

HOW TO DO A THESIS IN THE SECOND SEMESTER 2023

(FROM FEBRUARY/MARCH 2023 ON...)

DECEMBER 12, 2022

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HOW TO FIND A THESIS...

1. ASK A PROFESSOR
 2. FIND YOURSELF (THEN YOU MUST SEARCH FOR A POLITO TUTOR)
- NO DIFFERENCES BETWEEN ITALIAN OR ABROAD THESIS
 - NO DIFFERENCES BETWEEN INDUSTRIAL OR RESEARCH THESIS
 - YOU MUST DO THE THESIS (30CFU): INTERNSHIP IS AN OPTION (18+12)

AFTER THE THESIS...

- RESEARCH FELLOW
- PhD
- HIRED BY A COMPANY



6 months work
period (min)



Exams free
(possibly)



50% in the
company
+
50% @ PoliTO



Can be
configured as
30 or 18 + 12
credits



Experimental
(hard!!) work:
**no tyre
kickers,**
please... 😊



Possible direct
access to the
company
after thesis

COMMON CHARACTERISTICS

AVAILABLE THESIS 2023

WHERE?



@ PIC4SeR Centre for
Service Robotics

@ LIM MECHATRONICS LAB

HOW TO APPLY

- **LIM** THROUGH THE POLITO THESIS WEB SITE
- **PIC4SeR** THROUGH THE PIC4SeR APPLY PAGE
[HTTPS://PIC4SER.POLITO.IT/OPEN-POSITIONS/MASTER-THESIS/](https://pic4ser.polito.it/open-positions/master-thesis/)

THESIS PUBLISHED: 16/01/2023

APPLY DEADLINE: 31/01/2023

INTERVIEWS: MID FEBRUARY 2023

THESIS KICK-OFF: END FEBRUARY/MARCH 2023



Systems 4 Local Positioning & Navigation

Autonomous indoor/outdoor navigation systems using sensors & visual odometry



AI / ML 4 perception & control

AI / ML methodologies, algorithms and HW for positioning, navigation, obstacle detection



Data Processing

HW / SW architectures & systems (embedded, cloud, real-time, pre/post processing, ...) for data processing and data extraction

PIC4SeR

WWW.PIC4SER.POLITO.IT

Centre for Service Robotics

PIC4SER PROPOSALS

1	Sensor fusion as a solution to the Kidnapped Robot Problem	Ostuni, Eirale, Ambrosio, Boretti	C++, Python, ROS2, Statistics	In robotics, the kidnapped robot problem is the situation where an autonomous robot in operation is carried to an arbitrary location. It is currently one of the most difficult and unsolved problems in the robotics field. This thesis project aims to develop a system able to relocalize the robot by exploiting several sensors (cameras, LiDAR, IMUs, Encoders, etc.) and techniques (traditional methods and learning-based) to solve the kidnapped robot problem.
2	Complex environment exploration	Eirale, Boretti, Martini	C++/Python, ROS2	In order for the robotic platform to properly operate, the knowledge of the working environment is a fundamental aspect. Often this information is not previously provided and could be difficult or dangerous to retrieve. This thesis aims to develop a policy-based agent to fully explore a complex, unknown environment.
3	Edge Novelty Recognition	Albertin, Dara	C, Python	Novelty recognition is a "parallel branch" of predictive maintenance that recognizes novelties from the trained data. It can be useful when no historical data about failures is collected (e.g., a new machine). The thesis concerns the study and development of a novelty detection algorithm to be deployed in an embedded device for predictive maintenance purposes.
4	Terrain Traversability Analysis for (Planetary Exploration) Rovers	Franchini, Messina	C++/Python, ROS2	Traversability is the capability of a UGV to reside over a terrain region under an admissible state wherein the vehicle can enter, given its current state. This thesis aims to develop methods to derive terrain semantics and characteristics which are useful for rover navigation and resource prospecting (soil strength, slip detection, wheel forces). These methods will rely on onboard sensors and be used to compute cost maps, in order to enable effective planning.
5	Deep Computer Vision for Social Robotics	Angarano, Martini, Eirale, Boretti	Python, Deep Learning, Linear Algebra	Human-Robot Interaction (HRI) is a fundamental component of intelligent robots for well-being which aims to live beside us in the society. However, the nature of HRI can be different according to the context and the human behaviour. This thesis aims at investigating Deep Learning based robotic perception methods for extracting environmental features, in order to build a semantic representation of the human condition (available to interact/busy) and predict the best way of interacting with him/her (visually, talking, physically).
6	Navigation and Obstacle Avoidance in Vineyards	Martini, Mazzara, Ostuni	Python, Deep Learning, ROS2	Low-cost position-agnostic navigation is the solution to GPS-denied conditions in outdoor precision agriculture applications. The two main tasks of a mobile robot in vineyard rows are following the plant rows and avoiding obstacles (boxes, people, etc.) on its trajectory. Multi-class semantic segmentation and multi-objective control strategy can be combined to control the robot's motion and obtain the resulting final behavior. This thesis aims to improve existing visual-based navigation for vineyard rows.

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COLLABORATIONS
(ALWAYS CHANGING)



IIT Genova: Rehab Technologies
innovative high-tech solutions for
patients with physical impairment



**Intesa SanPaolo Innovation
Center:** indoor robotics for
sanitizing activities and
related tasks & technologies



REPLY: use of AUV/UGV for
automatic management of
large warehouses



EPF Automation: agricultural
robotics, AI/ML in agriculture,
automation systems

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COLLABORATIONS
(ALWAYS CHANGING)



ARGOTEC: micro and nano satellites, AI/ML for space applications

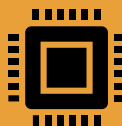


**THALES
ALENIA
SPACE:**

Cooperative robotics
for space exploration
& human support
Machine learning for
data and image
analysis



AIKO: AI/ML based image processing
tools and algorithms for space

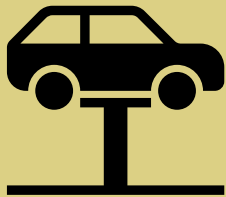


SPEA (www.spea.com): AI/ML based
embedded framework for predictive
maintenance



MAGNETI MARELLI:

exhaust energy
recovery system, high
frequency GaN, DSP
board design



AMET (www.amet.it):

embedded electronic
systems for automotive
testing

LIM

WWW.LIM.POLITO.IT

INTERDEPARTMENTAL
MECHATRONICS
LAB



AVL
(Graz,
Austria)

Automotive
systems and
components



ETEL
(Switzerland)

Control systems,
damping
systems,
Motors

EXTRA-IT

THANKS

