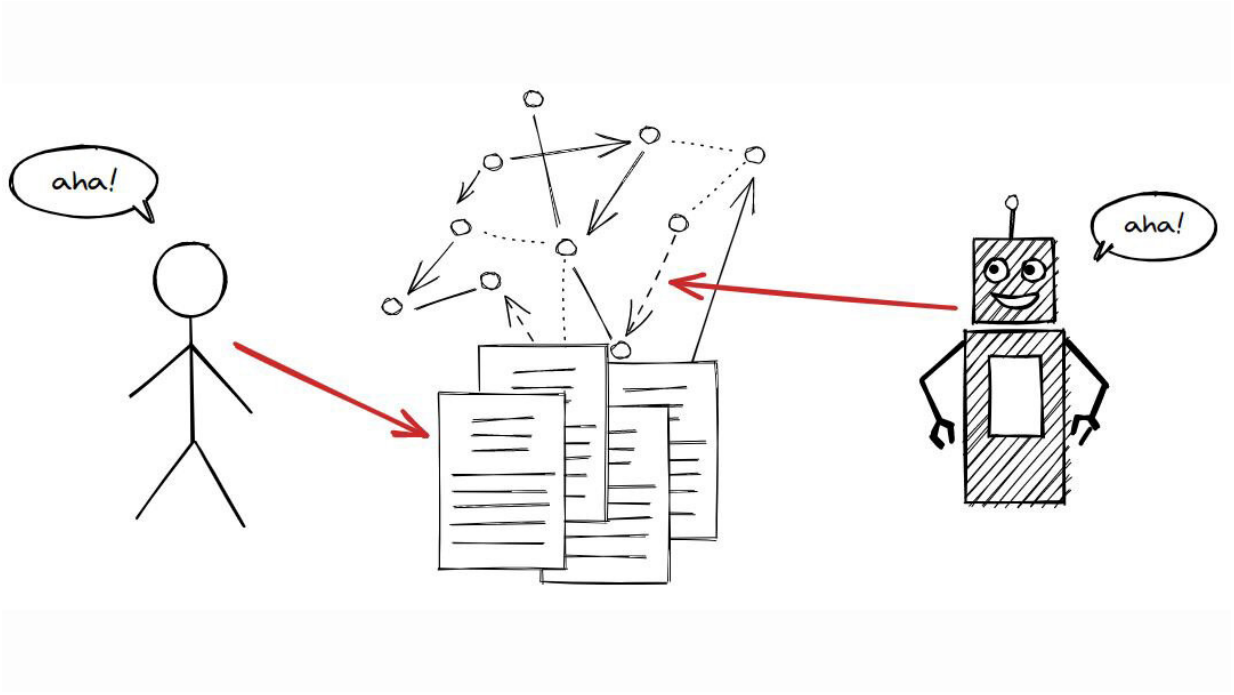
Innovators and publishers join forces to make scientific articles' findings machine-interpretable

May 9 2023



By allowing users to publish nanopublications linked to scientific articles, the partners make it possible for tiny snippets of what is presented in the scholarly paper to be fully 'understandable' by computer algorithms, in addition to regular (human) users. As a result, pieces of information in the form of precise statements will be delivered to the right person/machine in the right format almost instantaneously. Credit: Knowledge Pixels

Standing at the dawn of Artificial Intelligence (AI)-powered reality, we can hardly think of anything the exponentially advancing technologies would struggle to digest. A critical exception would most certainly be scientific knowledge, which has long been accumulating across disciplines, fields and academic publications in the form of extensive narratives based on data and observations.

Until AI technology "learns" how to interpret complex scientific literature and evaluates the data, methodology and evidence behind it, it is our responsibility to make sure what we know today is optimally available to the computer algorithms. In turn, those algorithms would be extremely helpful in assisting researchers to build on the knowledge of yesterday by delivering the right information at the right time in a ready-to-use format.

This is why the team behind Knowledge Pixels, a recent startup that develops software and services, devised a framework to publish scientific findings in a way that is simultaneously human-readable and machine-actionable. To do this, the duo teamed up with forward-looking scholarly publishers Pensoft and IOS Press to implement its goal.

The collaborators share a common vision and mission founded on the FAIR Principles, that is ensuring scientific outputs are Findable, Accessible, Interoperable and Reusable. To put it simply, you can find a FAIR publication on the Internet in a few clicks, and so can a computer algorithm mining the Web. Then, both you and the algorithm will be able to integrate that FAIR item into your own output almost instantaneously.

