Raphael Poulain

PhD Student in Computer Science
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Research Interests

Applied Machine Learning, Artificial Intelligence, Health Data Science, Deep Learning, Electronic Health Records

Education

University of Delaware — *Newark, DE*
Ph.D. in Computer Science — *2020 - Present*
Advisor: Rahmatollah Beheshti

EFREI Paris — *Villejuif, France*
M.S. in Engineering — *2018 - 2020*

EFREI Paris — *Villejuif, France*
B.S. in Engineering — *2015 - 2020*

Research Experience

healthy lAIfe Lab, University of Delaware — *Newark, DE*
PhD Student — *Sep. 2020 - Present*

- Studied an end-to-end Federated Learning approach to promote fairness in the model's prediction on underrepresented populations.
- Investigated a semi-supervised transformers architecture leveraging both labeled and unlabeled patients for few-shot learning on Electronic Health Records.
- Utilized Transformers and Electronic Health Records to perform a multi-target regression for primordial prevention of cardiovascular disease.
- Leveraged a BERT-based architecture to extract the bidirectional representation of patients' medical data by defining medical codes as words, visits as sentences, and the medical history as a document.
- Coupled the transformer architecture with another deep neural network using four main EHR modalities: demographics, conditions, prescriptions, and lab measurements.
- Implementation of a single RNN and GAN-based model to predict obesity status at different time-points in the future.
- Participated in the BARDA Pediatric COVID-19 Data Challenge.

Teaching Experience

CISC106, University of Delaware — *Newark, DE*
Teaching Assistant — *Fall 20 - Present*

Work Experience

Euronext — *Paris, France*
Software Engineer Intern — *Mar. 2020 - Aug. 2020*

- Built an automated API testing tool using Python and Cucumber during the development of the company's new on-demand market data platform.
- Participated actively in the choice of the technologies and tools used throughout the project.
- Organized the deployment of the tool to serve as the company's main testing engine for newly developed APIs.

Euronext — *Paris, France*
Software Engineer Intern — *Apr. 2019 - Sep. 2019*

- Built a cartography tool of the Optiq Trading system that allow engineers to better visualize the architecture of the system.
- Designed the Graph Database Model from the choice of the technology to the model itself.
- Realized a WebApp using JavaScript to keep the database up-to-date automatically and to help visualize each connection between Optiq's components.

Publications

Peer Reviewed Conference Papers

M. Gupta, B. Gallamoza, N. Cutrona, P. Dhakal, **R. Poulain**, R. Beheshti. "An Extensive Data Processing Pipeline for MIMIC-IV". Machine Learning for Health (ML4H), 2022. Link

R. Poulain, M. Gupta, and R. Beheshti. "Few-Shot Learning with Semi-Supervised Transformers for Electronic Health Records". Machine Learning for Healthcare Conference 2022 (MLHC), 2022. Link

M. Gupta, **R. Poulain**, TL. T. Phan, H. T. Bunnell and R. Beheshti. "Flexible-window Predictions on Electronic Health Records". The Thirty-Fourth Annual Conference on Innovative Applications of Artificial Intelligence (IAAI), 2022. Link

R. Poulain, M. Gupta, R. Foraker, and R. Beheshti. "Transformer-based Multi-target Regression on Electronic Health Records for Primordial Prevention of Cardiovascular Disease". 2021 IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2021. Link

Services & Activities

Conference Volunteer IEEE International Conference on Bioinformatics and Biomedicine 2021

Projects

Portfolio Optimization *2020*

Portfolio creation following the Markowitz's Optimal Portfolio using the returns predicted by an LSTM-based network.

NHL Players' salaries Prediction *2018*

Developed a Random Forest Regression model to predict NHL Players' salaries given their in-game statistics and personal information.

Self Driving Cars *2018*

Programmed a parking lot simulation populated by autonomous cars to teach them how to park using a genetic algorithm.

Relevant Coursework

University of Delaware	Artificial Intelligence, Advanced AI, Bioinformatics, Introduction to Data Mining, Advanced Algorithms, Game Theory, Theory of Computation, Introduction to NLP
EFREI Paris	Numerical Analysis Applied to Finance, Financial Risk, Econometrics, Big Data for Finance, Advanced Databases, Deep Learning and Applications

Skills and Certifications

Programming	Python, R, Keras, PyTorch, Tensorflow, SQL, C / C++, Java
Machine Learning	Neural Networks, RNN, Transformers, CNN, GAN
Certifications	Coursera Deep Learning Specialization