UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

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

Activities and Publications Report

PhD Student: Riccardo Corvi

Student DR number: DR996631

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: Luisa Verdoliva

e-mail: verdoliv@unina.it

PhD scholarship funding entity:
UNINA - DII, DISCOVER project, funded by DARPA under the
SEMAFOR program

General information

Riccardo Corvi received in year 2022 the Master Science degree in Computer Engineering from the University of Napoli Federico II. He attended a curriculum in Telecommunications within the PhD program in Information Technology and Electrical Engineering. He received a scholarship from Università Federico II Department of Industrial Engineering on a grant from DARPA under the SEMAFOR program through the DISCOVER project

Study activities

Attended Courses

Year	Course Title	Type	Credits	Lecturer	Organizer(s)
1st	Using Deep Learning Properly	Ad hoc course	4	Dr. Andrea Apicella	ITEE
1st	How to boost your PhD	Ad hoc course	4	prof. Antigone Marino - CNR-ISASI - Physics Department - University of Naples Federico II -	DIETI ITEE - ICTH - CQB PhD programs
1st	Statistical Multimedia Security and Forensics	External course	4	Prof. Fernando Pérez-González (University of Vigo)	IECS Doctoral School- University of Trento
1st	Visione per Sistemi Robotici	MSc course	9	Dr. Davide Cozzolino	DIETI UNINA
2nd	Strategic Orientation for STEM Research & Writing	Ad hoc course	5	Dr. Chie Shin Fraser	ITEE
2nd	Innovation and Entrepreneurship	Ad hoc course	4	Prof. Pierluigi Rippa	ITEE

Attended PhD Schools

Year	School title	Location	Credits	Dates	Organizer(s)
2nd	IEEE-EURASIP Summer School on Signal Processing (S3P-2024)	Capri, Italy	4	23/09/2024 – 27/09/2024	University of Napoli Federico II
3rd	IEEE-EURASIP Summer School on Signal Processing (S3P-2025)	San Vincenzo, Livorno, Italy	5.2	21/09/2025-26/09/2025	University of Florence, Universitas Mercatorum and CNIT

Attended Seminars

Year	Seminar Title	Credits	Lecturer	Lecturer affiliation	Organizer(s)
1st	Privacy and Data Protection	0.4	Dr. Stefano Mele	Partner at Gianni & Origoni	ITEE

1st	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 (AIDA) and University of Modena and Reggio Emilia
1st	Digital Forensics	0.4	Artem Artemov	Group-IB	ITEE
1st	Face Presentation Attack Detection	0.3	Prof. Sébastien Marcel	Idiap Research Institute	IEEE Biometrics Council
1st	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
1st	The Super Neuron Model - A new generation of ANN-based Machine Learning and Applications	0.2	Moncef Gabbouj	Tampere University	EURASIP Journal on Image and Video Processing
1st	Human Centric Visual Analysis - Hand, Gesture, Pose, Action, and Beyond	0.2	Dr. Joe (Zhou) Ren	Amazon AWS, Seattle	IEEE Signal Processing Society
1st	Algorithm Unrolling: Efficient, Interpretable Deep Learning for Signal and Image Processing	0.2	Prof. Vishal Monga	Pennsylvania State University, USA	ITEE
1st	What's Up with Image and Video Forensics?	0.2	Prof. Fernando Pérez-González	University of Vigo	EURASIP Journal on Image and Video Processing
1st	Unleashing the Power of LLMs: a Historical perspective on Generative AI	0.2	Prof. Tarry Singh	Real.AI, University of Texas at Dallas	ITEE
1st	Self-supervised learning for robotic bin-picking	0.2	Prof. Liming Chen	École Centrale de Lyon	EURASIP Journal on Image and Video Processing
1st	Scientific Integrity Verification Through Image Forensics	0.2	Dr. Daniel Moreira	Loyola University Chicago	IEEE SPS- IFS (Information Forensics and Security Technical Committee)
1st	The Digital World: Artificial Intelligence	1.2	Florian Ostmann, Sundeep Bhandari, Jennifer Cheung,		British Standards Institution

