Riccardo Renzulli

Bio

I'm a PostDoc researcher at the University of Turin, Computer Science Department, EIDOS group. My research focuses on artificial intelligence and deep learning, and I am particularly interested in representation learning, interpretability, robustness, multimodal foundation models and medical imaging.

Education

11/2019 – 07/2023
- **Doctoral Degree**, *University of Turin, Computer Science Department, Italy*
  Final grade: Passed with Honour
  Thesis title: Hierarchical Object-Centric Learning with Capsule Networks

09/2015 – 12/2018
- **Master Degree**, *University of Turin, Computer Science Department, Italy*
  Final grade: 110/110 cum laude
  Thesis title: An exploratory study into Capsule Networks and how to make them deeper

09/2012 – 10/2015
- **Bachelor Degree**, *University of Turin, Computer Science Department, Italy*
  Final grade: 105/110
  Thesis title: Non-monotonic extensions of Description Logics and a Protégé Plugin for reasoning about typicality

Work Experience

02/2025 – Now
- **PostDoc Researcher**, *University of Turin, Oncology Department, Italy*
  Research focused on representation learning and robotic surgery

11/2023 – 01/2025
- **PostDoc Researcher**, *University of Turin, Computer Science Department, Italy*
  Research focused on representation learning, including concept learning, compositionality, and interpretability

03/2022 – 09/2022
- **Visiting Researcher**, *Aalto University, School of Electrical Engineering, Helsinki, Finland*
  Development of a system for non-GNSS visual localization of UAVs, supervised by Prof. Ville Kyrki

03/2019 – 09/2019
- **Machine Learning Engineer**, *Machine Learning Reply, Turin, Italy*
  Designing and developing machine learning systems for cloud platforms

12/2018 – 02/2019
- **Deep Learning Scientist**, *Addfor S.p.A., Turin, Italy*
  Development of deep learning algorithms for image recognition tasks and writing scientific articles for digital marketing

02/2018 – 06/2018
- **Intern**, *Addfor S.p.A., Turin, Italy*
  This internship aimed to discover the advantages and disadvantages of Capsule Networks compared to the traditional Convolutional Networks

01/2016 – 10/2017
- **Scholarship Researcher**, *University of Turin, Computer Science Department, Italy*
  Development of a Protégé plugin to non-monotonically reason about defeasible inheritance with exceptions in ontologies

Additional Work Experience

11/2017 – 03/2018	**Inventory Operator**, *RGIS (Italy)* Count of items for different retailers
07/2012 – 09/2012	**Intern**, *Jatco Insurance Brokers, Malta* Master dei Talenti Neodiplomati (Fondazione CRT). General administration, archive management, contract renewal
06/2011 – 07/2011	**Intern**, *Archimede Library, Settimo Torinese (TO), Italy* Customer Support, school activities, book cataloging
04/2011 – 05/2011	**Intern**, *Equal Opportunity Office, Turin, Italy* Assistance at refugee and anti-violence centers

Academic Activities

Teaching

- **Teacher**
  - Laboratory of Biological and Diagnostic Imaging and Image Analysis Course, Bachelor in Artificial Intelligence for Biomedicine and Healthcare, University of Turin (4 hours, 2025)
  - Generative AI Course, Master in Mathematical and Physical Methods for Space Sciences and Industrial Applications, University of Turin (12 hours, 2025)
  - Software Engineering, Bachelor in Computer Science, University of Turin (20 hours, 2025)
  - Programming II Course, Bachelor in Computer Science, University of Turin (Arma Trasmissioni) (46 hours, 2025)
  - Programming Course, Master in Design and Management of Multimedia for Communication, University of Turin (60 hours, 2024)
- **Lecturer**
  DeepHealth Winter School 2022 (medical imaging master class)
- **Invited Seminar Speaker**
  - Talk on capsule networks for the Deep Learning Working Group of the IMAGES team, Télécom Paris (2022)
  - Talks on concept learning and capsule networks for the Deep Learning course (2019-2020, 2020-2021, 2021-2022), University of Turin, Computer Science Department
- **Laboratory Assistant**
  Support to the students of the Operating Systems course (40 hours, 2020-2021), University of Turin, Computer Science Department

Research Projects

- **Co.R.S.A.**
  WP leader of datasets and neural models, Co.R.S.A. - Covid Radiographic imaging System based on AI (18 months). PI: Marco Grangetto. Funded by Piedmont Region. Budget: 550k €
  https://corsa.di.unito.it
- **DeepHealth**
  Contributor, DeepHealth, Deep-Learning and HPC to Boost Biomedical Applications for Health (18 months). Leader: NTT DATA SPAIN. Funded by EU, call H2020-ICT-2018-2. Budget: 14M €
  https://deephealth-project.eu

HPC Grants

- **CINECA ISCRA B Grant**
  IsB28_HyGenAI 2023 (1,866,216 hours, LEONARDO Supercomputer). Hybrid Generative AI for Histopathology (12 months)

Academic Activities (continued)

- **CINECA ISCRA C Grant**
  IsCc6_MAGNIFY 2025 (56,000 hours, LEONARDO Supercomputer). MAGNIFY: Multimodal And Generalized Neural Insights For concept learning and explainabilitY (6 months)

Events Organization

- **COMETE PhD Workshop**
  Member of the organizing committee of the COMETE (COMputer SciEnce DeparTmEnt) PhD Workshop (2022-2025), a full-day event dedicated to PhD students of the Computer Science department at the University of Turin.

