UNIVERSITAIRES SANS FRONTIÈRES — ACADEMICS WITHOUT BORDERS

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Newsletter

Dear colleagues,

In this issue, you will find above all a small dossier on the use of artificial intelligence and in particular of ChatGPT in higher education. First, Prof. Alain Mille will give indications on the functioning of these tools. Then Dr. Silvestri from the University of Kentucky will present his experiments for scientific writing, his doubts and challenges. Finally, a Swiss organization will show how, through the analysis of style, we can detect sections written with such tools. All will pose the problems of fraud and of a new type of plagiarism.

This dossier will be preceded by an article showing how USF has been a catalyst in Ivory Coast through the creation of a professional Bachelor program in water treatment and waste management.

Wishing good reading.

Prof. Robert Laurini, Editor of the USF-AWB Newsletter. ■

Ivory Coast: companies collaborate with IUA and USF-AWB for a professional Bachelor program in water treatment and waste management

Ivory Coast is committed to achieving the Sustainable Development Goals (SDGs) defined in 2015. SDG 6 aims to ensure access to clean water and sanitation for all, as well as to ensure sustainable water resources management. The country has made significant commitments to achieve this goal. This concerns access to drinking water, sanitation, water resources management and waste management.

One of the factors contributing to improving access to clean water and sanitation for all, ensuring sustainable water resources management and improving waste treatment in the country is the actions taken for trained technical staff, available in sufficient staff, competent and able to act with private operators, public, and within the framework of NGOs.

The exchanges were conducted with Dr N'GUESSAN Kouamé André – Director of Planning and Mobilization of ONAD funding.

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Water treatment and waste management technicians can make an essential contribution to improving access to quality drinking water and reducing the risks of pollution and disease associated with waste management in Côte d'Ivoire.

In this context, USF-AWB collaborates with the Institut Universitaire d'Abidjan (IUA) to identify, with the operators involved in this sector, what forms of collaboration can be set up. This should make it possible to examine the terms of involvement of a professional Bachelor program in the field of water treatment and waste management to which they would be closely associated. These meetings took place with ANDE (National Agency for the Environment), ONAD (National Office for Sanitation and Drainage), National Agency for Waste Management (ANAGED), SODECI (Société de Distribution de l'Eau de la Côte d'Ivoire), CIAPOL (Centre Ivoirien Antipollution) and with UVICOCI (Union des Villes et Communes de Côte d'Ivoire).

The study that has just been conducted with Ivorian operators shows the need for technical skills and a necessary development of the workforce to meet the challenges of this sector. All the structures met are ready to engage in collaborations with the IUA to facilitate the training and professional integration of students who will be trained under the professional license "Biology – water treatment and waste management".

For more information, contact Professor Xavier Alphaize <xavier.alphaize@gmail.com>. ■

ChatGPT: the worst and the best in higher education

ChatGPT surge is disrupting higher education in both teaching and research by providing often stunning results. We could say that we are dealing with "*a talkative parrot with a prodigious memory*".

Personally, I did some small experiments by asking the question "Who is Robert Laurini?" in several languages. In French, it is said to be a professor at the University of ST-Etienne (false), in English at the INSA of Lyon (true but in the past), in Italian at the University of Grenoble (false), in Spanish in Paris (false) and in German the place is not specified. Besides other information, there were very different truths. In total, I would say 50% true.

This casts doubt on the credibility of the results!

However, a request for "Psychiatry and Literature" provided a very decent text. ■

ChatGPT: what impact on scientific writing?

ChatGPT?

ChatGPT uses a language model (GPT: Generative Pre-Trained Transformer) to animate a conversation (Chat).

GPT (many variants) is a trans-trainer trained to establish complex correlations between token, words, sentences by treating huge corpus of texts according to billions of variables. Each element is then close to others in a huge textual universe. The learning is very long and sophisticated to converge towards a language model (mainly English-American for now). This model is materialized by a network of deep neurons (built by learning) capable of taking an input (a text constituting the request) and output an output (a text generated by increasing or reducing the query from the relative neighborhood relationships of hundreds of billions of variables characterizing each element).

If the construction of the model is very complex, long and expensive in technology and energy, the resulting model is a very important neural network but can provide almost instantaneously (on large machines nevertheless) a response generated from the request (also called prompt).

The generated text is therefore built from the query by increasing or reducing it according to the specified constraints: maximum number of words for example.

