Panagiotis Liampas

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Education

Massachusetts Institute of Technology, Cambridge, MA — May 2028
Candidate for Bachelor of Science in Electrical Engineering with Computing
GPA: N/A
Relevant Coursework: Robotics: Science and Systems, Introduction to Machine Learning, Linear Algebra, Introduction to Computer Science Programming in Python, Mathematics for Computer Science

Mandoulides High School, Thessaloniki Greece — May 2023
High School Diploma
SAT: 1550, GPA: 19.8/20.0

Work Experience

Epsilon Orosimo Software, Thessaloniki, Greece — September 2023 - October 2023
Junior Software Developer

- Converted and developed custom extension modules for the **Pylon ERP software, using C#**, from another software, enhancing the capabilities and integrating custom operations with regards to the **UI, logic and backend**.

Alpha Systems, Thessaloniki, Greece — August 2022 - October 2022
Embedded Systems Intern

- Implemented an **IoT weather station**, which is connected using LoRaWAN to the **TTN Network and the Tago.io platform** and presents the data in a dashboard.
- **Cooperated with the Nokia technical team** to integrate it with the **Nokia IOC platform.**

Research Experience

MIT Laboratory for Atomistic and Molecular Mechanics, Cambridge, MA — February 2025 – May 2025
Undergraduate Research Opportunity

- Working on a new bio-inspired generative design framework, synthesizing the emergent dynamics of spacetime-inhomogeneous cellular automata, with the precision of finite element analysis using FEniCS, and the pattern-finding capabilities of transformer neural network (TNN) models, to be able to explore a larger geometric configuration space to further optimize the mechanical properties of architected materials.

BlueDot Impact AI Safety Fundamentals Alignment Course, Remote — May 2024 – June 2024
Independent Research — Certificate, GitHub, Article Part 1, Article Part 2

- Conducted a review of various state-of-the-art **Distributional Reinforcement Learning** methods, as well as **risk measures** that can be integrated into the optimization operators of **Q-Learning**, using knowledge of the **distribution of the possible rewards** at a specific state of the agent.
- Evaluated their **effectiveness in decreasing the risk and ensuring the safety of self-driving** cars at worst-case scenarios, by **training a Machine Learning model** in a **simulated highway environment** and capturing the results.

Non-Trivial Fellowship, Remote — July 2023 - October 2023
Independent Research — Preprint

- Invented "Risk-averse Batch Active Inverse Reward Design", an approach improving upon "Active Inverse Reward Design" in terms of **safety and robustness of AI models** and **reducing uncertain, potentially dangerous behaviors** after deployment, using **Reinforcement Learning from Human Feedback**. Specifically, I implemented a process that finds the intended reward

function by asking queries to the human, and repeating that process on real-world data, allowing its adaptability to new environments and improving its efficiency. It also takes the actions that are the most certain, increasing the safety and control over the process.

Dr. Kevrekidis (Johns Hopkins), Remote — July 2023 - October 2023
Research Collaborator — GitHub

- **Trained a Neural Network** (using TensorFlow) to **predict the behavior** of the Reduced MSP Model, from the **dynamical system** described in the paper: "On the parameter combinations that matter and on those that do not", based on data derived from time integration of the system with various parameters and start states using the Runge-Kutta method.

Dr. Koumoutsakos (Harvard), Remote — August 2023 - October 2023
Research Collaborator — GitHub

- Implemented a **simulated environment for Braitenberg vehicles**, to examine their interactions with each other, sources of various types, and certain "constrained" areas where the vehicles cannot be in.

Awards & Accomplishments

Greek Mathematics Team
Silver Medal (1 place from Gold), International Mathematical Olympiad**,** Chiba, Japan — July 2023
Silver Medal, International Mathematical Olympiad, Oslo, Norway — July 2022
Silver Medal (1 place from Gold), Balkan Mathematical Olympiad, Antalya, Turkey — July 2022
Silver Medal, Balkan Mathematical Olympiad, Agros, Cyprus — July 2022
Greek Astronomy Team
Bronze Medal, International Olympiad in Astronomy and Astrophysics, remote — November 2021
Greek Informatics Team
Bronze Medal, Balkan Olympiad in Informatics, Maribor, Slovenia — October 2023
Participation, International Olympiad in Informatics — 2021, 2022, 2023
Honorable Mention (2 places from Bronze), Balkan Olympiad in Informatics, remote — October 2023
Non-Trivial Fellowship — July 2023 – September 2023
Third Prize (4th – 8th place), for designing "Risk-Averse Batch Active Inverse Reward Design"

