

RESEARCH AND PROFESSIONAL EXPERIENCES

- **Computational Physiology Lab - Cornell University** Ithaca, USA
Postdoctoral Associate under the supervision of Thomas Cleland *September 2021 - Present*
 - **Project:** Development of Brain-Inspired technologies leveraging the development of an olfactory system based algorithm allowing for learning in the wild and implementing it in neuromorphic hardware.
 - **Algorithm development:** Lead developer on Sapinet, an olfactory system based algorithm that is able to leverage biological innovations to perform learning in the wild
 - **Substrate innovation:** Porting Sapinet code to a state compatible with latest neuromorphic hardware capabilities allowing edge device support
- **Numenta** Redwood City, USA
Research Scientist Consultant *April 2021 - April 2022*
 - **Project:** Development of Neuroscience-inspired deep learning models
- **Quantum Ventura Inc** California, USA
Data Scientist *March 2021 - August 2021*
 - **Software development:** End-to-end pipeline development: from data pre-processing to data analysis and data representations.
 - **Data Science:** Machine learning model development to predict and classify various datasets.
- **ContinualAI - Non-profit research organization** Virtual
Research Scientist - Neuroscience, Neuroscience-inspired AI, Continual Learning *January 2020 - Present*
 - **Project:** Support the production, organization and dissemination of original research on continual learning with technical research, open source projects and tools that can make the life of a continual learning researcher easier.
 - **ContinualAI Lab:** Supervising the ContinualAI Publication effort, contributor to ContinualAI Avalanche library.
- **Center for Neural Science - New York University** New York, USA
Postdoctoral Associate under the supervision of Alex Reyes *April 2019 - December 2020*
 - **Project:** Establish a whole optic electrophysiological system to study learning and memory storage in vitro on cortical cultures. This is a theoretically-driven project based on a computational model and in collaboration with Stefano Fusi at Columbia University.
 - **Software development:** Lead developer on an electrophysiological and imaging custom software
 - **Analysis pipeline development:** Lead developer on a high-throughput data-driven imaging pipeline aimed at processing high temporal resolution biological images
 - **Electrophysiology:** In-vitro whole-optical electrophysiological experiments
 - **Study design and implementation:** Plan and execute experimental designs and the required tools needed
- **Mortimer B. Zuckerman Mind Brain Behavior Institute - Columbia University** New York, USA
Postdoctoral Research Scientist under the supervision of Stefano Fusi *September 2019 - December 2020*
 - **Project:** Complex synapse model development that solve the problem of online memory storage in artificial neuronal networks and use it to study memory storage in the brain. Use this model to design biological experiments and validate this model plausibility in biological networks. This is a theoretically-driven project based on a computational model and in collaboration with Alex Reyes at New York University.
 - **Modeling:** Building models of complex neural data, deep neural networks, collaborative work on open source models
- **Lyon Neuroscience Research Center (CRNL)** Lyon, France
PhD in Neurosciences under the supervision of Dr Nathalie Mandairon and Pr Anne Didier. *Sept 2014 - Jan 2018*
 - **Project:** In my Phd work entitled Impact of adult neurogenesis versus preexisting neurons on olfactory perception in complex or changing environment, we worked toward a better understanding of the cellular and network modifications underlying perceptual olfactory learning in mice. We investigated learning-dependent modifications at the level of adult-born neurons as well as preexisting neurons (adult-born neurons survival, neuronal morphology, functional implication) in perceptual learning tasks that varied in complexity (number of learning tasks) or changed over time.
 - **Behavior:** behavioral tracking, image analysis, classification.
 - **Cellular, molecular and systems neuroscience:** brain data collection, analysis, interpretation and publication.
 - **Data analysis:** Complex data analysis using probability and statistics.
 - **Student supervision:** Supervise students through specific project.
 - **Teaching:** Teaching undergraduate and graduate level courses in neuroscience, biology, physiology, literature search.
- **Computational Physiology Lab (CPL) – Cornell University** Ithaca, USA
Mobility during my PhD, under the supervision of Dr Christiane Linster. *April 2017 - June 2017*

