Philippe Desjardins-Proulx

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Current Position Consultant in Artificial Intelligence, Machine Learning, & Bayesian Data Analysis.

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Citizenship Canada

Languages
French: Native language
English: Full professional proficiency
Japanese: Elementary proficiency

Expertise

- **Artificial Intelligence & Machine Learning:** My Ph.D. thesis focused on automatically learning and revising mathematical models for ecosystems. I learned various A.I. frameworks from statistical relational learning (the union of logic with probability), purely probabilistic approaches, and fuzzy logic. I'm particularly interested in techniques that combine classical or nonclassical logics with probability to achieve both clarity (or even better: formal verification) and performance. I've also developed an expertise in Bayesian data analysis, with a special focus on the new generation of rich probabilistic programming languages such as Pyro and Anglican.
- **High Performance Computing:** I worked four years (2009-2012) as a research professional, focusing on C/C++ and GPU computing with CUDA/OpenCL on the Canada Research Chair on Terrestrial Ecosystems' scientific cluster. My work involved ecological simulations and implementing machine learning algorithms.
- **Theoretical Ecology & Biodiversity:** I contributed to theoretical evolutionary ecology, with a special focus on the role of speciation in biodiversity.

Education

Department of Biology, Université de Sherbrooke, Canada.

Ph.D., September 2012 – Summer 2019

- **Thesis**: *Automatic Theory Revision of Ecological Theories*
- **Adviser**: Dr. Dominique Gravel
- **Co-adviser**: Dr. Timothée Poisot
- **Committee**: Dr. Shengrui Wang (Computer Science, U. Sherbrooke), Dr. Alireza Tamaddoni Nezhad (Computer Science, Imperial College)
- **Area of Study**: Artificial Intelligence; Logic; Statistical Relational Learning; Theoretical Ecology.
- **Comprehensive exam**: Maximum Entropy in Ecology & Evolution.
- **Courses**: Advanced Distributed Computing (A13), Business Intelligence (S15).

College of Engineering, University of Illinois at Chicago, Chicago, USA.

Graduate Certificate in Bioinformatics, 2012,

- **Area of Study**: Data Mining & Biostatistics.

Université du Québec, Québec, Canada.

B.S., 2009,

- Major in Biology,
- Minor in Mathematics & Computer Science.

Awards

Alexander Graham Bell Graduate Scholarship (2012)

- **From:** Natural Sciences and Engineering Research Council of Canada
- **Description:** Most competitive Canadian scholarship in science.
- **Value:** 105 000 CAD.

Windows Azure Research Award (2013)

- **From:** Microsoft Research
- **Description:** The first group of 32 awards given by Microsoft (1000 applications). Gives a generous access to Microsoft Azure (in my case, Linux VMs) for research purpose.
- **Proposal:** *Growing Intelligence with Cloud Markov Logic.*
- **Value:** >40 000 USD.

NVIDIA hardware donation program (2014)

- **Description:** I was awarded an NVIDIA card for high-performance computing.
- **Proposal:** *Transfer Learning, Deep Learning, and the Puzzle of Biodiversity.*

Refereed Journal Publications

[1] **P Desjardins-Proulx**, I Bartomeus, T Poisot, D Gravel. Learning fuzzy rules to predict ecological interactions.
Submitted

[2] **P Desjardins-Proulx**, D Gravel, T Poisot. Artificial Intelligence and synthesis in ecology and evolution.
Invited, Frontiers in Ecology and Evolution

[3] **P Desjardins-Proulx**, D Gravel, T Poisot. Ecological Interactions and the Netflix Problem.
PeerJ 5:e3644.

[4] D Beauchesne, **P Desjardins-Proulx**, P Archambault, D Gravel Thinking outside the box: Predicting biotic interactions in data-poor environments.
Vie & Milieu, 2017.

[5] MG Matias, D Gravel, F Guilhaumon, **P Desjardins-Proulx**, M Loreau, T Münkemüller, N Mouquet Estimates of species extinctions from species–area relationships strongly depend on ecological context.
Ecography 37(5): 431-442.

[6] D Gravel, T Poisot, **P Desjardins-Proulx** Using neutral theory to reveal the contribution of meta-community processes to assembly in complex landscapes.
Journal of Limnology 73 (s1).

