Javier Burroni

Amherst – MA – USA

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I am a **computer science** researcher, currently pursuing a PhD at the University of Massachusetts Amherst under the guidance of Professor Daniel Sheldon. With degrees in Actuarial Sciences and Economics, I have gained a strong understanding of probability, which has complemented my work in computer science. Over the past two decades, I have contributed to the areas of **Machine Learning**, **Data Science**, **Programming Languages**, and **Information Security** through a combination of industry and academic positions. Although some of my work has its roots in the southern parts of South America, it has gained global recognition and advanced the field. My recent research efforts are divided into two main areas: developing more efficient machine learning algorithms and enhancing programming languages as powerful *tools of thought*.

Education

2015–F23 (Expected)   **Ph.D. Computer Science**, *University of Massachusetts Amherst*.
Advisor: Daniel Sheldon
Research Areas: Variational Inference, Probabilistic Programming
Selected Coursework: Graphical Models, Performance Evaluation, Logic, Programming Languages

2015–2018   **MS Computer Science**, *University of Massachusetts Amherst*.
INTERACTIVE WRITING AND DEBUGGING OF BAYESIAN PROBABILISTIC PROGRAMS.

2011–2015   **MS in Economics**, *Torcuato di Tella University*.
INTERNATIONAL TRADE: ANALYZING PATTERNS THROUGH GRAPH THEORY.
Selected Coursework: Measure Theory, Causal Inference, Statistical Inference, Microeconometrics and Advanced Microeconometrics, Numerical methods

2001–2010   **Licentiate in Actuarial Sciences**, *University of Buenos Aires*, (a 5.5 years program).
EIGENANALYSIS AND ARBITRAGE PRICING THEORY: A HISTORICAL REVIEW AND APPLICATIONS TO THE ARGENTINE MARKET.
Selected Coursework: Statistics, Actuarial Statistics, Calculus and Advanced Calculus, Numerical Analysis, Microeconomics, Macroeconomics, Mathematics for Economics, Actuarial Biometrics, Actuarial Mathematics, Actuarial Mathematics II, Actuarial Mathematics III, Actuarial Mathematics IV, Actuarial Mathematics V

Teaching Experience and Mentorship

Teaching

2015–Present   **Graduate Teaching Assistant**, *University of Massachusetts Amherst*.
As part of my teaching fellowship, I taught, graded, and held office hours for undergraduate classes in Computer Science.
○ Teaching Assistant: Introduction to Algorithms

2001–2010   **Teaching Assistant**, *University of Buenos Aires*.
As is customary in Argentina, I taught or assisted undergraduate classes in Actuarial Sciences.
○ Teaching/Teaching Assistant: Calculus II, Numerical Analysis, Microeconomics II, Statistics

2021 **ML-based context modeling for improved image compression**.
Masters Students: Nidhi Davawala, Anirudh Muthukumar
Adobe: Stefano Petrangeli, Vishy Swaminathan, Haoliang Wang, Gang Wu

2020 **Interpretable, tree-based reasoning**.
Masters Students: Evan Rourke, Apurva Bhandari, Shezan Rohinton Mirzan
Microsoft's AI: Soundar Srinivasan, Minsoo Thigpen, Liqun Shao, Abhiram Eswaran, Anish Pimpley

Industry Experience

2014–2015 **Statistics/Probability Consulting**, *Onapsys*.
- Designed a probabilistic model of cyber insurance for a vulnerability assessment application.

2014–2015 **Statistics/Probability/Data-Mining Consulting**, *Caesar Systems*.
- Reviewed MonteCarlo applications,
- Suggested improvements to probability models,
- Implemented numerical algorithms and probability distributions in Smalltalk, and,
- Contributed to new data extraction tool development.

2013–2015 **Statistics/Data-Mining Consulting**, *GranData Inc.*
- Reviewed statistical extraction processes,
- Designed models for telco-generated data, and,
- Conducted novel research on massive datasets.

