on the effectiveness of active learning approaches in education. Here are a few examples:

- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences*, 111(23), 8410-8415.
- Cheng, Y., & Day, C. (2017). The effects of active learning on academic achievement: A meta-analysis. *Review of Educational Research*, 87(1), 79-122.
- Koperski, M., & Long, T. (2018). The effects of active learning on student achievement: A meta-analysis. *Education Research International*, 2018, 1-14.

從上述的對話可見，ChatGPT先總結了這本比較專業的書，接著在提問下給出此書最重要的觀點，即在課堂上運用 active learning 方法進行教學。我們緊接著追問有何研究支持 active learning 方法，並要求它根據自己的回答給出相關的論文引用（ChatGPT給出的引用可能是虛構的，上述給出的三篇引用只有第一篇是真的）。

求解應用題和撰寫程式碼

現在學生經常使用手機解題軟件求解書本或練習冊中的習題。為了阻止這種作弊方法，我採取的措施是設計原創的題目，令學生無法從網上找到答案。現在，教師可以用上文提到的方法用ChatGPT對題目進行改寫，令題目意思不變，但寫法卻不同，以此阻止手機軟件自動識別題目找出答案。

目前ChatGPT能夠求解應用題，但不一定正確。例如我設計了如下的題目並讓ChatGPT求解：

Q：已知火星的重力加速度為 3.71 m/s^2 ，那麼將在地球上重量為 73.4 N 的物體拿到火星上後，該物體的質量等於多少千克？

A：質量可以通過牛頓的第二定律計算，即 $F=ma$ ，其中 F 是物體受的外力， m 是物體的質量， a 是物體的加速度。因此，我們將重力加速度 g 用 a 代替，得到 $F=mg$ 。由於地球和火星的重力加速度不同，所以在地球上重量為 73.4 N 的物體在火星上的質量也會不同。

讓我們將等式展開：

$$m = F/g$$

在地球上， $F=73.4 \text{ N}$ ， $g=9.81 \text{ m/s}^2$ ，因此：

$$m = 73.4 \text{ N} / 9.81 \text{ m/s}^2 = 7.47 \text{ kg}$$

在火星上， $F=73.4 \text{ N}$ ， $g=3.71 \text{ m/s}^2$ ，因此：

$$m = 73.4 \text{ N} / 3.71 \text{ m/s}^2 = 19.8 \text{ kg}$$

因此，將在地球上重量為 73.4 N 的物體拿到火星上後，該物體的質量等於 19.8 千克 。

ChatGPT的答案是錯的，因為無論物體在何處，其質量都一樣。雖然ChatGPT未能成功解出此題，但這個回答顯示了ChatGPT已具備了一定的解題能力，其能夠分析題目、列出公式、代入數字，並進行計算。相信在將來，ChatGPT這類型的人工智能必定能夠求解任意中學水平的應用題。更多的討論可見參考文獻(Wang, 2023)。

筆者曾經在本刊撰文介紹如何用Python的Matplotlib庫在Jupyter Notebook上畫數學線圖(王恆, 2020)，此文對不熟悉Python的讀者來說不易理解。現在，我們可以讓ChatGPT幫我們生成Python代碼，能夠得到類似的結果。

Q：用Matplotlib畫出函數 $y=3x+2$ ，x軸的範圍為-1到1，要有網格，

要標出坐標軸的標籤。

ChatGPT先給出安裝Matplotlib的方法，然後逐句解析代碼，最後展示完整的代碼如下：

```
import matplotlib.pyplot as plt

def y(x):
    return 3*x + 2

x_values = range(-1, 2)
y_values = [y(x) for x in x_values]

fig, ax = plt.subplots()
ax.plot(x_values, y_values)
ax.grid()
ax.set_xlabel('X values')
ax.set_ylabel('Y values')

plt.show()
```

讓Google Colab運行此代碼，得出的結果如圖 2所示。這個圖的效果已經十分完美，但我們還可以繼續讓ChatGPT修改此圖，例如：

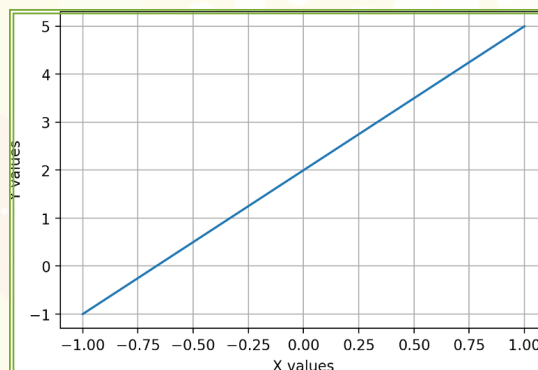


圖 2：ChatGPT 生成的代碼的運行結果

Q：將線的顏色改為紅色。

ChatGPT就會告訴你要修改上述代碼中的那個地方便能將圖2中的線的顏色改為紅色。

總結

總結來說，ChatGPT是一個人工智能的聊天機器人，能夠根據聊天的上下文作出回答。它既能改寫文章、給出文章的總結，也能夠按要求寫出文章、求解應用題和列出程式碼。讀者不難從前文的例子中發現，ChatGPT既能輔助教師教學，也會對日常的教學活動帶來影響。

可以想像，當ChatGPT此類人工智能聊天機械人得到廣泛的應用後，必定有學生會用它做作業。例如，教師佈置了一個社會研究類型的作業，目的在於讓學生綜合地運用各種能力，如設計研究的主題和方法，收集和 분석數據等。此時，學生可以先用ChatGPT列出一堆可能的研究主題進行選擇，接著再讓它根據選用的主題列出研究的要點並寫出文章。研究的數據和引用都可以用ChatGPT編造，還可以生成程式碼將圖畫出來。由於ChatGPT可以重覆生成答案，每個答案都不同，所以就算所有學生都做同一個研究主題，教師都無從判斷誰在作弊。最後，學生只需要讓ChatGPT對“研究報告”中的段落進行總

結，然後貼在PPT上，就算在課堂上做報告都沒有困難了。

隨著我們走向未來，人工智能在必定會為中學教學帶來深遠的影響。其中一個特別明顯的領域就是文字溝通。從學生週記、閱讀報告到課後作文和推薦信，人工智能都可以生成它們，其質量甚至可能超過認真的學生親自所寫的版本。不可避免地，人工智能會變成一種日常生活中不可或缺的工具，每個人都會用，這一天終會到來。教育界又要作出怎樣的改變去適應這個潮流呢？

參考文獻

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