

# Autonomous exploration, active learning and human guidance with open-source Poppy humanoid robot platform and Explauto library



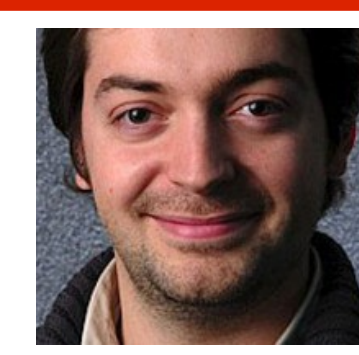
Sébastien Forestier



Yoan Mollard



Damien Caselli



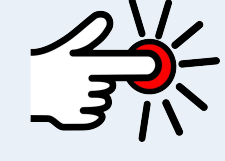
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## The Demonstration

The Torso robot **learns** how to move its arm to control the **ball**, **light** and **sounds**!  
Interact to **help** him:

- On the **Tablet**, click an element to focus on (*sound, light, ball pose...*)
- Push the **Demo Button**  and then **demonstrate** a motion:
  - Move Torso's left arm** to show him how to control the joystick
  - Move the left joystick** to show him how to teleoperate the Ergo robot



An open platform *Poppy robots + Explauto library*, to:

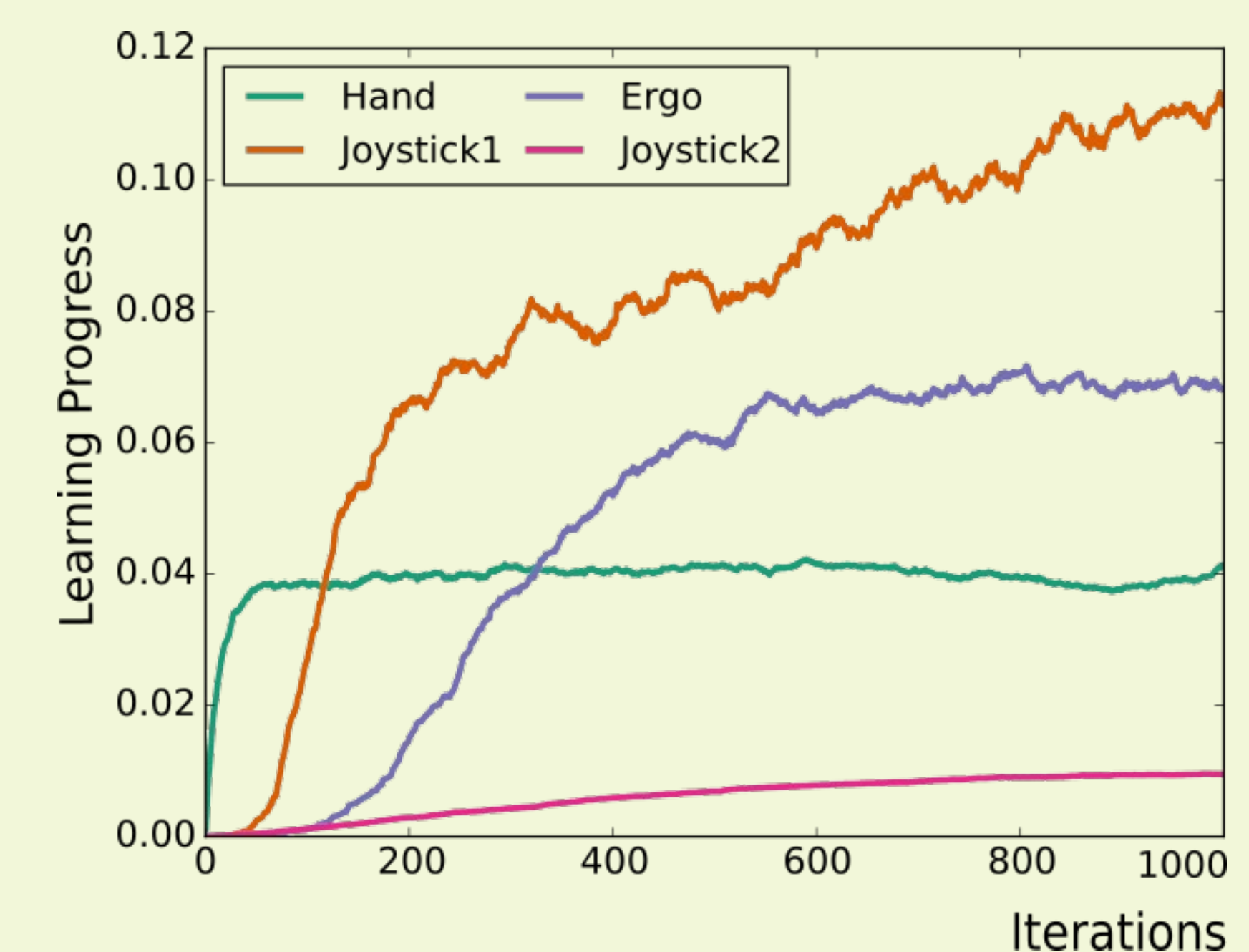
- Allow **non-roboticists** researchers to conduct **learning experiments** with robots
- Benchmark algorithms for active policy learning with multi-tasks robots

