



# Barbara Toniella Corradini

## Personal Information

First Name(s)	Barbara Toniella
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Nationality	Italian
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Github Page	<a href="https://github.com/bcorrad">https://github.com/bcorrad</a>
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## Relevant Skills

- **PhD in Smart Computing (Doctor Europaeus):** Earned through a joint program between the University of Florence and the University of Siena, with a thesis on deep generative models. The research focused on computer vision, generative architectures, and vision-language models, explored in both zero-shot and supervised learning settings.
- **Generative Models:** Worked with GANs, diffusion models, and encoder-decoder architectures for tasks such as image segmentation and open-vocabulary generation. Published work analyzing their training dynamics and semantic structure.
- **Deep Learning Models:** Hands-on experience with GNNs and Transformers applied to scientific tasks such as natural products molecular representation.
- **Programming and Frameworks:** Proficiency in Python (PyTorch, OpenCV and TDA libraries). Familiar with TensorFlow, Keras, and HuggingFace.
- **Publications and Reporting:** Author of peer-reviewed papers in journals and conferences (e.g., Neurocomputing, IJCNN, ESANN). Experienced in presenting and documenting research data.
- **Teamwork and Interdisciplinarity:** Worked with engineers, biologists, and clinicians on cross-domain projects. Comfortable integrating into collaborative, multidisciplinary research teams.
- **Soft Skills:** Highly motivated and able to manage priorities independently. Fluent in English (spoken and written, B2), with experience teaching and collaborating in international environments.

## Academic Service and Conference Activities

- Sep 2025 **Member, Local Organizing Committee**, *21st Conference of the Complex Systems Society (CCS 2025)*, Italy
  - Contribution to the organization of the XIX International Workshop on Artificial Life and Evolutionary Computation (WIVACE 2025).
  - Conference website: <https://sites.google.com/unisi.it/wivace2025/home>
- Jul 2025 **Session Chair**, *International Joint Conference on Neural Networks (IJCNN) 2025*, Rome, Italy  
Session Chair for the track on "Neural Networks for Image and Video Processing".

2021 – Present **Peer-Reviewer, International Conferences and Journals**

- International Joint Conference on Neural Networks (IJCNN)
- European Symposium on Artificial Neural Networks (ESANN)
- European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECMLPKDD)
- International Conference on Artificial Neural Networks (ICANN)
- Neurocomputing (Elsevier Journal)
- Soft Computing (Springer Journal)

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## Education

1 Nov 2021 – **PhD in Smart Computing (Doctor Europaeus), University of Florence & University of Siena,**  
31 Oct 2024 Siena, Italy

- Joint PhD Program, co-financed by the Universities of Florence, Pisa, and Siena, and by Regione Toscana under the European Social Fund. Two National Research Council institutes (ISTI and IIT) are supporting partners (<https://smartcomputing.unifi.it/>).
- Focus on Deep Learning Generative Models for Computer Vision.
- Thesis title: *“Generative models from the Inside: a Journey through Properties and Applications”*.
- Awarded with distinction on 04 April 2025.

Feb 2023 – **Semester of Study at Institut Systèmes Intelligents et de Robotique (ISIR) Lab, Sorbonne**  
Jul 2023 Université, Paris 5ème, France

- Focus on generative Vision-Language Models (Diffusion- and ViT-based multimodal models) in zero-shot setup for image segmentation downstream task.

2018 – 2021 **Master’s Degree in Computer and Automation Engineering, University of Siena, Siena,**  
Italy

- Thesis title: *“Trucks as Sensors: Classification and Mapping of Abandoned Waste by Deep Learning”*.
- Grade: 110 cum laude.
- Awarded on 09 April 2021

2013 – 2018 **Bachelor’s Degree in Computer and Information Engineering, University of Siena, Siena,**  
Italy

- Thesis title: *“Metodi statistici di feature selection per il rilevamento di armi ceramiche ed esplosivi nascosti”*.
- Grade: 98/110
- Awarded on 26 April 2018

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## Projects and Research Experience

Dec 2025 – **Postdoctoral Researcher, Istituto Italiano di Tecnologia (IIT), Genoa, Italy**

Now ○ Part of the AI for Good (AIGO) Research Unit.

