Eleni Nisioti

Curriculum Vitæ

Personal Information

Nationality	Greek
Date of birth	28/09/1993
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About me

Currently, I am a post-doctoral researcher at the Flowers team of Inria, working in the areas of multi-agent meta reinforcement learning (RL) and human behavioral ecology.

My research focuses on how individual adaptation and multi-agent dynamics emerge out of evolutionary pressures. While current RL research focuses on developing large, generally-capable agents my current post-doc agenda aims to show how aspects such as the social structure, population size and cognitive capacity are shaped by ecological properties such as resource availability and heterogeneity, resulting in agents that have learned to adapt, specialize or generalize, depending on their evolutionary history. To test such hypotheses I design and employ large-scale simulation environments inspired from ecology where multiple agents interact with simplified models of the real world and attempt to solve cooperative and competitive tasks, such as foraging and technological innovation.

My programming skills are focused on deep learning frameworks (JAX, Pytorch, Ray RLlib, Tensorflow, OpenAI Gym) and software engineering, on which I specialized during my Diploma thesis.

Education

2017-2020 **Ph.D. in Computer Science/Machine Learning**, *University of Essex*.
Research project focusing on multi-agent reinforcement learning in communication networks. Funded by a Departmental Scholarship of the University of Essex.
Diploma thesis: Reinforcement learning-based optimization of multiple access in wireless networks. See below.

2012-2017 **Diploma in Electrical and Computer Engineering**, *Aristotle University*.
An integrated Bachelor's and Master's degree with 324 ECTS. Grade: 8/10 **Major** in Electronics and Computers.
Diploma thesis: Automated Data Scientist. See below.

Academic Theses

Title	**Reinforcement learning-based optimization of multiple access in wireless networks**
Supervisors	Nikolaos Thomos
Description	The thesis aimed at the design adaptive solutions for the problem of Multiple Access (MA) in wireless networks based on Reinforcement Learning (RL). The application focus was on resource-constrained networks without a centralized point of control and the algorithmic designed was centered around low-complexity and theoretical guarantees in non-stationary settings. I worked both on Markov Decision Processes for modelling time allocation in adhoc sensor networks and multi-armed bandits for frequency allocation in cognitive radio.
Title	**Automated Data Scientist**
Supervisors	Andreas Symeonidis, Kyriakos Chatzidimitriou
Description	The thesis aimed at the design of a software tool, written in R, in the area of meta-learning. As part of it, I conducted extended research on state-of-the-art practices for binary classification tasks and defined a technique for automating hyper-parameter tuning, using meta-models trained on large repositories of datasets. This work was presented at the AutoML workshop of ICML, 2018.

Work experience

Contractual researcher	Flower group, Inria, Bordeaux
	Supervisor: Clément Moulin-Frier, Dates: 2022-2023
Description	I extended my stay at the Flowers lab as a contractual researcher to continue working on the ORIGINS project that I describe below.
Post-doctoral researcher	Flower group, Inria, Bordeaux
	Supervisor: Clément Moulin-Frier, Dates: 2020-2022
Description	I worked on the ORIGINS project, which aims at bringing closer the fields of Human Behavioral Ecology and Artificial Intelligence. Our approach is that of grounding open-ended skill acquisition in groups of agents employing deep learning algorithms on hypotheses that study how environmental complexity and group dynamics have affected human evolution. My tasks also involved the supervision of Master students and collaboration with other PhD students and researchers in the lab.
Content Writer	Applied Data Science Partners, London, United Kingdom
	Dates: 2018-currently

Description   During my PhD I converted my hobby of writing blogposts about AI to a part-time position at a data science consultancy in London. My contribution to the company is sharing their deep interest and expertise in theoretical and applied data science mainly through blogposts.

Publications

Journals

E. Nisioti and N. Thomos,**"Fast Q-learning for Improved Finite Length Performance of Irregular Repetition Slotted ALOHA"**, in IEEE Transactions on Cognitive Communications and Networking

E. Nisioti and N. Thomos,**"Robust Coordinated Reinforcement Learning for MAC Design in Sensor Networks"**, in IEEE Journal on Selected Areas in Communications, vol. 37, no. 10, pp. 2211-2224, Oct. 2019.

Conferences/Workshops

Eleni Nisioti, Mateo Mahaut, Pierre-Yves Oudeyer, Ida Momennejad, Clément Moulin-Frier. **"Social network structure shapes innovation: experience sharing in RL with SAPIENS"**. available as an arxiv preprint

Elias Masquil, Gautier Hamon, Eleni Nisioti, Clément Moulin-Frier. **"Intrinsically-Motivated Goal-Conditioned Reinforcement Learning in Multi-Agent Environments"**. Under revision at the International Conference on Autonomous Agents and Multi-Agent Systems, 2023, available as an arxiv preprint

Julius Taylor, Eleni Nisioti, Clément Moulin-Frier. **"Socially Supervised Representation Learning: the Role of Subjectivity in Learning Efficient Representations"**. International Conference on Autonomous Agents and Multi-Agent Systems, May 2022, Auckland, New Zealand.