Activities & Extracurriculars

MIT Arcturus Autonomous Robotics, Autonomy subteam — September 2024 – present

- Implemented a ROS node that computes a sequence of buoy pairs, as well as a preferrable region (center & radius) in between them, that the autonomous boat should go through to follow a specific path, based on an obstacle map that's provided as an input.
- Improved the fusion of LiDAR and Camera data in the autonomous catamaran, using PCL and OpenCV, so that the resulting point clouds and image segments best depict the detected objects, increasing the accuracy and robustness of the perception system of the robot on detecting buoys on the water.
- Implemented an Extended Kalman Filter based Simultaneous Localization And Mapping (SLAM) algorithm that uses the refined distance, angle, and color detections of the buoys and the GPS-based position and IMU-calculated orientation of the robot, to create an accurate map of the buoys' positions and capture the uncertainty of those predictions, increasing their accuracy over time.

Personal Projects

SLAM Bot — November 2023 - February 2024
Individual project — Article, GitHub

- Engineered a **3D printed robot**, including its chassis, moving mechanisms, and electronics, that uses the **Robot Operating System (ROS 2)** and **Simultaneous Localization and Mapping (SLAM)** algorithms to **map, locate itself, and navigate around an unknown area**.

Rover Hand December 2022 - February 2023
Individual project GitHub

- Programmed an autonomous robot that can **detect objects, track, and catch them** with its **robotic hand**, using **computer vision and machine learning**.

Parking Detection August 2022 - January 2023
Individual project GitHub, Municipality Website

- Implemented a system which uses machine learning to automatically **detect empty parking lots and highlight them on a website**, which was given for **use by the municipality and the local community** to solve the problem of the difficulty finding parking spaces.

Plant Watering July 2022 – November 2022
Individual project GitHub

- A system that **measures the humidity of the soil under some plants** and **sends the data to a website** to be used to **determine the amount of irrigation needed**.

Rover Sensors July 2018 – August 2019
Individual project GitHub

- Implemented a **remotely controlled prototype of a rover** with **integrated sensors** that can potentially be used to determine the habitability of a planet and **show the data, the results and the rover's route in a website, an android app and a windows app**.

Programs/Courses

The Knowledge Society Global Innovate, Remote September 2023 – June 2024
Completion

- Studied a broad range of areas and recent developments in various fields.
- Acquired a comprehensive understanding of the methods used to solve global problems, from examining their root causes to refining a concrete idea and plan for their mitigation, and applied them in internal challenges and hackathons.
- Conducted a review wrote an article about the fundamentals of Simultaneous Localization And Planning. Article
- Built a robot that applies the knowledge I acquired from studying the field of autonomous navigation.
- Conducted a review and wrote an article about state-of-the-art methods of LiDAR-Camera fusion, their characteristics and their limitations. Article

Hellenic Institute of Advanced Studies AI Summer School 2024, July 2024
NCSR Demokritos, Athens
Attendance

- Gained a comprehensive understanding of the fundamentals and state-of-the-art methods of Machine Learning, as well as their applications in a wide range of areas and ethical implications.

MITx's Circuits and Electronics XSeries Program, Remote July 2024
Circuits and Electronics 1: Basic Circuit Analysis
Circuits and Electronics 2: Amplification, Speed, and Delay Certificate

- Gained a comprehensive understanding of fundamental circuit concepts, analysis techniques, design methods, and applications in various real-world devices, acquiring the tools to be able to apply those in diverse situations and use cases.

Online Publications

A review of LiDAR-Camera fusion for robust perception in complex environments July 2024
Medium Article

- Examining how Autonomous Mobile Robots navigate in unstructured environments, using multiple sensors to improve robustness and accuracy and mitigate collisions and false positives.

Risk-Sensitive Reinforcement Learning with Applications in Autonomous Driving June 2024
Medium Part 1, Part 2

- An exploration of how Distributional Reinforcement Learning and appropriate risk measures can be used to improve safety, evaluated in a simple highway environment.

Building a 3D-printed robot that uses SLAM for autonomous navigation January 2024
Medium Article

- A thorough step-by-step writeup of the design and building process of a 3D-printed autonomous robot that uses Jetson Nano, Arduino, and the Nav2 package in Robot Operating System (ROS) 2.