- **Project:** The purpose was to implement adult neurogenesis process in a biologically-constraint integrate and fire neuronal network model of the olfactory bulb centered around the respective role of adult-born versus preexisting neurons in learning and memory processes.
- **Modeling:** Building integrate and fire neuron networks.
- **Lyon Neuroscience Research Center (CRNL)** Lyon, France
Internship at the CRNL under the supervision of Dr Nathalie Mandairon and Pr Anne Didier Jan 2014 - July 2014
 - **Project:** We started the first set of experiments that was later expended on during my thesis work.
 - **Cellular, molecular and systems neuroscience:** brain data collection, analysis, interpretation and publication.
 - **Data analysis:** Complex data analysis using probability and statistics.
- **Hotchkiss Brain Institute** Calgary, Canada
Internship (part time) in the Lukowiak's lab under the supervision of Dr. Kenneth Lukowiak. October 2012 - Mai 2013
 - **Project:** This work consisted on behavioral studies investigated how different kind of stressors influence learning and memory abilities in *Lymnaea stagnalis*, a pond-water snail. I also learned the basics of current-clamp electrophysiology.
 - **Behavior:** Behavioral studies in invertebrate.
 - **Electrophysiology:** Exposure to electrophysiological techniques.
 - **Data analysis:** Complex data analysis using probability and statistics.

EDUCATION

- **Claude Bernard Lyon 1 University and Lyon Neuroscience Research Center** Lyon, France
PhD in Neuroscience 2014 – 2018
- **Claude Bernard Lyon 1 University** Lyon, France
Graduate studies: Master 2, research-oriented in Neuroscience 2013 – 2014
- **University of Calgary and Lyon 1 University** Calgary, Canada
Graduate studies: Master 1: Integrative biology: Physiology and Neuroscience 2012 – 2013
- **Claude Bernard Lyon 1 University** Lyon, France
Undergraduate studies: Bachelor of Science, specialized in Physiology 2009 – 2012

CONFERENCES, WORKSHOPS AND SUMMER SCHOOLS

- **Conferences and Workshops organization**
 - **Neuromatch 4.0:** Organizer, coder Virtual 2021
 - **Neuromatch 3.0:** Help with emails management and help desk during conference Virtual 2020
 - **Integrity in scientific research:** Where are we now? Organization committee Lyon, France, 2017
 - **Season of the CRNL:** Importance of big data in Neurosciences. Organization committee Lyon, France, 2016
- **Summer school organization**
 - **Neuromatch Academy:** Volunteer. Helped where needed: video editing, closed-captionning Virtual, 2020
- **Workshop attendance**
 - **Columbia Neuronex Neurotheory Workshop Serie:** Learn new and advanced techniques in modeling and data analysis New York, USA 2020
 - **Neurodata Without Borders Worshop, 8th User Day:** Effort to standardize the description and storage of neurophysiology data and metadata Virtual, 2020
 - **Introduction to Python:** Numpy, Matplotlib, Pandas, Jupiter, Scipy, Sklearn Lyon, France, 2016
 - **Statistical analysis with R:** Introduction to R and modeling data Lyon, France, 2015
- **Summer School attendance**
 - **Neuromatch Academy:** Computational Neuroscience summer school. Observer track. Virtual 2020

WORK IN PROGRESS

1. Ayub, A., Lomonaco, V., Parisi, G. I., Cooper, K., **Forest, J.**, Ahrens, K., Churamani, N., Ahmad, S., Wermter, S., Diaz-Rodriguez, N., Maltoni, D., Pickett, M., Hayes, T. L., Rish, I., “Continual Learning in Biological and Artificial Systems,”

