Will AI Machines take the Position of Astronomers

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Keywords

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Abbreviations

LLM: Large Language Model; NLP: Natural Language Processing; AI: Artificial Intelligence.

Editorial

AlphaFold2, a famous AI tool, has been reported with its remarkable ability in forecasting/calculating the three-dimensional structures of proteins. Some news said that this ability almost brings the whole structural biology to an end. True or false, it is obvious that AI has resulted in a big strike to many fields, including astronomy.

Except observation along with its relevant techniques like telescope design and producing, etc., traditional astronomers' main work is to analyze data from telescopes, develop new theoretical models to adapt to the data, and write papers. Until now, with the recent emerging AI techniques like LLM (Large Language Model), the work of data analysis and paper writing has been done well automatically by AI.

As for data analysis, its contents generally include: preprocessing, measurement, classification, clustering, identification, etc. The needed techniques like data mining, feature mapping, simulation, data matching, etc., are very commonly used. In fact, for the whole data analysis work, almost all of them has turned into AI's field. More and more AI scientists have joined astronomy's research, and more and more astronomers have started to use AI techniques in their daily work. It's not a trend but a fact now, without AI, without data analysis. The traditional ways like using rulers to measure spectra have been put in history.

As for paper writing, with the great influence of ChatGPT, numerous researchers around the world start to consider writing papers upon LLM's help. Recently, a tool called StarWhisper has been published in National Astronomical Observatories, CAS [1]. One of its functions is to generate papers using the materials fed to it. It claims that thousands of papers from arxiv.org have been 'studied' by its engine, so that it can help 'write papers' with new astronomical data. Furthermore, it is connected to some telescopes' operation systems, and help control telescopes to work according to observation plans.

Jordan M [2] said, 'LLM assistance — used properly — can be a force-multiplier for technical writing'. He also mentioned that Google Docs or Overleaf has helped a lot in paper writings. But the limitation is also clear: hallucination and plagiarism are inevitable. Until now, AI's ability in simulating a human writer is still on the way.

As for theoretical model construction, it had become one of the main research topics years ago in the AI field, especially in NLP (Natural Language Processing). Now it comes to the LLM era, and many researchers are trying to use LLM to do the work of theoretical model construction, inside which the key factor is reasoning. Reasoning is a fundamental AI application which includes decision making, problem solving, etc. It uses evidence, arguments, and logic to arrive at conclusions or make judgments [3]. So far the AI reasoning has reached a new level. It has been applied in strategic reasoning, formula deduction, etc. Claude 3 has

brought lots of astonishments to researchers. However, in astronomy, the similar news hasn't been reported. But there are some astronomers are going to this direction. It is believed that many basic works in astronomy will be done by AI sooner or later.

Of course, there is another important work done by astronomers which hasn't been mentioned: the planning of observation. For astronomers, this is their 'experiment'. Different from other fields, in astronomy mankind has no ability to do experiments, and what they can do is planned observation. By using so-called 'multi-messenger' observations and cross validation, astronomers can realize their 'experiments'. Though so far this kind of work hasn't been 'invaded' by AI, as we can imagined, this part will soon be occupied in the near future, because the relevant logics are clear and easy to be realized by AI. This work seems to only lack some budgets from somewhere.

Then, the question is emerged: will the astronomers lose all their jobs in 5-10 years? Or the question about this question is not about 'yes' or 'no', but just about 'how long': when will it happen.

References

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