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Education and Experience

February 2022
Research fellow at the University of Warwick
I am leading research on causality and abstraction within the Warwick Machine Learning Group in the Computer Science Department and the Statistics Department. I also collaborate with researchers from the Turing Institute in London, as well as researchers in computer security at the University of Oslo and at NTNU.

January 2018 - March 2021
Postdoctoral researcher at the University of Oslo
I worked with the Digital Security group and OsloAnalytics group in the Informatics Department on unsupervised learning, causality, Bayesian machine learning, and fairness. Together with colleagues in the SecurityLab group, we led research on the application of reinforcement learning to hacking challenges.

July 2013 - October 2017
PhD candidate at the University of Manchester
I trained in the Machine Learning and Optimization group in the Computer School, where I studied novel algorithms for unsupervised learning, distribution learning, and deep learning, with the ancillary aim of applying these algorithms to the problem of automatic speech emotion representation and recognition.

September 2011 - September 2012
MSc student at University of Oxford
I was a graduate student in Mathematics and Foundations of Computer Science course. The main subjects I studied were quantum computer science, machine learning, and communication theory. I graduated with distinction. My final project was “Discrimination Nets: Improvement and Extension to Bang Graphs”.

September 2009 - August 2010
Trainee at NTT Basic Research Laboratories
I was selected for the Vulcanus Programme in Japan, an exchange programme between European and Japanese companies. I spent four months studying Japanese in Tokyo and eight months at the research laboratories of NTT Basic Research Laboratories working on brain-computer interfaces.

September 2007 - October 2010
MSc student at Politecnico di Milano
I was a graduate student in Computer Engineering. The main subjects I studied were computer science, software engineering, artificial intelligence, and mathematics. I graduated with honors. My final project was “Implementation and validation of a system for the classification of motor imagery in a brain-computer interface”.

September 2007 - June 2008

Exchange student at University College London

I participated in the Erasmus Programme at the Computer Science Department of UCL. The main subjects I studied were computer science, computer security, and network programming.

September 2004 - July 2007

BSc student at Politecnico di Milano

I was an undergraduate student in Computer Engineering. The main subjects I studied were computer science, electronics, telecommunications, automation, mathematics, physics, probability, and economics. My final project was "Comparing brain and computer: a conceptual analysis".

Conference and Workshop Papers

F. M. Zennaro, P.Turrini, T. Damoulas
Quantifying Consistency and Information Loss for Causal Abstraction Learning
IJCAI (International Joint Conference on Artificial Intelligence), 2023

Conference and Workshop Papers

F. M. Zennaro, M. Drávucz, G. Apachitei, W. D. Widanage, T. Damoulas
Jointly Learning Consistent Causal Abstractions Over Multiple Interventional Distributions [**Oral presentation** (9% acceptance rate)]
CLeaR (Causal Learning and Reasoning), 2023,

F. M. Zennaro
Abstraction between Structural Causal Models: A Review of Definitions and Properties [**Best paper award**]
UAI 2022 Workshop on Causal Representation Learning, 2022

F. M. Zennaro, P. Turrini, T. Damoulas
Towards Computing an Optimal Abstraction for Structural Causal Models
UAI 2022 Workshop on Causal Representation Learning, 2022

M. Del Verme, Å. Å. Sommervoll, L. Erdodi, S. Totaro, F. M. Zennaro
SQL Injections and Reinforcement Learning: An Empirical Evaluation of the Role of Action Structure
Nordic Conference on Secure IT Systems (NordSec), 2021

A. Egiazarov, F. M. Zennaro, V. Mavroeidis
Firearm Detection via Convolutional Neural Networks: Comparing a Semantic Segmentation Model Against End-to-End Solutions
IEEE Bigdata 2020 Workshop Cyberhunt, 2020

F. M. Zennaro, A. Jøsang
Using Subjective Logic to Estimate Uncertainty in Multi-Armed Bandit Problems
ECML 2020 Workshop on Uncertainty in Machine Learning, 2020

F. M. Zennaro
A Left Realist Critique of the Political Value of Adopting Machine Learning Systems in Criminal Justice
ECML 2020 Workshop on Data Science for Social Good, 2020

F. M. Zennaro, K. Chen
Towards Further Understanding of Sparse Filtering via Information Bottleneck
Under revision, 2020

F. M. Zennaro
Analyzing and Storing Network Intrusion Detection Data using Bayesian Coresets: A Preliminary Study in Offline and Streaming Settings
ECML 2019 Workshop on Machine Learning for CyberSecurity, 2019