- **UNIGHT**
  Referee for the EIDOS Lab group participation at the European Researchers' Night in Turin (2024).

Conferences Attended

- Publications presented at several conferences, such as DL 2017, ICANN 2021, ICIAP 2022, ICIP 2022, Ital-IA 2023, ECCV 2024, NeurIPS 2024.

Reviewing Service

- **Reviewer**
  Conferences: ICPR (2020), ICANN (2021-2024), ICIAP (2023), ECML PKDD (2023), IROS (2023), ICRA (2024), AIAI (2024-2025), BMVC (2024), NeurIPS (2024), ICLR (2025), AISTATS (2025), ICML (2025), NLDB (2025)
  Workshops: SciForDL (NeurIPS 2024), UniReps (NeurIPS 2024)
  Journals: IEEE Multimedia, IEEE Open Journal of Signal Processing, IEEE Transactions on Neural Networks and Learning Systems, Transactions on Machine Learning Research (TMLR)

Students supervision

- **Visiting student (École Polytechnique)**
  Candidate: Colas Lepoutre
  Topic: Mechanistic Interpretability for medical imaging (2025-On going)
- **Research scholar in Computer Science (University of Turin)**
  Candidate: Davide Vitturini
  Topic: Replace invasive right heart catheterization with advanced deep learning techniques to estimate cardiac hemodynamic parameters.)
- **Research scholar in Computer Science (University of Turin)**
  Candidates: Michele Cannito and Enrico Chiesa
  Topic: Prediction of the occurrence of aortic regurgitation following Transcatheter Aortic Valve Implantation (TAVI) from medical images.)
- **PhD in Computer Science (University of Turin)**
  Candidate: Enrico Cassano
  Topics: Concept learning and interpretability (2024-On going)
- **PhD in Computer Science (University of Turin)**
  Candidate: Giorgio Chiesa
  Topics: Robotic surgery, medical imaging (2024-On going)
- **Master's Degree in Computer Science (University of Turin)**
  Candidate: Enrico Cassano
  Thesis: Does pruning affect interpretability in deep neural networks? (2024)

Academic Activities (continued)

- **Bachelor's Degree in Computer Science (University of Turin)**
  Candidate: Alberto Aiello
  Thesis: Enriching lung nodules segmentation with morphological characteristics prediction (2024)
- **Master's Degree in Computer Science (University of Turin)**
  Candidate: Miriam Fasciana
  Thesis: Towards non-invasive stroke diagnosis: a neural network approach to CT perfusion imaging with subsampling (2023)
- **Master's Degree in Computer Science (University of Turin)**
  Candidate: Paolo Peretti
  Thesis: Capsule Networks for lung nodules segmentation (2022)
- **Bachelor's Degree in Computer Science (University of Turin)**
  Candidate: Alessandro Grassi
  Thesis: Encoding rotation representations of synthetic datasets in quaternions-based deep learning models (2021)
- **Master's Degree in Computer Science (University of Turin)**
  Candidate: Stefano Berti
  Thesis: Lung nodules segmentation from CT scans using deep learning (2021)

Others

- Non-permanent staff representative 2024-2025 (Computer Science Department, University of Turin)

Other Activities

- **Courses**
  Startup Lab 2024 (2i3T business incubator), Startup Creation Lab 2024 (also known as 2030 Academy, University of Turin), Google Cloud Platform 2019, Photography Course 2017 (Leica Akademie, CAMERA, Italian Center of Photography).

Research Publications

Preprints

1. F. Di Sario, R. Renzulli, E. Tartaglione, and M. Grangetto, "Gode: Gaussians on demand for progressive level of detail and scalable compression," In review, 2024.
2. C. Patrício, C. A. Barbano, R. Renzulli, *et al.*, "Unsupervised contrastive analysis for salient pattern detection using conditional diffusion models," In review, 2024.
3. R. Renzulli, E. Tartaglione, and M. Grangetto, "Capsule networks do not need to model everything," In review, 2024.
4. G. Spadaro, A. Bragagnolo, R. Renzulli, *et al.*, "Tep-ones: A simple yet effective approach for transferability estimation of pruned backbones," In review, 2024.

Journal Articles

1. U. A. Gava, F. D'Agata, E. Tartaglione, *et al.*, "Neural network-derived perfusion maps: A model-free approach to computed tomography perfusion in patients with acute ischemic stroke," *Frontiers in Neuroinformatics*, vol. 17, 2023, ISSN: 1662-5196. DOI: 10.3389/fninf.2023.852105.
2. J. Kinnari, R. Renzulli, F. Verdoja, and V. Kyrki, "Lsvl: Large-scale season-invariant visual localization for uavs," *Robotics and Autonomous Systems*, vol. 168, p. 104 497, 2023, ISSN: 0921-8890. DOI: 10.1016/j.robot.2023.104497.

