

Franco Terranova

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RESEARCH INTERESTS

Deep Learning, Reinforcement Learning, Automated Cyber-security, Vulnerability Assessment, Representation Learning, Graph Neural Networks, Computer Vision, Meta Learning, Federated Learning, Internet of Things, Game Theory

EDUCATION

Université de Lorraine & INRIA, Nancy, France 10/2023 — 10/2026

Ph.D. in Computer Science - RESIST Team / SuperviZ Project (France 2030)

Thesis Title: Reinforcement Learning-Based Approaches for Automated Security Analysis of Networked Systems

- Deep Reinforcement Learning (DRL) for cyber-attack paths discovery
- Development of a simulation automated environment for training DRL agents using real-world data on services and vulnerabilities
- Integration of Graph Neural Networks and Language Models to enhance the capabilities of the DRL agent

University of Pisa, Pisa, Italy 09/2021 — 09/2023

Master's Degree in Artificial Intelligence and Data Engineering

Final Grade: (110/110) cum laude

Thesis Title: Self-driving Telescopes - Reinforcement Learning for Planning Astronomical Observations

University of Pisa, Pisa, Italy 09/2018 — 07/2021

Bachelor's Degree in Computer Engineering

Final Grade: (110/110) cum laude

Thesis Title: Artificial Intelligence for Emotion Recognition using Data Gathered from a Wearable Sensor Network

EXPERIENCE

University of Waterloo Waterloo, Canada

Visiting Researcher - Cheriton School of Computer Science

06/2024 — 07/2024 / 11/2024 — 12/2024

- Multi-agent DRL for an attacker-defender competitive game into a 5G network
- Extension of the training environment for simulating a 5G network and integrated security features

Fermi National Accelerator Laboratory Chicago, Illinois

Master Degree Thesis Researcher - Deep Skies Lab

05/2023 — 08/2023

Project: Self-driving Telescopes - Reinforcement Learning for Planning Astronomical Observations

- DRL for automatizing telescope pointing using an offline dataset as environment
- Comparison of DRL Algorithms with Evolutionary Computation strategies
- Development of a framework for training domain-specific DRL agents based on custom input datasets

European Space Agency (ESA) Köln, Germany

AI/ML Engineer Intern - Spaceship EAC Team

11/2022 - 04/2023

Project: Deep Learning techniques for the detection of Spaceflight Associated Neuro-ocular Syndrome (SANS)

- Convolutional Neural Network (CNN) for the detection of Optic Disc Edema
- Object Detection via CNN for the localization of the Optic Disc
- Federated Learning Architecture for Distributed Training

Fermi National Accelerator Laboratory Chicago, Illinois

Summer Intern - GlidenWMS Project

07/2022 — 09/2022

Project: Flexible Pilot Jobs Framework for Distributed High Throughput Computing

- Machine learning based techniques for the job/site matching in the workload manager
- Design of a flexible, modular and customizable structure of the worker node software
- Redesign of custom script management on the worker node

OTHER PROJECTS

Internet of Things for a Smart Regolith Transportation System Golden, Colorado

Over The Dusty Moon Challenge 2023 - Colorado School of Mines / Lockheed Martin Team Website - 12/2022 — 06/2023

- Internet of Things for Regolith Transportation Monitoring
- CNN-based System for Rock Obstacle Detection
- Project Management & Website Development

TEACHING

Symbolic AI Course	IDMC (Nancy, France) - 01/2025
Tutorial on Deep Reinforcement Learning	DeepLorIA (Nancy, France) - 10/2024
Tutorial on Deep Reinforcement Learning	European Agent Systems Summer School (Dublin, Ireland) - 08/2024
Introduction to Reinforcement Learning Workshop	Fermilab Cross-lab AI Meetings (Chicago, Illinois) - 07/2023