[7] **P Desjardins-Proulx**, EP White, JJ Adamson, K Ram, T Poisot, and D Gravel. The case for open preprints in biology.
PLoS Biology 11(5): e1001563

[8] R Vergilino, TA Elliott, **P Desjardins-Proulx**, TJ Crease and F Dufresne. Evolution of a transposon in *Daphnia* hybrid genomes. *Mobile DNA* 4-7, 2013.
DOI: 10.1186/1759-8753-4-7

[9] D Ai, **P Desjardins-Proulx**, C Chu, and G Wang. The influence of immigration and dispersal limitation on the repeatability of niche and neutral communities.
PLOS ONE 7(9): e46164, 2012.
DOI: 10.1371/journal.pone.0046164

[10] **P Desjardins-Proulx** and D Gravel. A complex speciation-richness relationship in a simple neutral model. *Ecology and Evolution* 2(8): 1781–1790, 2012. DOI: 10.1002/ece3.292

[11] **P Desjardins-Proulx** and D Gravel. How likely is speciation in neutral ecology? *The American Naturalist* 179(1):137-144, 2012. DOI: 10.1086/663196

Other Contributions

[12] **P Desjardins-Proulx**. The case for arXiv and a broader conception of peer-reviews. Invited blog, International Network of Next-Generation Ecologists, 2012. http://www.innge.net/?q=node/330.

[13] **P Desjardins-Proulx**, JL Rosindell, T Poisot, and D Gravel. A simple model to study phylogeographies and speciation patterns in space, 2012. arXiv: 1203.1790.

[14] **P Desjardins-Proulx**. A foot in the neutral trap. Invited comment for *Trends in Ecology & Evolution*, 2012.

[15] **P Desjardins-Proulx**. L'origine de la Biodiversité. Le Mouton Noir, Mai-Juin. Cahier Spécial sur la Biodiversité p.2, 2010. *Selected and republished by Gaia-Presse, a group sponsored by the Université Laval.*

Job Experiences

Research Professional, Canada Research Chair on Terrestrial Ecosystem

- From 2009 to 2012.
- **Supervisor**: Dr. Dominique Gravel
- **Responsabilities**: Programming high-performance simulations in C, C++, and CUDA on a distributed cluster (Xeon processors + Tesla cards); Design ecological models to understand biodiversity; Teaching scientific computing to graduate students (C, C++, CUDA, UNIX tools).

Teaching Experiences

Université du Québec, Québec, Canada.

- 2013. I organized a series of meetings on information theory and inference.
- 2012. CUDA training (intensive one-day course).
- 2012. Scientific computing with C and C++ (grad. students/post-docs).
- 2011. Scientific computing with C and C++ (grad. students/post-docs).

Referee Service

Physica A: Statistical Mechanics and its Applications; Molecular Ecology Ressources; Methods in Ecology and Evolution; Ecology Letters; Journal of Theoretical Biology; Theoretical Ecology; Acta Biotheoretica; The American Naturalist; Journal of Plant Ecology.

Programming skills

I have some experience with many programming languages, libraries, frameworks. I only list here my current working tools:

- **Languages**: *Expert* C, C++11/14; *Intermediate* Rust, Haskell, Python, Scala; *Basic* Java, R, Clojure, F#.
- **High performance computing**: CUDA, OpenCL, OpenMP, ZeroMQ, basic MPI.
- **Operating Systems**: Linux (mostly Debian/Ubuntu-based).
- **Cloud:** Azure (Linux VMs), Google, Amazon.
- **Writing**: LaTeX 2_ε.

Graduate Courses	• 2015. Business Intelligence [A, 3 credits]	Athabasca
	• 2013. Advanced Distributed Computing [A, 3 credits]	Athabasca
	• 2012. Datamining (machine learning) [A, 4 credits]	UIC
	• 2011. Biostatistics [A, 4 credits]	UIC
	• 2010. Intro. to bioinformatics [A, 4 credits]	UIC
	• 2010. Reading course on Ancestral Recombination Graphs [A+, 3 credits]	UQAR
Online Courses	• 2014. Technology Entrepreneurship	NovoEd/Stanford