Alice Plebe

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Researcher in large language models, multi-agent systems, and human-inspired autonomous driving, with a strong record of interdisciplinary collaboration, teaching innovation, and applied research. Professional experience in 3D computer graphics, including over eight years of forensic reconstruction for legal proceedings. Dedicated to advancing diversity and wellbeing in academia through mentoring initiatives and mental health advocacy.

CURRENT POSITION

Assistant Professor (RTDa) *10/2025 – present*
Department of Industrial Engineering, University of Trento, Italy

- Investigating neural networks with architectures explicitly structured according to underlying physical problem formulations, with an emphasis on interpretability, stability, and control-oriented design.
- Contributing to the FIS project "Neu4mes", exploring structured neural networks for modeling and control of autonomous systems.

PREVIOUS ACADEMIC POSITIONS

Research Fellow *05/2024 – 09/2025*
Department of Computer Science, University College London, United Kingdom

- Led research on how visual misinformation shapes reasoning in Vision–Language Models, with implications for human susceptibility to image-driven bias.
- Investigated LLM-based agent collaboration and trust mechanisms, focusing on language-guided partner selection and coordination in dynamic environments.
- Contributed to the UKRI EPSRC project "Satisficing Trust in Human-Robot Teams" (gtr.ukri.org), exploring trust-based mechanisms for collaboration applied to multi-agent teamwork in high-stakes scenarios.

Postdoctoral Researcher *11/2020 – 04/2024*
Department of Industrial Engineering, University of Trento, Italy

- Led research in human-inspired autonomous driving that integrated insights from cognitive science, neuroscience, and psychology, resulting in a comprehensive categorization of biologically inspired approaches.
- Collaborated on the development of an affordance-based driving agent and a framework for emergent human–vehicle collaboration grounded in distributed cognition.
- Contributed to the Horizon Europe project "Sunrise" (ccam-sunrise-project.eu), developing ML algorithms for Operational Design Domain analysis to support scenario-based safety assessment of autonomous vehicles.

Visiting PhD Student *02/2020 – 06/2020*
Department of Cognitive Robotics, TU Delft, the Netherlands

- Designed a cognitively inspired occupancy grid mapping algorithm based on cortical magnification, improving obstacle prediction precision in collision-critical zones.

PhD Student *11/2017 – 10/2020*
Department of Information Engineering and Computer Science, University of Trento, Italy

- Thesis: *"Cognitively guided modeling of visual perception in intelligent vehicles"*.
- Contributed to the EU Horizon 2020 project "Dreams4Cars" (`www.dreams4cars.eu`), investigating cognitively inspired deep neural networks to predict and generate novel visual scenarios in autonomous driving systems.

EDUCATION

PhD in Computer Science, Information and Communication Technology *20/04/2021*
Department of Information Engineering and Computer Science, University of Trento, Italy

Master's degree in Computer Science, 110/110 cum laude *29/11/2016*
Department of Mathematics and Computer Science, University of Catania, Italy

Bachelor's degree in Computer Science, 110/110 cum laude *25/07/2014*
Department of Mathematics and Computer Science, University of Catania, Italy

TEACHING

Workshop Lead, "Introduction to LLM-based Agents". *06/2025*
Summer Institute in Computational Social Science,
UCL Computer Science and Imperial College Business School.

- Designed and delivered a cross-disciplinary workshop for researchers in behavioral economics and social science, introducing core concepts of LLMs and their application in building agents.
- Equipped participants with practical tools and methods to apply LLM-based approaches within their own domains.

Lecturer, "Vision-Language-Action models for Robotics and Autonomous Vehicles". *2023 – 2024*
Doctoral School in Materials, Mechatronics and Systems engineering,
University of Trento, Italy.

- Proposed and secured approval for a new doctoral-level module on LLMs for perception and action in robotics, which was formally incorporated into the doctoral school curriculum.
- Designed and taught the course, combining theoretical foundations with hands-on programming to support students from diverse academic backgrounds.

Guest Lecturer, "Sensors for Intelligent vehicles and autonomous driving". *2022 – 2023*
Graduate Degree in Mechatronics engineering, University of Trento, Italy.

- Delivered a specialist module on sensor technologies and vision for autonomous driving.
- Co-developed and implemented blended assessment methods combining written exams and seminar-style presentations.