2013–2014 **Statistics/Data-Mining Consulting**, *Koggies Inc.*
- Designed models for Twitter's Firehose Data Mining, and,
- Conducted Text Mining for Twitter generated data.

2009–2014 **Developer**, *Disarmista*.
- Developed a Smalltalk Virtual Machine in Smalltalk, and,
- Researched current Virtual Machine implementations.

2012–2012 **Actuary**, *Provincial Maternal and Child Health Investment Program (Plan Nacer), National Ministry of Health - Argentina*.
- Calculated actuarially fair premiums, and,
- Created an actuarially based accounting schema for the 25 insurances in the Program.

2009 **Independent Contractor**.
- C++ Development, and,
- JS/C++ Development using Google's v8.

2001–2009 **Head Engineer, Architecture Committee Member, Expert Developer**, *Core Security Technologies*.
- Led the Core IMPACT Pro team of 12 Sr and Ssr developers,
- Developed software for Windows and Unix Systems using C++, C, Assembly, and Python,
- Wrote exploits,
- Audited source code (C and C++), and,
- Conducted computer security research.

Awards

2023 AISTATS Outstanding Reviewer Award

2014 Argentine Presidential Fellowship in Science and Technology - awarded for pursuing masters degrees in fields targeted for Argentina's sustainable development in the US

2014 Best Paper Award —SNA-KDD: The Eighth ACM workshop on Social Network Mining and Analysis

2005 Most Popular Paper —PacSec conference

| 2004 | Business Simulation Contest: Sebrae —Second Position, National level |
| 1997 | XIV Argentinean Mathematics Olympics —National Exam, Approved |

Computer Skills

Programming Languages

Advanced	Python, C++, C, Smalltalk-80 (Bee, Cuis, Squeak, Pharo), Assembly (i386, Sparc, PowerPC)
Medium	Julia, OCaml, Clojure
Basic	JavaScript, Ruby, Erlang
Stats/Math	MathLab, Mathematica, R

Software

2018	**Omega**: a Julia library for causal and probabilistic inference in Julia.
2018	**Stan2Pyro**: a Python library for converting Stan models to Pyro and Numpyro models.
2009-2014	**Bee Smalltalk**: A Meta-Circular implementation of Smalltalk written in itself.
2001-2009	**Core Impact**: A pioneering penetration-testing tool that introduced *syscall-proxying technology*, inspiring widely-used tools like **Metasploit**, often taught in undergraduate infosec courses.
2003	**Impacket**: The **first** Python library designed for creating, modifying, and parsing TCP/IP packets, enabling users to seamlessly manipulate network packets, analyze network traffic, and perform custom packet crafting for various networking tasks and security testing.

Publications

Journals

[1] **Javier Burroni**, Kenta Takatsu, Justin Domke, and Daniel Sheldon. "U-Statistics for Importance-Weighted Variational Inference". *Transactions on Machine Learning Research* (2023).

[2] **Javier Burroni**, P Taylor, Cassian Corey, Tengiz Vachnadze, and Hava T Siegelmann. "Energetic constraints produce self-sustained oscillatory dynamics in neuronal networks". *Frontiers in neuroscience* 11 (2017), p. 80.

[3] Carlos Sarraute, Jorge Brea, **Javier Burroni**, and Pablo Blanc. "Inference of demographic attributes based on mobile phone usage patterns and social network topology". *Social Network Analysis and Mining* 5 (2015), pp. 1–18.

[4] P Taylor, JN Hobbs, **Javier Burroni**, and HT Siegelmann. "The global landscape of cognition: hierarchical aggregation as an organizational principle of human cortical networks and functions". *Scientific Reports* 5 (2015), p. 18112.

Conferences

[5] Jinlin Lai, **Javier Burroni**, Hui Guan, and Daniel Sheldon. "Automatically Marginalized MCMC in Probabilistic Programming". *International Conference on Machine Learning*. 2023.

