Prof. dr. ing. Lucian BUSONIU
Contact: **lucian.busoniu@aut.utcluj.ro. See also: http://rocon.utcluj.ro, http://busoniu.net**

Nr. crt.	Titlu lucrare	Scurtă descriere	Cerinţe	Nivel (licenţă/ master)
1	**AI planning for minimax and real-time nonlinear control**	The student will work on a minimax version of AI optimistic planning methods, applied to robust control where we aim to maximize an infinite-horizon discounted cost under the worst-case sequence of disturbances. Near-optimality guarantees and convergence rates are desired. A second student will focus on applying planning methods in real-time.	Strong analytical and mathematical skills, algorithmics, and Matlab programming.	Licenţă sau Master
2	**Nonlinear identification and control of a DC-motor based inverted pendulum setup**	An Arduino-controlled, Dynamixel DC motor is encapsulated in a USB-connected box and usable for system identification experiments (transient analysis, step and impulse response identification, FIR and parametric models). We will focus on developing a nonlinear variant by way of adding an asymmetrical weight to the disk turned by the motor, and solving the required steps for control: modeling/identification, control design.	Embedded programming, Matlab.	Licenţă sau Master
3, 4, 5, 6	**Underwater litter detection, multimodal pre-tagging, and litter-based SLAM**	In the context of the SeaClear2.0 EU project, we are working on mapping underwater litter with autonomous underwater vehicles. The per-student topics will be: * Tweaking the sonar ROS API for better integration, sonar data formatting. * Detecting litter in sonar and camera images. * Using the locations of uniquely identified objects to perform SLAM. * Using litter detections from camera to pre-trag sonar images for later revision by a human, in order to more easily develop datasets for training sonar-based detection models.	State estimation, Python, ROS.	Licenţă sau Master
7, 8	**A platform for underwater mapping tests**	In the context of the SeaClear2.0 EU project, the students will focus on developing a real-life scale model of the litter mapping system using an already existing BlueRobotics BlueROV2, a pool, and an overhead-camera-based positioning system. Per-student components: * Control design. * Path planning and obstacle avoidance. * Integration of a gripper device.	Matlab, Python, ROS.	Licenţă sau Master

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9	**Multiagent control of a team of TurtleBot robots**	We will develop and apply multiagent control methods to a team of 2 to 6 TurtleBot robots. The application may be modeling of a traffic intersection, and methods will exploit control and AI to optimize objective functions that include group-level objectives like throughput as well as local objectives like energy usage.	Matlab, ROS	Licenţă sau Master
10	**Reinforcement learning for control**	The student will work either on fundamental developments in reinforcement learning, on their real-time application to nonlinear control, or a combination of the two.	Strong analytical and mathematical skills, algorithmics, and Matlab programming.	Licenţă sau Master
11	**Nonlinear state estimation with uncertainty**	We will be developing state estimation methods for nonlinear uncertain systems where channels may drop measurements stochastically.	Python, ROS.	Licenţă sau Master
12	**Path-aware optimization with locally smooth functions**	We will be working on developing methods for robots to find the maxima of a function defined over their operating space. Different from previous work where we only assumed Lipschitz continuity, here we will impose stronger smoothness conditions on the function and aim to obtain faster convergence rates to the optima.	Strong analytical and mathematical skills, algorithmics, and Matlab programming.	Master