Teaching Assistant, "C++ programming for Numerical Analysis". *2021 – 2023*
Undergraduate Degree in Industrial engineering, University of Trento, Italy.

- Designed and delivered all programming exercises, translating theoretical numerical methods into practical C++ implementations.
- Reinforced conceptual understanding through applied coding tasks and one-on-one student support.

PROFESSIONAL EXPERIENCE IN 3D VISUALIZATION

Forensic Reconstructions *2014 – 2021*

- Developed 3D reconstructions of criminal events for use in court proceedings, primarily in organized crime and homicide cases.
- Created spatiotemporal reenactments by interpreting forensic evidence, supporting prosecutors in visualizing and presenting complex criminal dynamics.

Industry Visualization Projects *2015 – 2017*

- Produced a 3D visualization of a smart-home hub prototype (Morpheos S.r.l., Catania, Italy).
- Produced a 3D visualization of a homeland security system with integrated surveillance and communication features (Temix Communication Engineering S.r.l., Catania, Italy).

VOLUNTEER WORK AND PUBLIC ENGAGEMENT

Published for *The Conversation* *07/2024*

- Published *"Driverless cars still lack common sense. AI chatbot technology could be the answer"*.
- Article examined limitations of autonomous vehicle technology and argued that integrating foundation models may bridge gaps in common sense reasoning.

Volunteering and Mentorship *11/2021 – 04/2024*
Voxel Community (`github.com/voxel-community`), *Trento, Italy*

- Organized and mentored courses within a transqueer-inclusive community supporting individuals identifying as women in pursuing careers in tech.
- Empowered early-career participants (high school to bachelor's level) to enter a predominantly male-dominated field.
- Provided guidance on technical career skills and strategies for recognizing, addressing, and overcoming toxic behaviors in academic and professional contexts.

AWARDS AND CERTIFICATIONS

Best Student Paper Award *05/05/2019*
5th International Conference on Vehicle Technology and Intelligent Transport Systems.

- Awarder for the paper *"Mental Imagery for Intelligent Vehicles"* (A. Plebe et al.).

CapoCaccia Workshop for Neuromorphic Intelligence *05/2023*
Institute of Neuroinformatics, University of Zurich and ETH Zurich

- Completed a two-week workshop on neuromorphic engineering, covering biological foundations and hardware implementations.

Training on Deep Learning for Autonomous Vehicles – Perception *10/2018*
NVIDIA Deep Learning Institute, Munich, Germany

- Completed an intensive 8-hour certification course on perception for autonomous vehicles, leveraging NVIDIA architectures and platforms.

International Summer School on AI and Games *05/2018*
University of Crete, Chania, Greece

- Completed a 40-hour summer school on AI techniques for procedural content generation and player modeling in video games.

International Summer School on Deep Learning *07/2017*
University of Deusto, Bilbao, Spain

- Completed a 50-hour program covering fundamentals of deep learning and applications in computer vision, translation, and language processing.

SKILLS AND TECHNICAL TRAINING

Programming languages and Development Environments

- Python (PyTorch, TensorFlow, HuggingFace Transformers, TRL, NumPy, SciPy, Pandas, Matplotlib), C, C++, C#, Wolfram Mathematica.
- Linux/Unix systems (Bash shell, Vim), Git version control.

Computer Graphics and Game Engines

- Blender: extensive professional experience and advanced training:
  - *"Real Time Motion Graphics"* (2020) on procedural modeling, advanced animation techniques, advanced shading and lighting, and EEVEE optimization.
  - *"Character Animation"* (2016) on advanced 3D character rigging and animation techniques.
  - *"Architectural Rendering in Blender"* (2014) on advanced 3D architectural visualization techniques.
- Unity: working knowledge, gained through a bachelor-level module on game development.

Languages: Italian (native), English (proficient).