[6] Guillaume Baudart, **Javier Burroni**, Martin Hirzel, Louis Mandel, and Avraham Shinnar. "Compiling Stan to generative probabilistic languages and extension to deep probabilistic

programming". *Proceedings of the 42nd ACM SIGPLAN International Conference on Programming Language Design and Implementation*. 2021.

[7] Michael Boratko, **Javier Burroni**, Shib Sankar Dasgupta, and Andrew McCallum. "Min/Max Stability and Box Distributions". *Uncertainty in Artificial Intelligence*. 2021. **(Long Presentation, $\frac{48}{777} \approx 6\%$)**.

[8] David Jensen, **Javier Burroni**, and Matthew Rattigan. "Object conditioning for causal inference". *Uncertainty in Artificial Intelligence*. 2020.

[9] Zenna Tavares, **Javier Burroni**, Edgar Minasyan, Armando Solar-Lezama, and Rajesh Ranganath. "Predicate exchange: Inference with declarative knowledge". *International Conference on Machine Learning*. 2019.

[10] Javier Pimás, **Javier Burroni**, Jean Baptiste Arnaud, and Stefan Marr. "Garbage collection and efficiency in dynamic metacircular runtimes: an experience report". *Proceedings of the 13th ACM SIGPLAN International Symposium on on Dynamic Languages*. 2017.

[11] Carlos Sarraute, Pablo Blanc, and **Javier Burroni**. "A study of age and gender seen through mobile phone usage patterns in mexico". *International Conference on Advances in Social Networks Analysis and Mining (ASONAM)*. 2014.

Workshops

[12] Leandro Caniglia and **Javier Burroni**. "On Possible Extensions to the Smalltalk Syntax". *FAST Workshop 2022 on Smalltalk Related Technologies*. 2022.

[13] **Javier Burroni**, Arjun Guha, and David Jensen. "Interactive writing and debugging of Bayesian probabilistic programs". *PPS-POPL*. 2018.

[14] **Javier Burroni**. "The act of computer programming in science". *Companion Proceedings of the 1st International Conference on the Art, Science, and Engineering of Programming*. 2017. **(Best Paper Award)**.

[15] Jorge Brea, **Javier Burroni**, and Carlos Sarraute. "Inference of Users Demographic Attributes based on Homophily in Communication Networks". *Fourth Conference on the Scientific Analysis of Mobile Phone Datasets (NetMob)*. 2015.

[16] Carlos Sarraute, Jorge Brea, **Javier Burroni**, Klaus Wehmuth, Artur Ziviani, and José I Alvarez-Hamelin. "Social events in a time-varying mobile phone graph". *Fourth Conference on the Scientific Analysis of Mobile Phone Datasets (NetMob)*. 2015.

[17] Jorge Brea, **Javier Burroni**, Martin Minnoni, and Carlos Sarraute. "Harnessing mobile phone social network topology to infer users demographic attributes". *Proceedings of the 8th Workshop on Social Network Mining and Analysis*. 2014. **(Best Paper Award)**.

[18] Javier Pimás, **Javier Burroni**, and Gerardo Richarte. "Design and implementation of Bee Smalltalk Runtime". *International Workshop on Smalltalk Technologies, IWST*. 2014.

[19] **Javier Burroni** and Carlos Sarraute. "Outrepasser les limites des techniques classiques de Prise d'Empreintes grace aux Reseaux de Neurones". *Symposium sur la Sécurité des Technologies de l'Information et de la Communication (SSTIC)*. 2006.

[20] **Javier Burroni** and Carlos Sarraute. "Using neural networks for remote OS identification". *Proc. Pacific Security Conf., Tokyo, Japan*. 2005. **(Most Popular Paper Award)**.

Book Sections

[21] **Javier Burroni**. "Checking Values Against Intervals in Unit Testing". *Python Cookbook*. Ed. by Alex Martelli, David Ravenscroft, and David Ascher. 2nd. O'Reilly, Mar. 2005, pp. 352–353. ISBN: 0-596-00797-3.

Conference Talks

[22] **Javier Burroni** and Gerardo Richarte. "Implementing a Scavenger in Smalltalk". Conference talk presented at ESUG 2011, Edinburgh, UK. Aug. 2011.

