



PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 39th cycle

PARTENARIATO PNRR Research Field: ADVANCED LOCALIZATION TECHNIQUES FOR AUTONOMOUS DRIVING

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Autonomous driving promises to revolutionize transportation, enhance road safety, and improve overall efficiency. At the heart of this technology lies the crucial aspect of self-localization, which plays a pivotal role in the development and success of autonomous vehicles. Self-localization, or the ability of a vehicle to accurately determine its position and orientation in real-time, is essential for autonomous driving to navigate complex road networks and make informed decisions. By precisely knowing its location, an autonomous vehicle can safely interact with its surroundings, anticipate obstacles, and plan optimal routes, thereby minimizing the risk of accidents and improving traffic flow. By precisely knowing its location, an autonomous vehicle can safely interact with its surroundings, anticipate obstacles, and plan optimal routes, thereby minimizing the risk of accidents and improving traffic flow. The importance of self-localization becomes evident when considering the intricate challenges faced by autonomous vehicles. From changing weather conditions to dynamic urban environments, self-localization ensures that vehicles can adapt and respond accordingly, making real-time adjustments to their trajectories. Furthermore, the development of self-localization technology requires advanced sensor systems, such as GPS, LiDAR, radar, and cameras, working in synergy. These sensors provide rich data inputs that, when processed and fused together, enable the vehicle's perception of its



	<p>surroundings. However, sensors can fail or provide degraded performance. In order to tackle this problem, the development of an innovative solution that can take into account multiple sensors failure or degraded performance in the state estimation will be investigated. In detail, the capability of the system itself of detecting failures or performance degradation by means of model-based or deep learning approaches will be studied and compared. Moreover, the possibility of relying on X2V communication to incorporate sensor data provided by other agents in the estimation process in order to increase accuracy (cooperative localization) and robustness (by means of a distributed set of sensors) will be considered. The research activity is financed within the Sustainable Mobility Center (<i>Centro Nazionale per la Mobilità Sostenibile - CN MS</i>), Spoke 6 (Connected and autonomous vehicle - <i>Guida autonoma e veicolo connesso</i>) CN00000023, as part of the National Plan for Recovery and Resilience (PNRR, M4 C2 Dalla ricerca all'impresa, Investimento 1.4), finanziato dall'Unione Europea - Next GenerationEU.</p> <p>Norms of reference:</p> <p>CUP D43C22001180001 - D.D. 1033 del 17/06/2022</p> <p>D. D. 3138 del 16/12/2021 rettificato con D.D. 3175 del 18/12/2021</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research will be performed by using both simulated and real dataset to design algorithms. Vehicle prototypes will be equipped with multiple sensors including cameras, lidars, IMU, GNSS and others in order to experimentally verify algorithm performance.</p>
<p>Educational objectives</p>	<p>The PhD student will gain an interdisciplinary knowledge of technologies and processes related to autonomous vehicles: from vehicle dynamics, to control in presence of significant delays, and to communication protocols.</p>
<p>Job opportunities</p>	<p>Skills and competences in the field are extremely interesting for all the companies involved in automotive</p>



	<p>industry.</p> <p>Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary compared to Master of Science holders in the same field.</p>
Composition of the research group	<p>1 Full Professors 0 Associated Professors 1 Assistant Professors 0 PhD Students</p>
Name of the research directors	<p>Prof. Francesco Braghin, Eng. Stefano Arrigoni</p>

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of euro 5.707,13.</p> <p>Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 700 euro/month - net amount).</p> <p>Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p>