EXPECT Science explainer

Using machine learning to 'plug and play' with EXPECT research.

OPEN-SCIENCE | PLATFORM | AI-ML

FULL NAME

Amanda Duarte

INSTITUTION & DEPARTMENT

Barcelona Supercomputing Center, Earth Sciences

EXPERTISE

Artificial Intelligence for Earth Science

SUMMARY

By creating an open science platform that prioritises the reproducibility of and access to EXPECT research, we aim to unlock the full potential of machine learning for climate science. The platform will standardise research workflows, enabling more transparent, collaborative, and inclusive scientific progress.

Can you explain why/how your expertise is related to climate change?

Amanda Duarte: My background is in computer science, with a master's degree in computer engineering focused on image processing and robotics. During my PhD I specialised in machine learning, which I applied to sign language translation and representation. In need of a change, I later transitioned into climate science, bringing this expertise to a new domain.

Throughout my educational career, I came across many tech developments and research papers with limited real-world impact. This motivated me to develop tools and approaches that are genuinely useful for others. Inspired by the rapid progress in computer science, I saw an opportunity for climate science to better leverage machine learning's potential. As this meant convincing researchers to unlearn previous habits of handling data, EXPECT was a good place to start introducing these borrowed ideas.

Within EXPECT, what's the focus of your research?

A.D.: My work in EXPECT focuses less on conducting research and more on making project outputs accessible through an open science platform. This platform consists of a repository for code, data, models, and algorithms. It enables users to 'plug and play' with existing research, supported by accompanying scripts that document methods and workflows. The platform promotes a more democratic approach to science, as it allows easier reproducibility and replicability of research and higher access to information *(Figure 1)*.

In practice, adapting new research to the platform often resembles a trial-and-error process. Context matters when developing a model using machine learning, as each dataset has unique characteristics. This requires experimenting with different approaches to extract meaningful information. Iterative development can bring incremental refinements to the visibility and impact of your work.

Figure 1: EXPECT's Open Science Platform, coming soon)

What is a common misbelief about the topic we are covering?

A.D.: Machine learning has been around since the 1970s, but it remained a dormant field because resources and data were lacking. Its resurgence started in the 2010s when the AlexNet machine learning model outperformed numerical models. The open availability of code and models accelerated this progress, and the field has since evolved at remarkable speed *(Figure 2)*. Alongside innovation, however, the growing prominence of artificial intelligence has also raised important challenges.

There is an apparent gap between how machine learning models function and how people understand them. Not far from black magic, even model developers have a hard time explaining why their predictions turn out well.

In addition, the use of such technology raises questions about responsibility and ethics. For example, many ChatGPT users are unaware that returning an answer to a simple prompt requires a lot of energy. The ethical side of using these tools becomes even clearer when military applications and robotics are involved.

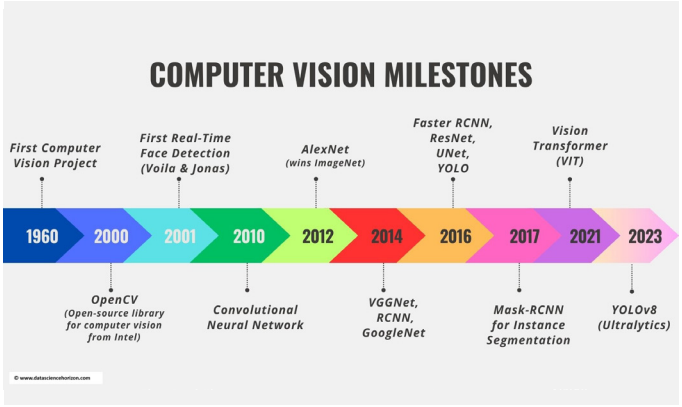

Figure 2: Infographics to show important milestones in the journey of Computer Vision,

LOOKING FORWARD

EXPECT allowed me to start standardising climate data on a small scale and testing the open science platform like an experiment. Its potential to broaden access to research outputs while reducing duplication of efforts and resources makes it a no-brainer. Furthermore, we provide assistance with the intermediate steps required to adopt the platform. The next step is to assess its uptake within the research community.

WHY A SCIENCE EXPLAINER

Through short, focused questions, project researchers share what they study, why it matters, and how their investigations lead to real-world findings.

By opening up the day-to-day challenges and thinking behind climate research, these explainers make science more accessible, transparent, and trustworthy for other researchers and decision-makers alike.

To know more about us:
expect-project.eu

Connect with us on social media

Funding

Funded by the European Union

UK Research and Innovation

Government of Canada