

Education

- 2019–2023 **Scaling Up Active Inference - PhD**, *Kent University*, Canterbury
Applying machine learning such as Monte Carlo Tree Search and Variational Auto-Encoders to scale up Active Inference. The agent is equipped with a generative model of the world, and computes posterior beliefs using Variational Inference. Its goal is to maximize reward while reducing its uncertainty.
- 2018–2019 **Advanced Computer Science - MSc**, *Kent University*, Canterbury
Computational Intelligence speciality, two prizes for academic excellence and 92/100 in my examinations. The classes presented an excellent overview of Machine Learning techniques, such as Decision Tree, Ensemble Methods and various other optimisation techniques.
- 2015–2017 **Bachelor in Information Technologies**, *Epitech*, Nantes
Project-based pedagogy aiming to create autonomous and skilled IT professionals. I am familiar with linux and git as well as procedural, object oriented, functional and logic programming.

Publications

- 2023 **Planning horizons in cyber-security simulation: comparing deep reinforcement learning and heuristics.**
Théophile Champion, Declan J Collins, Marek Grześ, Rogério de Lemos, Lisa Bonheme, and Joshua Sylvester.
- 2023 **Reframing the Expected Free Energy: Four Formulations and a Unification.**
Théophile Champion, Marek Grześ, and Howard Bowman.
- 2023 **Deconstructing deep active inference.**
Théophile Champion, Marek Grześ, Lisa Bonheme, and Howard Bowman, Submitted.
- 2022 **Branching time active inference: Empirical study and complexity class analysis.**
Théophile Champion, Howard Bowman, and Marek Grześ, Neural Networks. (11 citations)
- 2022 **Branching time active inference: The theory and its generality.**
Théophile Champion, Lancelot Da Costa, Howard Bowman, and Marek Grześ, Neural Networks. (14 citations)
- 2022 **Branching Time Active Inference with Bayesian Filtering.**
Théophile Champion, Marek Grześ, and Howard Bowman, Neural Computation. (1 citation)
- 2022 **Multi-modal and multi-factor branching time active inference.**
Théophile Champion, Marek Grześ, and Howard Bowman, Submitted.
- 2021 **Realizing active inference in variational message passing: The outcome-blind certainty seeker.**
Théophile Champion, Marek Grześ, and Howard Bowman, Neural Computation. (14 citations)

Professional experience

- January 2023 **Research Assistant**, *Defence Science and Technology Laboratory*, Canterbury
One year during which I have trained reinforcement learning models to defend computer networks using Hydra and PyTorch. The benchmarking and analysis of the network simulators was based on Pandas and Matplotlib.
- April 2018 **Intern as Data Scientist**, *OwnPage*, Paris
Five months during which I have improved a recommender system running on AWS using Spark in Scala and Jupyter Notebook in python.
- Sept 2016 **Intern as Web Developer**, *Inéance*, Brest
Four months of internship during which I have developed a web application for veterinarians using PHP with ZendFramework 2, HTML, CSS, JavaScript, Ajax, and MySQL.

Computer skills

- C language **Procedural Programming**, *Concurrency, parallelism and networking*
Obtained by developing clients and servers implanting the FTP and IRC protocol, a multi-threaded and GPU-based Deep Learning package and a small virtual machine.
- Python Java **Object oriented programming**, *Design patterns*
- C++ Acquired by creating my own implementation of Tensorflow and by coding an artificial intelligence to play five-in-a-row using Monte Carlo Tree Search and heuristics on different patterns.

Scala Spark **Functional programming and data storage**, *Distributed system*
S3 MySQL Learned by developing a veterinarians appointment booking website using ZendFramework2 and a recommender system for newsletters' articles using Singular Value Decomposition, Spark in Scala and EC2 instances.

Machine Learning skills

Weka **General Machine Learning**, *Tree Based Models, Evolutionary Algorithms and Clustering*

Obtained by watching Andrew Ng's Online MOOC on Machine Learning, playing with Weka to understand overfitting and underfitting in Decision Trees, reading Christopher Bishop's book on Pattern Recognition and Machine Learning.

TensorFlow **Deep Learning**, *Image processing and time series*

I have been reading about basic layers such as Dense, Convolutional, Up-Conv, Recurrent, GRU and LSTM. More complex architectures for image classification (e.g. ResNet, VGG, AlexNet and GoogleNet), image segmentation (e.g. UNet and LinkNet), language translation (e.g. encoded/decoder architecture) and popular techniques (e.g. Variational Autoencoders and Generative Adversarial Networks). I have been using Tensorflow for Kaggle challenges.

My own **Probabilistic Modelling**, *Exact Inference, Variational Inference and Markov Chain Monte Carlo*

toolbox During my PhD, I have been studying exact inference methods (e.g. sum-product algorithm), approximate inference methods (e.g. Expectation Maximisation, Active Inference and Variational Message Passing) as well as sampling based methods (e.g. Markov Chain Monte Carlo).

Languages

French C2

Native speaker

English C2

Fluent