



UC Berkeley

Alexandre Bouchard-Côté

Ph.D. candidate

Computer Science Division

University of California, Berkeley

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Research Interests

My main field of research is statistical machine learning. I am currently working on high-resolution computational models for evolutionary processes, which can be used to automatically reconstruct protolanguages or to align proteins. This work has the potential to bring methods from computer science to bear on significant problems in both biology and historical linguistics.

Other current or recent research projects include: approximate inference in structured combinatorial spaces using MCMC and variational inference, multiple sequence alignment, and using non-parametric Bayesian statistics to train machine translation models. In the past, I also worked on logical characterization and approximation of labeled Markov processes and on reinforcement learning. Other topics of interest include: probability theory, design and analysis of randomized algorithms.

Education

University of California, Berkeley, PhD in Computer Science — 2005-present

Major: artificial intelligence. Minors: linguistics and statistics. *Designated Emphasis in Communication, Computation and Statistic.*

Coursework: probability theory, machine learning, statistics, randomized algorithms, natural language processing, computer vision, historical linguistics, Mandarin Chinese.

Research advisors: Michael I. Jordan and Dan Klein.

McGill University, B.Sc. in Mathematics and Computer Science — 2002-2005

Joint Honours Program in Mathematics and Computer Science, First Class Honours.

Awards: *Courtemanche Scholarship, Dean's List, McGill Certificate of Merits, James McGill Scholarship.*

Strong training in Real, Complex and Functional Analysis (6 courses), Machine Learning, Abstract Algebra, Complexity Theory. Electives in linguistics and astrophysics.

Experience

Research Assistant, UC Berkeley, Computer Science Division — 2006-present

Supervisors: Michael I. Jordan and Dan Klein

Description: Research in phylogenetic inference, approximate inference, machine translation and non-parametric Bayesian statistics.



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Co-instructor (CS294-34: Practical Machine Learning), UC Berkeley, Computer Science Division – Fall 2006, Spring 2008, Fall 2009

Creating a new course from scratch in collaboration with other students under the supervision of Michael Jordan.

Graduate Student Instructor (CS281A: Statistical Learning Theory), UC Berkeley, Computer Science Division – Spring 2007

Teaching sections and preparing assignment problems for a graduate level course on machine learning. I was also guest lecturer for the part of the course on variational inference.

Research Assistant, McGill University, School of Computer Science – 2004-2005

Supervisors: Prakash Panangaden, Doina Precup

First Prize for the *Courtemanche scholarship* (best undergraduate research project in the computer science department), *NSERC Undergraduate Student Research Award (twice)*.

Description: Study of the computability of LMP metrics for continuous state space systems. Investigation on the properties of SDM, an approximation architecture for reinforcement learning. Empirical tests on standard reinforcement learning problems.

Programmer, Bell Canada, Emerging Solutions Group – 2001-2004

Supervisor: Joanne Santerre

Recipient of the *Performance Award*.

Description: Research and development for an IP telephony system. Various programming skills acquired; application of concepts related to algorithms and concurrency.

Tutor, CÉGEP d'Alma – 2001-2002

Peer tutoring for an integral calculus course (201-203-RE) and for the *Centre d'Aide en Français (CAF)*, a free service for students that need help with written French.

Awards

***Siebel Scholarship* – 2009-present**

Award offered to five students in seven of the best computer science schools in the US.

National Science and Engineering Research Council, *Post-Graduate Scholarship* – 2008-present

Offered to the highest-ranked applicants to the Natural Sciences and Engineering Research Council of Canada's national fellowship competition.

Fond Québécois de Recherche sur la Nature et les Technologies, *Bourse de Doctorat* – declined

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Fond Québécois de Recherche sur la Nature et les Technologies, *Bourse de Maîtrise* – 2005-2008

Awarded on the basis of academic excellence, strong communication skills and research potential.

National Science and Engineering Research Council, *Canada Graduate Scholarship* – declined

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McGill University, *Courtemanche Scholarship* – 2004

Best undergraduate research project in McGill University's computer science department.

National Science and Engineering Research Council, *Undergraduate Student Research Award* – 2003, 2004

Awarded to the top computer science students at McGill who wished to do research.

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McGill University, *James McGill Scholarship* – 2002-2004

Offered to the highest-ranked students admitted to McGill University.

McGill University, *Certificate of Merit* – 2002

Selection based on academic excellence during CÉGEP.

Université de Montréal, *Bourse d'Admission* – declined

Offered to the highest-ranked students admitted to Université de Montréal.

