
UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

**DOTTORATO DI RICERCA / PhD PROGRAM IN
INFORMATION TECHNOLOGY AND ELECTRICAL ENGINEERING**

Activities and Publications Report

PhD Student: **Giada Zingarini**

Student DR number: DR996629

PhD Cycle: XXXVIII

PhD Chairman: Prof. Stefano Russo

PhD program student's start date: 01/11/2022

PhD program student's end date: 31/10/2025

Supervisor: Prof. Luisa Verdoliva

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PhD scholarship funding entity:

DARPA, under the SEMAFOR program through the DISCOVER project

General information

Giada Zingarini received in year 2022 the Master Science degree in Biomedical Engineering from the University of Napoli Federico II. She attended a curriculum in Telecommunications Engineering within the PhD program in Information Technology and Electrical Engineering. She received a grant from DARPA, under the SEMAFOR program through the DISCOVER project.

Study activities

Attended Courses

Year	Course Title	Type	Credits	Lecturer	Organization
1 st	Using Deep Learning Properly	Ad hoc course	4	Dr. Andrea Apicella	ITEE
1 st	How to boost your PhD	Ad hoc course	4	Prof. Antigone Marino	UniNA
1 st	Elaborazione di Segnali Multimediali	MSc course	9	Prof. Luisa Verdoliva	UniNA
1 st	Statistical Multimedia Security and Forensics	Ad hoc course	4	Prof. Fernando Pèrez-González	University of Trento - IECS Doctoral School
2 nd	Strategic Orientation for STEM Research & Writing	Ad hoc course	5	Dr. Chie Shin Fraser	UniNA

Attended PhD Schools

Year	School title	Location	Credits	Dates	Organization
1 st	Summer School on Metaverse Technologies	Cagliari, Italy	5	18-22/09/23	EURASIP / IEEE SPS Summer School - University of Cagliari
2 nd	Understanding and modeling the world around us	Capri (NA), Italy	4	23-27/09/24	EURASIP / IEEE SPS Summer School - University of Napoli Federico II
3 rd	From Foundational Models to Multimedia Signal Processing: A deep dive in Multimodal AI	San Vincenzo (LI), Italy	5.2	21-26/09/25	EURASIP / IEEE SPS Summer School - University of Firenze

Attended Seminars

Year	Seminar Title	Credits	Lecturer	Lecturer affiliation	Organization
1 st	From Handcrafted to End-to-End Learning, and Back: a Journey for Multi-Object Tracking	0.4	Prof. Dr. Laura Leal-Taixé	NVIDIA, Technical University of Munich	International AI Doctoral Academy and University of Modena and Reggio Emilia

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1 st	Digital Forensics	0.4	Artem Artemov	Group-IB ITEE	ITEE
1 st	Face Representation Attack Detection	0.3	Prof. Sébastien Marcel	Idiap Research Institute	IEEE Biometrics Council
1 st	Advances on Multimodal Machine Learning Solutions for Speech Processing Tasks and Emotion Recognition	0.2	Dr. Fei Tao and Dr. Carlos Busso	Beihang University, University of Texas at Dallas	IEEE Signal Processing Society
1 st	The Super Neuron Model - A new generation of ANN-based Machine Learning and Applications	0.2	Moncef Gabbouj	Tampere Univeristy	EURASIP
1 st	SPS Webinar: Human Centric Visual Analysis - Hand, Gesture, Pose, Action, and Beyond	0.2	Dr. Joe (Zhou) Ren	Amazon	IEEE Signal Processing Society
1 st	Algorithm Unrolling: Efficient, Interpretable Deep Learning for Signal and Image Processing	0.2	Prof. Vishal Monga	University of Pennsylvania	ITEE
1 st	What's up with image & video forensics and security?	0.2	Prof. Fernando Pérez-González	University of Vigo	EURASIP
1 st	Unleashing the Power of LLMs: a Historical perspective on Generative AI	0.2	Prof. Tarry Singh	University of Texas at Dallas	ITEE
1 st	Nanoneuro: the power of nanoscience to explore the frontiers of neuroscience	0.2	Dr. Aitzol Garcia-Extarri	Donostia International Physics Center	ITEE
1 st	Computational Disinformation Symposium	1.4	Micah Musser, Joe Cheravitch, Sougata Saha...	NYU School of Law, National Defense University's College, MBZUAI	Justin Hendrix (NYU Tandon School of Engineering)
1 st	Scientific Integrity Verification Through Image Forensics	0.2	Dr. Daniel Moreira	Loyola University Chicago	IEE SSPS-IFS
1 st	The Digital World: Artificial Intelligence	1.2	Ben Sheridan, Milan Patel, Nathan Parker...	Digital BSI	British Standards Institution (BSI)