RESEARCH PAPERS

1. Molano-Mazon, M., Barbosa, J., Pastor-Ciurana, J., Fradera, M., Zhang, R.-Y., **Forest, J.**, Pozo Lerida, J., Ji-An, L., Cueva, C. J., Rocha, J., Narain, D., Yang, G. R., “NeuroGym: An open resource for developing and sharing neuroscience tasks,” en, *PsyArXiv*, preprint, Feb. 2022, 00001. DOI: 10.31234/osf.io/aqc9n
2. Lamprecht, A.-L., Martinez-Ortiz, C., Barker, M., Bartholomew, S. L., Barton, J., Chue Hong, N., Cohen, J., Druskat, S., **Forest, J.**, Grad, J.-N., Katz, D. S., Richardson, R., Rosca, R., Schulte, D., Struck, A., Weinzierl, M., “What do we (not) know about Research Software Engineering?” 00000, Mar. 2022
3. Iyer, A., Grewal, K., Velu, A., Souza, L. O., **Forest, J.**, Ahmad, S., “Avoiding Catastrophe: Active Dendrites Enable Multi-Task Learning in Dynamic Environments,” *Frontiers in Neurorobotics*, vol. 16, p. 846 219, Apr. 2022, 00001. DOI: 10.3389/fnbot.2022.846219
4. Greco-Vuilloud, J., Midroit, M., Terrier, C., **Forest, J.**, Sacquet, J., Mandairon, N., Didier, A., Richard, M., “12 months is a pivotal age for olfactory perceptual learning and its underlying neuronal plasticity in aging mice,” en, *Neurobiology of Aging*, vol. 114, pp. 73–83, Jun. 2022, 00000. DOI: 10.1016/j.neurobiolaging.2022.03.003
5. Lomonaco, V., Pellegrini, L., Cossu, A., Carta, A., Graffieti, G., Hayes, T. L., De Lange, M., Masana, M., Pomponi, J., Ven, G., Mundt, M., She, Q., Cooper, K., **Forest, J.**, Belouadah, E., Calderara, S., Parisi, G. I., Cuzzolin, F., Talias, A., Scardapane, S., Antiga, L., Amhad, S., Popescu, A., Kanan, C., Weijer, J., Tuytelaars, T., Bacciu, D., Maltoni, D., “Avalanche: An End-to-End Library for Continual Learning,” *arXiv:2104.00405 [cs]*, Apr. 2021, arXiv: 2104.00405
6. 't Hart, B. M., Achakulvisut, T., Blohm, G., Kording, K., Peters, M. A. K., Akrami, A., Alicea, B., Beierholm, U., Bonnen, K., Butler, J. S., Caie, B., Cheng, Y., Chow, H. M., David, I., DeWitt, E., Drugowitsch, J., Dwivedi, K., Fiquet, P.-É., Gu, Q., Hyafil, A., **Forest, J.**, et al., “Neuromatch Academy: A 3-week, online summer school in computational neuroscience,” en, *Open Science Framework*, preprint, Feb. 2021. DOI: 10.31219/osf.io/9fp4v
7. Midroit, M., Chalençon, L., Renier, N., Milton, A., Thevenet, M., Sacquet, J., Breton, M., **Forest, J.**, Noury, N., Richard, M., Raineteau, O., Ferdenzi, C., Fournel, A., Wesson, D. W., Bensafi, M., Didier, A., Mandairon, N., “Neural processing of the reward value of pleasant odorants,” en, *Current Biology*, Feb. 2021. DOI: 10.1016/j.cub.2021.01.066
8. Linster, C., Midroit, M., **Forest, J.**, Thenaisie, Y., Cho, C., Richard, M., Didier, A., Mandairon, N., “Noradrenergic Activity in the Olfactory Bulb Is a Key Element for the Stability of Olfactory Memory,” en, *Journal of Neuroscience*, vol. 40, no. 48, pp. 9260–9271, Nov. 2020, Publisher: Society for Neuroscience Section: Research Articles. DOI: 10.1523/JNEUROSCI.1769-20.2020
9. **Forest, J.**, Moreno, M., Cavelius, M., Chalençon, L., Ziesel, A., Sacquet, J., Richard, M., Didier, A., Mandairon, N., “Short-term availability of adult-born neurons for memory encoding,” en, *Nature Communications*, vol. 10, no. 1, pp. 1–9, Dec. 2019. DOI: 10/ggfh4d
10. **Forest, J.**, Chalençon, L., Midroit, M., Terrier, C., Caillé, I., Sacquet, J., Benetollo, C., Martin, K., Richard, M., Didier, A., Mandairon, N., “Role of Adult-Born Versus Preexisting Neurons Born at P0 in Olfactory Perception in a Complex Olfactory Environment in Mice,” en, *Cerebral Cortex*, Jun. 2019. DOI: 10/gf4hnb
11. Mandairon, N., Kuczewski, N., Kermen, F., **Forest, J.**, Midroit, M., Richard, M., Thevenet, M., Sacquet, J., Linster, C., Didier, A., “Opposite regulation of inhibition by adult-born granule cells during implicit versus explicit olfactory learning,” *eLife*, vol. 7, e34976, 2018. DOI: 10.7554/eLife.34976
12. Sunada, H., Watanabe, T., Hatakeyama, D., Lee, S., **Forest, J.**, Sakakibara, M., Ito, E., Lukowiak, K., “Pharmacological effects of cannabinoids on learning and memory in *Lymnaea*,” *The Journal of Experimental Biology*, vol. 220, no. 17, pp. 3026–3038, Sep. 2017. DOI: 10.1242/jeb.159038
13. **Forest, J.**, Sunada, H., Dodd, S., Lukowiak, K., “Training *Lymnaea* in the presence of a predator scent results in a long-lasting ability to form enhanced long-term memory,” *Journal of Comparative Physiology A*, vol. 202, no. 6, pp. 399–409, Jun. 2016. DOI: 10/f8qgrn
14. Kermen, F., Midroit, M., Kuczewski, N., **Forest, J.**, Thévenet, M., Sacquet, J., Benetollo, C., Richard, M., Didier, A., Mandairon, N., “Topographical representation of odor hedonics in the olfactory bulb,” *Nature Neuroscience*, vol. 19, no. 7, p. 876, 2016. DOI: 10.1038/nn.4317

