

# Olaya Álvarez Tuñón, Ph.D.

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## About

📖 I am a Computer Vision and Deep Learning Engineer with extensive expertise in visual odometry and VSLAM (Visual Simultaneous Localization and Mapping). My primary research areas are machine learning and computer vision within the robotics field, focusing on the development and implementation of visual SLAM algorithms.

**As a professional in computer vision and machine learning**, my research objectives include designing optimal architectures grounded in a geometric understanding of deep learning models.

**As a roboticist**, I possess hands-on experience with both hardware and software. My hardware experience encompasses the design and maintenance of robotic systems, while my software experience includes implementing state-of-the-art algorithms in robots, utilizing operating systems such as ROS (1 and 2), and libraries like behavior trees.

**As a person**, I am self-motivated, proactive, and determined. When presented with a problem, I design a clear set of goals to achieve a solution. While I am highly independent, I am always eager to collaborate with and learn from others. I am results-driven, striving to complete tasks efficiently in both my professional and personal life, which also fuels my commitment to volunteering.

I believe knowledge is only valuable when it can be understood and applied by others. Therefore, I am passionate about participating in science dissemination activities and documenting my software projects with clarity. This passion extends to my writing experience, which includes drafting funding proposals.

## Employment History

2024 – now

📖 **Robotics & AI developer, Postdoc** ITU Copenhagen & EIVA A/S.

IFD Project: *Deep visual odometry for underwater intervention drones (DeepODO)*.

Development of a deep-learning-based visual SLAM system to enable autonomous underwater robot localization. Focused on training neural networks for accurate, real-time camera-based navigation, overcoming unique underwater vision challenges to improve reliability and precision over existing methods.

2021 – 2024

📖 **Marie Curie PhD fellow**, Aarhus University & EIVA A/S.

EU Project: *Reliable AI for Marine Robotics (REMARO)*.

Teaching: Autonomous Mobile Robots, Deep Learning, Control Systems.

Research stays:

OceanScan-MST: design of behavior trees for AUV mission planning.

DFKI: Implement and test visual SLAM in the testbed with Qualisys ground truth control.

2015 – 2020

📖 **Research technician**. RoboticsLab, University Carlos III Madrid.

EU Project: *Long Term Stability Assessment and Monitoring of Flooded Shafts (STAMS)*.

Teaching: Industrial Automation, Industrial Robotics.

## Employment History (continued)

- 2013 – 2014    **Research technician.** R&D Arcelor-Mittal center in Avilés.  
Project: *Computer Vision for Automated Defect and Dust Detection on Rolled Steel Plates.*

## Education

- 2021 – 2024    **Ph.D., Aarhus University** Marie Curie Scholarship at ETN project REMARO.  
Thesis title: *Visual-based navigation for underwater-safety critical applications.*
- 2018 – 2019    **M.Sc. Robotics and Automation** in University Carlos III Madrid.  
Thesis title: *Visual Localization of an Underwater Robot in Flooded Mine Shafts.*
- 2011 – 2015    **B.Sc. Electronics and Automation Engineering** in University of Oviedo.  
Thesis title: *Visual Odometry for quadcopters.*

## Research Publications

### Journal Articles



- 1 O. Álvarez-Tuñón, Y. Brodskiy, and E. Kayacan, “Monocular visual simultaneous localization and mapping:(r) evolution from geometry to deep learning-based pipelines,” *IEEE Transactions on Artificial Intelligence*, 2023.
- 2 O. Álvarez-Tuñón, A. Jardón, and C. Balaguer, “Generation and processing of simulated underwater images for infrastructure visual inspection with uavs,” *Sensors*, vol. 19, no. 24, p. 5497, 2019.

### Conference Proceedings

- 1 O. Álvarez-Tuñón, L. R. Marnet, L. Antal, M. Aubard, M. Costa, and Y. Brodskiy, “Subpipe: A submarine pipeline inspection dataset for segmentation and visual-inertial localization,” in *2024 Oceans Conference*, IEEE, 2024.
- 2 M. Aubard, S. Quijano, O. Álvarez-Tuñón, L. Antal, M. Costa, and Y. Brodskiy, “Mission planning and safety assessment for pipeline inspection using autonomous underwater vehicles: A framework based on behavior trees,” in *2024 Oceans Conference*, IEEE, 2024.
- 3 O. Alvarez-Tunon, Y. Brodskiy, and E. Kayacan, “Loss it right: Euclidean and riemannian metrics in learning-based visual odometry,” in *ISR Europe 2023; 56th International Symposium on Robotics*, VDE, 2023, pp. 107–111.
- 4 O. Álvarez-Tuñón, H. Kanner, L. R. Marnet, *et al.*, “Mimir-uw: A multipurpose synthetic dataset for underwater navigation and inspection,” in *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2023, pp. 6141–6148.
- 5 A. Amer, O. Álvarez-Tuñón, H. Í. Ugurlu, J. L. F. Sejersen, Y. Brodskiy, and E. Kayacan, “Unav-sim: A visually realistic underwater robotics simulator and synthetic data-generation framework,” in *2023 21st International Conference on Advanced Robotics (ICAR)*, IEEE, 2023, pp. 570–576.
- 6 O. Álvarez-Tuñón, Á. Rodríguez, A. Jardón, and C. Balaguer, “Underwater robot navigation for maintenance and inspection of flooded mine shafts,” in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2018, pp. 1482–1487.





## Awards

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- 2021  **Robotics Institute, University of Technology Sydney** Virtual School on SLAM in Deformable Environments. Third prize.
-  **PAL Robotics** IROS-RSJ Robotic Challenge for Young Students. Second prize.

## Skills


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- Languages  Strong reading, writing, and speaking competencies in English and Spanish.
- Coding  Python, C++,  $\LaTeX$ .
- Tools  Pytorch, OpenCV, Behavior trees, ROS (1 and 2), ArduPilot, Unreal Engine, Inkscape.
- Misc.  Academic research, writing project proposals, science dissemination, teaching, consultation, graphic design.




## Miscellaneous Experience

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### Certification

- 2020  **Certified Deep Learning Specialization**. Awarded by Coursera.

### Volunteering

- 2021-now  **Spanish Scientists in Denmark (CED)**, Secretary and Aarhus delegate.
- 2023  **Pint of Science Denmark**, organized and speaker, with the talk "*AI and the philosophy of seeing: what would Aristotle think about today's AI?*".
- 2021 – 2024  **Aarhus University PhD Association (AUPA)**, Social activity organizer.

## References

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Available on Request.