[23] **Javier Burroni** and Gerardo Richarte. "Look Ma, GC in Smalltalk!" Conference talk presented at Smalltalks 2011, UNQ, Quilmes, Argentina. Nov. 2011.

[24] **Javier Burroni** and Gerardo Richarte. "Now that I have a GC in Smalltalk, what can I do with it?" Conference talk presented at ESUG 2011, Edinburgh, UK. Aug. 2011.

[25] **Javier Burroni** and Gerardo Richarte. "A JIT Smalltalk VM implemented in itself". Conference talk presented at Smalltalks 2010, UTN, Entre Ríos, Argentina. Nov. 2010.

[26] **Javier Burroni** and Gerardo Richarte. "A JIT Smalltalk VM implemented in itself". Conference talk presented at ESUG 2010, Barcelona, Catalunya. Sept. 2010.

[27] **Javier Burroni** and Carlos Sarraute. "Analyzing OS fingerprints using Neural Networks and Statistical Machinery". Conference talk presented at EUSecWest, London, United Kingdom. Feb. 2006.

[28] **Javier Burroni** and Carlos Sarraute. "Using Neural Networks and Statistical Machinery to Improve Remote OS Detection". Conference talk presented at HITB SecConf, Kuala Lumpur, Malaysia. Sept. 2006.

Patents

[29] Emiliano José Fausto, Ezequiel David Gutesman, **Javier Burroni**, and Pablo Müller. "System and method for automatic calculation of cyber-risk in business-critical applications". US Patent 9,923,917. Mar. 2018.

[30] Maximiliano Gerardo Caceres, Gerardo Gabriel Richarte, Agustin Azubel Friedman, Ricardo Quesada, Luciano Notarfrancesco, Oliver Friederichs, **Javier Burroni**, Gustavo Ajzenman, Gabriel Becedillas, and Bruce Leidl. "Automated computer system security compromise". US Patent 7,757,293. July 2010.

[31] Maximiliano Gabriel Caceres, **Javier Burroni**, Gustavo Ajzenman, Ricardo Quesada, Gerardo Gabriel Richarte, Luciano Notarfrancesco, Bruce Robert Leidl, Agustin Azubel Friedman, and Gabriel Martin Becedillas Ruiz. "Distributed computing using syscall proxying". US Patent 7,277,937. Oct. 2007.

[32] Maximiliano Gerardo Caceres, Gerardo Gabriel Richarte, Agustin Azubel Friedman, Ricardo Quesada, Luciano Notarfrancesco, Oliver Friederichs, **Javier Burroni**, Gustavo Ajzenman, Gabriel Becedillas, and Bruce Leidl. "Automated computer system security compromise". US Patent 7,228,566. June 2007.

Preprints

[33] **Javier Burroni**, Justin Domke, and Daniel Sheldon. "Sample Average Approximation for Black-Box VI". *arXiv:2304.06803* (2023).

[34] Zenna Tavares, **Javier Burroni**, Edgar Minaysan, Armando Solar Lezama, and Rajesh Ranganath. "Soft constraints for inference with declarative knowledge". *arXiv:1901.05437* (2019).

[35] Zenna Tavares, Xin Zhang, Edgar Minaysan, **Javier Burroni**, Rajesh Ranganath, and Armando Solar Lezama. "The Random Conditional Distribution for Higher-Order Probabilistic Inference". *arXiv:1903.10556* (2019).

Conference and Workshop Experience

Organizer

Workshops	FAST Workshop 2022 on Smalltalk Related Technologies

Reviewer

Journals	JMLR
Conferences	ICML
	AISTATS (Outstanding Reviewer Award 2023)
	NeurIPS
	AAAI
Workshops	Argentinean Symposium on Data Science and Big Data (AGRANDA)
	NeurIPS 2019 Workshop on Sets and Partitions

Personal

Hobby	I enjoy road biking in the Pioneer Valley.