BIOGRAPHICAL SKETCH

S. R.
MARR Student
Sapienza University of Rome

(a) Education & Training

Sapienza University	Rome, IT	Artificial Intelligence and Robotics	Master, 2020-present
Roma Tre University	Rome, IT	Computer Engineering - 95/110	Bachelor, 2016-2018
Liceo Plauto	Rome, IT	Liceo Classico	Diploma, 2011-2015

(b) Languages

Italian	(mother tongue)
English	high listening, writing and speaking skills
	B2 First Certificate English FCE (2019) - Cambridge Assessment English

(c) Professional & Scientific Activity

Most closely related to the research program

2020 – present AlcorLab, Sapienza University
Contribution to deep learning research software in activity detection and recognition, in particular, in the implementation of the submission for the AVA-Kinetics Challenge 2020. The proposed algorithm uses an hand-crafted U-Net to learn tracking and highlighting of the relevant subjects into videos and a R(2+1)D Net to infer their most probables atomic actions over 80 possibles classes.

2020 SPQRTeam of ROBOCUP@Soccer, Sapienza University
Implementation of a planning algorithm which realizes the kick-in behavior for the NAO5 by SoftBank Robotics, using B-Human environment, which takes into account the game situation, the number of opponents, their position and the reachable teammates.

Other significant

2019 – 2020 iOS, Android and Web Developer, VIK School S.R.L.
Implementation of a multi-platform e-learning application, created with the intent to intrigue and entertain the students of the new generations with daily quizzes on ministerial educational topics.

2018 McipLab, Roma Tre University
MATLAB & Simulink implementation of Iterative Learning Control applied to a 2-DOF manipulator and its comparison with most commonly used control schemes (PID/PI/P).

(d) Achievements

Most closely related to the research program

1. S. R. and A. G., GAN-based Synthetic Medical Image Augmentation for increased CNN Performance in COVID-19 Classification,

"Large-scale annotated datasets have proven to be extremely important part that powers the convolutional neural networks (CNNs) and other deep learning methods. Medical domain is one such area where obtaining this is practically impossible. In this project we try to address the stated critical issue with the help of Generative Adversarial Networks (GANs). We demonstrated that GAN can be used to generate synthetic medical images when trained with even small number of available real images. We demonstrated that even for a small CNN trained on a GAN augmented datasets learning is largely improved.", GitHub , 32 (2020).

2. S. R. and A. G., Implementation of SteganoGAN: High Capacity Image Steganography for Image and Audio Input with GANs,
   "Steganography is a generic term that denotes all those techniques that somehow try to hide information within other forms of data. We present steganography applied to images and audio, and in particular we will analyze the benefits that generative adversarial training produces in this context. The method used consists in three networks which works together: the first, which from now on we will refer to as encoder*, responsible for hiding the information, the second, named* decoder*, responsible for recovering the secret message and the third, called the* critic *which detect the presence of the hided information."*, GitHub , 20 (2020).
3. S. R., Reinforcement Learning: Proximal Policy Optimization in discrete action space,
   "PPO algorithm is a new kind of policy gradient method for reinforcement learning, which directly optimizes the cumulative reward. It alternates between sampling data through interaction with the environment, and optimizing a surrogate objective function using stochastic gradient ascendant. Proximal policy optimization algorithm performs very efficiently in discrete action spaces. This method is very stable and reliable when using a joint architecture for the policy and value function. This method has the faculty to learn very fast.", GitHub , 5 (2020).

Other significant

4. S. R. and A. G., SpaceY,
   "The work touches upon various concepts of the field of Interactive Graphics like modeling, scene creation, animation, physics, setting, user interaction, controls etc. This project is a testament of the high potential and the wide use that can be made of 3D web graphic, using WebGL3 and Babylon.js libraries.", GitHub , 27 (2020).
5. S. R., SR_ROBO,
   "MATLAB and Simulink robotic toolbox and examples for academical use. It contains linear algebra functions, manipulator's direct and inverse kinematic tools, numerical and analytical methods, differential kinematic, inverse differential kinematic, trajectory planning functions at cartesian and joint space levels, some control scheme and some basic feedforward-feedback control loops.", GitHub (2020).
6. S. R., Iterative Learning Control applied to a 2-DOF planar manipulator,
   "MATLAB Simulink implementation of Iterative Learning Control applied to a2-DOF manipulator and its comparison with most commonly used controlschemes (PID/PI/P).", GitHub (2018).
7. S. R. and A. T., Infrastructures and systems for industrial automation: a vertical car park controlling using PLC and SCADA,
   "In Visual Studio the environment of a vertical car park is virtually simulated using C#. TwinCat 3 is used to program in SFC the Programmable Logical Unit which, thanks to sensors and

actuators, controls the motion of a cart which parks the cars. iFix 5.0 is used to program a Supervisory Control And Data Acquisition system to monitor the processes.", GitHub (2018).

