

Simona Nisticò

Resume

Positions

- 2024– **Research Fellow**, *DIMES, University of Calabria, Rende (CS)*.
- 2022– **Permanent High-school Teacher**, *Ministry of Education and Merit*.
- 2020–2024 **Ph.D. student in Information and Communication Technology**, *DIMES, University of Calabria, Rende (CS)*.

Education

- 2020–2024 **Ph.D. in Information and Communication Technology**, *DIMES, University of Calabria, Rende (CS)*, Magna Cum Laude.
Title: "*Towards Reliable Machine Learning*".
Advisors: Professor Fabrizio Angiulli, Professor Fabio Fassetti.
- 2018–2020 **MSc Degree in Computer Engineering**, *DIMES, University of Calabria, Rende (CS)*, Magna Cum Laude.
Specialized in Artificial Intelligence and Machine and Deep Learning.
Thesis Title: "*A ResNet and RNN based approach for the disfluences detection*".
Supervisors: Professor Fabrizio Angiulli, Professor Fabio Fassetti
- 2015–2018 **BSc Degree in Computer Engineering**, *DIMES, University of Calabria, Rende (CS)*, Magna Cum Laude.
Thesis Title: "*An approach based on deep learning for the identification of episodes of disfluency*".
Supervisor: Professor Fabio Fassetti

Research Interests

My current research interests focus on Explainable Artificial Intelligence (XAI), regarding which I have considered different problems dealing with different scenarios. In particular, I focus on post-hoc explanations for black-box models, self-explainable model design and outlier explanations.

Concerning the post-hoc explanation problem, until now, I have been following two different paths. In one of them, I focus on the LIME algorithm, particularly investigating semantic feature use during the neighbourhood generation phase, a strategy attempting to overcome LIME's weak points and enlarge the expressive power of its explanations. Up to now, I focused on textual data; in future research, I want to apply the same idea to other data types to enlarge the methodology's applicability.

On the other, I use neural networks as masking models that aim to produce a mask that, applied to the considered sample, changes the outcome of black-box model classification. The goal of this strategy is to use the mask obtained and the modified example to explain model behaviour. In the future, I

plan to enlarge the applicability of this strategy, currently applied only to images, to other data types.

Looking at the self-explainable model design, since this field often involves human decision-makers who need insights into model behaviour, I have considered anomaly detection models. About the above-stated problem, I am working on a methodology which modifies the training loss of an autoencoder in order to make it able to produce heatmaps, which can be seen simultaneously as an explanation and a collection of per-feature scores, exploited to compute the sample anomaly score. In particular, this loss takes advantage of a semi-supervised setting and aims at maximizing the distance between the reconstruction and the original value assumed by anomalous features.

On the outlier explanation problem front, I am currently working on neural-network-based approaches. Recently, my efforts have been invested in developing a technique in which a neural architecture is designed for extracting the reason for sample outlieriness directly from data. In this work, the explanation consists of a subset of the features, called choice, and an associated set of changes to be applied, called mask. This explanation form represents a novelty in this field. These two pieces of information represent a transformation that makes the outlier "behave normally", that is to say, it exhibits a behaviour similar to that of the reference normal population.

Publications

Journals

- 2023 **Audio Super-Resolution via Vision Transformer**, *Simona Nisticò, Luigi Palopoli, Adele Pia Romano*, Journal of Intelligent Information Systems, 1-15.

Conferences

- 2023 **Counterfactuals Explanations for Outliers via Subspaces Density Contrastive Loss**, *Fabrizio Angiulli, Fabio Fassetti, Simona Nisticò, Luigi Palopoli*, Proceedings of the International Conference on Discovery Science (DS 2023), Porto (PT).
- 2023 **Towards reliable machine learning**, *Simona Nisticò*, European Conference on Advances in Databases and Information Systems (ADBIS 2023), Barcellona (ES).
- 2022 **A Semi-automatic Data Generator for Query Answering**, *Fabrizio Angiulli, Alessandra Del Prete, Fabio Fassetti, Simona Nisticò*, International Symposium on Methodologies for Intelligent Systems (ISMIS 2022), Cosenza (IT).
- 2022 **Audio Super-Resolution via Vision Transformer**, *Simona Nisticò, Luigi Palopoli, Adele Pia Romano*, International Symposium on Methodologies for Intelligent Systems (ISMIS 2022), Cosenza (IT).
- 2022 **Outlier Explanation Through Masking Models**, *Fabrizio Angiulli, Fabio Fassetti, Simona Nisticò, Luigi Palopoli*, European Conference on Advances in Databases and Information Systems (ADBIS 2022), Torino (IT).
- 2021 **Finding Local Explanations through Masking Models**, *Fabrizio Angiulli, Fabio Fassetti, Simona Nisticò*, 22nd International Conference on Intelligent Data Engineering and Automated Learning (IDEAL2021), Manchester (UK).
- 2021 **Local Interpretable Classifier Explanations with Self-generated Semantic Features**, *Fabrizio Angiulli, Fabio Fassetti, Simona Nisticò*, Proceedings of the International Conference on Discovery Science (DS 2021), Halifax (Canada).

- 2019 **Stream analysis for detecting stuttering episodes**, *Fabio Fassetti, Ilaria Fassetti, Simona Nisticò*, 10th International Conference of Experimental Linguistics, Lisbon (Portugal).
- 2019 **Learning and detecting stuttering disorders**, *Fabio Fassetti, Ilaria Fassetti, Simona Nisticò*, IFIP International Conference on Artificial Intelligence Applications and Innovations, Hersonissos (Greece).

