

Opening of a Postdoc position on Vision and Touch empowered Robot Learning for dexterous bi-manual manipulation

@Imagine Team of LIRIS lab, Ecole Centrale de Lyon

A Postdoc position of 12 months duration, extensible to 3 years, is opened on vision and touch empowered Robot Learning for dexterous bi-manual manipulation within the Imagine team, [LIRIS lab](#) at [Ecole Centrale de Lyon](#), under the supervision of Ass.Prof. Emmanuel Dellandréa and Prof. [Liming Chen](#).

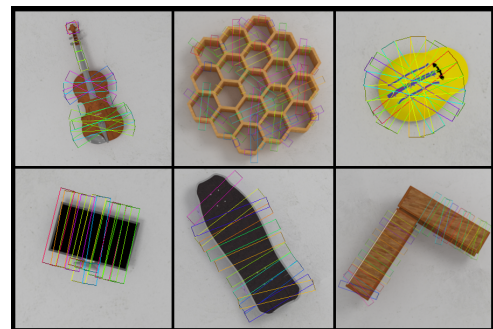
We are seeking a highly motivated research fellow in the field of robot manipulation learning for an expected starting date on September 1st, 2021.

Background

Aristotle noted that the hand is the “tool of tools”, and Anaxagoras held that “man is the most intelligent of the animals because he has *hands*”. Intelligence has long been understood to come together with dexterity.

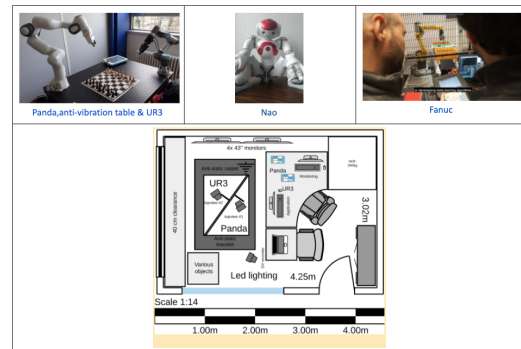
The Imagine team at ECL has been developing cutting edge research in AI and Robotics with the aim to endow robots with human-like vision, learning intelligence and dexterity. Over the last 5 years, the Imagine team at ECL has been a key player within a number of large scale R&D projects in the field of AI & robotics at national, european and international wide, including in particular:

- The FUI Pikaflex project, in partnership with [Siléane](#), and Renault, to developing autonomous, adaptable and flexible grasping robots for the Picking and Kitting task;
- a joint R&D research lab [Arès](#) in collaboration with [Siléane](#), in order to provide robots with a vision and learning intelligence, able to perform bin-picking for both rigid and deformable objects;
- The EU [LEARN-REAL](#) project in partnership with the Idiap Research Institute ([Dr. Sylvain Calinon](#) and Dr. André Anjos) and Italian Institute of Technology ([Prof. Darwin Caldwell](#)), to develop simulation environments to enable data effective robotic manipulation skill learning;
- The [PSPC FAIR WASTES](#) project in partnership with [EXCOFFIER FRERES](#), [MTB](#) and [SILEANE](#), three French companies specialized in waste recycling



and industrial robots, which aims to better recycle wastes through AI enhanced robotised sorting within the national programme “[Projets Structurants Pour la Compétitivité \(PSPC\)](#)” For a better understanding of the project, please watch the video [here](#);

The team owns a number of robots, including UR3 by Universal Robots, Panda by Franka Emika, Tiago+, Fanuc, *etc.* Furthermore, they have released strong impact simulation datasets for robot manipulation learning, including the [Mikado](#) dataset, a large scale dataset of homogeneous and dense synthetic objects in bulk, and the [Jacquard](#) dataset, the largest public synthetic dataset (50 K images of 11K objects and 1 M grasp locations) so far known for grasp prediction (see the figure opposite). Various toolsets for simulation and robot manipulation learning are developed under way, in particular the [AI4Robot](#) platform (See Figure opposite), composed of multiple robots and tactile sensors, to enable seamless sim2real deep robotic manipulation learning.



Funded by ANR, the [CHIRON](#) project within the [trilateral French-German-Japanese call on AI](#), teams up the Imagine team at ECL with Prof. Jan Peters’ group at Technische Universität Darmstadt in Germany and Prof. Yasuhisa Hasegawa’s group at Nagoya University in Japan, to develop an AI empowered general purpose assistive robotic system for dexterous object manipulation through embodied teleoperation and shared control; This research project is further reinforced and complemented by a novel Aristotle project within the [first specific Franco-German call for proposals](#) on AI for hierarchical and reinforcement learning on bimanual robotic dexterity. This Postdoc position will be funded by these two research projects. The privileged use case for the Chiron project is assistance for “stick-to-bed” patients or elders with limited physical ability in their daily life object manipulation tasks, *e.g.*, fetching a bottle of water and pouring it into a glass, through an intuitive and embodied robot tele-operated by themselves, whereas the target application domain for the Aristotle project is maintenance and repair, an area that requires bi-manual manipulation by the essence of the tasks (*e.g.*, opening cans, assembling parts, screwing light bulbs).

Mission

The mission of this Postdoc position is to take part in the Chiron and Aristotle project and develop learning-based robot control systems for dexterous manipulation using both vision and touch and showcase the learned control system using real robots,

e.g., Tiago++. Specifically, the recruited Postdoc is expected to work on the following research axes :

- Simulation of the interactions of haptic-enabled soft hands with deformable objects, e.g., oranges, along with their physical properties (elasticity, plasticity, friction)
- Design and implementation of vision and touch enhanced control strategy for the whole underactuated system including in particular unknown objects to be manipulated, and underactuated operators without known dynamics and kinematics models
- Development of simulations to real world transfer strategies in robot perception and control

This Postdoc position is fully research oriented. The successful candidate is expected to actively take part in dissemination of the research results, the search of research funding and supervision of interns and collaboration with PhD students.

Skills

The candidate must:

- be fluent in french or english
- have confirmed expertise in robot learning and manipulation
- be familiar with linux, Cmake, ROS and Gitlab
- have programming skills in Python, C/C++

Former experience on robot learning using computer vision, deep learning and data simulation data and modelling, e.g., Unity 3D, Nvidia Isaac, [Ignition gazebo](#) will be appreciable.

Environment

The successful candidate will work in direct collaboration with researchers having an established expertise in computer vision and machine learning in partnership with international academic partners (Idiap/EPFL from Switzerland, Italian Institute of Technology from Italy, Intelligent Autonomous Systems at Darmstadt University of Technology from Germany, MEIDAI at Nagoya University from Japan). Ecole Centrale de Lyon is part of the top ten engineering schools in France (Grande Ecoles), part of the elite of "Grande Ecoles" offering access to excellent quality graduate and undergraduate students.

Application

Applications should include a detailed curriculum vitae, brief statements of interests and two reference letters.

Applications and letters should be sent via electronic mail to:

- Pr. Liming Chen (liming.chen@ec-lyon.fr)
- Dr. Emmanuel Dellandréa (emmanuel.dellandrea@ec-lyon.fr)