Feb 2025 – **Research Fellow, University of Siena, Siena, Italy**

Nov 2025 ○ Project Title: *“Segmentation and analysis of DICOM images for the automatic reconstruction of 3D models of human organs and their visualization in Virtual Reality applications”*.

- Funded by SAIHUB Foundation of Monte dei Paschi di Siena Foundation (<https://fondazionesaihub.fondazionemps.it/>).

Dec 2024 **Consulting on Deep Learning-based applications for 3D Object Recognition, Nuovo Pignone Baker Hughes, Siena, Italy**

- Exploration of state-of-the-art methods for 3D object detection in the context of autonomous navigation in hazardous environments.

Oct 2023 – **Software Development, Zucchetti S.p.A., Lastra a Signa (FI), Italy**

Nov 2023 ○ Engineering and development of a software for robot autonomous navigation.

Dec 2022 **Software Development, AOUS, Siena, Italy**

- Engineering and development of a web application to monitor lung transplant patient care.
- Published in the gold open-access journal JHLT Open [8].

Oct 2019 – **Web App Development, GSK, Siena, Italy**

Nov 2019 ○ Engineering and development of a paperless parental leave management application.

- May 2018 – **Internship (Bachelor's Degree)**, *SAIMA Sicurezza S.p.A.*, Arezzo, Italy  
Sep 2018 ○ Engineering and development of a portable device to detect explosives and dangerous objects hidden under clothing.

## Teaching Activities

- 28 Oct 2022 – **Lectures on Data Representation and SQL Language**, *DIGI-SKILLS*, Siena, Italy  
3 Nov 2022 ○ Role: Course Instructor.  
○ Language: Italian.  
○ Teaching sessions with a final exam, totaling 11 hours, as a part of a training and job placement project promoted by the Tuscany Region — *DIGI-SKILLS – Competenze strategiche per l'innovazione digitale cod. 298630*.
- Feb 2023 **Lecture on Data Analysis and Computer Networks**, Siena, Italy  
○ Role: Guest Lecturer.  
○ Language: Italian.  
○ A 6-hour lecture as part of the Lean Healthcare Management master's program (8th edition).
- Mar 2024 **Lecture on Artificial Intelligence for Museum Management**, *ITS Vita*, Grosseto, Italy  
○ Role: Guest Lecturer.  
○ Language: Italian.  
○ 6-hour training for museum directors on topics related to Artificial Intelligence.
- May 2024 – **Lectures on Fundamentals of Artificial Intelligence**, *ITS Vita*, Siena/Grosseto/Volterra,  
June 2024 Italy  
○ Role: Guest Lecturer.  
○ Language: Italian.  
○ Teaching sessions totaling 15 hours, as part of a training and job placement project promoted by the Tuscany Region — *Sviluppo del sistema di formazione professionale terziaria (ITS)" Potenziamento dell'offerta formativa degli Istituti Tecnologici Superiori "ITS Academy" Attività B.2 – Orientamento formativo - Percorsi di gruppo – Codice CUP: I64D23001850006*.
- Jan 2025 – **Course on Programming Fundamentals**, *FISM Education*, Firenze, Italy  
June 2025 ○ Role: Module Instructor.  
○ Language: Italian.  
○ 50-hour course as part of a training and job placement project promoted by the Tuscany Region.
- Jan 2025 – **Course on Database and Data Analysis**, *CET Siena Study Abroad*, Siena, Italy  
May 2025 ○ Role: Course Instructor.  
○ Language: English.  
○ 96-hour course aimed at undergraduate students from American universities.  
○ School website: <https://cetacademicprograms.com>.
- July 2025 **Course on Artificial Intelligence**, *ITS Prodigy*, Arezzo, Italy  
○ Role: Module Instructor.  
○ Language: Italian.  
○ Teaching sessions (32 hours) as a part of a training and job placement project promoted by the Tuscany Region — *"Transizione 5.0: sviluppo di software integrati con strumenti di Intelligenza Artificiale" -Machine Learning-ML.Net-*.