Activities as a Reviewer

Journals

- Journal of Big Data
- Ai Communication
- Scientific Report

Conferences

- ECML/PKDD: European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases
- IJCAI: International Joint Conference on Artificial Intelligence
- ICDM: IEEE International Conference on Data Mining
- SAC: Symposium on Applied Computing

Teaching Activities

- 2023–current **Advanced Architecture of Processing and Programming Systems**, *MSc in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I held practical lessons about SSE and AVX Assembly language extensions and OpenMP framework.
- 2023–current **Fundamentals of Programming I**, *BSc in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I held practical lessons about Python programming Language.
- 2022–current **Theoretical Informatics**, *MSc in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I gave practical lessons about the application of concepts related to the computability and the computational complexity.
- 2021-2023 **Logic Circuits and Computer Organization**, *BSc Degree in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I gave lessons about practical concepts of Finite State Automata, Karnaugh Maps, Register Transfer Language (RTL) and Assembly Language.
- 2021-2022 **Time Series Analysis**, PC Cube S.r.l, Topics covered: Apache Spark, Machine Learning techniques, Time-Series Analysis..
- 2021 **Artificial Intelligence and Knowledge Representation**, *MSc in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I held project tutoring activities. The project consists of an automatic player for Murus Gallicus game to develop in a team. Each automatic player play against the players of all the other teams in a tournament to establish a ranking.

- 2020 **Fundamentals of Programming I**, *BSc in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I held tutoring activities about Python programming Language.
- 2019 **Probability Methods in Operations Research**, *BSc Degree in Computer Engineering*, DIMES, Università della Calabria, Rende (CS).
I held tutoring activities about basic methods and tools of probabilistic modeling and analysis in the context of information systems engineering.

Degree Thesis Co-Supervision

MSc Degree

- 2023 **AE-MMOAM: an autoencoder-based anomaly explanation technique**, *MSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Arianna Russo, Supervisor: Prof. Fabio Fassetti, Co-supervisor Dr. Simona Nisticò.
- 2022 **Audio Super-Resolution via Vision Transformer**, *MSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Adele Pia Romano, Supervisor: Prof. Luigi Palopoli, Co-supervisor Dr. Simona Nisticò.
- 2021 **Local explanations for textual black-box models via S-LIME**, *MSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Francesco Pasceri, Supervisor: Prof. Fabrizio Angiulli, Co-supervisor Dr. Simona Nisticò.
- 2021 **Explanation for image data model via Masking Models**, *MSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Giuliano Stirparo, Supervisor: Prof. Fabio Fassetti, Co-supervisor Dr. Simona Nisticò.
- 2021 **Experimentation of Deep Learning Techniques for the Explanation of anomalies in Time Series.**, *MSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Francesco Buffone, Supervisor: Prof. Fabrizio Angiulli, Co-supervisor Dr. Simona Nisticò.

BSc Degree

- 2023 **A Pytorch implementation of an Outlier Explanation technique**, *BSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Monea Stefano Francesco, Supervisor: Prof. Fabrizio Angiulli, Co-supervisor Dr. Simona Nisticò.
- 2023 **An examination of GNNs and their application contexts**, *BSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Francesco Pileggi, Supervisor: Prof. Fabrizio Angiulli, Co-supervisor Dr. Simona Nisticò.
- 2022 **Outlier Explanation: models, techniques and methodologies**, *BSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Giuseppe Mallamo, Supervisor: Prof. Fabio Fassetti, Co-supervisor Dr. Simona Nisticò.
- 2022 **Outlier explanation techniques: understanding the nature of outliers**, *BSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Fabrizia Allevato, Supervisor: Prof. Fabio Fassetti, Co-supervisor Dr. Simona Nisticò.
- 2022 **Domain-specific Dataset creation for Question Answering in Italian Language**, *BSc Degree in Computer Engineering*, DIMES, UNICAL, Candidate: Emanuele Maremmano, Supervisor: Prof. Fabio Fassetti, Co-supervisor Dr. Simona Nisticò.

2021 **Techniques and algorithms for the Explainable Artificial Intelligence.**, BSc
Degree in Computer Engineering, DIMES, UNICAL, Candidate: Francesco Palumbo,
Supervisor: Prof. Fabrizio Angiulli, Co-supervisor Dr. Simona Nisticò.

Dichiaro che le informazioni riportate nel presente Curriculum Vitae sono esatte e veritiere Dichiaro di essere consapevole di quanto comporta l'affermazione della veridicità di quanto sopra rappresentato e di essere a conoscenza delle sanzioni penali di cui all'art. 76 del D.P.R. 28.12.2000 n.445 "Testo unico delle disposizioni legislative e regolamentari in materia di documentazione amministrativa" ed in particolare di quanto previsto dall'art. 495 del Codice Penale in caso di dichiarazioni mendaci o di false attestazioni. Quanto sopra viene presentato sotto forma di autocertificazione (dichiarazione sostitutiva di certificazione e dichiarazione sostitutiva di atto di notorietà) ai sensi degli artt. 19, 46 e 47 del DPR n. 445/2000. Autorizzo il trattamento dei dati personali, ai sensi e per gli effetti del D.Lgs. 30.6.2003, n.196 "Codice in materia di protezione dei dati personali".

Rende 28/05/2024,

Simona Nisticò