

# Dimitris Panagopoulos

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## EDUCATION

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- **University of West Attica** Athens, Greece
  - *MEng (5 years Diploma, 300 ECTS) - Industrial Design & Production Engineering* Oct 2015 - July 2020
  - *Track:* Control Systems Design
  - *Grade-CGPA:* 8.06/10.0
  - *Diploma Thesis:* Bayesian probabilistic approach for operator intent inference in Human-Robot Interaction (Supervisor: Dr. Grigoris Nikolaou) ~ Grade: 10.0/10.0

## SKILLS SUMMARY

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- **Languages:** Greek (native), English (fluent)
- **Programming:** Python, C++, JAVA
- **Other Tools:** SciKit, Keras/Tensorflow, PyTorch, Ubuntu, ROS, MATLAB/Simulink, git, Arduino
- **Soft-Skills:** Commitment, Curiosity, Critical Thinking, Perseverance, Time Management, Collaboration, Active listening

## WORK EXPERIENCE

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- **Hellenic Navy - Centre of Automated Combat Systems (CACS)** Athens, Greece
  - *Systems Engineer (Full-time mandatory military service)* Dec 2021 - Aug 2022
    - **Description:** My work focuses on designing and implementing the back-end functionality of a mechanism employed by Hellenic Armed Forces for exchanging digital information among land-based, ship-board and airborne tactical data systems. (Tech used: JAVA)
- **University of Birmingham - Extreme Robotics Laboratory (ERL)** Edgbaston, UK
  - *Research Associate (Full-time, Contract) - Manager: Dr Manolis Chiou* Nov 2020 - Oct 2021
    - **Description:** The research goal was to build autonomous mobile robots that can navigate through harsh environments, robots that can be remotely controlled and quickly learn and perceive what people or operators want. Such robots must be able to perform effectively with uncertain and limited knowledge of the world and be easily deployed in new environments. The challenge required algorithmic advances in decision-theoretic planning, statistical inference, and artificial intelligence. (Tech used: Python, C++, ROS, FuzzyLite, SciKit, Probability Theory)
- **University of Birmingham - Extreme Robotics Laboratory (ERL)** Edgbaston, UK
  - *Internship (Part-time) - Manager: Dr Manolis Chiou* Mar 2019 - Oct 2019
    - **Description:** My work focused on implementing Artificial Intelligence algorithms in robotics, specifically probabilistic-based algorithms, in support of the ERL's research projects in order to assist variable autonomy in the form of Mixed-Initiative (MI) control or shared control in the field of robotics. (Tech used: Python, ROS, Probability Theory)

## PROJECTS

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- **Hierarchical Mixed-Initiative (MI) controller (Computer Vision, Bayes' Theorem, Fuzzy Logic):** Improvement over existing Mixed-Initiative (MI) controller by proposing and implementing a criticality-based hierarchical fuzzy controller that allows robots to leverage upon expert knowledge enabling them to perceive context across human-robot interaction and better addressing control authority transfer. (May 2022)  
(Tech used: Python, C++, ROS, FuzzyLite, Probability Theory, Computer Vision)
- **Wind Turbine assessment (Mathematical modeling):** Repository that contains a straightforward implementation of the simplified analytical model given by the paper: (Rick Damiani et. al, "Assessment of wind turbine component loads under yaw-offset conditions" - 2018) for the  $\alpha$  and  $U_{rel}$  azimuthal variations under different yaw offsets. (Feb 2022)  
(Tech used: MATLAB/Simulink, Python)
- **Multi-IP parallel testing (Network Programming):** Tool for checking multiple IP networks' connectivity in parallel and evaluating them accordingly. (Jan 2022)  
(Tech used: JAVA)
- **SciRoc 2021 (Computer Vision, Navigation, NLP):** I participated in the second SciRoc challenge 2021 (Episode 01) being member of "Gravastars" (University of West Attica) team. (Sep 2021)  
(Tech used: Python, OpenCV, YOLOv5, TensorFlow, VOSK, Docker)
- **Operator Intent package (Probability Theory, Bayes' Theorem):** Creation of ROS package in support of the ERL's projects to recognize human intent while human-operators are assigned to remotely control a mobile robot in multiple *Search & Rescue* scenarios. (May 2021)  
(Tech used: Python, ROS)
- **Bayesian Experiment Offline (Probability Theory, Bayes' Theorem):** Creation of supportive repository (to the Operator Intent package) that encourages the user to test and evaluate various/modified algorithms based on experiments that have already been executed, just by utilizing the generated ROS topic values. (May 2021)  
(Tech used: Python)
- **Reinforcement learning basics (Machine Learning, Markov Decision Process):** Creation of repository to test model-free reinforcement learning algorithms implemented in several environments provided by OpenAI gym. The codes are made from scratch based on pseudo-codes presented in Sutton & Barto's book. (April 2021)  
(Tech used: Python, OpenAI gym)