Eleni Nisioti, Clément Moulin-Frier. **"Plasticity and evolvability under environmental variability: the joint role of fitness-based selection and niche-limited competition"**, GECCO, July 2022, Boston

Eleni Nisioti and Katia Jodogne-del Litto and Clément Moulin-Frier, **"Grounding an Ecological Theory of Artificial Intelligence in Human Evolution"**, NeurIPS 2021 - Conference on Neural Information Processing Systems / Workshop: Ecological Theory of Reinforcement Learning, Dec 2021

Eleni Nisioti and Daan Bloembergen and Michael Kaisers, **"Robust Multi-agent Q-learning in Cooperative Games with Adversaries"**, AAAI-2021 Workshop on Reinforcement Learning in Games

Eleni Nisioti and Nikolaos Thomos and Borris Bellalta and Anders Jonsson, **"Collision Resolution in Multi-player Bandits Without Observing Collision Information"**, ICML 2021 Workshop on Reinforcement Learning Theory

E. Nisioti and N. Thomos, **"Decentralized Reinforcement Learning Based MAC Optimization"**, 2018 IEEE 29th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Bologna, 2018, pp. 1-5.

E. Nisioti, K. Chatzidimitriou and A. Symeonidis, **"Predicting Hyperparameters from Meta-features in Binary Classification Problems"**, In AutoML Workshop at ICML, 2018

Awards and Scholarships

2019 The 365 Data Science Scholarship was an essay competition where my essay on the philosophical subject of recommendation algorithms and free will received the first prize ($1500 and access to the institution's courses).

2019 The **Young European Research Network Universities (YERUN) Mobility Award** is a financial award for initiating a collaboration with researchers of YERUN institutions. As part of it, I visited the AI and Machine Learning and Wireless Networking Groups at Universitat Pompeu Fabra, under the supervision of Dr. Jonsson and Dr. Bellalta. Since this visit, I have been working on an ongoing collaborative project on multi-armed bandits for dynamic spectrum access (See Section Research Visits for more information).

2017 **CSEE Departmental scholarship** by the University of Essex for pursuing a PhD.

2016 Winner of the MIT SANA hackathon, organized by MIT SANA and my Diploma Thesis supervisor. The goal of the hackathon was the inception, design and implementation of a health-related Android app. Our team designed an app that aimed at battling second-hand smoking in public places in Greece. The award was a visit to MIT, funded by MIT SANA, and participation at the Hacking Hackathons conference.

Activities

Research Visits

Jan - April 2020 **Visit at the Intelligent and Autonomous Systems group at Centrum Wiskunde & Informatica**, *Amsterdam*.
Research project, funded by CWI, focusing on the design of a robust multi-agent temporal difference learning operator for anonymous cooperative games. In our currently under progress work, we formulate an abstract load balancing problem and an adversarial attack where attackers perform an adversarial selection of both agents and actions, and design an operator inspired from minimax-Q that agents employ to learn a priori robust polices.
Supervisors: Dr. Michael Kaisers and Dr. Daan Bloembergen

June 2019 **Visit at the AI and Machine Learning and Wireless Networking groups at the Pompeu Fabra University**, *Barcelona*.
Research project, funded by the YERUN Mobility Award, focusing on the design of Dynamic Spectrum Access strategies under the Multi-armed Bandit framework. In addition to designing a solution for real-world wireless networks, we are also working on a theoretical regret analysis of Upper Confidence Bounds algorithms in multi-agent settings.
Supervisors: Dr. Anders Jonnson and Dr.Boris Bellalta

June - September 2017 **Visit at the Centre for Research & Technology-Hellas**, *Thessaloniki*.
As part of my Diploma studies, I visited the major research institute of Greece, where I worked on a C++/Qt framework for predicting acute leukemia using supervised learning algorithms. The focus was on using support vector machines for predicting rare events in high dimensional flow cytometry data.

Teaching

General Lab Assistant My responsibilities included marking of assignments and exams and support during lab hours. I assisted for a variety of undergraduate and postgraduate courses, including Games and AI, Digital Systems Design, Introduction to Programming, Databases and Computer Security.

Talks

Conference talk Main conference talk about my paper "Plasticity and evolvability under environ- mental variability: the joint role of fitness-based selection and niche-limited competition" at GECCO 2022.

Conference talk Contributed talk about my paper "Grounding an Ecological Theory of Artificial Intelligence in Human Evolution" at the EcoRL workshop of NeurIPS 2021.

Conference talk Presented my paper titled "Decentralized Reinforcement Learning Based MAC Optimization" at PIMRC, 2018.

Invited talk Presented part of my PhD research to the Wireless Networking and AI and Machine Learning groups at UPF, during my research visit.

Other Academic Activities

09/2018 **Chair** of the CEEC 2018 conference at the University of Essex

Since 2018 **Reviewer** for various publications

Science Communication

since 2019 Writer of AI-related blog posts for Applied Data Science Partners

2019 Writer of AI-related blog posts for the Cognitive Marketing Institute

Further Training

SFI Complex Systems Summer School At the Santa Fe Institute, New Mexico in July 2022. Inter-disciplinary lectures and a group research project on computational neuroscience and ecology.

SFI Complexity Interactive Course At the Santa Fe Institute, New Mexico in 2021 (virtual event). My team worked on providing an interdisciplinary review and conceptual model for the concept of "Resilience" in complex systems.

Winter school At the Complexity Science Hub in Vienna in April, 2022. The school focused on the Evolution of Social Complexity and entailed lectures and a group project.

Programming Languages and Frameworks

General Programming Python, C++, Java, R, Matlab

ML frameworks JAX, Tensorflow, Ray RLlib, OpenAI Gym, PyTorch

Miscellaneous Linux Shell Scripting, Git, SQL, LaTeX

Languages

Greek	**Fluent**	*Mothertongue*
English	**Fluent**	*Main language throughout higher education*
German	**Intermediate**	*Very good writing skills and understanding of spoken and written German, moderate speaking skills.*
French	**Basic**	*Good understanding of spoken and written French, poor speaking skills*
Spanish	**Basic**	*Good understanding of spoken and written Spanish, poor speaking skills*