

ABOUT SUPERVISOR:

Stefano Nichele, Associate Professor at Oslo Metropolitan University



Website: www.nichele.eu

CV: http://www.nichele.eu/cv_nichele.pdf

RESEARCH FIELD OF THE SUPERVISOR

Main research field: Artificial Life and Artificial Intelligence

Sub-fields:

- Artificial Life, Complex Systems, Evolutionary and Developmental Systems, Cellular Automata, Evolution-in-Materio
- Artificial Intelligence, Biological and Artificial Neural Networks, Deep Learning, Reservoir Computing, Spiking Neural Networks
- Bio-inspired and Evolutionary Computation, Neuro-evolution, Artificial General Intelligence, Multi-agent systems
- AI and ALife art

Stefano Nichele is Associate Professor at the Department of Computer Science at the Oslo Metropolitan University, where he is the founder and deputy head of the Applied Artificial Intelligence (AI²) research group. Nichele has recently started the Living Technology Lab, where he uses an artificial life and complex systems approach to intelligence. Nichele is also the founder and deputy head of the OsloMet AI Lab. In addition, he is a member of the Autonomous Systems and Networks (ASN) research group. Nichele is the founder and interim chair of the IEEE Norway Section Computational Intelligence Society.

Living Technology Lab (<http://www.nichele.eu/lab.html>)

Beyond AI. Technology and computing are becoming more and more **alive**, by incorporating functions of living systems such as intelligence, evolution, emergence, self-repair, self-reproduction, and learning. By researching at the boundary of **science, fiction and art**, we seek to explore future (speculative) scenarios at the intersection of **biological life and artificial life**, and to carry out research towards their practical realization. We use a bottom-up **complex systems** and **artificial life** approach to **intelligence**.

Our lab is located at the **Dept. of Computer Science**, and it is part of the [OsloMet AI Lab](#).

Recent Projects:

- **NFR project DeepCA (Hybrid Deep Learning Cellular Automata Reservoir)**
2020 - 2023, Project Manager (Young Researcher Talent, FRIPRO and IKTPLUSS)
Funding: ~1.5 M€
The ambitious research goal of the DeepCA project is to create a theoretical and experimental foundation for a novel hybrid deep learning paradigm based on cellular automata and biological in-vitro neural networks, in order to bridge the gap between neuroscience and deep learning towards self-learning devices that are significantly more efficient than the state-of-the-art.
- **NFR project [SOCRATES \(Self-Organising Computational Substrates\)](#)**
2017 - 2022, Principal Investigator (IKTPLUSS)
Funding: ~2.1 M€
SOCRATES exploits novel substrates that support self-organization through local interactions to create a theoretical and experimental foundation for a new computing paradigm. Such a complex systems approach to analytics opens for a radical breakthrough in the field of computing, alleviating main problems of contemporary computer systems relating to energy efficiency, scalability, and self-learning. The investigates substrates include biological and artificial neural networks, and nanomagnetic systems.
- **FELT project [Futures of Living Technologies](#)**
2018 - ongoing, Principal Investigator
Funding: OsloMet internal
FELT engages in the interrelations and intersections that occur between human beings, living environments and machines (robots and artificial intelligence), relations on the edge of how we experience aliveness today. We aim at merging artistic strategies from bioart and techno-ecologies with contemporary perspectives on sensory experience and materiality in artistic production and research. Bioart explores the principles of phenomena associated with living systems. The blending of computer technology and robotics with biology is moving into the realm of constructing synthetic organisms and biological programming. Artistic responses vary from dystopian visions of total control to playful sci-fi utopian visions.
- **Lighthouse project [CAOS \(Complex, Adaptive, Self-Organising Systems\)](#)**
2017 - 2018, Coordinator
Funding: ~100 K€, OsloMet internal
Our society and many of the systems that surround us are complex. Complex can be defined as “consisting of interconnected or interwoven parts”. To understand the behavior of a complex system we must understand not only the behavior of the parts but how they act together to form the behavior of the whole. Such emergent and self-organizing behavior is a bottom-up process.
- **NTNU [Cyborg](#)**
2016 - 2017, Coordinator
Interfacing a robot with biological neuronal cultures.
- **EU project [NASCENCE \(Nanoscale Engineering for Novel Computation using Evolution\)](#)**
2012 - 2015, Researcher
Computation in carbon-nanotube materials, evolution in physical materials.