A. Egiazarov, V. Mavroeidis, F. M. Zennaro, K. Vishi.
Firearm Detection and Segmentation using an Ensemble of Semantic Neural Networks
European Intelligence and Security Informatics Conference (EISIC), 2019

F. M. Zennaro, M. Ivanovska
Counterfactually Fair Prediction Using Multiple Causal Models
16th European Conference on Multi-Agent Systems (EUMAS), 2018

F. M. Zennaro, M. Ivanovska
Pooling of Causal Models under Counterfactual Fairness via Causal Judgement Aggregation
ICML 2018 Workshop on Machine Learning for Causal Inference, Counterfactual Prediction, and Autonomous Action, 2018

F. M. Zennaro, K. Chen
Covariate Shift Adaptation via Sparse Filtering for High-Dimensional Periodic Data
NIPS 2016 Workshop on Learning in High Dimensions with Structure, 2016

Journal Publications

F. M. Zennaro, L. Erdodi,
Modeling Penetration Testing with Reinforcement Learning Using Capture-the-Flag Challenges: Trade-offs between Model-free Learning and A Priori Knowledge
IET Information Security, 2023

Å. Å. Sommervoll, L. Erdodi, F. M. Zennaro
Simulating All Archetypes Of SQL Injection Vulnerability Exploitation Using Reinforcement Learning Agents
Under revision at International Journal of Information Security, 2023

L. Erdodi, Å. Å. Sommervoll, F. M. Zennaro
Simulating SQL Injection Vulnerability Exploitation Using Q-Learning Reinforcement Learning Agents
Journal of Information Security and Applications, 2021

L. Erdodi, F. M. Zennaro
The Agent Web Model - Modelling web hacking for reinforcement learning
International Journal of Information Security, 2021

A. Yazidi, M. Ivanovska, F. M. Zennaro, P. G. Lind, E. Herrera Viedma
A new decision making model based on Rank Centrality for GDM with fuzzy preference relations
European Journal of Operational Research, 2021

W.A. Dahl, L. Erdodi, F. M. Zennaro
Stack-based Buffer Overflow Detection using Recurrent Neural Networks
Under revision, 2021

F. M. Zennaro, M. Ivanovska, A. Jøsang
An Empirical Evaluation of the Approximation of Subjective Logic Operators Using Monte Carlo Simulations
International Journal of Approximate Reasoning, 2019

F. M. Zennaro, K. Chen
On the Use of Sparse Filtering for Covariate Shift Adaptation
Under revision, 2019

F. M. Zennaro, K. Chen
Towards Understanding Sparse Filtering: A Theoretical Perspective
Neural Networks, 2017

Invited Talks

Abstraction of Causal Structural Models
Talk at the *Warwick Statistics Department Research Seminar*, 2022

Abstracting Causal Structural Models
Talk at the *Warwick Machine Learning Group*, 2022

Applications of reinforcement learning to computer security: problems, models, and perspectives
Talk at the *OsloMet AILab*, 2021

The (new) attack surfaces of data-learned models: Adversarial attacks and defenses for ML models
Keynote at *IEEE Big Data CyberHunt workshop*, 2020

Information Bottleneck (and Unsupervised Learning)
Talk at the University of Oslo *Robotics and Intelligent Systems (ROBIN) group*

A Gentle Introduction to Casual Models
Talk at the *OsloMet AILab*, 2019

Overview of Adversarial Machine Learning and AI Safety
Talk at *Workshop on the Security of Autonomous Systems* in Oslo, 2019

Research Challenges for Applying Machine Learning in Cybersecurity
Talk at *AFSecurity Seminars* at the University of Oslo, 2018

Networks and collaborators

My current and more active research networks include:

Warwick Machine Learning Group: I am part of the WMLG group at the University of Warwick, contributing to research and talks on causality and Bayesian machine learning.
Alan Turing Institute: as a grant awardee, I am part of the Turing community in London, where I am organizing a workshop on abstraction and causality.
Warwick Manufacturing Group: I am exploring potential applications of my work on causality and abstractions with researchers working on modelling the battery manufacturing process.
SecurityLab: I have close ties with my former colleagues at the University of Oslo, with whom I am working on application of machine learning to computer security.
NTNU: I have connections with NTNU on developing applications of reinforcement learning for automated penetration testing.
MiLA: I collaborated with students and researchers from the University of Montreal on automating penetration testing.