[github.com/sebastien-forestier/NIPS2016](https://github.com/sebastien-forestier/NIPS2016)

## Intrinsically Motivated Multi-Task Reinforcement Learning

Intrinsically motivated RL allows:

- To learn **parameterized policies**
- To solve families of **parameterized problems**
- Problems structured in spaces that can be
- organized in a **hierarchy of reusable skills**



[github.com/sebastien-forestier/ExplorationAlgorithms](https://github.com/sebastien-forestier/ExplorationAlgorithms)

Forestier, S. and Oudeyer, P.-Y. (2016). *Modular active curiosity-driven discovery of tool use*. In 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Daejeon, Korea.

## Poppy: an experimental platform for science

*"Make **scientific** outputs openly **accessible**, **reproducible** and **cumulative**"*

Poppy robots are accessible in terms of **cost** and **complexity**, allowing researchers to share hardware and experimental details

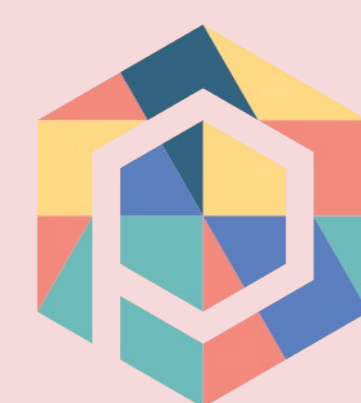
**Fast design**, building and experimentation of alternative morphologies: **3D printing** and **rapid prototyping** techniques now make it possible!

[poppy-project.org](http://poppy-project.org)