The thing is, the academic community has been talking about sharing scientific findings in a FAIR manner for quite some time, but such a publication workflow is yet to see the light of day.

"The way how science is performed has dramatically changed with

digitalization, the Internet, and the vast increase in data, but the results are still shared in basically the same form and language as 300 years ago: in narrative text, like a story. These narratives are not precise and not directly interpretable by machines, thereby not FAIR. Even the latest impressive AI tools like ChatGPT can only guess (and sometimes 'hallucinate') what the authors meant exactly and how the results compare," say Philipp von Essen and Tobias Kuhn, the two founders of Knowledge Pixels.

When asked why there are no FAIR publications of scientific results yet, Philipp von Essen states, "We use nanopublications as our core technology. The conceptual basis for nanopublications was laid more than 10 years ago, at the time when Semantic Web was a bit of a hype. It turned out that the technical implementation was not so easy and the concepts needed further development."

"Only a few researchers pursued the ideas and continued to work on prototypes. One of them was Tobias Kuhn, and now we are ready to put nanopublications into scientific practice."

When asked why FAIR publications are so difficult, Tobias Kuhn explains, "We want research findings to be FAIR, because they can then be automatically interpreted and compared by computers, thus multiplying the value we can draw from them. Yet, to make such findings fully interoperable, as the FAIR principles require, they need to be specified clearly and consistently."

"For example, when we informally use the verb 'treat' to state that a medication treats a disease, it is not clear whether that medication is necessarily associated with a drug, whether a viral disease is considered the same thing as the virus itself, and what 'treats' exactly means, such as how often and under what circumstances the treatment is supposed to be successful."

"As a result of this, computers currently understand complex topics like scientific findings only in a very superficial and imprecise manner. To solve this problem, the findings need to be modeled in a more structured and more precise way, which has to involve researchers too, not just better algorithms, and we at Knowledge Pixels are working on the tools for that."

By launching a set of pilot projects involving innovative journals, Data Science published by IOS Press and Research Ideas and Outcomes by Pensoft, the partners are giving scientists the opportunity to publish nanopublications alongside their standard research articles. Additionally, scientists can use the nanopublication format and workflow to evaluate and comment on research papers by others.

Unlike research articles, a nanopublication is just a tiny snippet of a scientific finding (e.g., medication X treats disease Y), which exists as a complete and straightforward piece of information stored on a decentralized server network. Thus, an algorithm can fully "understand" it and use it to deliver to the right user, at the right time, in the right place. Nonetheless, the nanopublication remains linked to the research paper, so that its scientific value can be scrutinized just the same.

Within the workflow already in place at Data Science and Research Ideas and Outcomes (RIO Journal), the authors can fill in a form accessible from the dedicated Nanodash tool, where they can create and browse nanopublications. They can express what they have found with little effort and no programming skills. Furthermore, the authors will soon be able to add citations to their academic CVs for their nanopublications. The feature is expected to be released later this year.

"As pioneers in the semantic open access scientific publishing field for over a decade now, at Pensoft we are deeply engaged with making research work actually available at anyone's fingertips," says Prof.

Lyubomir Penev, founder and CEO at Pensoft.

"What once started as breaking down paywalls to research articles and adding the right hyperlinks in the right places, is time to be built upon."

Over a period of 35 years, Einar Fredriksson, Ph.D., founder and director of IOS Press, has observed "substantial change across all facets of the scholarly publishing landscape—from the transition from a print to a digital environment driven by technological advancements. Among these innovations, open access and shared data initiatives, in particular the initiative of Knowledge Pixels, are reshaping the global STM publishing industry."

Founders of IOS Press Einar Fredrikksson and Pensoft Prof. Lyubomir Penev jointly state, "This is a truly revolutionary step in the way we express the most significant outcomes of a scientific article in both machine-actionable and human-readable formats".

"We do expect that machine-actionability of the 'elementary units of knowledge', such as the nanopublication, will change the way we publish and re-use scientific information."

Provided by Pensoft Publishers

Citation: Innovators and publishers join forces to make scientific articles' findings machine-interpretable (2023, May 9) retrieved 3 May 2024 from https://techxplore.com/news/2023-05-publishers-scientific-articles-machine-interpretable.html