The different versions of GPT (and its competitors) see the number of variables increase for more fitness of the conditional proximity calculation of the elements of a text, in general, or more exactly as calculated from the texts selected for learning. More than 500 billion variables for the latest versions.

The functioning of GPT is already very efficient, but the language model generates texts without notice on their content. Each generated text element is the result of multivariate calculations without any possibility of giving meaning to what is generated. Quickly, requests on sensitive subjects (sexuality, crime, security, weapons of war, etc.) generate problematic texts that

can help any activity and take up learning biases (Western culture, racism, patriarchy, etc.) linked to the corpus of texts used and in particular texts resulting from textual productions on the Web.

InstructGPT
To reduce these problems, a process of controlling the use of the product model was devised. It is a supervised learning process that starts with a set of queries labeled (as inappropriate) and then matches them with queries made on GPT-3, and labels these queries as problematic if they are close to the queries labeled as inappropriate. The matching is done by supervised learning with 100 times fewer variables, but the authors consider that InstructGPT's opinion can significantly reduce generations of inappropriate texts. The authors specify that they thus detect the intentions of the user by allowing to filter the unacceptable intentions.

Chat(GPT): This is a conversation-type application with several modules:
• A (minimal) interface to allow you to enter the prompt and display the generated text. The texts, whatever the language used, are translated into American with a translation module.
• Probably, a prompt parser (in American) to dissociate the parts of the text of the constrained request (size of the response for example) and the text that will serve as a request for GPT.
• A problematic query detection module (Instruct GPT) that will return to the user a generic text explaining that it is not possible to respond to this request.
• The GPT model will be iteratively requested until the constraints of the expected number of words are reached. However, the method of summarizing a text is not documented. We can imagine several methods, but we are not sure. The result of a summary seems much less reliable than the generation. Similarly, the method of translation is not known but remains a generation and therefore requires a corpus in the target language.

So, can we generate a valid scientific article from a few lines text?

Yes, of course, ChatGPT (or its competitors) will generate a text that will have all the appropriate forms of a scientific article, or even a complete dissertation. This is not yet the case, however, as the length of a generated text is much smaller than that of a thesis.

The question of bibliographic references will undoubtedly pose a problem, it will be necessary to check them carefully because, like the rest, they are generated, unless they are sufficiently represented in the corpus to be considered as elements very close to the text that quotes them.

The generalities on the state of the art will probably be correct if the domain is well represented in the database of learning texts and if the mode of expression of a community is also well represented, but requires very careful handling of requests and checking the validity of responses.

Experiments with scientific writings have been made and they are obviously not conclusive. Different AI tools can be used to facilitate a particular task required in a thesis, but writing the thesis… no .

For more information, contact Professor Alain Mille <alain.mille@gmail.com>.■

ChatGPT for Scientific Writing: Navigating Potentials and Challenges

ChatGPT, and in general AI-assisted technologies, have recently been at the center of public attention and debate. The ability of these tools to write coherent human-style texts has impressed many within and outside Computer Science, and let many speculate that now computers can "think" or soon replace humans.

As a result, we have seen multiple articles, videos, and tutorials supporting the use of ChatGPT in a variety of tasks. These include giving financial advice, providing ideas for books, writing poems, summarizing documents, etc. It is indeed impressive the ability and adaptability of this tool in providing content on virtually any topic.

Inevitably, the skills of ChatGPT have attracted attention in the scientific community for its

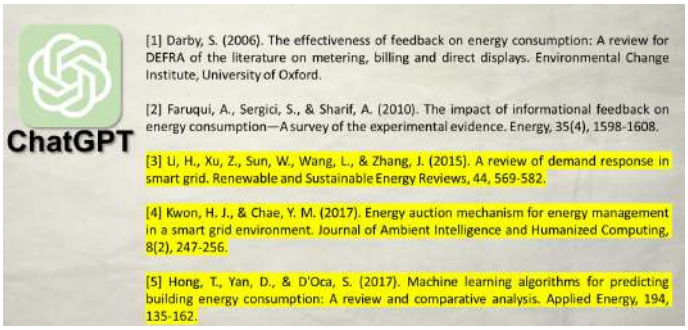
ability to potentially help the writing of scientific papers. I have personally tested the ability of ChatGPT in writing an Abstract and a Related Work section of a paper, with mixed results.