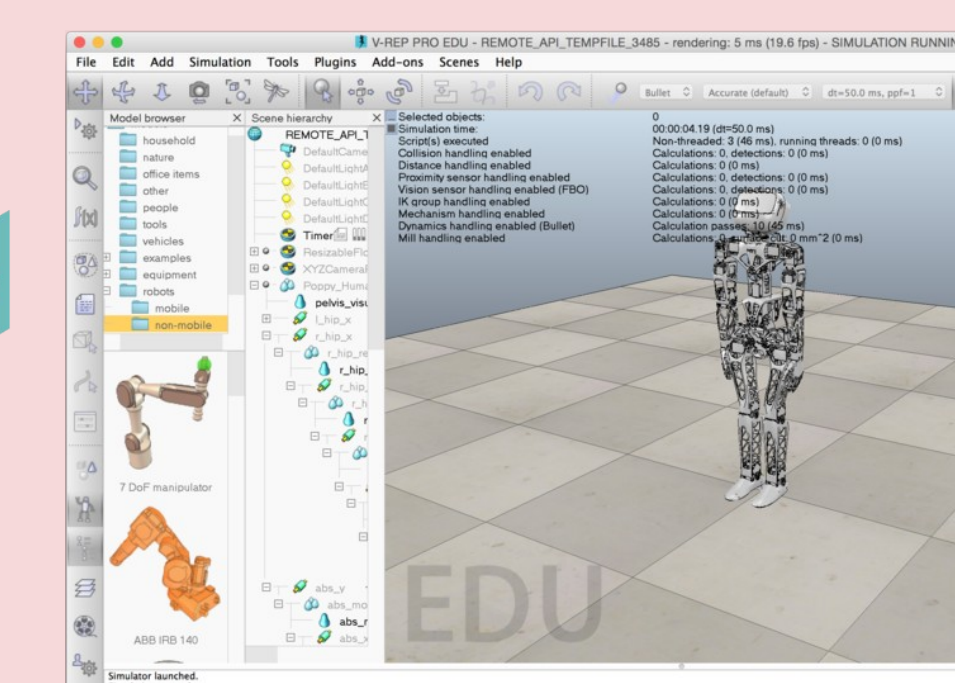


Make your Ergo Jr jump in 3 lines of code

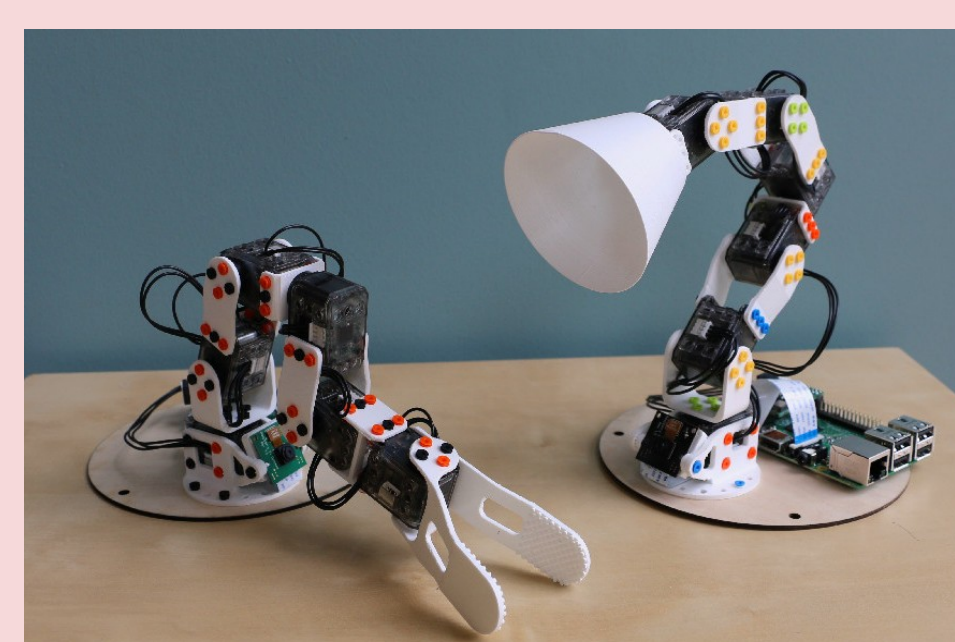
```
In [ ]: from poppy.creatures import PoppyErgoJr
jr = PoppyErgoJr()
In [ ]: jr.jump.start()
```



