DIALOGUE: REPLICATION CRISIS IN AI

Interest

The image metaphorically represents the iterative and self-referential nature of scientific inquiry and knowledge building.

* Google published a study in relation with cancer diagnosis with medical images where they didn't include sufficient info about the AI model' code & testing procedures, less alone hyperparameters.
* 31 Scientists argue -> defending their proprietary interests = Intellectual Property Protection -> putting forward their own corporate interests (Competitive advantage + market positioning) over advancing scientific knowledge in the medical field)

IMPACT

The formal complaint has a huge impact on the scientific community and society on itself.  
Building Trust and Ethical Assurance:

1. Slows/even stops the progress on scientific knowledge and innovation, the so used collective intelligence.  
   It enables researchers and practitioners to learn from existing work, understand its limitations, and build upon it.

This accelerates innovation and the development of more robust, efficient, and effective AI systems.

It helps in identifying and correcting errors, refining methods, and challenging assumptions. This process is essential for the continuous improvement of AI technologies and methodologies

1. This is essential to build trust among users and stakeholders, especially given the increasing impact of AI in sensitive areas like healthcare, finance, and criminal justice.

Transparency helps ensure that AI systems are not seen as "black boxes," thus fostering greater acceptance.

Replication of results is a key aspect of scientific integrity. In AI, replicability ensures that the results claimed by a particular AI model or algorithm can be independently verified by others.

What are exactly the consequences / the impact on the scientific community?

What is not allowing the scientists to replicate?

* The 5 main secrets/obstacles to reproducing tests:

1. Data (inaccessible due to Intellectual Property /sensitive content (for example: medical records))
2. Hardware (unaffordable for small/medium labs, huge data centres with millions of servers with very expensive CPU’s)
3. Training (multiple models before reaching the product level -> multiple trainings -> training around 100-120M GPT3 not even final product)
4. Code (not shared)
5. Metadata (The devil is in the details - hyperparameters, small changes) these parameters make the difference between the system working and not working.

* What are the solutions/ How do we achieve transparency?

In terms of Code + Metadata:

1. Establishing mandatory standards, more precisely checklist of what any study must provide

2. Challenges to replicate experiments based on published studies (but the prize is absurd)

3. Workforce of students used to replicate studies as part of their machine-learning courses

4. Papers with Code Project (website where researchers link papers with their corresponding code / partnership with arXiv (archive Chi)) -> Progress: increase of papers with code from 50 to 75% in checklist

In terms of data:

1. Sensitive / IP -> directions so others can build their own.
2. Access to small number of auditors to check for everyone else.

In terms of hardware:

1. DeepMind argues that high-budget AI research eventually benefits everyone through a trickle-down effect.
2. As AI models evolve, they often become more efficient and accessible, requiring fewer computational resources.
3. In fact, if you think about it, the issues of limited hardware is not unique to AI but also exists in fields like particle physics. (CERN where you find the Hadron Collider)
4. Efforts are being made to address this issue, with initiatives like Compute Canada providing computing clusters for universities to run large AI experiments.
5. Some companies, such as Facebook, offer limited access to their hardware for universities, indicating a gradual shift toward greater accessibility.

In terms of research approach:

1. Splitting Research Publications:

Consider separating research publications into two streams: one for reproducible studies and another for tech showcases. This approach aims to balance the competing demands of business and research, allowing for both transparency and the promotion of technological advancements.

1. Maintaining an Open Approach:  
     
   Large tech companies like Meta AI Research, and DeepMind emphasize their commitment to transparency, scrutiny, and replication in their research practices (for example with open-source ML tools like TensorFlow for google and PyTorch for Meta). This open approach to research encourages collaboration and engagement with the wider research community.
2. Third Way of Conducting Research:

AI companies such as OpenAI are seen as demonstrating a third way to conduct research, different from purely open or closed approaches. This approach seeks to strike a balance between sharing research openly and protecting proprietary interests, creating a unique model for AI research in industry.

KARL POPPER

One of the most prominent advocates for the concept of cumulative knowledge in science is Karl Popper, a philosopher of science.

QUOTE AND PEOPLE  
Karl Popper's approach integrates rationalism, through the logical structure of scientific theory, with empiricism, via the rigorous testing of these theories against empirical evidence. Popper's philosophy implies that science progresses through a series of conjectures and refutations, leading to a cumulative growth of knowledge.

He values critical scrutiny and continuous testing, fostering a robust and self-correcting scientific process.

NOVELTY

The novelty lies in its exploration of the challenges and implications of replicability in AI research.

While the concept of a replication crisis is not new in scientific fields, applying this lens specifically to AI, particularly in the context of big tech companies offers a fresh perspective on the unique challenges and ethical considerations in this field.

Two notable fields that have experienced replication crises are psychology and biomedicine:

Psychology: The reproducibility project, which attempted to replicate 100 studies from top psychology journals and found that less than half could be replicated.

Biomedicine: A report by researchers at the pharmaceutical company Amgen found that they could only replicate 6 out of 53 landmark cancer studies.

FIGURE

The Tower of Babel, in its traditional interpretation, symbolizes humanity's collective endeavour reaching for the heavens, which parallels the pursuit of scientific knowledge as a cumulative, collaborative effort to understand the universe.

However, where the Tower of Babel narrative ends with the dispersion of people, scientific spirit aims for unity and coherence in human knowledge despite the diversity of disciplines and perspectives.

ETHICS

Profit vs. Public Good:

Corporations often prioritize profit, which may conflict with broader social and ethical responsibilities.

It's ethically imperative to balance commercial interests with societal welfare.

European Commission:

The European Centre for Algorithmic Transparency (ECAT) plays a crucial role within the European Commission, focusing on the implementation and enforcement of the Digital Services Act (DSA). Specifically, ECAT's responsibilities include:

- Providing scientific and technical expertise to support the European Commission's supervisory and enforcement roles, particularly regarding systemic obligations under the DSA.

- Concentrating on designated Very Large Online Platforms (VLOPs) and Very Large Online Search Engines (VLOSEs), which are significant due to their extensive reach and impact on EU users.

- Ensuring that these large platforms and search engines adhere to the DSA's requirements, particularly in terms of algorithmic transparency and accountability.

In essence, ECAT acts as a specialized entity within the European Commission, focusing on the complex and influential digital ecosystem created by VLOPs and VLOSEs.