SELECTED PRESENTATIONS

Invited talk: "Trust as a collaboration mechanism in teams of language-based agents", *26/03/2025*
Financial Computing and Analytics Group seminars, UCL Computer Science [video]

Conference presentation: "Autonomous vehicles inspired by human brain and cognition", *17/07/2024*
UCL NeuroAI Annual Conference 2024 [video]

Invited talk: "Challenges and opportunities in autonomous driving", *09/11/2022*
USERN (Universal Scientific Education and Research Network) Congress

Conference presentation: "A cognitively informed perception model for driving", *08/11/2019*
Cognitive Vehicles workshop, International Conference on Intelligent Robots and Systems (IROS)

Conference presentation: "Mental imagery for intelligent vehicles", *09/06/2019*
Challenges for Autonomous Driving workshop, IEEE Intelligent Vehicles Symposium (IV)

Complete List of Publications

PREPRINTS

1. A. Plebe, T. Douglas, D. Riazi, and R. del Rio-Chanona, "I'll believe it when I see it: Images increase misinformation sharing in Vision-Language Models," *arXiv preprint arXiv:2505.13302*, 2025

JOURNALS

1. X. Dong, M. Cappuccio, H. A. Jassmi, F. Alnajjar, E. Debie, M. Ghasrikhouzani, A. Lanteri, A. Luqman, T. McGregor, O. Molloy, A. Plebe, M. Regan, and D. Zhang, "Why autonomous vehicles are not ready yet: A multi-disciplinary review of problems, attempted solutions, and future directions," *Journal of Field Robotics*, 2025
2. T. Dorigo, G. D. Brown, C. Casonato, A. Cerdà, J. Ciarrochi, M. Da Lio, N. D'Souza, N. R. Gauger, S. C. Hayes, S. G. Hofmann, R. Johansson, M. Liwicki, F. Lotte, J. J. Nieto, G. Olivato, P. Parnes, G. Perry, A. Plebe, I. M. Rao, N. Rezaei, F. Sandin, A. Ustyuzhanin, G. Vallortigara, P. Vischia, and N. Yazdanpanah, "Artificial intelligence in science and society: the vision of USERN," *IEEE Access*, vol. 13, pp. 15993–16054, 2025
3. A. Cherubini, G. P. Rosati Papini, A. Plebe, M. Piazza, and M. Da Lio, "Bootstrapped neural models for predicting self-driving vehicle collisions with quantified confidence: Offline and online applications," *IEEE Transactions on Intelligent Vehicles*, vol. [early access], 2025
4. A. Plebe, H. Svensson, S. Mahmoud, and M. Da Lio, "Human-inspired autonomous driving: A survey," *Cognitive Systems Research*, vol. 83, p. 101169, 2024
5. A. Plebe and M. Da Lio, "Bio-inspired circular latent spaces to estimate objects' rotations," *Frontiers in Computational Neuroscience*, vol. 17, 2023
6. M. Da Lio, A. Cherubini, G. P. Rosati Papini, and A. Plebe, "Complex self-driving behaviors emerging from affordance competition in layered control architectures," *Cognitive Systems Research*, vol. 79, pp. 4–14, 2023
7. A. Plebe, G. P. Rosati Papini, A. Cherubini, and M. Da Lio, "Distributed cognition for collaboration between human drivers and self-driving cars," *Frontiers in Artificial Intelligence*, vol. 5:910801, 2022
8. M. Da Lio, R. Donà, G. P. Rosati Papini, and A. Plebe, "The biasing of action selection produces emergent human-robot interactions in autonomous driving," *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 1254–1261, 2022
9. G. P. Rosati Papini, A. Plebe, M. Da Lio, and R. Donà, "A reinforcement learning approach for enacting cautious behaviours in autonomous driving system: Safe speed choice in the interaction with distracted pedestrians," *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 7, p. 8805 – 8822, 2021
10. A. Plebe and M. Da Lio, "On the road with 16 neurons: Towards interpretable and manipulable latent representations for visual predictions in driving scenarios," *IEEE Access*, vol. 8, pp. 179716–179734, 2020
11. A. Plebe, M. Da Lio, and D. Bortoluzzi, "On reliable neural network sensorimotor control in autonomous vehicles," *IEEE Transactions on Intelligent Transportation Systems*, vol. 21, pp. 711–722, 2020
12. A. Plebe and G. Grasso, "Conceptual integrity without concepts," *International Journal of Software Engineering and Knowledge Engineering*, vol. 28, no. 7, pp. 955–981, 2018