8. S. R., Azienda!,
   "A simple web application which involves the usage of web technologies and methodologies for management of persistence (jdbc, JPA), of client side (HTML, CSS) and of server side (Servlet, JSP, MVC, Spring boot).", GitHub (2018).
9. S. R. and A. R., CrossyClouds,
   "An arcade game developed in Corona SDK. Written in Lua and deployed for Android and iOS.", GitHub (2018).

(e) Academic Background & Skills

Most closely related to the research program

Machine Learning Wide cover and knowledge of fundamental machine learning techniques and algorithms, starting from supervised learning classification methods such as decision trees, Bayesian learning, linear models, Support Vector Machines, kernel functions and multiple classifiers, to regression methods such as linear and logistic regression, instance based (K-NN) and perceptron. Broad understanding and several applications of Neural Networks and Convolutional Neural Networks (CNNs) and comprehension, usage and fine-tuning of some of the most popular ones (i.e. LeNet, AlexNet, Inception, VGG, ResNet, RetinaNet, SSD, Cdcl and others), RNNs, LSTMs and GANs. Knowledge of the main unsupervised learning methods in clustering (k-Means) and latent variables (EM), autoencoders and PCA. Cognition of the main reinforcement learning methods such as MDP & decision making, temporal difference learning, SARSA algorithm, Q-learning algorithm, Monte Carlo methods (On/Off-Policy).

Artificial Intelligence Starting from basic knowledge about AI such as intelligent agents, logical agents and learning agents to a wider knowledge of automated problem solving, such as Uninformed Search, Heuristic Search, the A* algorithm, Local Search, Constraints Classical Planning, Partial Order Planning and Hierarchical Planning. And a deeper cover about knowledge representation and reasoning, such as Propositional Logic, First Order Logic, Logic Programming, Semantic Networks and Frames and Non monotonic Reasoning.
Knowledge about Multi-agent systems, such as games, cooperation and teamwork, Distributed Constraint Optimization, MAS Applications and Multi Robot Systems, and more about Logic Programming and Natural Language Processing.

Robotics Acquired knowledge ranges from basics about mechanic to advanced topics about dynamic. Therefore concepts of manipulation, actuators, transmissions, proprioceptive and exteroceptive sensing devices, control architecture and programming. About direct, inverse, and differential kinematic models. Trajectory planning methods in the joint and in the task (cartesian) space. Control schemes, kinematic control for robot arms and decentralized dynamic control of a manipulator. Advanced kinematics for robot manipulators (calibration, redundancy resolution). Derivation and use of the dynamic model of robots. Identification of dynamic coefficients. Inclusion of joint transmission elasticity. Linear and nonlinear control schemes for set-point regulation (PD with gravity compensation, saturated PID, iterative learning) and for trajectory tracking (feedback linearization and decoupling, passive control, adaptive control) in free motion tasks, as well as for interaction tasks with the environment (admittance control, compliance control, impedance control, hybrid force/velocity control).

(f) Computer Skills

In order of relevance to the research program

Programming Languages	Python3, Python2, Prolog, PDDL, C, C++, C#, MATLAB Octave, Simulink, Fortran, Assembly 8088, JavaScript, TypeScript, HTML5, CSS3, SQL, Lua, CABSL, SFC, FBD, IL, ST, Java EE 8, Java SE 7.
Programming Frameworks	PyTorch 1.7, TensorFlow 2.3, Keras 2.4, MATLAB, Octave, Simulink, B-Human, Babylon.js, Three.js, WebGL, OpenGL, Blender, TwinCat 3, iFix 5.0, Apache Tomcat, pgAdmin, Corona SDK, Apache Cordova, PhoneGap, Ionic, Onsen-UI.
Operative Systems	Ubuntu 20.04.1 LTS, Ubuntu 18.04.5 LTS, Ubuntu 16.04.7 LTS, MacOS Catalina, MacOS Mojave, Windows 10.