Can ChatGPT write an Abstract and a Related Work section?

I asked ChatGPT to write an Abstract of a scientific paper, in less than 200 words. The paper topic is a Network Tomography approach for traffic monitoring in Smart Cities. ChatGPT took its time, and eventually returned an abstract of 196 words. At first, the result was impressive. Having reviewed many first drafts of students' papers in my career, I can tell that the outcome was definitely above average. Specifically, not only the English was flawless, but the abstract had a good structure, starting from the "big picture", limitation of current approaches, proposed method, and summary of results. However, at higher level qualities of the writing, a few limitations appeared. As an example, the motivation provided for the diffusion of Smart Cities (i.e., "their ability to integrate advanced technologies for efficient traffic management") seemed very artificial and unconvincing. Additionally, ChatGPT could have better handled the setting and delivery of the reader's expectations. Nevertheless, I need to admit this is a challenging aspect of writing where many students also struggle.

More interesting, however, is the outcome for a Related Work section. Here, I asked ChatGPT to write a Related Work section of a paper on the use of HVAC-based power conservation framework that uses reverse auction theory and machine learning. ChatGPT took a while to produce the text, and it came up with a section of only five references, clearly insufficient for any paper published nowadays, especially on a well-investigated topic such as the one I asked. The section was again well structured. The section started with an overview of the problem, and then analyzed several relevant research directions in the literature such as smart meters, demand response, reverse auction theory, and machine learning for energy systems, etc. For each of these lines of research, it provided a short paragraph discussing the limitations of that research and motivating the need for the current paper.

Again, at a high level, ChatGPT produced a well-structured section, with few citations, but overall decent. The problem, however, begins when we look at the content more in detail. First, some topics such as demand response, which has been investigated for more than twenty years, has been discussed with a single citation. Second, the limitations of the current research are not accurate.



Most importantly, the discussions of the content of some existing papers sounded very unconvincing. I decided to go and directly look at these papers myself. To my great astonishment, I discovered that several of these papers (the three highlighted in the picture) do not exist. ChatGPT completely made up those citations, and consequently, also the content of the papers it cited. The journals are real, but the papers are not. Even more disturbing, looking at some of the authors of such non-existent citations, the authors indeed exist, and even worked on those topics. However, they never published such papers.

Challenges to our publishing systems

After serving as an Editor of several Scientific Journals, Technical Program Chair of several conferences, and being in the Technical Program Committee (TPC) of more than a hundred conferences, I have several concerns about the implication of tools like ChatGPT in our scientific publishing system. It is well known that the Computer Science field produces an overwhelming number of papers. It is not uncommon for conferences to receive hundreds of submitted papers, and even thousands for large conferences such as IEEE GLOBECOM or IEEE ICC. Inevitably, the assignment of papers to TPC members is imperfect, and many papers are assigned to reviewers who have only a limited knowledge of the specific topic. Furthermore, it is also not uncommon for reviewers to receive several

papers to review, many of which are delegated to others. I am concerned that, in these circumstances, it will be easy for papers partially generated by ChatGPT, containing all the inaccuracies described earlier, to be published. Reviewers are inevitably too overwhelmed to carefully check if some citations do not exist, or if the content of a cited paper actually matches the description provided.

Currently, publications societies such as ACM, IEEE, and Elsevier are providing guidelines for the use of AI tools in writing papers. These include the mandatory human oversight of any AI generated content, as well as the disclosure that these tools have been used. Also, AI tools cannot be listed as authors and cannot be cited to support statements made in the paper. Failure to comply would result in the paper being labeled as plagiarized. While these high-level rules make sense, it is hard to see how they will be implemented in practice. Currently, we are not able to distinguish AI-generated text from human generated text. Editorial tools such as EDAS, HotCRP, or Manuscript Central will most likely provide in the future, in addition to the currently available "similarity score", an "AI-generated score". However, it is unclear what Editors and reviewers should do once the use of AI tools is suspected or even declared. Furthermore, with the unfortunate wide diffusion of predatory conferences and journals, I would not be surprised if papers almost entirely generated by AI tools will be accepted for publication.