			Eleanor Drage, Colin Crone, Nuala Polo, Milan Patel, Nathan Parker, Connor Dunlop, Adam Leon Smith, Abdellatif Benjelloun Touimi		
1st	IEEE Authorship and Open Access Symposium: Tips and Best Practices to Get Published from IEEE Editors	0.3	Prof. Sergio Benedetto, Eszter Lukács, Judy Brady	Politecnico di Torino, IEEE, IEEE	IEEE Xplore
1st	RICERCA E FORMAZIONE NELLA SOCIETÀ DELLA TRANSIZIONE DIGITALE	1	Paolo Prinetto, Francesco Ubertini, Vincenzo Loia, Prefetto Bruno Frattasi, Mario Nobile, Agostino Santoni, Luca D'Agnese, Giorgio Ventre, Nicola Mazzocca, Remo Morzenti Pellegrini, Paolo Vincenzo Pedone, Nicola Blefari Melazzi, Daniele Nardi, Marco Aldinucci, Enrico Nardelli, Fabio Gadducci, Beniamino Di Martino, Rita Mastrullo, Gaetano Manfredi, Valeria Fascione,	Direttore Laboratorio Nazionale CINI Cybersecurity, Cineca e Centro Nazionale HPC BD e QC, Rettore Università di Salerno, Agenzia per la Cybersicurezza Nazionale, Agenzia per l'Italia Digitale, Confindustria Digitale, Cassa Depositi e Prestiti, Apple Academy Federico II, referente CINI dell'Università Federico II,Scuola Nazionale dell'Amministrazione, CUN, Fondazione RESTART. Laboratorio Competenze Digitali, Laboratorio Inf. Scuola, Gruppo di Informatica, Gruppo di Informatica, Gruppo di Ingegneria Informatica, Prorettrice Università di Napoli Federico II, Sindaco Città	CINI – Consorzio Interuniversitario Nazionale per l'Informatica

			Giuseppe De Pietro	Metropolitana di Napoli, Assessore Ricerca, Innovazione e Start up	
2nd	GAN fingerprint for active detection/attribution of fake media	0.2	Prof. Mauro Barni	Università di Siena	EURASIP Journal on Image and Video Processing
2nd	Progressive JPEGs in the Wild: Implications for Information Hiding and Forensics	0.2	Ms. Nora Hofer	University of Innsbruck	IEEE SPS- IFS (Information Forensics and Security Technical Committee)
2nd	Data sciEnce on GrAphS (DEGAS): Simple Yet Powerful Graph-aware and Simplicial-aware Neural Models	0.2	Dr. Sundeep Prabhakar Chepuri	Indian Institute of Science (IISc) in Bengaluru, India	IEEE SPS Data Science Initiative
2nd	Deep Learning for Inverse Problems in Imaging	0.2	Prof. Enrico Magli	Politecnico di Torino	IEEE SPS (Signal Processing Society)
2nd	Universal Architectures for Progressive Machine Learning: Model, Performance Evaluation, Applications	0.2	Prof. John S. Baras	University of Maryland at College Park	AIDA: Artificial Intelligence Doctoral Academy
2nd	Time-based sampling: Theory and an application to video reconstruction from events	0.2	Prof. Pier Luigi Dragotti	Imperial College London	EURASIP Journal on Image and Video Processing
2nd	Hominis	1	Prof. Tarry Singh, Dr. Giuseppe Fiameni, Dr. Michela Tuozzo, Prof. Guglielmo Tamburrini	Real.AI, NVIDIA, Department of Law UniNa, DIETI UniNa	ITEE
2nd	The Power of Retrieval for Video Analysis on Human Behavior Understanding	0.2	Dr. Jianquan Liu	NEC Corporation	EURASIP Journal on Image and Video Processing
2nd	Video-based identity proofing	0.2	Dr Cecilia Pasquini	Fondazione Bruno Kessler (FBK)	IAPR Computational Forensics Technical Committee