CONFERENCES, WORKSHOPS, BOOK CHAPTERS

1. A. Cherubini, G. P. Rosati Papini, A. Plebe, A. Giugliano, M. Muro, and M. Da Lio, "A subsumption scheme for emergent collaboration of self-driving vehicles in intersections," in *Proceedings of the 17th IFAC Symposium on Control of Transportation Systems (CTS)*, vol. 58, pp. 43–47, Elsevier, 2024
2. A. Cherubini, G. P. Rosati Papini, A. Plebe, and M. Da Lio, "Energy costs of safe speed policies in a pedestrian-crossing scenario," in *Proceedings of the 35th IEEE Intelligent Vehicles Symposium (IV)*, pp. 1–6, IEEE, 2023
3. E. Pagot, M. Piccinini, A. Plebe, E. Bertolazzi, and F. Biral, "Real-time autonomous parking in unstructured scenarios with an indirect optimal control approach," in *Workshop at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022
4. S. Mahmoud and A. Plebe, "A critical look into cognitively-inspired artificial intelligence," in *8th International Workshop on Artificial Intelligence and Cognition (AIC)*, 2022
5. A. Plebe, J. F. Kooij, G. P. Rosati Papini, and M. Da Lio, "Occupancy grid mapping with cognitive plausibility for autonomous driving applications," in *Proceedings of the IEEE/CVF International Conference on Computer Vision Workshops (ICCVW))*, pp. 2934–2941, 2021
6. A. Plebe and M. Da Lio, "Neurocognitive-inspired approach for visual perception in autonomous driving," in *Smart Cities, Green Technologies and Intelligent Transport Systems*, pp. 113–134, Cham: Springer International Publishing, 2021
7. A. Plebe and M. Da Lio, "Visual perception for autonomous driving inspired by convergence–divergence zones," in *Proceedings of the 11th International Symposium on Image and Signal Processing and Analysis (ISPA)*, pp. 204–208, IEEE, 2019
8. A. Plebe and M. Da Lio, "Variational autoencoder inspired by brain's convergence-divergence zones for autonomous driving application," in *Proceedings of the 20th International Conference on Image Analysis and Processing (ICIAP)*, vol. 11751 of *Lecture Notes in Computer Science*, pp. 367–377, Springer, Cham, 2019
9. A. Plebe, R. Donà, G. P. Rosati Papini, and M. Da Lio, "Mental imagery for intelligent vehicles," in *Proceedings of the 5th International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS)*, pp. 43–51, Science and Technology Publications, 2019
10. A. Plebe, G. P. Rosati Papini, R. Donà, and M. Da Lio, "Dreaming mechanism for training bio-inspired driving agents," in *Proceedings of the 2nd International Conference on Intelligent Human Systems Integration (IHSI)*, pp. 429–434, Springer, Cham, 2019
11. A. Plebe, V. Cutello, and M. Pavone, "Optimizing costs and quality of interior lighting by genetic algorithm," in *Computational Intelligence: 9th International Joint Conference, IJCCI 2017 Funchal-Madeira, Portugal, November 1-3, 2017 Revised Selected Papers*, pp. 19–39, Cham: Springer International Publishing, 2019
12. M. Da Lio, A. Plebe, D. Bortoluzzi, G. P. Rosati Papini, and R. Donà, "Autonomous vehicle architecture inspired by the neurocognition of human driving," in *Proceedings of the 4th International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS)*, pp. 507–513, Science and Technology Publications, 2018
13. A. Plebe, V. Cutello, and M. Pavone, "Evolving illumination design following genetic strategies," in *Proceedings of the 9th International Joint Conference on Computational Intelligence (IJCCI)*, pp. 289–296, Science and Technology Publications, 2017
14. A. Plebe and M. Pavone, "Multi-objective genetic algorithm for interior lighting design," in *Proceedings of the 3rd International Workshop on Machine learning, Optimization, and Big Data (MOD)*, vol. 10710 of *Lecture Notes in Computer Science*, pp. 222–233, Springer, Cham, 2017
15. A. Plebe and G. Grasso, "Particle physics and polyedra proximity calculation for hazard simulations in large-scale industrial plants," in *Proceedings of the 12th International Conference of Computational Methods in Sciences and Engineering (ICCMSE)*, pp. 090003–1–090003–4, American Institute of Physics Publishing, 2016