REVIEW PAPERS

1. **Forest, J.**, Midroit, M., Mandairon, N., “La plasticité hors du commun du système olfactif,” *Pollution atmosphérique*, no. 234 Avril - Juin 2017, 2017. DOI: 10.4267/pollution-atmospherique.5247

TALKS

1. **Forest, J.**, Reyes, A., “Optical stimulation and recording acquisition software,” Neuromatch3.0, 10.5281/zenodo.4302292, Virtual, Oct. 2020
2. **Forest, J.**, “Principles of long-term memory storage in cultured networks,” Rinzel and Reyes lab meeting, Virtual, Jun. 2020
3. **Forest, J.**, “Continual learning in neuroscience,” ContinualAI meetups, Virtual, Mar. 2020
4. **Forest, J.**, Caillé, I., Sacquet, J., Richard, M., Didier, A., Mandairon, N., “Functional and structural plasticity of adult-born versus preexisting granule cells of the olfactory bulb during simple and complex perceptual learning in mice,” Society for Neuroscience 47th annual meeting, Washington, USA, Nov. 2017
5. **Forest, J.**, “Neuronal plasticity in the olfactory bulb during simple and complex perceptual learning,” Neurosciences and Cognition doctoral school. Lyon, France., Sep. 2017
6. **Forest, J.**, “Olfactory bulb plasticity during simple and complex learning – the central role of newborn neurons,” CPL, Apr. 2017
7. **Forest, J.**, “Plasticité neuronale du bulbe olfactif lors d’apprentissage simple et complexe,” Workgroup olfaction. Lyon, France, Oct. 2016
8. **Forest, J.**, Richard, M., Sacquet, J., Benetollo, C., Didier, A., Mandairon, N., “Neuronal plasticity in the olfactory bulb during simple and complex learning,” Plasticity Workshop. Lyon, France., Mar. 2016
9. Yin, X., **Forest, J.**, Midroit, M., Sacquet, J., Kuczewski, N., Richard, M., Mandairon, N., Didier, A., “Olfactory perceptual learning shapes morphology of adult born granule cells and their inputs from locus coeruleus,” Society for Neuroscience 45th annual meeting. Chicago, USA., Oct. 2015
10. Mandairon, N., Richard, M., Moreno, M. M., **Forest, J.**, Yin, X., Didier, A., “Top down control on adult-born neurons during olfactory learning,” Association for Chemoreception Science, Fort Meyers, FL USA., Apr. 2015

POSTER PRESENTATIONS

1. Grewal, K., **Forest, J.**, Ahmad, S., *Going Beyond the Point Neuron: Active Dendrites and Sparse Representations for Continual Learning*, 00001, Virtual, Sep. 2021
2. Grewal, K., **Forest, J.**, Cohen, B., Ahmad, S., “Going Beyond the Point Neuron: Active Dendrites and Sparse Representations for Continual Learning,” en, Tech. Rep., Oct. 2021, Company: Cold Spring Harbor Laboratory Distributor: Cold Spring Harbor Laboratory Label: Cold Spring Harbor Laboratory Section: New Results Type: article, p. 2021.10.25.465651. DOI: 10.1101/2021.10.25.465651
3. Molano-Mazón, M., Pastor-Ciurana, J., Fradera, M., Zhang, R.-Y., **Forest, J.**, Pozo, J., Barbosa, J., Ji-An, L., Cueva, C., Compte, A., Rocha, J., Yang, G. R., *Neurogym: An open resource to developing and sharing neuroscience tasks*, 2021
4. Terrier, C., Yin, X., Midroit, M., **Forest, J.**, Sacquet, J., Thevenet, M., Mandairon, N., Didier, A., Richard, M., “Investigating role of noradrenaline in olfactory discrimination during aging,” Association for Chemoreception Science, Bonita Springs, FL, USA., Apr. 2018
5. **Forest, J.**, Caillé, I., Sacquet, J., Richard, M., Didier, A., Mandairon, N., “Functional and structural plasticity of adult-born versus preexisting granule cells of the olfactory bulb during simple and complex perceptual learning in mice,” Society for Neuroscience 47th annual meeting, Washington, USA, Nov. 2017
6. **Forest, J.**, Richard, M., Sacquet, J., Benetollo, C., Didier, A., Mandairon, N., *Olfactory bulb plasticity during complex perceptual learning in mice*. Society for Neuroscience 45th annual meeting, Chicago, USA., Oct. 2015
7. Sunada, H., **Forest, J.**, Sakakibara, M., Lukowiak, K., *Traumatic stress impairs learning and memory formation via an endocannabinoid system in *Lymnaea stagnalis**. 37th Annual Meeting of the Japan Neuroscience Society, Yokohama Japan., Sep. 2014
8. Sunada, H., **Forest, J.**, Sakakibara, M., Lukowiak, K., *Traumatic stress impairs learning and memory formation via an endocannabinoid system in *Lymnaea stagnalis**. 52nd Annual Meeting of the Biophysical Society of Japan. Sapporo, Japan., Sep. 2014