## Research Topics

The research activity is primarily dedicated to the development and analysis of deep learning methods tailored to scientific applications, with a particular focus on large generative and multimodal architectures. Key areas of investigation include:

- **Deep Generative Models:** Study of GANs, diffusion models, and encoder-decoder architectures for open-vocabulary segmentation [5], novel recursive GAN architectures [11], and topological analysis of training dynamics [4].
- **Vision-Language and Multimodal Learning:** Investigation of zero-shot segmentation and cross-modal representations using pre-trained diffusion-based vision-language models (e.g., CLIP, BLIP), also within the framework of a research period at Sorbonne Université [5].
- **Applications in Chemistry and Biology:** Use of GNNs for metabolites classification and evaluation of

domain-specific language models for natural product discovery [7, 3].

- **Model Evaluation and Interpretability:** Analysis of the semantic consistency and internal structure of generative models through persistent homology and statistical techniques [9, 10, 4].

## Skills

Programming Languages Python, C++, Matlab, Java, HTML, Javascript, SQL, PHP

Frameworks and Libraries Pytorch, Tensorflow, Keras, OpenCV, HuggingFace Transformers

Languages Italian, English (B2 certificate), Français (A2)

## References

- **Prof. Franco Scarselli**, Department of Information Engineering and Mathematics, University of Siena, Italy  
francoscarselli@gmail.com
- **Prof. Monica Bianchini**, Department of Information Engineering and Mathematics, University of Siena, Italy  
monica.bianchini@unisi.it

## Publications

- [1] Andreini, P., Bonechi, S., Bianchini, M., Scarselli, F., Manni, F., Quercioli, M., **Corradini, B. T.**, "A comparison on Cross-Domain Representation Learning for Skin-Lesion Classification". In: *XIX International Workshop on Artificial Life and Evolutionary Computation*. Accepted for publication. 2025.
- [2] Bonechi, S., Andreini, P., **Corradini, B. T.**, "Who Made This? Fake Detection and Source Attribution with Diffusion Features". In: *XIX International Workshop on Artificial Life and Evolutionary Computation*. Accepted for publication. 2025.
- [3] **Corradini, B. T.**, Bianchini, M., Scarselli, F., Nigi, L., Sali, V., Prete, A. L., "Comparing General and Domain-Specific Pre-trained Language Models for Natural Product Classification". In: *XIX International Workshop on Artificial Life and Evolutionary Computation*. Accepted for publication. 2025.
- [4] **Corradini, B. T.**, Cullen, B. W. G., Gallegati, C., Marziali, S., D'Inverno, G. A., Bianchini, M., Scarselli, F., "Training Dynamics of GANs Through the Lens of Persistent Homology". In: *Neurocomputing* (2025). under review.
- [5] **Corradini, B. T.**, Shukor, M., Couairon, P., Couairon, G., Scarselli, F., Cord, M., "FreeSeg-Diff: Training-Free Open-Vocabulary Segmentation with Diffusion Models". In: *International Joint Conference on Neural Networks (IJCNN)*. Accepted for publication. 2025.
- [6] Melacci, S., Nunziati, G., **Corradini, B. T.**, De Magistris, G., Fiorucci, M., Schillaci, G., "Mixed 2D-3D Object Recognition for Autonomous Inspection in Industrial Environments". In: *2025 5th International Conference on AI-ML-Systems (AIMLSystems)*. Accepted for publication. IEEE. 2025, pp. 1–6.
- [7] Prete, A. L., **Corradini, B. T.**, Costanti, F., Scarselli, F., Bianchini, M., "Leveraging Molecular Graphs for Natural Product Classification". In: *Computers in Biology and Medicine*. Under review. IEEE. 2025, pp. 1–6.
- [8] Bennett, D., Fanetti, M., Messina, M., **Corradini, B. T.**, Bendjeddou, A., Ferrari, S., Perillo, F., Luzzi, L., Paladini, P., Marchini, E., "A novel web-based tool for lung transplant patients undergoing extracorporeal photopheresis". In: *JHLT Open* 5 (2024). Under review, p. 100106.
- [9] Bonechi, S., Andreini, P., **Corradini, B. T.**, Scarselli, F., "An Analysis of Pre-trained Stable Diffusion Models through a Semantic Lens". In: *Neurocomputing* 5 (2024). In press, p. 100106.
- [10] Bonechi, S., Andreini, P., **Corradini, B. T.**, Scarselli, F., "DiffProps: Is Semantics Preserved within a Diffusion Model?". In: *Proceedings of the 28th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES 2024)*. Vol. 5. In press. IEEE. Siena, Italy: Elsevier, 2024, p. 100106.