2nd	Analytic center selection of optimization-based controllers for robot ecology	0.2	Prof. Gennaro Notomista	University of Waterloo	PRISMA Lab - Unina
2nd	Image-to-Image Translation: Methods and Applications	0.2	Dr. Zhibo Chen, Dr. Jianxin Lin	University of Science and Technology of China, Hunan University	IEEE SPS (Signal Processing Society)
2nd	Sustainable IT: Strategies and Best Practices for a Green Engineering Future	1.0	Annalisa Di Leva, Dimitri Cuomo, Benedetta Ramazzotti, Tiziano Marcozzi		UNINA, 5G Academy
2nd	Generative AI for Software Engineering: Strategies, Impacts and Practical Applications	1.0	Annalisa Di Leva, Cynthia Cuvi, Giulia Favale, Alessio Zoccoli		UNINA, 5G Academy
2nd	Understanding the LLM Development Cycle: Building, Training, and Finetuning	0.2	Sebastian Raschka		ACM Learning Center & Webinars
2nd	Learning in nonstationary environments	0.4	Prof. Cesare Alippi	Politecnico di Milano, Università della Svizzera italiana	ITEE - ICTH
3rd	On the Security of Semantic Watermarking to Detect AI-Generated Content	0.2	Dr. Erwin Quiring	Ruhr University Bochum and ICSI @ UC Berkeleyv	ITEE
3rd	Trends in Image Aesthetics Assessment	0.2	Prof. Leida Li	Xidian University	EURASIP Journal on Image and Video Processing
3rd	Overview of Special Issue on Neural Speech and Audio Coding	0.3	Prof. Minje Kim, Dr. Jan Skoglund, Prof. Gopala K. Anumanchipalli, Mr. Haohe Liu, Ms. Xue Jiang & Dr. Lars Villemoes	University of Illinois Urbana-Champaign, Google, University of California Berkeley, University of Surrey, Communication University of China, Dolby Sweden AB	IEEE JSTSP (Journal of Selected Topics in Signal Processing)

Research activities

Riccardo Corvi has conducted his research on the detection of synthetic media, both images and videos. Firstly, he conducted a thorough analysis of the generation artifacts present in synthetic images to identify the most useful forensic cues for the detection. Then he moved to proposing a simple new detector based on the features of the large a Vision Language Model, CLIP, that despite being trained on a much smaller training set, obtains state-of-the-art performance. Finally, he moved his attention to the detection of synthetic videos. He proposed a new augmentation framework based on the wavelet decomposition to push the focus on the most robust features along the diagonals. Despite not introducing any new architecture, his proposal obtains SoTA performance.

He spent a period of three months at the Centre for Research and Technology Hellas (CERTH) in Thessaloniki, Greece. There, he participated in the organization of the MediaEval 2025 Challenge organized as part of the Vera.AI project, with the aim of pushing forward the tasks of synthetic image detection, and of image forgery detection and localization.

Part of his research was conducted during a one-year part-time internship with NVIDIA, where he tackled the issue of synthetic video detection.

He presented his papers at the IEEE International Conference on Acoustics, Speech and Signal Processing in 2023 and at the Workshop on Media Forensics at IEEE/CVF Conference on Computer Vision and Pattern Recognition in 2024.

Tutoring and supplementary teaching activities

None

Credits summary

PhD Year	Courses	Seminars	Research	Tutoring / Supplementary Teaching
1st	21	5.6	31	0
2nd	13	5.6	38.6	0
3rd	5.2	0.7	60	0

Iter formativo	corsi / scuole	seminari	attività ricerca	tutorato / did. int.
1 anno	min 20 - max 40	min 5 - max 10	min 10 - max 35	min 0 – max 1.6
2 anno	min 10 - max 20	min 5 - max 10	min 30 - max 45	min 0 – max 1.6
3 anno	min 0 - max 10	min 0 - max 10	min 40 - max 60	min 0 – max 1.6
TOTALE	min 30 – max 70	min 10 – max 30	min 80 – max 140	min 0 – max 4.8

Research periods in institutions abroad and/or in companies

PhD Year	Institution / Company	Hosting tutor	Period	Activities
3rd	Centre for Research and Technology Hellas (CERTH) ,Thermi, Thessaloniki, Greece	Symeon Papadopulos	21/04/2025-25/07/2025	Experiments on the detection of synthetic images. Preparation of the challenge MediaEval 2025 as part of Vera.ai project.