## RESEARCH INTEREST

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My research focuses on algorithms that generate robot behavior that coordinates well in applications with human-in-the-loop control. Considerations on how the robots should respond to persuasive attempts made by humans, to what extent trusting belief among agents does remain high; what the strategy of negotiation should be when agent(s) constitute high-creative risk should be addressed. My vision is to advance fundamental understanding of intelligent agents' decision-making in human(s)-robot(s), robot(s)-robot(s) cooperation/collaboration/coordination drawing from a range of different disciplines such as stochastic modeling, Bayesian inference, game theory, reinforcement learning and optimization.

In particular, my research has aimed to address the question, "How could low-level data from observations made (exploiting multiple sources of information) best inform the policies of autonomous agents that govern high-level decision making?". So far, my research has helped to partially answer this question by endowing autonomous agents with the ability to perceive and disambiguate human aspects (e.g. intent recognition) in order to improve the quality of variable autonomy systems in advanced safety-critical human-robot interaction (HRI) schemes. However, I am interested in diving further into researching how autonomous agents would eventually be capable of high-level reasoning and resilient decision making in the process of behaving accordingly to meet goals and the reliability of their behavior to bring off certain assigned tasks. One of the factors that really attracts me is that the key to autonomy, being part of the robot's behavior, is the necessity of equipping the robot with the ability to adapt online and change the course of action in order to best perform the task based on what it has been observed, while still acting in a goal-driven manner. The complex interactions between agents and environment, under non-deterministic (due to sensor and system limitations) and time-varying conditions, lead to a major number of possible situations which might be encountered and need to be handled. The challenge here is the dynamics, the unpredictability, the fact that the robot cannot know in advance everything that is present, where it is present, what to anticipate and how other agents will behave. Therefore, to guarantee effectiveness and safety, it is necessary to assess what the robot knows, coordinate their actions and adapt to unseen behaviors by reasoning over the beliefs that the robots think the world contains. Achieving high-level behavior and facilitating efficient coordination through autonomy means having a set of actions with the ability to independently choose from, checking the unsafe actions to avoid, being capable of interacting with and modeling the behavior of other agents, learning the intelligence level and degree of rationality.

## WORKSHOPS

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- **Robotics and Artificial Intelligence Summer School 2021 (Online)**: Current main robotic issues were presented: Deep learning perception on Robotics, Human Robot Interaction and robot navigation and Assistive Robotics. The Summer School included experimentation sessions. (28-30 June 2021)  
<https://www.iri.upc.edu/workshops/RoboticsAISummerSchool2021/index.html>

## PUBLICATIONS

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- **Conference: IEEE International Conference on Systems, Man & Cybernetics (SMC)**: Panagopoulos D. et. al, "A Bayesian-based Approach to Human Operator Intent Recognition in Remote Mobile Robot Navigation" (Oct 2021)  
<https://ieeexplore.ieee.org/abstract/document/9658942>

## PUBLICATIONS (UNDER REVIEW)

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- **Conference: IEEE International Conference on Human-Machine Systems (ICHMS)**: Panagopoulos D. et al, "A Hierarchical Variable Autonomy Mixed-Initiative Framework for Human-Robot Teaming in Mobile Robotics" (August 2022)

## HONORS AND AWARDS

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- Second place (team Gravastars) at second SciRoc challenge 2021 (Episode 01 - Simulation) ~ September, 2021

## REFERENCES

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- Dr. Manolis Chiou, Research Fellow - Extreme Robotics Laboratory (ERL) & National Centre for Nuclear Robotics (NCNR), Birmingham B15 2SE, UK ~ [m.chiou@bham.ac.uk](mailto:m.chiou@bham.ac.uk)  
(Relationship: Direct-Line Manager at ERL)
- Dr. Grigoris Nikolaou, Senior Lecturer - University of West Attica (UniWA), Athens 122 43, Greece ~ [nikolaou@uniwa.gr](mailto:nikolaou@uniwa.gr)  
(Relationship: Diploma Thesis Advisor)
- Professor Rustam Stolkin, Chair in Robotics - Royal Society Industry Fellow, Director of NCNR & ERL, Birmingham B15 2SE, UK ~ [r.stolkin@cs.bham.ac.uk](mailto:r.stolkin@cs.bham.ac.uk)  
(Relationship: First-Line Manager at ERL)