

THÉOPHILE SAUTORY

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Education

University of California, Berkeley

May 2023

MS in Mechanical Engineering, *GPA:3.93/4.00.*

Physics-Informed ML, ML for Energy Transport and Conversion, NLP & Computer Vision, Parallel Computing.

Imperial College London

MS in Computer Science, Artificial Intelligence & Machine Learning, *GPA:4.00/4.00.*

Sep. 2020

Deep Learning, Computer Vision, NLP, Robotics, Reinforcement Learning, Mathematics for ML, Statistics.

BSc in Mechanical Engineering, *GPA:4.00/4.00.*

Jun. 2019

Thermodynamics, Heat Transfer, CFD, Statistics, Embedded C, System Design Optimization, Manufacture.

Work Experience

Arup

Aug. 2023 – current

Research Engineer

San Francisco, CA

- Automating microclimate and datacenter thermal analyses, using CAD and CFD, and presenting results to clients.
- Enhanced urban scale building energy prediction accuracy by 20% using physics-based deep learning models.

Ansys

May. 2022 – Aug. 2022

Machine Learning Research Intern, CTO Office

San Jose, CA

- Designed autoencoders and training mechanisms for multi-objective optimization in ML based physics simulations.
- Led the research on merging Ansys Fluent with deep learning for novel PDE solvers with C++ and Python.

Scortex

Sep. 2020 – Apr. 2021

Machine Learning Engineer

Paris, France

- Designed and tested deep learning generative models on a prototype production line equipped with cameras.
- Improved the ROC-AUC performance in anomaly detection on images from the production line from 93 to 98% leveraging unsupervised and transfer learning.

Selected Projects

RL from LLM Feedback to Counteract Goal Misgeneralization (Team of 2)

Sep. 2023 – current

- Reduced RL agent biases by integrating LLM feedback by an average of 15% for various bias strength.
- Trained a reward model with LLM feedback to enhance a maze-solving reinforcement learning (RL) agent's policy.

Denoising and Super-resolution of 4D flow MRI blood flow images

May. 2022 – current

- Provided a solution to condition a single PINN to solve distributions of PDEs in various 3D geometries.
- The model robustly denoises and super-resolves 3D blood flows up to 20x the input resolution.
- Improving model performance by conditioning diffusion models with flow and geometry vectors via cross-attention.

Multimodal AI for Video Reasoning

Mar. 2020 – Nov. 2020

- Fine-tuned 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.
- Outperformed sota accuracy by 2-12% for the video question answering CLEVRER task, for 5/7 questions types.

Google Waymo 2D Object Detection (Team of 3)

Apr. 2020 – May 2020

- Fine-tuned an EfficientDet4 model on 700k-1080p images using GCP and an NVIDIA Tesla V100 GPU.
- Implemented test time augmentation, mixed precision training and k-means clustering for anchor priors.

Technical Skills

Coding: Python, PyTorch, TensorFlow, OpenCV, C/C++, CUDA, MATLAB, Answer Set Programming, Linux, Git, LaTeX.

Design: CAD (Rhino, Solidworks), FEM / CFD (CFX, Fluent, STAR CCM+, Abaqus).

Selected Publications

- [1] Theophile Sautory, Shawn C. Shadden (2024): Unsupervised Denoising and Super-resolution of Vascular Flow Images by Physics-Informed Machine Learning. *Journal of Biomechanical Engineering*, 1–22. <https://doi.org/10.1115/1.4065165>
- [2] Theophile Sautory, Nuri Cingillioglu, Alessandra Russo (2021): A Hybrid Spatio-Temporal Event Reasoner for Video Question Answering, Thirty-Fifth AAAI Conference on Artificial Intelligence Workshop on Hybrid Artificial Intelligence.
- [3] Alvaro Prat, Theophile Sautory & S. Navarro-Martinez (2020): A Priori Sub-grid Modelling Using Artificial Neural Networks, *International Journal of Computational Fluid Dynamics*, DOI: 10.1080/ 10618562.2020.1789116.