PhD Thesis

Synthetic media generation has improved enormously in the previous years and is now available to everyday users. Powered by large language models, these new generators allow users to create incredibly detailed content starting from a simple text description. These are incredible resources for all types of creative works. However, they provide extraordinarily powerful tools for malicious actors to spread disinformation. As such, Multimedia Forensics is more relevant than ever with the need for general and robust detectors to distinguish real from generated content. This thesis aims first to conduct a systematic study of a large number of generators to discover the most relevant characteristics for forensics applications. This initial analysis has shown that all generators leave artifacts in the generated content and that there are some major discrepancies in the mid-high frequencies between real and synthetic images. Then, the power of large pre-trained Vision-Language Model has been exploited to design a lightweight synthetic image detector based on CLIP. Such models have also been used to develop a robust strategy for the task of fully synthetic video detection. To this end, a novel forensic-oriented data augmentation strategy based on the wavelet decomposition is introduced, in which specific frequency-related bands are replaced to drive the model to exploit more relevant forensic cues. In fact, a well-designed forensic classifier should focus on identifying intrinsic low-level artifacts introduced by a generative architecture rather than relying on high-level semantic flaws that characterize a specific model. This approach improves the generalizability of the detectors, without the need for complex algorithms. Despite its simplicity, the method achieves a significant accuracy improvement over SoTA detectors and obtains excellent results even on very recent generative models.

Research products

Research results appear in *1* papers published in international journals, 6 contributions to international conferences.

List of scientific publications

International journal papers

D. Tariang, **R. Corvi**, D. Cozzolino, G. Poggi, K. Nagano, L. Verdoliva
"Synthetic Image Verification in the Era of Generative Artificial Intelligence: What Works and What Isn't There yet"
IEEE Security & Privacy, Volume: 22, Issue: 3, May-June 2024, DOI: 10.1109/MSEC.2024.3376637

International conference papers

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

R. Corvi, D. Cozzolino, G. Poggi, K. Nagano, L. Verdoliva
"Intriguing properties of synthetic images: from generative adversarial networks to diffusion models",
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), IEEE Workshop on Media Forensics at CVPR 2023
Vancouver, BC, Canada, 2023, pp. 973-982, DOI: 10.1109/CVPRW59228.2023.00104

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

D. Cozzolino, G. Poggi, **R. Corvi**, M. Nießner, L. Verdoliva
"Raising the Bar of AI-generated Image Detection with CLIP"
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), IEEE Workshop on Media Forensics at CVPR 2024
Seattle, WA, USA, pp. 4356-4366, DOI: 10.1109/CVPRW63382.2024.00439

R. Corvi, D. Cozzolino, E. Prashnani, S. De Mello, K. Nagano, L. Verdoliva
"Seeing What Matters: Generalizable AI-generated Video Detection with Forensic-Oriented Augmentation"
Conference on Neural Information Processing Systems (NeurIPS)
San Diego, CA, United States of America December 2025

O. Papadopoulou, M. Schinas, **R. Corvi**, D. Karageorgiou, C. Koutlis, F. Guillaro, E. Gavves, H. Mareen, L. Verdoliva, S. Papadopoulos
"Synthetic Images at MediaEval 2025: Advancing detection of generative AI in real-world online images"
Multimedia Benchmark Workshop, Dublin Ireland, 25-26 October 2025

Patents and/or spin offs

None

Awards and Prizes

Top 3% Paper Recognition for the paper: "On the detection of synthetic images generated by diffusion models" at the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2023 Rhodes Island, Greece
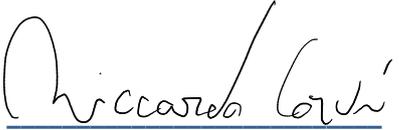
Best paper for scientific value and rigor: "Seeing What Matters: Generalizable AI-generated Video Detection with Forensic-Oriented Augmentation" PhD summer school: IEEE - EURASIP Summer School on Signal Processing 2025, San Vincenzo, Livorno, Italy

First place at the SAFE Synthetic Video Detection Challenge 2025 at the Authenticity & Provenance in the age of Generative AI Workshop at ICCV 2025 Honolulu Hawaii with the paper : "Seeing What Matters: Generalizable AI-generated Video Detection with Forensic-Oriented Augmentation"

Date __27/10/2025_____

PhD student signature _____

Supervisor signature _____