# 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 approximating cyber-attackers in a proactive fashion
- Development of an environment for training DRL agents using real-world data on services and vulnerabilities
- Integration of Graph Neural Networks and Language Models to enhance the DRL agent deployment

**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

**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

## PUBLICATIONS

**Conference papers**

- Terranova, F., Lahmadi, A. & Chrisment, I. (2024). "Leveraging Deep Reinforcement Learning for Cyber-Attack Paths Prediction: Formulation, Generalization, and Evaluation," currently under review for 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. & Chrisment, 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** Pisa, Italy
Italian Scientists and Scholars in North America Foundation (ISSNAF) 12/2022

**National Winner of the High School Program "Code the Rules"** Rome, Italy
Italian Ministry of Education 06/2018

## MENTORING & OTHERS

- Mentee for the Mentorship Program of the Université de Lorraine (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, RLiable, 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