Francesco Pro

WORK EXPERIENCE

🏢 *La Sapienza University of Rome* – Rome, Italy

Junior research fellow

[1/5/2024 – 31/12/2024]

- Research in the Ground-to-Aerial image matching problem using **Python**, **TensorFlow**, and **OpenCV**;
- Commercial project: implementation of road **object detection** and **tracking** system for a traffic analysis pipeline, using **PyTorch**, **TensorFlow**, and **OpenCV.**

🏢 *Tor Vergata Racing Team* – Rome, Italy

Web developers

[1/10/2019 – 1/10/2020]

- Developed a unique online accessible calendar module, shared among all the team members, based on their permissions, using HTML, CSS, Vue.js, Node.js

EDUCATION AND TRAINING

PhD in Computer Engineering

AlcorLab - Sapienza University of Rome [1/11/2024 – Current]

City: Rome │ **Country:** Italy │ **Field(s) of study:** Computer Vision ; Generative Models

Master's degree in Artificial Intelligence and Robotics

Sapienza University of Rome [10/10/2020 – 26/10/2023]

City: Rome │ **Country:** Italy

Bachelor's degree in Computer Engineering

Tor Vergata University of Rome [5/10/2016 – 20/2/2020]

City: Rome │ **Country:** Italy

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English	Spanish
LISTENING B2 **READING** B2 **WRITING** B2	**LISTENING** A1 **READING** A1 **WRITING** A1
SPOKEN PRODUCTION B2 **SPOKEN INTERACTION** B2	**SPOKEN PRODUCTION** A1 **SPOKEN INTERACTION** A1

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

SKILLS

HTML / CSS / Javascript / Vue.Js / PHP / SQL / Node.Js / C / C++ / Python / Machine Learning Algorithms / Neural Networks / Deep Learning / Reinforcement Learning / Computer Vision / PyTorch / TensorFlow / Keras / OpenCV / Numpy / Matplotlib

PROJECTS

GROUND-TO-AERIAL IMAGE MATCHING FOR GEOSPATIAL APPLICATIONS
- Thesis project in **Computer Vision**, the work has been done in collaboration with the **ESA-ɸ-lab**
- Developed a **Neural Networks**-based architecture to match a query ground view image with a satellite one representing the same location, using **Python** and **TensorFlow**

DISTANCE ESTIMATION OF TRAFFIC SIGNS IN DRIVING ENVIRONMENT
- Developed an offline **Neural Networks**-based architecture to estimate the distances to the traffic signs from a camera mounted on a car, using **Python** and **TensorFlow**.

COVID-19 DETECTION FROM CHEST X-RAY
- Developed a **Neural Networks**-based architecture to detect patients affected by COVID-19 through chest x-ray images, first training and testing three well-known networks and then developing two networks from scratch. The project has been implemented using **Python** and **TensorFlow**
- Collected online accessible chest x-ray images to create an ad hoc dataset

COMPUTER VISION - PAPER "FIGHTING FAKE NEWS: IMAGE SPLICE DETECTION VIA LEARNED SELF-CONSISTENCY"
- Implemented and tested the mentioned paper **Neural Network**-based architecture, using **Python** and **Keras**, to learn real images metadata to discriminate them from fake ones

HUMAN ROBOT INTERACTION - REASONING AGENT
- Developed a hospital assistive robot able to help people navigate within the structure by providing positions and information about departments of the hospital and assigning emergency codes to patients in the emergency room. The project is implemented using **Python** and **NAOqi server**

ASSEMBLY FUNCTION RECOGNIZER
- Implemented a method to recognize assembly functions among 4 classes, using **Python** to exploit two **Machine Learning Algorithms**, the **Support Vector Machine** and the **Generative Model**

OBJECT CLASSIFICATION IN A HOME ENVIRONMENT
- Developed an object classification method, based on **Neural Networks**, for images representing home environment objects using **Python** and **Keras**

REINFORCEMENT LEARNING - PPO ALGORITHM
- Developed the Reinforcement Learning **PPO Algorithm (Proximal Policy Optimization)** in a simulated environment using **Neural Networks**. It is implemented with **Python** and **PyTorch**

REINFORCEMENT LEARNING - PAC-MAN
- Developed an automated Pac-Man game that automatically finds the solution through the **Policy Iteration Algorithm**, using **Python**

RASA NLP - MALL RECEPTIONIST
- Implemented a mall receptionist to assist customers in finding shops, restaurants, and related information, by filters. The project has been implemented with the **SpeechRecognition Python** library in combination with the **Rasa Framework** for the **Language Understanding** part

RESTAURANT DATABASE SYSTEM
- Developed a **Database System** for a pizza restaurant, to track clients' orders, waiters' work shifts, menu, and the pantry with the quantity of each product. The project has been implemented with **C** and **SQL**

RELIABLE UDP PROTOCOL
- Implemented a reliable version of the **UDP Protocol** to reduce the loss of information in a communication between two endpoints. This project was implemented using **C**

CLIENT SERVER CHAT
- Developed a client/server chat using **C**. A client connecting to the server receives the list of clients ready to talk, choosing one of them the communications starts

AGRICULTURE PRODUCTS DELIVERY WEB APP
- Developed a web app for local agriculture products delivery using **Vue.js**, **CSS**, **HTML**, **Node.js** and **Javascript**

PUBLICATIONS

[2025]

R3ST: A Synthetic 3D Dataset with Realistic Trajectories

Authors: Simone Teglia, Claudia Melis Tonti, Francesco Pro, Leonardo Russo, Andrea Alfarano, Matteo Pentassuglia, Irene Amerini

[2025]

Unsupervised pedestrian intention estimation through deep neural embeddings and spatio-temporal graph convolutional networks

Authors: Simone Scaccia, Francesco Pro, Irene Amerini

[2025]

Enhancing Ground-to-Aerial Image Matching for Visual Misinformation Detection Using Semantic Segmentation

Authors: Emanuele Mule, Matteo Pannacci, Ali Ghasemi Goudarzi, Francesco Pro, Lorenzo Papa, Luca Maiano, Irene Amerini

[2024]

PMDI: An AI-Enabled Ecosystem for Cooperative Urban Mobility

Authors: William Fornaciari, Giovanni Agosta, Massimo Fioravanti, Paolo Giuseppetti, Alessandro Solinas, Luigi Gallo, Manuel Pernigotto, Mario Pedol, Francesco Pro, Irene Amerini, Lorenzo Papa, Luca Maiano, Giovanni Trovini, Mauro Di Giamberardino,Paolo Satta

[2024]

A Semantic Segmentation-guided Approach for Ground-to-Aerial Image Matching

Francesco Pro, Nikolaos Dionelis, Luca Maiano, Bertrand Le Saux, & Irene Amerini. IGARSS 2024

[2024]

Learning from Unlabelled Data with Transformers: Domain Adaptation for Semantic Segmentation of High Resolution Aerial Images

Nikolaos Dionelis, Francesco Pro, Luca Maiano, Irene Amerini, & Bertrand Le Saux. IGARSS 2024

[2023]
Distance Estimation of Fixed Objects in Driving Environments

Giorgio Leporoni, Valerio Ponzi, Francesco Pro, & Christian Napoli. Ceur-ws 2023

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