Challenges for our students

Among the biggest dangers of these technologies is the impact on our students' learning outcomes, and thus on the future generation of scientist and workforce in general. I have been analyzing ChatGPT generated content from the perspective of a scientist with decades of experience and almost a hundred published papers. However, a student that is just starting would inevitably see ChatGPT with different eyes. From their perspective, it would look like a tool that can write better and with minimal effort. Advisors will be most likely happy to see an improvement in the student writing, investing less time in editing and providing feedback. As a result, my fear is that students, and especially PhD students, will not learn how to write and communicate their scientific discoveries effectively through scientific papers. I do believe that this is an important skill that we should preserve and teach to our students.

The perspective looks even worse when we focus on undergraduate students. How many students will use, and are using, ChatGPT to generate answers to homework and assignments automatically? These tools offer the opportunity to get good grades without even the need of reading the provided answers.

A different perspective: another calculator?

There is a chance that 20 years from now I will look at this letter and think that I completely lacked a vision of the future. I have discussed my concerns with other scientists and, while many share my ideas, some provided different angles and parallelism with other groundbreaking advancements in the past.

An interesting parallelism can be drawn with the invention of calculators. At that time, many thought that students must have the ability to perform relatively complex arithmetic operations by themselves. Calculators were a way of automatizing an important skill, that will be forever lost, with fundamental repercussions. I think that today most of us would laugh at those concerns, as nobody would expect a student, and even a PhD student, to be able to do complex calculations. As a result, many years from now, we may look at writing papers as a skill that we do not value anymore, and completely delegate this task to AI tools. Obviously, calculators do not make mistakes and do not lie, while ChatGPT does. Nevertheless, these tools are just at their infancy, it is reasonable to assume that in the next years we will be able to see new improved versions that are able to provide reliable content. Therefore, if an AI tool would be able to provide a well-written, correct, and reliable representation of our scientific discoveries, and basically write a paper with minimal human oversight, should we still worry about scientific writing as a skill that our students need?

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Detecting Academic Fraud Using ChatGPT by Stylistics Measurement

This article is intended for university teachers, to reassure them that strategies for controlling the ChatGPT tool exist. Their role is to prevent the risks of its use: plausible texts, but without foundation, and likely to be detected as such. In order to raise the regulatory and even legal issues of the drafting by ChatGPT, the article focuses first on its functioning to determine the constraints of the drafting ChatGPT and to exploit them, then, in the two pen detection solutions of this ChatGPT writing independent of language models.

ChatGPT is a useful tool for professional writing (to sketch a text or summarize a document). Well used, it is an excellent research tool. It can write all or part of a document through its writing ability. In a certification review or evaluation framework, it can be misused as a ghostwriter, more as a ghost writer. But ChatGPT can be used for fraud. Thus, the problem of a text without source, with an encyclopedic tone not necessarily plausible, can lead to hallucinations out of step with reality.

OrphAnalytics
to track down orphan sequences

ChatGPT escapes plagiarism detections. However, the need for ChatGPT writing detectors is becoming important. The detectors available today are developed from the language models that were used to develop it. AI text detectors can therefore be manipulated by AI writing providers to make AI texts non-detectable.

Two detection solutions independent of ChatGPT language models are proposed in this article in order to guarantee integrity. They were developed in the framework of the OrphAnalytics company to which the authors of this article belong.

1/ We have developed a fraud detection tool capable of highlighting ghostwriting, that is, text written by someone other than the candidate. This tool is able to detect the writing by ChatGPT of all or part of a document certifying, because with these stylistic tools, the writing of ChatGPT behaves like that of a ghostwriter. These style comparison analyses measure whether the signatory of a document is the actual author of that document.
2/ A vocabulary richness measurement approach makes it possible to ascertain credibly whether a text was written by a conversational agent such as ChatGPT, because an artificial intelligence written with less vocabulary richness than a human being. AI texts are marked by repetitions.

In order to respond to societal challenges, such as large-scale fraud or the temptation to use ChatGPT as an aid to the examination or writing of certificating documents, the article focuses on the essential needs to detect to regulate, not to sanction. Since ChatGPT's pen detection is independent of language models and the language of texts, we believe that our contribution is likely to be a guarantee of good practice.

To understand the AI revolution with a positive prism, let's note that supervised students can learn differently using this new research tool. The controlled use of ChatGPT should significantly reduce the risk of loss of innovation in academic institutions.

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2 Institut de Recherche et d'Action sur la Fraude et le Plagiat Académiques. Voir : https://irafpa.org/
3 https://www.orphanalytics.com/