Poppy Humanoid



Robot simulator



Poppy Ergo Junior

## Explauto: a library to study learning in robotics agents

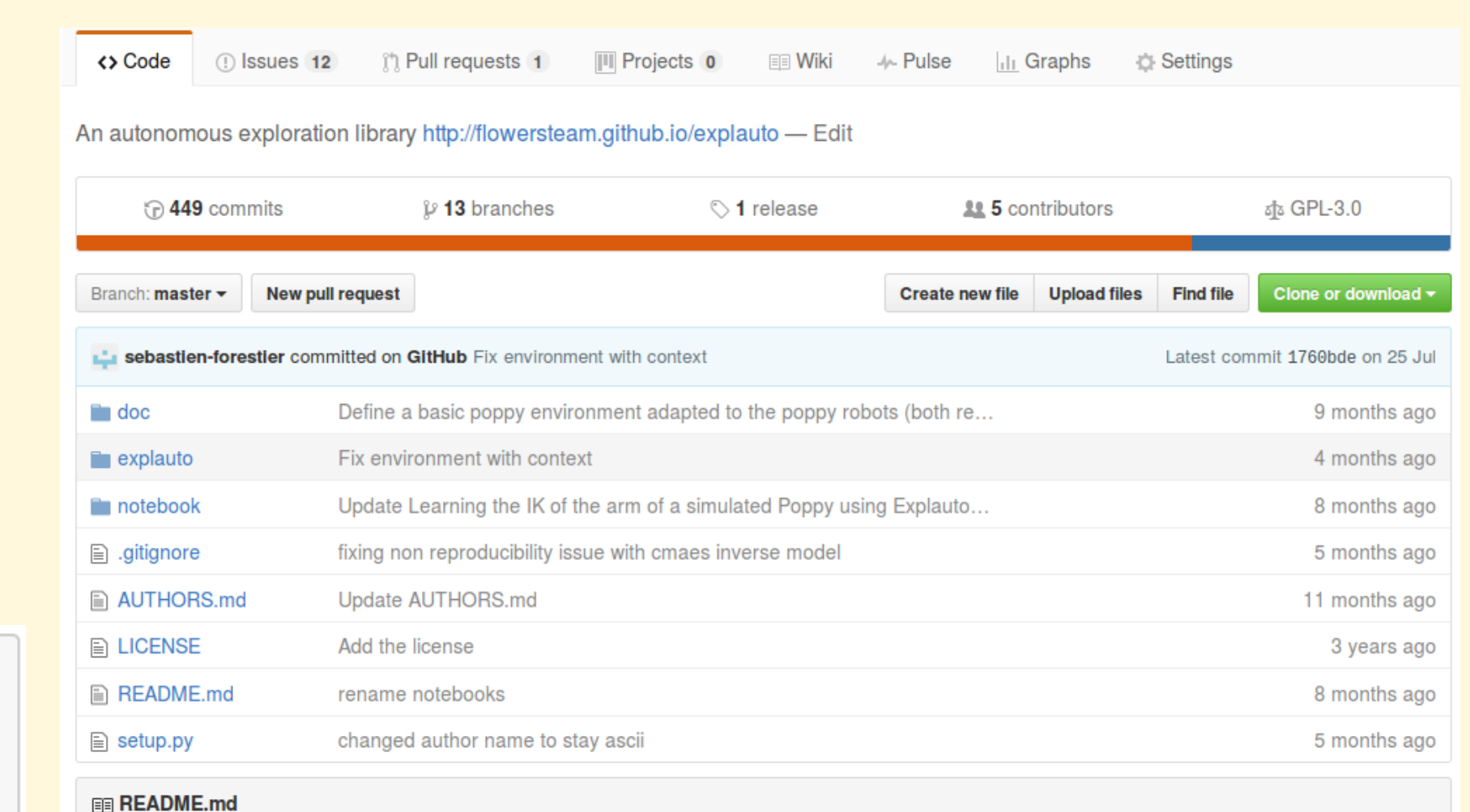
Explauto provides a high-level Python API for an easy definition of:

- Real and simulated **robotics setups**
- Incremental learning** of parametrized policies
- Active selection** of parametrized RL problems

```
from explauto.experiment import Experiment, make_settings

s = make_settings(environment='simple_arm',
                  babbling_mode='motor',
                  interest_model='random',
                  sensorimotor_model='nearest_neighbor')

expe = Experiment.from_settings(s)
```



Explauto: A library to study, model and simulate curiosity-driven learning and exploration in virtual and robotic agents

[github.com/flowersteam/explauto](https://github.com/flowersteam/explauto)