PhD title: Data-driven safe worker-collaborative robot navigation

Host laboratory: Connaissance et Intelligence Artificielle Distribuées (CIAD) – http://www.ciad-lab.fr, Computer Science and Systems Engineering Laboratory (U2IS) – http://u2is.ensta-paris.fr/

Speciality of PhD: Computer Science

Keywords: Mobile robotics, robot perception and learning, human-aware robot navigation, long-term robot autonomy

Research background and motivation: This PhD study is part of the JCJC (*Programme Jeunes Chercheuses et Jeunes Chercheurs*) project NavWare (yzrobot.github.io/navware/) funded by the French National Research Agency (ANR). The project is interested in exploring human-robot interaction using deep learning methods with contemporary characteristics, and aims to advance existing automated intralogistics from AGV (Automated Guided Vehicle) -based solutions to AMR (Autonomous Mobile Robot) -based ones, allowing mobile robots to truly work alongside human workers.

Methodology and research objectives: We propose to use data-driven methods to intervene in the AMR's navigation layers for fast and reliable local obstacle avoidance and unspecified global path planning, and ultimately generate safe worker-collaborative robot navigation. The new approach to be developed should make the deployment and maintenance of AMRs in intralogistics less costly and the system performance better compared to existing methods.

What we can offer: The doctoral scholarship offers the opportunity to engage in national and international collaboration within an ambitious team, to work with state-of-the-art robotic hardware and software, and to benefit from excellent support to produce and disseminate original research contributions in the leading international conferences and journals.

Related work:

[1] Zhi Yan, Li Sun, Tomas Krajnik, Tom Duckett, and Nicola Bellotto. **Towards long-term autonomy: A perspective from robot learning**. In *Proceedings of the AAAI-23 Bridge Program on AI and Robotics*, Washington, USA, February 2023.

[2] Zhi Yan*, Simon Schreiberhuber*, Georg Halmetschlager, Tom Duckett, Markus Vincze, and Nicola Bellotto. **Robot perception of static and dynamic objects with an autonomous floor scrubber**. *Intelligent Service Robotics*, 13(3):403-417, June 2020, Best Paper Award.

[3] Zhi Yan, Tom Duckett, and Nicola Bellotto. **Online learning for 3D LiDAR-based human detection: Experimental analysis of point cloud clustering and classification methods**. *Autonomous Robots*, 44(2):147-164, August 2019.

[4] Di Yang, Yaohui Wang, Quan Kong, Antitza Dantcheva, Lorenzo Garattoni, Gianpiero Francesca, François Bremond. **Self-Supervised Video Representation Learning via Latent Time Navigation**. *arXiv preprint:2305.06437*, 2023.

[5] Hao Chen, Yaohui Wang, Benoit Lagadec, Antitza Dantcheva, François Bremond. **Learning invariance from generated variance for unsupervised person re-identification**.

Candidate Profile:

- Master degree in robotics, machine learning, computer vision, computer science, applied mathematics or other related fields.

- Good mathematical and coding skills (C++, Python).

- Fluent English writing and communication skills.

- Hands-on experience with ROS or ROS2 is a plus.

Finance Institution: *Agence nationale de la recherche (ANR)*

Application deadline: Until the right candidate is found

Start of contract: ASAP

Duration: 36 months

How to apply: Please email a single pdf to the supervisors indicated below, which contains: a CV, a motivation letter, transcripts, diplomas, and letters of recommendation (if any).

Supervisors: Dr. Zhi Yan <zhi.yan@ensta-paris.fr>, Dr. François Brémond <francois.bremond@inria.fr>