Conference Proceedings

1. F. Di Sario, R. Renzulli, E. Tartaglione, and M. Grangetto, "Boost your nerf: A model-agnostic mixture of experts framework for high quality and efficient rendering," in *Computer Vision – ECCV 2024*, Cham: Springer Nature Switzerland, 2025, pp. 176–192, ISBN: 978-3-031-73010-8.
2. C. A. Barbano, R. Renzulli, D. B. Marco Grosso, M. Busso, and M. Grangetto, "Ai-assisted diagnosis for covid-19 cxr screening: From data collection to clinical validation," in *21st IEEE International Symposium on Biomedical Imaging (ISBI)*, Oct. 2024.
3. R. Renzulli, D. Vranay, and M. Grangetto, "Are capsule networks texture or shape biased?" In *NeurIPS 2024 Workshop on Scientific Methods for Understanding Deep Learning*, 2024. URL: https://openreview.net/forum?id=B8waqrHeCo.
4. F. Di Sario, R. Renzulli, E. Tartaglione, and M. Grangetto, "Two is better than one: Achieving high-quality 3d scene modeling with a nerf ensemble," in *Image Analysis and Processing – ICIAP 2023*, G. L. Foresti, A. Fusiello, and E. Hancock, Eds., Cham: Springer Nature Switzerland, 2023, pp. 320–331, ISBN: 978-3-031-43153-1.
5. G. Spadaro, R. Renzulli, A. Bragagnolo, *et al.*, "Shannon strikes again! entropy-based pruning in deep neural networks for transfer learning under extreme memory and computation budgets," in *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV) Workshops*, Oct. 2023, pp. 1518–1522.
6. H. A. H. Chaudhry, R. Renzulli, D. Perlo, *et al.*, "Lung nodules segmentation with deephealth toolkit," in *Image Analysis and Processing. ICIAP 2022 Workshops*, P. L. Mazzeo, E. Frontoni, S. Sclaroff, and C. Distante, Eds., Cham: Springer International Publishing, 2022, pp. 487–497, ISBN: 978-3-031-13321-3.
7. H. A. H. Chaudhry, R. Renzulli, D. Perlo, *et al.*, "Unitochest: A lung image dataset for segmentation of cancerous nodules on ct scans," in *Image Analysis and Processing – ICIAP 2022*, S. Sclaroff, C. Distante, M. Leo, G. M. Farinella, and F. Tombari, Eds., Cham: Springer International Publishing, 2022, pp. 185–196, ISBN: 978-3-031-06427-2. DOI: 10.1007/978-3-031-06427-2_16.
8. R. Renzulli and M. Grangetto, "Towards efficient capsule networks," in *2022 IEEE International Conference on Image Processing (ICIP)*, Oct. 2022, pp. 2801–2805. DOI: 10.1109/ICIP46576.2022.9897751.
9. R. Renzulli, E. Tartaglione, A. Fiandrotti, and M. Grangetto, "Capsule networks with routing annealing," in *Artificial Neural Networks and Machine Learning – ICANN 2021*, I. Farkaš, P. Masulli, S. Otte, and S. Wermter, Eds., Cham: Springer International Publishing, 2021, pp. 529–540, ISBN: 978-3-030-86362-3. DOI: 0.1007/978-3-030-86362-3_43.
10. L. Giordano, V. Gliozzi, G. L. Pozzato, and R. Renzulli, "An efficient reasoner for description logics of typicality and rational closure," in *Proceedings of the 30th International Workshop on Description Logics*, A. Artale, B. Glimm, and R. Kontchakov, Eds., ser. CEUR Workshop Proceedings, vol. 1879, CEUR-WS.org, 2017.
11. L. Giordano, V. Gliozzi, G. L. Pozzato, and R. Renzulli, "RAT-OWL: reasoning with rational closure in description logics of typicality," in *Joint Proceedings of the 18th Italian Conference on Theoretical Computer Science and the 32nd Italian Conference on Computational Logic*, D. D. Monica, A. Murano, S. Rubin, and L. Sauro, Eds., ser. CEUR Workshop Proceedings, vol. 1949, CEUR-WS.org, 2017, pp. 306–320.

Skills

Languages	• Italian (Mother tongue) and English (C1)
Coding	• Java, PHP, Python, R, SQL, XML/XSL, LaTeX, …
Frameworks	• GitHub, Docker, Kubernetes, Pandas, Numpy, Scikit-learn, Scipy, Pytorch, Tensorflow …
Databases	• MySQL, PostgreSQL, HSQL, SQLite

Skills (continued)

Web Dev
- HTML, CSS, JavaScript, Apache Web Server, Tomcat Web Server, Streamlit

Miscellaneous

Hobbies and Interests

- Gardening, Photography, Cinema, Music, Books, Hiking, Saunas and many more!

Driving Licence

- B (Cars)

Turin, April 10, 2025