



Federica COCCI

EDUCATION AND TRAINING

Master's degree in Artificial Intelligence and Robotics

Sapienza, University of Rome [10/2020 – Current]

City: Rome

Country: Italy

Thesis: "Multi-abstraction Reinforcement Learning applied to a robotic arm"

Bachelor's degree in Engineering in Computer Science

Sapienza, University of Rome [09/2017 – 10/2020]

City: Rome

Country: Italy

Final grade: 110 Cum Laude

Thesis: "Indoor 2D localization for differential drive robot"

TECHNICAL EXPERIENCE

Multi-abstraction Reinforcement Learning applied to a robotic arm

[09/2023 – Current]

This master thesis work is born from the will to equip the rover of the project ROSITA (a Sapienza project in collaboration with ASI "Italian Space Agency") with a robotic arm in order to accomplish some future tasks during the competition.

The implementation of the robotic arm's model takes place in *Gazebo* and the code that controls the arm is implemented in *ROS*. The model makes use of *hierarchical Reinforcement Learning* in order for it to be able to perform tasks of shifting objects up, down, left and right (e.g. an amount of soil). The topmost level of the hierarchy (the easiest one) is comprised of a 3D grid world where planning techniques are applied in order to find solutions that will be the starting point for the level below (the harder one). *Deep Reinforcement Learning* algorithms are then applied to this bottom level using the *Gymnasium* environment as interface to represent the RL problem.

RushHour: a collaborative social robot

[03/2023]

We developed RushHour (a Pepper robot) which is a social and interactive robot for people's entertainment. It plays the Rush Hour game with the human in a collaborative way.

The social interaction consists in an introductory presentation, an initial and final survey and different robot animations that are also played during the game.

The robot reasoning aspect is developed through *AIPlan4EU*, a Python framework.

The physical communication between the several components of the project has been developed using a system of clients and servers. We have made use of websockets, offered by the Python's *Tornado* library.

Thanks to *JavaScript (JS)* and *CSS* and *HTML*, we created a web application to reproduce the Pepper tablet. This web application allows the user and the robot to play together, as the human can visualize the progress of the game and play the next move for solving the given problem.

Visual Question Answering

[09/2022]

We developed several architectures that address the "Visual QA" which is a semantic task that aims to answer questions based on an image. These questions require an understanding of vision, language and commonsense knowledge to answer them. We implemented two trivial baselines (prior yes and random baselines) and then we approached the problem using CNN and LSTM.

Implementation of impedance control for a tele-ecographic system

[03/2022]

In our project, we were asked to implement impedance control for a manipulator with the future goal of remotely performing a commanded tele-echographic examination. The simulated manipulator is equipped with an ultrasound probe which will be in contact with an *abdomen phantom*. Starting from an initial position above the phantom, the probe approaches the abdomen perpendicularly and then slides on it, keeping low contact forces.

Hotel-bot

[01/2021]

We developed a simple spoken italian chatbot: it is an assistant for hotels research in european capitals. In particular we implemented a formbot which stores the user information and at the end it returns a recap. These informations are: the hotel city, the number of people, if the user wants a suite or a simple room, if the user wants a smoker bedroom, eventually a feedback of the user about the experience of interaction with the bot and finally if the user wants to keep hotel crew waiting for him at the airport when he arrives in the city. We used *Google Speech Recognition* and the library *pyttx3* to handle the voice interaction between user and bot.

WORK EXPERIENCE

Volunteer for Komen Italy

[04/2023 – Current]

City: Rome

Country: Italy

Volunteer for AlxIA ("Italian Association for Artificial Intelligence")

22nd International Conference [06/11/2023 – 09/11/2023]

City: Rome

Country: Italy

Volunteer for European Aquatics Championships

[05/08/2022 – 21/08/2022]

City: Rome

Country: Italy

OTHER EXPERIENCES

Partecipation to the "Math Olympics" (during several years of high school)

[2013 – 2017]

Partecipation to the "Problem Solving Olympics" (during several years of high school)

[2013 – 2017]

Partecipation to the "Neuroscience Olympics" (in the 3rd year of high school)

[2016]

Youth camp and sailing course at "Marina Militare", Livorno, as deserving student

[2016]

LANGUAGE SKILLS

Mother tongue(s): **Italian**

Other language(s):

English

LISTENING B2 READING B2 WRITING B1

SPOKEN PRODUCTION B2 SPOKEN INTERACTION B2

French

LISTENING A1 READING A1 WRITING A1

SPOKEN PRODUCTION A1 SPOKEN INTERACTION A1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

C / Prolog / PDDL / PyTorch, Keras / Java / Git / Tensorflow / OpenCV / Python / C++ / Assembly x86 / Gazebo / Google colab / ROS / Gymnasium / Tmux / Docker / LaTeX

COMMUNICATION AND INTERPERSONAL SKILLS

teamwork, problem-solving, rational, reverse engineering, adaptability, empathetic

HOBBIES AND INTERESTS

space, sudoku, reading, music, concert, decoupage, embroidery

Il presente curriculum vitae è ai fini della pubblicazione. Autorizzo il trattamento dei miei dati personali ai sensi del Dlgs 196 del 30 giugno 2003 e dell'art. 13 GDPR.

Roma, 14/11/2023