- **Plant Bio-Machines**

Plants are very efficient computing machines. They are able to sense diverse environmental conditions and quickly react through chemical and electrical signaling. In this project, we study an interface between plants and machines (a cybernetic plant), with the goal of augmenting the capabilities of plants towards the creation of plant biosensors.

- **Pepper robot at OsloMet**

Our Pepper robot is used in many student projects spanning from robotic control, sensors and IoT, artificial intelligence, speech-to-text and text-to-speech, obstacle avoidance, storytelling and gesture recognition. In addition, our students are often invited to conferences, workshops and public presentations to show demos of applications or AI and robotics developed at OsloMet.

- **Swarm robotics**

We investigate the use of swarms of Thymio robots for different applications, spanning from collective art (see video https://www.youtube.com/watch?v=hA_YsC6mLP0) to self-organising ad-hoc networks (see paper <https://arxiv.org/pdf/1807.04505.pdf>).

RECENT TRACK-RECORD and other SIGNIFICANT ACHIEVEMENTS

Publications in major international/leading peer reviewed journals relevant for the scientific field:

https://scholar.google.com/citations?hl=en&user=gKy4k4sAAAAJ&view_op=list_works&sortby=pubdate

Preferred main research goals for candidate:

Technology and computing are becoming more and more alive, by incorporating functions of living systems such as intelligence, evolution, emergence, self-repair, self-reproduction, and learning. By researching at the boundary of science, fiction and art, I seek to explore future (speculative) scenarios at the intersection of biological life and artificial life, and to carry out research towards their practical realization. I use a bottom-up complex systems and artificial life approach to intelligence. **For more details on the available Marie Curie research projects, see the individual project descriptions.**

RESEARCH ENVIRONMENT

Faculty/Department/Laboratory

Faculty of Technology Art and Design at Oslo Metropolitan University

The Faculty of Technology, Art and Design (TKD) offers higher education and research and development (R&D) activities within technical subjects, arts and design. The Faculty has approximately 3.000 students and 280 staff members and is situated at Pilestredet Campus in downtown Oslo and at Kjeller Campus in Akershus.

Department of Computer Science

The Department of Computer Science offers bachelor's and master's degree programmes in computer science, qualifying candidates for further studies within engineering, international semester and other further education programmes. The department also offers research and development activities. The department has approximately 65 staff members and 750 students.

Artificial Intelligence Lab (<https://ailab.oslomet.no/>)

The OsloMet AI lab conducts both applied and fundamental research projects and student projects in artificial intelligence, including theory and applications of machine learning in

several domains. The OsloMet AI Lab will position OsloMet's AI research environment at the forefront of AI in Norway, will educate students within AI and attract talents.

Living Technology Lab (<http://www.nichele.eu/lab.html>)

Beyond AI. Technology and computing are becoming more and more alive, by incorporating functions of living systems such as intelligence, evolution, emergence, self-repair, self-reproduction, and learning. By researching at the boundary of science, fiction and art, we seek to explore future (speculative) scenarios at the intersection of biological life and artificial life, and to carry out research towards their practical realization. We use a bottom-up complex systems and artificial life approach to intelligence. Our lab is located at the Dept. of Computer Science, and it is part of the OsloMet AI Lab.

Research Infrastructure

Academic and non-academic collaboration

- Involvement in important networks and projects
 - o Collaboration with multidisciplinary projects in Computer Science, Neuroscience, Electronics, Art and Design
 - o The Faculty of Technology, Art and Design at OsloMet is a *unique* environment, with strong collaborations across technology, art and design.

SPECIFIC REQUIREMENTS/PREFERENCES

Language skills: English

Degree field: Computer Science, Electrical Engineering, Neuroscience, Biology, Complex Systems, Art (or related fields)