CÉGEP d'Alma, *Prix d'Excellence Alcan-Volet Science* – 2002-2004

Awarded for promising scientific abilities.

Refereed Publications

Alexandre Bouchard-Côté, Slav Petrov and Dan Klein (2009). Randomized Pruning: Efficiently Calculating Expectations in Large Dynamic Programs. *Advances in Neural Information Processing Systems 22 (NIPS)*. (In press) Vancouver, Canada.

Alexandre Bouchard-Côté and Michael I. Jordan (2009). Optimization of structured mean-field objectives. *Proceedings of the 25th Conference on Uncertainty in Artificial Intelligence (UAI09)*. Montreal, Canada.

Alexandre Bouchard-Côté, Thomas L. Griffiths and Dan Klein (2009). Improved reconstruction of protolanguage word forms. *Proceedings of the North American Chapter of the Association for Computational Linguistics (NAACL09)*. Boulder, USA.

Alexandre Bouchard-Côté, Michael I. Jordan and Dan Klein (2009). Efficient inference in phylogenetic InDel trees. *Advances in Neural Information Processing Systems 21 (NIPS)*. Vancouver, Canada.



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John DeNero, Alexandre Bouchard-Côté and Dan Klein (2008). Sampling alignment structure under a Bayesian translation model. *Proceedings of the 2008 Conference on Empirical Methods on Natural Language Processing (EMNLP08)*. Waikiki, USA.

Alexandre Bouchard-Côté, Percy Liang, Thomas L. Griffiths and Dan Klein (2008). A probabilistic approach to language change. *Advances in Neural Information Processing Systems 20 (NIPS)*. Vancouver, Canada.

Alexandre Bouchard-Côté, Percy Liang, Thomas L. Griffiths and Dan Klein (2007). A probabilistic approach to diachronic phonology. *Proceedings of the 2007 Conference on Empirical Methods on Natural Language Processing (EMNLP07)*. Prague, Czech Republic.

Percy Liang, Alexandre Bouchard-Côté, Ben Taskar and Dan Klein (2006). An end-to-end discriminative approach to machine translation. *Proceedings of the 44th Annual Meeting of the Association for Computational Linguistics (ACL06)*. Sydney, Australia.

Alexandre Bouchard-Côté, Norm Ferns, Prakash Panangaden and Doina Precup (2005). An approximation algorithm for labelled Markov processes: towards realistic approximations. *Proceedings of the International Conference on Quantitative Evaluation of Systems*. Torino, Italy.

Workshop Papers, Reports and Presentations

John DeNero and Alexandre Bouchard-Côté (2009). *A hierarchical Dirichlet process prior for a conditional model of phrase alignment*. *Workshop on statistical NLP at Advances in Neural Information Processing Systems 21 (NIPS)*. Whistler, Canada.

Alexandre Bouchard-Côté (2005). *Domaines et langues*. Canadian Undergraduate Mathematical Conference (CUMC). Kingston, Canada.

Alexandre Bouchard-Côté (2004). *Sparse distributed memories: some theoretical and empirical results*. Report and presentation for the *Courtemanche scholarship* (first prize).

Alexandre Bouchard-Côté (2004). *Reinforcement learning and function approximation*. Canadian Undergraduate Mathematical Conference (CUMC). Halifax, Canada.

Service

Reviewer — 2008-present

Reviewing papers for EMNLP, NAACL and ICML.

Social chair, Strawberry Canyon Aquatic Masters — 2008

Organizing and coordinating social events for Cal's master swimming team.

Co-Organizer of Computer Science Visit Day, UC Berkeley — 2006-2008

Planning and implementing the visit day of 2007 and 2008 with Shareena Samson and a peer grad student.

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Organizer of the Practice Preliminary Exam Sessions, UC Berkeley – 2007-2008

Recruiting grad students volunteers, preparing prelim questions and administering the practice preliminary exam sessions. I also coached some of the students with more difficulty and anxiety.

Co-Organizer, CS Games – 2003-2004

Designing the registration website, helping with the logistics and volunteering during the event.

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Webmaster, Registre des Ostéopathes du Québec – 2002

Designing a search engine for the website of a nonprofit organization, www.registre.org.

Miscellaneous

Member of the Golden Key Honour Students Society

Honoric membership offered on the basis of academic excellence.

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Technical Skills

In-depth knowledge of the Java platform. Functional with most mainstream programming languages, computing environments and UNIX.

Swimming

Swimmer with Cal's master swimming team (Strawberry Canyon Aquatic Masters). Competing both in open water and pool events.

Languages

English, French (fluent), Mandarin Chinese (beginner)