Brazil Profile for the AI4PEP

Principal Investigator (PI): Dr. Andre de Carvalho

Project Title: AutoAI-Pandemics: Democratizing Machine Learning for Analysis, Study, and Control of Epidemics and Pandemics

Objective(s):

- Our main objective is to develop an integrated and user-friendly platform, called AutoAI-Pandemics, democratizing access to data science and machine learning techniques by allowing non-experts to use them well, e.g., biologists, physicians, and epidemiologists. AutoAI-Pandemics seeks to provide the following solutions:
  - (T1) Automated epidemiologic analysis to detect possible epidemic scenarios and corresponding optimal intervention policies.
  - (T2) Automated bioinformatics analysis, e.g., drug discovery or pathogen genome mining.
  - (T3) Fighting misinformation/disinformation to assist in the search for reliable sources.

1 – How did this project come about?

This project emerged as a response to the growing need for accessible and user-friendly tools in Data Science (DS) and Machine Learning (ML). Despite its wide application, designing robust and trustworthy ML solutions usually requires expertise not commonly found in health researchers, causing severe inequalities. In this context, democratizing Artificial Intelligence (AI) implies granting accessibility to ML for individuals who are not specialists in the domain. Recognizing the potential of these technologies to address crucial challenges in epidemiology, bioinformatics, and information reliability during pandemics, we propose an integrated platform called AutoAI-Pandemics. Our main objectives are to contribute to society by generating AI solutions that directly impact the lives of people who require them. Our studies aim to

significantly reduce the expertise required to operate AI/ML pipelines. This support empowers researchers to tackle a wide range of issues, including diseases that have a profound impact on human lives.

2 – How does your project leverage Artificial Intelligence (AI) to advance equitable health?

Artificial Intelligence (AI) can provide tools to deal with several challenging epidemiological scenarios, demonstrating promising results in the fight against the COVID-19 pandemic. Although AI creates new opportunities, its proper use requires advanced knowledge of computing, statistics, and mathematics, restricting its use by public health professionals working with infectious diseases. Therefore, our objective is to develop an integrated and user-friendly platform that can be effectively employed by non-experts working with infectious diseases. This platform, named AutoAI-Pandemics, will provide robust solutions using Automated Machine Learning for (T1) epidemiological analysis to detect possible epidemic scenarios and corresponding interventions to suppress disease spread with minimal social impact safely; (T2) bioinformatics analysis, supporting pathogen genome mining, and (T3) fighting misinformation by assisting the search for reliable information sources. AutoAI-Pandemics has a high potential to significantly reduce the experience needed to use ML pipelines, helping researchers in the fight against infectious diseases, mainly in low- and middle-income countries, giving biologists, physicians, epidemiologists, and other stakeholders, an opportunity for widespread use of these techniques.

3 – How are you decolonizing research, and giving your community a voice?

In an era where Artificial Intelligence (AI) is present in various processes that impact society, it is essential to ensure that its contributions are distributed equitably. Moreover, the democratization of AI must empower each individual, community, or society to contribute proportionately to their aptitude, availability, dedication, and speed. However, it is crucial to ensure, not only, that AI benefits are distributed equitably, but also, its

responsible use. These aims require equal opportunities across the world. Furthermore, we should lay plans to share knowledge and training involving AI to benefit all regions of the globe. Therefore, the democratization of AI knowledge and tools in Latin America and Caribbean countries, as proposed by our project, represents a fundamental step towards making AI accessible to a broader set of stakeholders, covering healthcare professionals, policymakers, and the general population. This democratization is a multifaceted effort that requires cooperation, innovation, and a firm commitment to ethical principles not only in Latin America and Caribbean countries but worldwide. By promoting international collaboration, disseminating knowledge, and adopting responsible AI practices, we can harness the transformative power of AI to build a more resilient and equitable world, prepared to face future challenges, whether pandemics or not.

4 – AI4PEP is also famous for its gender transformative approach to health, what efforts has the project taken to realize this goal?

AI solutions have been proposed in several domains, e.g., in October 2022, the Food and Drug Administration (FDA) reported 521 AI and ML-enabled medical devices. Nevertheless, many studies have a black-box nature (decisions are not understandable on a human level), which may reduce AI's trust, accountability, and acceptance. Another concern is that ML models can follow hidden social biases in the data, leading to unfair, harmful, or discriminatory decisions. In search of responsible solutions, this project follows guidelines recommended in the literature, such as how to develop and use AI responsibly (DIGNUM, 2019), AI for all (RAMOS, 2021), Guidelines for Trustworthy AI (ZHANG; ZHANG, 2023), Ethics of AI (UNESCO), and others. We also adopt the principles of Data-Centric AI (DCAI) (ZHA et al., 2023; WHANG et al., 2023), putting data at the heart of an AI system development process. For such, we applied the FAIR (Findable, Accessible, Interoperable, and Reusable) data principles (WILKINSON et al., 2016), guidelines to improve the Findability, Accessibility, Interoperability, and Reuse of data, aiding scientific advancement.

5 – What is the novelty of your project?

Our proposal, AutoAI-Pandemics, seeks to democratize access to data science and Machine Learning (ML) techniques, allowing non-specialists to use them without needing knowledge of programming, artificial intelligence, and other disciplines. That is, our proposal aims to serve non-specialist researchers who wish to use ML for the analysis, study, and control of epidemics and pandemics. To the best of our knowledge, AutoAI-Pandemics will be the first end-to-end ML platform for the analysis, study, and control of epidemics and pandemics.