PUBLICATIONS

Conference papers

- Terranova, F., Lahmadi, A. & Chrismont, I. (2024). "Leveraging Deep Reinforcement Learning for Cyber-Attack Paths Prediction: Formulation, Generalization, and Evaluation," in Proceedings of the 27th International Symposium on Research in Attacks, Intrusions and Defenses (RAID'24).
- Terranova, F., Voetberg, M., Nord, B. & Pagul, A. (2023). "Self-Driving Telescopes: Autonomous Scheduling of Astronomical Observation Campaigns with Offline Reinforcement Learning," in Proceedings of the Machine Learning and the Physical Sciences Workshop, 37th Conference on Neural Information Processing Systems (NeurIPS).
- Ritter, S., Terranova, F., Stern, C., Tuohy, E., Cowley, A., Drescher, J. & Sznitman, R. (2023). "Federated Learning for Space Medicine Research and its application for Spaceflight Associated Neuro-ocular Syndrome (SANS)", in Proceedings of the International Astronautical Congress 2023, Baku, Azerbaijan, Oct 2023.
- Ritter, S., Terranova, F., Stern, C., Tuohy, E., Cowley, A., Drescher, J. & Sznitman, R. (2023). "An Artificial Intelligence Method for Autonomous Monitoring of the Retina for Medical Applications in Space and Extreme Environments", in Proceedings of the International Astronautical Congress 2023, Baku, Azerbaijan, Oct 2023.

Posters & Abstracts

- Ritter S, Stern C, Drescher J, Terranova F, Milian O, Zanus E, Majmudar G, Cowley A, Siggel R, Ahmad O, Sznitman R. An ophthalmology process for an Earth-independent, real-time diagnosis of Spaceflight Associated Neuro-ocular Syndrome (SANS) for deep space missions. 94th Aerospace Medical Association Annual Scientific Meeting, 2024:11041.
- Terranova, F., Lahmadi, A. & Chrismont, I. (2024). "Deep Reinforcement Learning for Automated Cyber-Attack Path Prediction in Communication Networks", Geilo Winter School 2024 - Graphs and Applications, Geilo, Norway, 21 January - 26 January 2024.
- Terranova, F., Voetberg, M., Nord, B. & Neilsen, E. (2023). "Reinventing Astronomical Survey Scheduling with Reinforcement Learning: Unveiling the Potential of Self-Driving Telescopes" in Proceedings of the ML-IAP/CCA-2023 Conference, Paris, France, 27 November - 01 December 2023.
- Terranova, F., Voetberg, M., Nord, B. & Neilsen, E. (2023). "Unlocking Autonomous Telescopes through Reinforcement Learning: An Offline Framework and Insights from a Case Study" in Proceedings of the Hammers & Nails 2023 Conference, Ascona, Switzerland, 29 October - 03 November 2023.
- Terranova, F., Voetberg, M., Nord, B. & Neilsen, E. (2023). "Self-driving Telescope Schedules: A Framework for Training RL Agents based on Telescope Data" in Proceedings of the Python in High Energy Physics (PyHEP) 2023 Workshop, Online, 9 October - 12 October 2023.
- Ritter, S., Stern, C., Drescher, J., Terranova, F., Milian, O., Tuohy, E., Cowley, A. & Sznitman, R. (2023). "Monitoring retina changes associated with SANS aboard ISS as preparation for countermeasure support and deep space missions". Abstract presented at the 12th Annual International Space Station Research and Development Conference, Seattle, Washington, USA, 31 July - 3 August 2023.
- Terranova, F., Voetberg, B., Nord, B. & Neilsen, E. (2023). "Telescopes Drive Themselves: Optimizing Cosmic Survey Scheduling with Reinforcement Learning". Abstract presented at Fermi National Accelerator Laboratory New Perspectives 2023 Conference, Chicago, Illinois, USA, Jun 2023.
- Bourdarie, C., Chaussard, J., Conway, C., Ghaffari, F., Lesenne, C., Milian, O., López, M.R., Terranova, F. & Veronese, N. (2023). "Modular Regolith Transport Solution for the Moon". Abstract presented at the Space Resources Roundtable Conference at Colorado School of Mines, Golden, Colorado, USA, 06 Jun 2023.
- Terranova, F., Tessa, B., Tempesti, P. & Pezzuti, F. (2022). "WheelFlow: AI smart assistant for urban wheelchair accessibility". Poster presented at the FIAB European Mobility Week 2022, Pisa, Italy, 16 Sep 2022.

