Cédric Colas

PhD Student

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Education

nov 2017- **PhD Artificial Intelligence**, *INRIA - Flowers Lab*, Bordeaux, FR.
Focus on exploration and intrinsic motivations for Reinforcement Learning. Subject: Deep Curiosity: Intrinsic Motivations and Deep Learning to Build Behavioral Repertoires in Autonomous Robotics.

2016-2017 **Master in Cognitive Science**, *École Normale Supérieure*, Paris, FR.
Main topics : Cognitive Neuroscience of the Prefrontal Cortex, Human Reasoning, Neuroscience of Consciousness. Grade: 15/20.

2015-2016 **Msc Biomedical Engineering**, *Imperial College*, London, UK.
Stream Neurotechnology. Main topics: Biomedical Imaging, Speech Processing, Image Processing, Computational Neurosciences, Brain-Machine Interfaces. Results: 78/100, with distinctions.

2013-2015 **BSc Electrical Engineering, Computer Science and Telecom.**, *Supelec*, Gif-sur-Yvette, FR.
4^{th} best french engineering school. Main subjects: Algorithmic, Signal Processing, Statistics, Probability. GPA: 3.7/4

2011-2013 **French Scientific Preparatory Classes**, *Lycée Lakanal*, Sceaux, FR.
Main subjects: Physics, Maths, Engineering. Grade: A

2011 **French Scientific High School Diploma**, *Lycée Louis-Le-Grand*, Paris, FR.
Obtained with highest honors.

Research Projects

Jun-Sept 2019 **Research Internship**, *Uber AI Labs*, San Francisco, US.
Scaling the Quality-Diversity algorithm *Map-Elites* to Deep Neuroevolution via the use of Evolution Strategies.

Nov 2017 - **PhD**, *INRIA - Flowers Lab*, Bordeaux, FR.
see list of publications below

Jan-Jun 2017 **Master Project**, *Brain and Spine Institute - Motivation, Brain and Behavior Lab*, Paris, FR.
Project: Computational model of the exploration-exploitation dilemma in a two-armed bandit task using variational Bayesian inference (supervised by Dr Jean Daunizeau).

May-Sep 2016 **Msc Project**, *Imperial College - Brain and Behaviour Lab*, London, UK.
Project: design of a brain-machine interface using EEG and convolutional neural networks to control an avatar in a video game for the international Cybathlon competition (supervised by Dr Aldo Faisal).

Apr 2016 **Msc Project**, *Imperial College - Brain-Machine Interfaces Class*, London, UK.
Project: Offline decoding of a monkey's hand trajectories from 98 neuronal spike trains. We used average firing rates computed over temporal bins for each spike train as features. The direction of the hand reach was decoded using k-nearest neighbors classification while the position was estimated by linear regression. My team achieved the 2^{nd} rank of the competition.

Jul-Aug 2015 **Internship**, *Center of Psychiatry and Neuroscience*, Paris, FR.
I assisted a PhD student in the development of a fear renewal protocol in rats exploring wide environments. I setup the controlled experiment (rat conditioning, camera for movement detection, automatic protocol for stimuli).

Other Projects

Exploring Wikipedia Automatic creation of a random walk in Wikipedia database. Each day, the program exposes a picture scrapped from Google Image to illustrate a concept detailed in a Wikipedia page. The next concept is chosen from the links of the previous day Wikipedia page.

Color Evolution	Genetic algorithms to evolve colors towards a target color (Processing language). The genotype is the RGB code, the phenotype is the color.
Pianocktail	Design of a system that produces a cocktail from a song played on an electric piano. The song representation is computed from handcrafted features from the MIDI signal, before being mapped to cocktail types, then cocktail ingredients using Fuzzy Logic.
Charabia	Piece of code to learn statistics from a language corpus and to create new words according to these statistics.

Languages

Real Life	French (mother tongue), English (proficient), Spanish (beginner).
Computer Life	Python (proficient), Matlab (proficient), Latex (proficient), Processing (intermediary), Arduino-C++ (beginner).

Publications

RL **Colas, C.**, Karch, T., Lair, N., Dussoux, J. M., Moulin-Frier, C., Dominey, P. F., Oudeyer, P. Y. (2020). *Language as a Cognitive Tool to Imagine Goals in Curiosity-Driven Exploration.* Under review. Link.

RL Lair, N., **Colas, C.**, Portelas, R., Dussoux, J. M., Dominey, P. F., Oudeyer, P. Y. (2019). *Language Grounding through Social Interactions and Curiosity-Driven Multi-Goal Learning.* Accepted at Visually Grounded Interaction and Language NeurIPS workshop, 2019. Link.

RL Portelas, R., **Colas, C.**, Hofmann, K., Oudeyer, P. Y. (2019). *Teacher Algorithms for Curriculum Learning of Deep RL in Continuously Parameterized Environments.* Accepted at CoRL 2019. Link.

RL Fournier, **Colas, C.**, Chetouani, M., P., Sigaud, O. (2019). *CLIC: Curriculum Learning and Imitation for feature Control in non-rewarding environments.* Accepted at IEEE Transactions on Cognitive and Developmental Systems. Link.

RL **Colas, C.**, Sigaud, O., Oudeyer, P. Y. (2018). *CURIOUS: Intrinsically Motivated Modular Multi-Goal Reinforcement Learning.* Accepted at ICML 2019. Link.

Stats for RL **Colas, C.**, Sigaud, O., Oudeyer, P. Y. (2019). *A Hitchhiker's Guide to Statistical Comparisons of Reinforcement Learning Algorithms.* Link.

Stats for RL **Colas, C.**, Sigaud, O., Oudeyer, P. Y. (2018). *How Many Random Seeds? Statistical Power Analysis in Deep Reinforcement Learning Experiments.* Link.

RL **Colas, C.**, Sigaud, O., Oudeyer, P.. (2018). *GEP-PG: Decoupling Exploration and Exploitation in Deep Reinforcement Learning Algorithms.* Accepted at ICML 2018. Link.

BCI Ortega, P., **Colas, C.**, Faisal, A. A. (2018). C*ompact Convolutional Neural Networks for Multi-Class, Personalised, Closed-Loop EEG-BCI.* In 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) (pp. 136-141). Link.