Alice Plebe

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E-mail: alice.plebe@gmail.com
Website: www.aliceplebe.com
Pronouns: She/Her
ORCID: 0000-0001-8567-0553

I am a researcher in artificial intelligence and large language models, with a focus on cognitively informed neural architectures. My work investigates how cognitive theories can guide the structural design of artificial neural networks, and how human-like characteristics such as trust, collaboration, and susceptibility to misinformation emerge in the linguistic and decision-making behavior of large language models. I have a strong record of interdisciplinary collaboration and teaching experience, and I am committed to advancing diversity and wellbeing in academia through mentoring and advocacy initiatives. I also have professional experience in 3D computer graphics, including over eight years of forensic reconstruction for legal proceedings.

CURRENT POSITION

Junior Assistant Professor (RTD-A) *10/2025 – present*
Department of Industrial Engineering, University of Trento, Italy

- Investigating artificial neural networks with modular and interpretable architectures, whose structure is explicitly informed by underlying physical principles and problem formulations.
- Contributing to the FIS project "Neu4mes", exploring structured neural networks for modeling and control of autonomous systems.

PREVIOUS ACADEMIC POSITIONS

Senior Postdoctoral Researcher (Research Fellow) *05/2024 – 09/2025*
Department of Computer Science, University College London, United Kingdom

- Led a research group demonstrating that vision–language models exhibit the same susceptibility to image-driven misinformation observed in humans, and analyzing how visual input and persona conditioning influence linguistic reasoning.
- Investigated the expression of linguistic trust and belief formation about others' trustworthiness in teams of LLM-based agents, including the existence of a dispositional propensity to trust and the presence of stable internal representations of trust within model hidden layers.
- 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 a systematic survey and critical classification of human-inspired approaches to autonomous driving, reviewing models grounded in cognitive science, neuroscience, and psychology, and organizing the field according to underlying cognitive principles.
- Investigated a framework for human–autonomous system collaboration based on a distributed cognition paradigm, implementing shared affordance-based representations to support coordinated decision-making between human drivers and autonomous agents.
- Contributed to the Horizon Europe project "Sunrise" (ccam-sunrise-project.eu), developing machine learning methods for Operational Design Domain analysis and scenario-based safety assessment in autonomous systems.

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

- Developed a neuroscience–inspired occupancy grid mapping algorithm grounded in cortical magnification, incorporating non-uniform representational allocation across the visual field and improving obstacle prediction accuracy in safety-critical regions.

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

- Conducted research on cognitively inspired neural architectures for visual mental imagery, supporting prediction and generation of novel visual scenarios in complex environments.
- Contributed to the EU Horizon 2020 project "Dreams4Cars" (`www.dreams4cars.eu`), exploring dream-like learning mechanisms in artificial agents, where simulated and imagined experiences were used to support learning in scenarios not yet encountered in the real world.

EDUCATION

PhD in Information and Communication Technology *20/04/2021*
Department of Information Engineering and Computer Science, University of Trento, Italy
Thesis: "Cognitively guided modeling of visual perception in intelligent vehicles".

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

AWARDS

Best Student Paper Award *05/05/2019*
5th International Conference on Vehicle Technology and Intelligent Transport Systems.
For the paper "Mental Imagery for Intelligent Vehicles" (A. Plebe et al.).

TEACHING

Lecturer, "Artificial Intelligence for Industrial Systems". *2025 – 2026*
Undergraduate Degree in Industrial engineering, University of Trento, Italy.

- Course on artificial neural networks and AI methods for students with an engineering background.

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

- Introductory workshop on LLMs and agent-based applications for interdisciplinary researchers.

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

- Doctoral-level teaching on vision–language models and LLM-based architectures for perception and action.

Guest Lecturer, "Sensors for Intelligent Vehicles and Autonomous Driving". *2022 – 2023*
Graduate Degree in Mechatronics engineering, University of Trento, Italy.

- Specialist lectures on sensing and perception systems for autonomous platforms.

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

PUBLIC ENGAGEMENT AND VOLUNTEER WORK

Published for *The Conversation* *07/2024*

- Authored a public-facing article on the potential role of foundation models in supporting common-sense reasoning in autonomous vehicle technology [link].

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

- Organized mentoring and educational activities supporting individuals identifying as women in pursuing careers in technology, with a focus on inclusivity and wellbeing in academic and professional environments.

CERTIFICATIONS AND TRAINING

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 program 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.

PROFESSIONAL EXPERIENCE IN 3D VISUALIZATION

Forensic Reconstructions *2014 – 2021*

- Commissioned development of high-fidelity 3D reconstructions of crime scenes and incident dynamics, supporting analysis and communication in forensic and legal contexts.

Industry Visualization Projects *2015 – 2017*

- Commissioned development of 3D visualization and prototyping for industrial and technology products, supporting design communication and technical showcasing.

TECHNICAL SKILLS

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:
- Unity: working knowledge, gained through a bachelor-level module on game development.

Languages:

- Italian (native).
- English: near-native proficiency (C2).

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