Using SLAM to Autonomously Navigate in Unknown Environments October 2023
Medium Article

- A review of Simultaneous Localization and Mapping, consisting of an understanding of its sensor/hardware and algorithmic/software aspects, its applications, but also limitations and anticipated developments in the field.

Teaching Experience

Mandoulides High School, Thessaloniki, Greece December 2022 - March 2024
Olympiad Preparation Teaching Assistant

- Prepared students at Mandoulides High School for Mathematics and Informatics Olympiads.

Mandoulides High School, Thessaloniki, Greece November 2022 - February 2023
Robotics Mentor

- Mentored the robotics team of Mandoulides High School for their participation in the Greek FIRST LEGO League.

Leadership & Service

Greenpeace Greece, Thessaloniki, Greece September 2023 – August 2024
Project Coordinator

- Organized initiatives to identify all the public water taps of Thessaloniki.
- Organized and participated in awareness campaigns, increase the use of water taps by citizens to refill their bottles.
- Increased the interest and capacity of the team by presenting the project to new members and facilitating their onboarding.
- Got in touch with and convinced certain municipalities to fix the malfunctioning water taps, resulting in their improved state and increased use in many areas.
- Developed the dashboard/map where the usable water taps are presented, including their location, status, and additional information.

Arcturos Wildlife Shelter, Thessaloniki, Greece September 2023 – August 2024
Volunteer 2 weeks, 8 hours/day

- Took care of ~20 Greek Shepherds, by feeding and walking them daily.
- Contributed to various operations of the Bear Sanctuary and the Wolf Sanctuary.

Skills & Knowledge

Language: English (Certificate of Proficiency in English**,** CEFR C2 level), French (Delf, CEFR B1 Level)

Technology

Building & programming **autonomous robots** and **electronics devices/embedded systems**, using **Arduino (C++) & Raspberry Pi (mostly Python, runs on Linux)** and **custom PCB** circuit boards designed with **Fritzing and EasyEDA**, including the integration of **sensors, motors, batteries/solar panels and custom power management circuits**, as well as **3D-printed mechanical parts** & **moving**

structures designed using **Fusion 360**. Those are connected to an ecosystem of **websites and databases**, with which data is transmitted (**LoRaWAN, Wi-Fi, or GSM modules**) & processed using **JS, PHP, and SQL**, and accessed/used via a **web app/dashboard** using **HTML, CSS (& Bootstrap)**, or **Android (Android Studio & Java)** and **Windows UWP or .NET applications (Visual Studio & C#)**.

Knowledge in **Robotics, Localization, Mapping and Planning**, read **"Probabilistic Robotics" by Sebastian Thrun**, and practical experience in using the **Robot Operating System (ROS 2)**, specifically publishing/subscribing to topics, working with various frames & transforms, implementing a **perception/localization/planning/navigation stack** using the respective packages and related nodes, using the **ROS 2 Control framework**, and designing drivers (hardware components) that use **Arduino for communication between the Raspberry Pi and the motors/servos**.

Integration of **Computer Vision and Machine Learning** technologies in autonomous systems and robots, using **Python or C++** based frameworks like **Point Cloud Library (PCL)** and **OpenCV**, for autonomous perception and sensor fusion, and **TensorFlow, Keras,** and **PyTorch** for object detection or Neural Network applications, theoretical and practical knowledge of **Q-Learning** and related decision-making algorithms used for determining the optimal policy for a **Markov Decision Process**, including the design, implementation, and evaluation of **risk-averse methods in the field of Reinforcement Learning from Human Feedback**, and ability to design and apply **inverse kinematics and control loop (PID)** mechanisms in an autonomous robot. Have also studied various methods used to fuse LiDAR (point cloud) and Camera (RGB/RGBD image) data, to improve accuracy and robustness of Autonomous Mobile Robots (Article).

Knowledge in **Dynamical Systems** and predicting their evolution, read "Nonlinear Dynamics And Chaos" by Steven H. Strogatz, as well as usage of **Neural Networks for fitting an ordinary differential equation**.

Knowledge in **Braitenberg Vehicles** and their properties, as well as their connection to human psychology, read "Vehicles: Experiments in Synthetic Psychology" by Valentino Braitenberg, and ability to **design physics simulations using Unity**.