Théophile Sautory

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Education

University of California, Berkeley Exp. May 2023
MS in Mechanical Engineering (PhD track)
Superresolution of PC-MRI images with physics-informed machine learning.

Imperial College London
MS in Computer Science, Artificial Intelligence & Machine Learning Sep. 2020
Thesis: Neuro-symbolic video question answering with spatio-temporal properties.

BEng in Mechanical Engineering Jun. 2019
Thesis : Turbulence modelling with artificial neural networks.

Work Experience

Ansys May. 2022 – Aug. 2022
Machine Learning Research Intern, CTO Office *San Jose, USA*
- Worked on the research and development of a new generation of PDE solvers.
- Designed an autoencoder and its training mechanism for multi-objective optimization in the context of physics-informed neural networks.
- Combined Ansys Fluent with deep learning to generate and reconstruct solutions of the Navier-Stokes equations from combinations of randomly generated potential, shear and vortex fields.

UK National Crime Agency Apr. 2021 – Jul. 2021
Machine Learning Research Assistant with Pr. Dalal Alrajeh *London, UK*
- Implemented Siamese autoencoders trained with contrastive loss for crime linkage.
- Formalized a method to learn to rank the distinctiveness of behaviour in serial offending with inductive logic programming and Fisher's Exact tests.
- Presented our algorithms to crime analysts, and mentored them towards their application.

Scortex – Quality Intelligence Sep. 2020 – Mar. 2021
Machine Learning Researcher in Semi & Unsupervised Deep Learning *Paris, France*
- Improved the ROC-AUC performance in anomaly detection on images for the MVTec dataset by leveraging descriptors of pre-trained networks with generative models and data augmentation.
- Developed low-data regimes datasets with distribution shifts to increase the robustness of our convolutional autoencoders.

Publications

[1] M Law, T Sautory, L Mitchener, K Davies, M Tonkin, J Woodhams, D Alrajeh (2022): Learning to Rank the Distinctiveness of Behaviour in Serial Offending, International Conference on Logic Programming and Nonmonotonic Reasoning

[2] Pierre Gutierrez, Antoine Cordier, Thaïs Caldeira, Theophile Sautory (2021): Data augmentation and pre-trained networks for extremely low data regimes unsupervised visual inspection, Proc. SPIE 11787, Automated Visual Inspection and Machine Vision IV, 1178703

[3] Theophile Sautory, Nuri Cingillioglu, Alessandra Russo (2021): HySTER: A Hybrid Spatio-Temporal Event Reasoner, Thirty-Fifth AAAI Conference on Artificial Intelligence Workshop on Hybrid Artificial Intelligence.

[4] Alvaro Prat, Theophile Sautory & S. Navarro-Martinez (2020): A Priori Sub-grid Modelling Using Artificial Neural Networks, International Journal of Computational Fluid Dynamics

Projects

Parallelization of Vasculature Tracing Mar. 2022 - May. 2022

- Collaborated with a classmate to parallelize a serial automatic blood vessel tracing algorithm.
- Produced a solution using multiprocessing, a shared memory, local locks and spatial locality.
- Reduced the runtime of the algorithm by a factor of 3 using 4 processors.

Neuro-Symbolic AI for Video Question Answering Mar. 2020 - Nov. 2020

- Created a neuro-symbolic learning framework for the video question answering CLEVRER task.
- Incorporated a Mask R-CNN for segmentation, ResNets for depth estimation, alongside an Answer Set Programming framework for natural language processing and temporal and causal reasoning.
- Presented my paper in the 35th AAAI Conference, Workshop in Hybrid AI (Sautory, Cingillioglu, Russo, 2021).

Turbulence Modelling with Artificial Neural Networks Oct. 2018 - Jun 2019

- Formulated a new turbulence model to close the filtered Navier-Stokes equations for sub-grid Large Eddy Simulation using artificial neural networks.
- Improved correlation coefficients on the stress tensor terms in homogeneous isotropic turbulence from the John Hopkins turbulence dataset.
- Partnered with my supervisor and classmate to publish our research (Prat, Sautory & Navarro-Martinez, 2020).

Technical Skills

Programming: Python, C/C++ (CUDA/MPI/OpenMP), Julia, MATLAB.

Libraries: PyTorch, TensorFlow, Scikit-learn, Keras, OpenCV, Matplotlib, Numpy, Scipy, Pandas.

Tools: Git, Github, LaTeX, Unix environment, Slurm, Abaqus, Star CCM+, Solidworks.

Awards

UC Berkeley **Graduate Division Block Grant Award**, Mechanical Engineering. 2021

Imperial College London Engineering **Dean's List** (top 10%). 2016, 2017, 2018, 2019

Leadership and Extracurricular

Basketball

- Vice-president of the Imperial College Basketball Society, leading the 120 members to win Imperial Sports Club of the Year (2018-2019).
- Captain of the Imperial College team(2018), 15 years of practice.