Furthermore, I occasionally work and discuss with former colleagues and researchers from other institutions such as the University of Manchester, University of Edinburgh, University of Oslo, OsloMET, University of Oxford, UCL, Norwegian Business School, Google, Mnemonic.

Teaching

Introduction to Artificial Intelligence and Machine Learning
Guest lecturer, undergraduate and graduate course, University of Oslo, 2021

Programming in Python
Guest lecturer, undergraduate course, OsloMET, 2020

Introduction to Artificial Intelligence and Machine Learning
Guest lecturer, undergraduate and graduate course, University of Oslo, 2020

Modelling and Visualization of High Dimensional Data
Teaching assistant, graduate and undergraduate course, University of Manchester, 2016

Modelling and Visualization of High Dimensional Data
Teaching assistant, graduate and undergraduate course, University of Manchester, 2015

Digital Biology
Teaching assistant, undergraduate course, University of Manchester, 2015

Introduction to Machine Learning
Teaching assistant, undergraduate course, University of Manchester, 2014

MSc Thesis Supervision

M. Dravucz, *Jointly Learning Consistent Causal Abstraction Over Multiple Interventional Distributions*
MSc by research at the University of Warwick, 2022

M. Heggem, *Graph Neural Networks to Process Threat Data*
MSc dissertation at the University of Oslo, 2022

W. Arild Dahl, *Malware Detection using Recurrent Neural Networks*
MSc dissertation at the University of Oslo, 2020

S. Waisi, *Analyzing AI Safety Problems in Reinforcement Learning*
MSc dissertation at the University of Oslo, 2020

M. Nini, *Speech Emotion Recognition via Covariate Shift Adaptation*
MSc dissertation at the University of Manchester, 2016

MSc Advisory Supervision

A. Wang-Hansen, *Fair Automated Decision-making*
MSc dissertation at the University of Oslo, 2020

A. Egiazarov, *Firearm Detection Through Component Decomposition*
MSc dissertation at the University of Oslo, 2019

L. Parker, *Wind Power Predictions for Norwegian Wind Farms with Machine Learning*
MSc dissertation at the University of Oslo, 2019

S. Berdal, *A Holistic Approach to Insider Threat Detection*
MSc dissertation at the University of Oslo, 2018

Funding and Awards

Best paper at UAI 2022 Workshop on Causal Representation Learning, 2022
My paper was awarded the prize for best submission.

Turing Post-doctoral Award (PDEA), 2022
I secured external project funding from the Turing Institute to organize a workshop on my research on causal abstraction.

Kilburn Scholarship, 2013-2016
I was awarded complete funding to support my PhD studies.

Isabella Sassi-Bonadonna Scholarship, 2012
I was awarded external funding to support my MSc studies.

Vulcanus Scholarship, 2009
I was awarded complete funding to support my work at NTT.

Departmental Engagement

I strongly believe in the value of communities within a department as places for sharing ideas and knowledge. I have been active and contributed to:
Machine Learning and Optimization seminars at the University of Manchester
MLS research seminars at the University of Oslo
WMLG seminars at the University of Warwick

Reviewing Service

Theoretical Aspects of Rationality and Knowledge (TARK) 2023
Neural Networks
Bayesian Analysis
Journal of Machine Learning Research (JMLR)
International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2023
International Conference on Learning Representations (ICLR) 2023
Neural Information Processing Systems (NeurIPS) 2021
International Conference on Learning Representations (ICLR) 2021
AAAI Conference on Artificial Intelligence 2021
International Conference on Machine Learning (ICML) 2020
AAAI Conference on Artificial Intelligence 2020
International Joint Conference on Artificial Intelligence (IJCAI) 2019
Norwegian Artificial Intelligence Society (NAIS) Symposium 2019
Nordsec 2018-2019
IEEE Bigdata Workshop Cyberhunt 2018-2022

Outreach and popular media

Machine learning offers fresh approach to tackling SQL injection vulnerabilities
Public coverage of research on automating penetration testing on *The Daily Swig*, 2021

Causal Models and Machine Learning
Public talk at the Oslo Machine Learning Meetup, 2019

`https://fmzennaro.github.io/year-archive/`
Repository of posts and explainers about my work

`https://github.com/FMZennaro`
Public code related to my research