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2 nd	Progressive JPEGs in the wild: Implications for information hiding and forensics	0.2	Nora Hofer	University of Innsbruck	IEEE SPS-IFS
2 nd	Energy-Efficient Data Science	0.2	Dr. Carlos Ordonez	University of Houston	ITEE
2 nd	Universal Architectures for Progressive Machine Learning: Model, Performance Evaluation, Applications	0.2	Prof. John S. Baras	University of Maryland	International AI Doctoral Academy (AIDA)
2 nd	Time-based sampling: Theory and an application to video reconstruction from events	0.2	Prof. Pier Luigi Dragotti	Imperial College London	EURASIP
2 nd	Hominis	1.0	Prof. Tarry Singh, Dr. Giuseppe Fiameni, Dr. Michela Tuozzo, Prof. Guglielmo Tamburrini	University of Texas at Dallas, University of Modena and Reggio Emilia, University of Naples Federico II,	ITEE
2 nd	The Power of Retrieval for Video Analysis on Human Behavior Understanding	0.2	Dr. Jianquan Liu	Visual Intelligence Research Laboratories of NEC Corporation	EURASIP
2 nd	Video-based identity proofing	0.2	Dr. Cecilia Pasquini	University of Innsbruck	IAPR Computational Forensics Technical Committee
2 nd	Analytic center selection of optimization-based controllers for robot ecology	0.2	Dr. Gennaro Notomista	University of Waterloo	UniNA – PRISMA Lab
2 nd	Understanding the LLM Development Cycle: Building, Training, and Finetuning	0.2	Dr Sebastian Raschka, Marlene Mhangami	University of Wisconsin-Madison, Microsoft	ACM Learning Center & Webinars
2 nd	Sustainable IT: Strategies and best practices for a green engineering future	1.0	Annalisa Di Leva, Dimitri Cuomo, Benedetta Ramazzotti, Tiziano Marcozzi	Capgemini	UniNA - 5G Academy

2 nd	Generative AI for software engineering: Strategies, impacts, and practical applications	1.0	Annalisa Di Leva, Cynthia Cuvi, Giulia Favale, Alessio Zoccoli	<u>Capgemini</u>	UniNA - 5G Academy
2 nd	Introduction to Large Language Models: Evolution and the current state	0.4	Prof. Tanmoy Chakraborty	Indian Institute of Technology	ITEE
2 nd	Learning in nonstationary environments	0.4	Prof. Cesare Alippi	Università della Svizzera italiana	ITEE
3 rd	Pixel-Inconsistency Modeling for Image Manipulation Localization	0.2	Dr. Chenqi Kong	Nanyang Technological University	Recod.ai Lab University of Campinas
3 rd	On the Security of Semantic Watermarking to Detect AI-Generated Content	0.2	Dr. Erwin Quiring	Ruhr University Bochum	ITEE

Research activities

Giada Zingarini has conducted research in the field of Image Forensics, focusing on the localization of tampered images and the detection of fully synthetic images. She works with data across two different domains, the natural and the medical ones. Therefore, she explored the task of forgery localization for medical and scientific papers' images, and the detection of synthetic images with a specific attention to the robustness and generalization abilities. She investigated the capability of general forensics detectors to suit adequately for the medical field, and, at this regard, she proposed a large 3D medical AI-manipulated dataset. She also contributed to developing an image detector, based on a novel training paradigm, able to generalize properly on several different generators not seen in training, and to be effective even on images shared across social networks.

Giada Zingarini spent three months as a PhD Research Visiting at Recod.ai laboratory, in the Institute of Computing, University of Campinas, Brazil. During this period, she focused on the design of a fusion architecture able to combine the localization maps produced by some state-of-the-art models in order to produce an enhanced final probabilistic map.