- [11] **Corradini, B. T.**, Andreini, P., Hagenbuchner, M., Scarselli, F., Tsoi, A. C., "Exploring the Role of Recursive Convolutional Layer in Generative Adversarial Networks". In: *International Conference on Artificial Neural Networks*. Vol. 5. In press. Springer. Siena, Italy: Elsevier, 2023, pp. 53–64.
- [12] Intravaia, M., Fort, A., Landi, E., Mugnaini, M., Bianchini, M., **Corradini, B.**, Scarselli, F., Tanfoni, M., Spinelli, F., "A MobileNet Neural Network Model for Fault Diagnosis in Roller Bearings". In: *Proceedings of IEEE I2MTC 2023 Conference*. Vol. 5. In press. IEEE. Siena, Italy: Elsevier, 2023, pp. 53–64.
- [13] Landi, E., Spinelli, F., Intravaia, M., Mugnaini, M., Fort, A., Bianchini, M., **Corradini, B. T.**, Scarselli, F., Tanfoni, M., "A mobilenet neural network model for fault diagnosis in roller bearings". In: *2023 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)*. Vol. 5. In press. IEEE. Siena, Italy: Elsevier, 2023, pp. 01–06.
- [14] Addabbo, T., Fort, A., Mugnaini, M., Vignoli, V., Intravaia, M., Tani, M., Bianchini, M., Scarselli, F., **Corradini, B. T.**, "Smart gravimetric system for enhanced security of accesses to public places embedding a mobilenet neural network classifier". In: *IEEE Transactions on Instrumentation and Measurement* 71 (2022). In press, pp. 1–10.
- [15] Andreini, P., Pancino, N., Costanti, F., Eusepi, G., **Corradini, B. T.**, "A Deep Learning approach for oocytes segmentation and analysis.". In: *ESANN*. Vol. 71. In press. IEEE. Siena, Italy: IEEE, 2022, pp. 1–10.
- [16] Addabbo, T., Fort, A., Mugnaini, M., Vignoli, V., Intravaia, M., Tani, M., Bianchini, M., Scarselli, F., **Corradini, B. T.**, "Smart gravimetric system based on Deep Learning for enhanced safety of accesses to public places". In: *2021 IEEE International Instrumentation and Measurement Technology Conference (I2MTC)*. Vol. 71. In press. IEEE. Siena, Italy: IEEE, 2021, pp. 1–6.

## Declaration of Truthfulness

The undersigned **Barbara Toniella Corradini**, born in **Termoli (CB)** il **10/09/1994**, residing in **Petac-  
ciato (CB)**, **CAP 86038** in **Via Mediterraneo, 52**,

aware of the criminal penalties provided for false statements or the use of false documents, pursuant to Articles 46 and 47 of Presidential Decree 445 of December 28, 2000,

**declares**

that all the information provided in this curriculum vitae is true and provided under her own responsibility.