CERTIFICATES & COURSES

- NVIDIA DLI Workshop on Diffusion Models, May 2024.
- Uncertainty Estimation in Machine Learning, University of Groningen, Feb 2024.
- Cisco Certified Network Associate (CCNA), Cisco Systems, Inc., Mar 2022.
- TOEFL iBT Test, ETS, Oct 2021, Expiration: Oct 2023, Grade: 101/120.
- CyberChallenge.IT, Cybersecurity National Lab, Mar 2019.
- Huawei Seeds for the Future, Huawei Technologies Co., Ltd, Nov 2020.
- Samsung Innovation Camp, Samsung Electronics, Oct 2018.

AWARDS

ISSNAF Scholarship for Master Thesis Research in North America Italian Scientists and Scholars in North America Foundation (ISSNAF)	Pisa, Italy 12/2022
National Winner of the High School Program "Code the Rules" Italian Ministry of Education	Rome, Italy 06/2018

MENTORING & OTHERS

- Founder and Organizer of the DeepLorIA network within the LORIA laboratory (2024)
- Mentee for the Université de Lorraine Mentorship Program (2024)
- President of Students for the Exploration and Development of Space (SEDS) federation at the University of Pisa (2023)
- Mentee for the LeadTheFuture Mentorship Program for Italian Students (2023)
- Mentee for the Young Italian Scientists & Scholars in North America Foundation (ISSNAF) Mentoring Program for Students (2023)
- Mentee for the Space Generation Advisory Council (SGAC) Summer Mentorship Program

SKILLS

- **Programming:** Java, Python, Erlang, PHP, C, C++, R, Verilog, Matlab, JavaScript, CSS, HTML, SQL, Cypher Query Language, Assembly, UML, XML, JSON
- **AI/ML Libraries and Frameworks:** Tensorflow, Keras, PyTorch, TensorFlow Object Detection API, PyTorch AgentNet, Stable-Baselines, scikit-learn, Matplotlib, NLTK, Numpy, Pandas, Scipy, Gym, RLlib, RLiab, PyTorch Geometric, Hugging Face
- **Networking:** TCP/IP protocol suite, Ethernet, DHCP, DNS, ACL, NAT, VLAN and Trunking, Routing Protocols, Cloud, IoT, Network Security
- **Cloud Technologies:** OpenStack, Docker, Kubernetes, Hadoop, Spark, QEMU, Virsh
- **Database Technologies:** MySQL, MongoDB, LevelDB, Neo4J, Redis
- **Cyber-security:** Kali Linux, Wireshark, Metasploit, NMap, Nessus, Shodan, CyberBattleSim

MEMBERSHIP

- Member of the Artificial Intelligence Doctoral Academy (AIDA) since 2023
- IEEE, IEEE Computer Society, IEEE Computational Intelligence Society & IEEE Communications Society Member since 2024
- ACM, and ACM SIGAI Member since 2024

REFERENCES

Prof. Abdelkader Lahmadi

Ph.D. Supervisor - *Associate Professor, Université de Lorraine, Nancy, France* - abdelkader.lahmadi@loria.fr

Prof. Isabelle Chrisment

Ph.D. Supervisor - *Professor, Université de Lorraine, Nancy, France* - isabelle.chrisment@loria.fr

Prof. Brian D. Nord

Master Thesis Co-Supervisor - *Scientist, Fermi National Accelerator Laboratory, Chicago, Illinois* - nord@fnal.gov

Prof. Mario G.C.A. Cimino

Master Thesis Supervisor - *Professor, University of Pisa, Pisa, Italy* - mario.cimino@unipi.it