She presented one research contribution at the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) in 2024.

Tutoring and supplementary teaching activities

Giada Zingarini performed the following tutorship activities (Teaching assistance, Laboratory activities and Seminars):

-Elaborazione di Segnali Multimediali (9 hours). Tutor: Prof. Luisa Verdoliva

-Teoria dei Segnali (4 hours). Tutor: Prof. Giovanni Poggi

-Visione per Sistemi Robotici (2 hours). Tutor: Prof. Davide Cozzolino

Credits summary

PhD Year	Courses	Seminars	Research	Tutoring / Supplementary Teaching
1 st	26	5.3	30.8	0
2 nd	9	5.4	41	0.52
3 rd	5.2	0.4	57	0

Research periods in institutions abroad and/or in companies

PhD Year	Institution / Company	Hosting tutor	Period	Activities
3 rd	Recod.ai lab, Institute of Computing, University of Campinas, Brazil	Prof. Anderson Rocha	01/05/25 - 28/07/25	Research topic and experiments: Design of a fusion model to perform forgery localization in scientific images.

PhD Thesis

The rise of generative AI has revolutionized the production of synthetic content, enabling the creation of high-quality and sophisticated media with unprecedented ease, even for users without advanced technical expertise. Through intuitive interfaces and powerful pretrained models, individuals can now generate synthetic images from simple inputs or textual prompts. This accessibility has democratized content creation, however, it also introduces significant challenges, including the potential misuse, such as the large-scale spread of misinformation. These concerns extend beyond natural imagery to encompass medical and scientific images within academic publications. Manipulating such content can alter diagnoses, support unproven theories, or promote misleading assumptions.

This thesis provides a comprehensive analysis of this issue across both image domains, proposing general solutions for image forgery detection and localization. Since natural images are often shared repeatedly across social networks, detector robustness becomes a key requirement. The proposed method, B-Free, is specifically designed to address this need, demonstrating strong generalization across a wide range of generative tools. It employs a novel training paradigm that

eliminates both coding and semantic content biases from the training data, compelling the detector to focus exclusively on generative artifacts.

Similarly, medical and scientific images are also vulnerable to AI-driven manipulation. To address this, a tampered dataset of 3D images, M3Dsynth, is introduced to enable an extensive benchmark of SoTA detection and localization methods. Furthermore, a Fusion Model is proposed to enhance forgery localization capabilities for scientific imagery. The evaluations highlight the necessity of deploying specific data and models tailored to these different types of manipulations.

Research products

Research results appear in 3 contributions to international conferences.

List of scientific publications

International conference papers

R. Corvi, D. Cozzolino, **G. Zingarini**, G. Poggi, K. Nagano, and L. Verdoliva,
On the detection of synthetic images generated by diffusion models,
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),
Rhodes, Greece, June 2023, pp. 1-5, Publisher, DOI: 10.1109/ICASSP49357.2023.10095167.

International conference papers

G. Zingarini, D. Cozzolino, R. Corvi, G. Poggi, and L. Verdoliva,
M3Dsynth: A dataset of medical 3D images with AI-generated local manipulations,
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP),
Seoul, South Korea, Apr. 2024, pp. 13176-13180, Publisher, DOI: 10.1109/ICASSP48485.2024.10446605.

International conference papers

F. Guillaro, **G. Zingarini**, B. Usman, A. Sud, D. Cozzolino, L. Verdoliva,
A bias-free training paradigm for more general ai-generated image detection,
IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR),
Nashville, Tennessee, USA, June 2025, pp. 18685-18694, Publisher, DOI: 10.1109/CVPR52734.2025.01741.

Awards and Prizes

Top 3% Paper Recognition for the paper: "On the detection of synthetic images generated by diffusion models", R. Corvi, D. Cozzolino, G. Zingarini, G. Poggi, K. Nagano, and L. Verdoliva at the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Rhodes, June 2023.

First Prize Winner in Team Competition at "2023 IEEE SPS / EURASIP - Summer School on Metaverse Technologies, University of Cagliari".

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Date 27/10/2025

PhD student signature

Giada Zingarini

Supervisor signature

Luisa Verdoliva