OPEN SOURCE SOFTWARE CONTRIBUTIONS

- **OPTIMAS: whOle-oPTical IMaging AnalysiS pipeline:** Pipeline under development for the analysis of whole electrophysiological experiments
- **OPTIMAQS: whOle-oPTical IMaging AcQuisition Software:** Software under development for the execution of automatic whole electrophysiological experiments
- **NeuroGym: a curated collection of neuroscience tasks with a common interface:** Framework under development to study learning and behavior using artificial neural networks
- **Avalanche: a Comprehensive Framework for Continual Learning Research:** Framework under development to study continual learning in artificial neural networks
- **Numenta's research code:** Framework for numenta's research

TEACHING

- **Teaching assistant** Lyon, France
Teaching assistant in the Neurosciences department. Teaching undergraduate and graduate level courses 2014 - 2017
 - **Literature research (Spring 2014):** Project oriented course in which student chose a subject inside a broader given theme and are guided toward the redaction of a commented referencing paper. The goal is to present them multiple research supports (databases, internet searches, university library ...) and guide them to use them correctly and efficiently.
 - **Preparation to paramedical exam (Winter 2016):** Introduction to the physiology of the nervous system. This course focuses on imparting students with the required knowledge for the paramedical exam. Consist of teaching essential brain mechanistic including brain organization, neuron-neuron communication, resting potential and action potential mechanisms, neuromuscular junction, reflexes and nerves. Classes also include QCM and exercise completions.
 - **Neurosciences (Winter 2014, Spring 2014, Winter 2015, Spring 2015, Winter 2016):** Guided work within an introductory course in Neurosciences. The purpose was to introduce students to the scientific method and reasoning. During class they had to think about figures extracted from different papers and converse on how to properly analyze interpret and draw conclusion. They then had to write a short paper on that. Also they were task with doing group presentation (2-3 student/group) on a scientific article of their choice.
 - **Neurophysiology (Spring 2014, Spring 2015):** Practice work within a broader course involving general neurophysiology which go into all the different sensory modalities as well as motor function and memory. Practice work consisted in the microscope histological observations of tissue samples from every modality were student were asked to draw and legend what they saw.
 - **Neurobiology of behavior (Spring 2014, Spring 2015):** This course is about different type of behavior and their underlying neuronal substrate, from place cells of the hippocampus to animal cognition. Practice work consisted of guiding the students through an animal experiment with mice over several days. Mice were performed on spatial and olfactory memory tasks with or without drug injection (norepinephrine agonist or antagonist). This was an opportunity to talk about experiment design or potential biases involved during an experiment. Student then wrote a paper on their experiment. Guided work was centered about a relevant scientific article analyzed during class with the students whom had to write on paper on it afterward.

STUDENTS SUPERVISION

- **Undergraduate level:** Killian Martin (2016), Kamela Nikolla (2016), Loic Richard (2015), Matthias Cavelus (2015), Merouann Kasa (2014)
- **Graduate level:** Barbara Labaune (2015)

GRANTS

- **2014-2017:** Grant for PhD studies, delivered by the French government.
- **2014-2017:** Grant for a teaching assistant (TA) position. 64 hours teaching per academic year.

AWARDS

- **2016:** 3rd place – flash oral presentation (180s). Olfaction workgroup (GDR). Lyon, France.