Riccardo Majellaro

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Email Website LinkedIn GitHub

RESEARCH INTERESTS

My primary research interests are in machine learning and computer vision, with a focus on representation learning and self-supervised learning. I am also interested in vision-language models, (model-based) reinforcement learning, and external memories for artificial neural networks.

EDUCATION

MSc in Computer Science (Artificial Intelligence track), Leiden University — Sep 2021 – Jul 2023

Graduated Cum Laude

Thesis: "Disentangling Shape and Texture Dimensions in Object-Centric Representations"

Novel architectural design that biases object-centric models toward encoding texture and shape information into two non-overlapping subsets of the latent space dimensions that are known a priori.

Novel self-supervised loss, enabled by the proposed architectural design, to help achieve the desired disentanglement.

BSc in Computer Engineering, University of Modena and Reggio Emilia — Sep 2017 – Oct 2020

Thesis: "Distributed Training of DETR on Marconi100"

Study of the Detection Transformer (DETR) model created by Meta AI.

Implementation of scripts for distributing the training of DETR over multiple GPUs and nodes of the cluster Marconi100.

EXPERIENCE

Teaching Assistant, Leiden University — Feb 2023 – Jul 2023

MSc course "Reinforcement Learning" taught by Prof. Aske Plaat.

Correcting and grading assignments. Helping students via email and during workgroup sessions.

PUBLICATIONS

Explicitly Disentangled Representations in Object-Centric Learning — Preprint

Riccardo Majellaro, Jonathan Collu, Aske Plaat, Thomas M. Moerland

Under review at ICLR 2024

Slot Structured World Models — Preprint

Jonathan Collu, Riccardo Majellaro, Aske Plaat, Thomas M. Moerland

Under review at ICLR 2024

RELEVANT PROJECTS

Interaction Information Optimization for Object-Centric Representation Learning — Report

Generalization of the objective presented in "Information-Theoretic Segmentation by Inpainting Error Maximization" from 1 to N foreground objects.

Aiming to improve Slot Attention's scene decomposition ability with our generalized objective.

Aiming to speed up Slot Attention's training process to ease its usage in, e.g., model-based reinforcement learning.

TrashAway Robot — Repo

Trained with deep reinforcement learning a mobile robot to perform the task of "cleaning" a squared environment from cubes, using a camera as its only sensor.

Created with CoppeliaSim the simulated environment used during the training process.

Successfully deployed the trained agent in the real world (using a PiCar-X).

Text-to-Image additions/subtractions solver — Repo

Solution of additions/subtractions between two 3-digit (or less) numbers using recurrent neural networks (RNNs).

The expression to be solved is represented by a string, while the solution is generated as a series of images.

Adversarial Attacks on Vision Models Repo

Adversarial attacks on CNN, Transformer-based, and Multi-modal models.

Implemented, experimented, and analyzed both gradient-based and evolutionary strategy methods.

Classic/Vision CartPole with Deep RL Repo — Repo

Solved the Cartpole V1 by OpenAI both with classic and vision (images) observation formats.

Implemented, experimented, and analyzed Deep Q-Learning and Policy-based methods.

SKILLS

Languages: Italian (native), English (fluent)
Relevant Tools: Python, NumPy, PyTorch, TensorFlow, OpenCV, Scikit-learn, Matplotlib, C, Unix shell, Slurm