ANDREA SCORSOGLIO

1127 E. James E. Rogers Way
Tucson, AZ
85721

Phone: 5204096810
andrea.scorsoglio@gmail.com
andreascorsoglio@email.arizona.edu
https://andreascorsoglio.github.io

PROFESSIONAL SUMMARY

- Graduate research assistant trained in the areas of aerospace engineering and artificial intelligence. Current research emphasis on reinforcement learning, computer vision and physics informed neural networks applied to spacecraft guidance, navigation and control.
- Technical skills acquired in the fields of coding using multiple programming languages (MATLAB, Python), applications and conducting multidisciplinary research.
- Experienced in discussing and critically thinking about engineering problems. Experience working with people with diverse backgrounds and personalities.
- Successful in communicating methodologies and achievements at engineering conferences and in peer reviewed articles.

SKILLS

Essential: Public Speaking | Time Management | Problem Solving | Teamwork | Critical Thinking | Research Strategy

Computer

- Programming languages and data analysis: MATLAB | Python | R
- Python Packages: PyTorch | Tensorflow/Keras | OpenAI gym | OpenAI baselines | Ray RLlib | matplotlib | numpy | scipy
- Mission analysis: GMAT | Spacecraft Control Toolbox (SCT)
- Modeling and rendering software: Blender
- Game Engines: Unreal Engine 4
- CAD: Solid Edge | SolidWorks | Autodesk Inventor
- Productivity: Word | Excel | PowerPoint | Latex
- Operating systems: Linux/Unix | Windows | Mac OSX
- Command line interface and scripting: bash

Languages

Italian: native | English: fluent | Spanish: basic

EXPERIENCE

Jan 2019 – present

Graduate Research Assistant
THE UNIVERSITY OF ARIZONA, Tucson, AZ, USA

- *Part of the Target Follow-up working group on the NASA mission Near Earth Objects Surveillance Mission (NEOSM) – currently in phase B*
  Developing a ranking and decision-making tool based on fuzzy cognitive maps, capable of assessing the importance of follow-up for each observed target and providing critical information to decision-makers for tasking space and ground assets. Also developing a simulator used, at this stage, to test the tool on a synthetic dataset of objects and that will then support real data inputs and will help the decision-making process on later phases of the mission.
- Working on an orbit determination and simulation pipeline that integrates Find_Orb orbit determination software with GMAT and MATLAB.
- Working on various research projects about applications of reinforcement learning to spacecraft guidance navigation and control, as well as physics informed neural networks for orbit determination
- Collaborated in the University of Arizona CubeSat project (CatSat) as attitude dynamics and control, and simulation lead. Learned to use the MATLAB package “Spacecraft Control Toolbox (SCT)” from Princeton Satellite Systems, as well as procuring hardware according to specifications.

- Collaborated on a tool that generates and maintains a catalog of objects in cislunar space by performing orbit determination and matching. Part of a team that designed and maintains a webpage for requests of data products related to the project.
- Worked as teaching assistant for the class of Theory of Linear Systems. Graded assignments and kept student class records for a class of roughly 20 people as well as provided assistance to students during office hours.

Oct-Dec 2018 **High School Teacher**
LICEO MELCHIORRE GIOIA, Piacenza, Italy

Developed a teaching program in two mathematics courses at different levels. Explained concepts of varying difficulties to different audiences (aged 14-16). Developed a testing and grading strategy.

RESEARCH EXPERIENCE

Topics: (meta-)reinforcement learning, recurrent neural networks, convolutional neural networks, semantic segmentation, physics informed neural networks, systems visualization, computer vision and 3D simulation, guidance navigation and control, keplerian and non-keplerian orbital mechanics, orbit determination, modeling and simulation of linear and non-linear systems.

- Worked on a proprietary **advantage actor-critic reinforcement learning** algorithm coded from scratch in MATLAB and Python. The method is based on a radial-basis function network that allows for spacial representation of neurons and very fast training for low dimensional inputs. Applied to planetary landing and relative motion in highly non-linear systems.
- Working on **computer vision for space applications**.
    - Developed an in-house simulator for **real-time rendering of 3D visual environments** based on Blender and OpenAI Gym. Created custom OpenAI Gym environment for testing. Used on different projects to train reinforcement learning agents.
    - Used **semantic segmentation** to obtain **hazard maps** of lunar surface based on digital terrain models, to be used for on-line landing site selection.
    - Used visual simulator and hazard maps to train a meta-reinforcement learning model for **real-time landing site selection** and landing guidance.
- Worked on **meta-reinforcement learning** techniques using recurrent and convolutional neural networks.
    - Used proximal policy optimization (PPO) with convolutional-recurrent neural networks to create a guidance algorithm for planetary landing with optical observations and uncertain dynamics and engine failures (coded in Python using PyTorch).
    - Applied a similar architecture based on convolutional-recurrent neural networks to a binary asteroid redirect mission (used the Python package RLlib).
    - Applied recurrent neural networks also to generate a guidance algorithm capable of carrying out multi-target missions in the asteroid belt.
- Collaborated on recurrent neural networks for velocity estimation of a satellite using optical measurements in asteroid environment.
- Working on **physics informed neural networks** for orbit determination applications. Applied a neural network to learn the state of a satellite both in keplerian and non-keplerian dynamics using range/range-rate and angle measurements. Used the physics of the problem to regularize training which makes for better generalization of the solution to points in the training domain. Coded in MATLAB with no additional packages.

EDUCATION

Jan 2019 – present **Doctor of Philosophy in Systems & Industrial Engineering**
THE UNIVERSITY OF ARIZONA, Tucson, AZ, USA

Oct 2015 – Jul 2018 **Master of Science in Space Engineering**
POLITECNICO DI MILANO, Milano, Italy

Oct 2017 – April 2018 **Visiting Scholar**
THE UNIVERSITY OF ARIZONA, Tucson, AZ, USA

Oct 2012 – Jul 2015 **Bachelor's Degree in Aerospace Engineering**
POLITECNICO DI MILANO, Milano, Italy