

José Bento

CONTACT INFORMATION	Computer Science Department St. Mary's Hall, 2nd floor S., Boston College, Chestnut Hill, MA 02467	office: +001 617 552 1780 e-mail: jose.bento@bc.edu
RESEARCH INTERESTS	Distributed and parallel optimization; machine-learning and probabilistic graphical models; multi-robot planning; computer vision/graphics; emergence and control of antibiotic resistance; emergence and control of stable microbial communities.	
PROFESSIONAL AFFILIATION	Amazon Robotics Innovation Hub , Cambridge, Massachusetts, USA <i>Amazon Visiting Academic</i>	2020 – present
	Boston College , Chestnut Hill, Massachusetts, USA <i>Associate Professor</i>	2020 – present
	Boston College , Chestnut Hill, Massachusetts, USA <i>Assistant Professor</i>	2014 – 2020
	Disney Research Boston , Cambridge, Massachusetts, USA <i>Post Doctoral Researcher</i>	2012 – 2014
	• Advisor: Jonathan Yeddida	
EDUCATION	Stanford University , Stanford, California, USA <i>Doctor of Philosophy</i>	2008 – 2012
	• Principal advisor: Professor Andrea Montanari • Co-advisor: Professor Iain Johnstone	
	<i>Master's Program</i>	2006 – 2008
	Porto University , Porto, Portugal <i>Engineering Degree</i>	2001 – 2006
GRANTS, HONORS AND AWARDS	Amazon Machine Learning Award, “Distributed Large Scale Optimization”, (\$75k), 2018 NSF-IIS, “Design and Computation of Scalable Graph Distances in Metric Spaces: A Unified Multi-scale Interpretable Perspective”, (PI, 37.5%, \$1.6M, ¹), 2017–Present NIH-NIAID, “Predicting the Emergence of Antibiotic Resistance through Multi-omics Approaches and Immune System-Surveillance”, (PI, 22.5%, \$10M, ²), 2016–Present Disney Inventor Award, “Method and Device for 3-Weight Message-Passing Optimization Scheme”, 2014 RecSys-CAMRa Challenge winner, “Identifying users from their rating patterns”, 2011 SIGWEB DocEng Best paper award, “Probabilistic document model”, 2011 Doctoral Fellowship from Fundação para a Ciência e Tecnologia, Portugal, 2007-2010 Stanford University, Electrical Engineering, Departmental Fellowship, 2006 - 2007 Prize Infineon Technologies (top graduating student class of 2006), 2006 Porto University Engineering merit scholarship award (top 10 students), 2002-2006	
PAPERS ACCEPTED TO PEER-REVIEWED JOURNALS	G. França, J. Bento, “Distributed Optimization, Averaging via ADMM, and Network Topology”, <i>Proceedings of the IEEE 108 (11)</i> , 1939-1952, 2020. Z. Zhu, D. Surujon, J. C Ortiz-Marquez, W. Huo, R. R Isberg, J. Bento, T. van Opijnen, “Entropy of a bacterial stress response is a generalizable predictor for fitness and antibiotic sensitivity”, <i>Nature communications</i> , 2020.	

¹https://nsf.gov/awardsearch/showAward?AWD_ID=1741129

²<https://www.niaid.nih.gov/research/systems-biology-consortium-antibacterial-resistance>

D. Oh, J. Strattan, J. Hur, J. Bento, A. Urban, G. Song, J. Cherry, “cnn-peaks: chip-Seq peak detection pipeline using convolutional neural networks that imitate human visual inspection”, *Scientific reports*, 2020.

A. Moharrer, J. Gao, S. Wang, J. Bento, S. Ioannidis, “Massively Distributed Graph Distances”, *IEEE Transactions on Signal and Information Processing over Networks*, 2020.

J. Bento, S. Ioannidis, “A Family of tractable graph distances”, *Applied Network Science*, 2019.

J. Bento, R. Furmaniak, S. Ray, “On the complexity of the weighted fused Lasso”, *IEEE Letters in Signal Processing*, 2018.

G. França, J. Bento, “Markov chain lifting and distributed ADMM”, *IEEE Letters in Signal Processing*, 2017.

T. van Opijnen, S. Dedrick, J. Bento, “Strain dependent genetic networks for antibiotic-sensitivity in a bacterial pathogen with a large pan-genome”, *Plos Pathogens*, 2016.

N. Ben-Zvi, J. Bento, M. Mahler, J. Hodgins, A. Shamir, “Line-Drawing Video Stylization”, *Computer Graphics Forum*, 2015.

N. Derbinsky, J. Bento, J. S. Yedidia, “Scalable methods to integrate task knowledge with the three-weight algorithm for hybrid cognitive processing via optimization,” *Biologically Inspired Cognitive Architectures*, 2014.

J. Bento, M. Ibrahimi, “Support Recovery for the Drift Coefficient of High-Dimensional Diffusions”, *IEEE Transactions on Information Theory*, 2013.

PAPERS ACCEPTED
TO
PEER-REVIEWED
CONFERENCES

L. Yang, M. Saunders, J. Lachance, B. Palsson, J. Bento, “Estimating cellular goals from high-dimensional biological data”, *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, 2019.

S. Safavi, J. Bento, “Tractable n-metrics for multiple graphs”, Spotlight talk only, *International Conference on Machine Learning, (ICML)*, 2019.

B. Jia, S. Ray, S. Safavi, J. Bento, “Efficient projection onto the perfect phylogeny model”, *Advances in Neural Information Processing Systems (NIPS)*, 2018.

J. Bento, S. Ioannidis, “A Family of tractable graph distances”, *SIAM International Conference on Data Mining (SDM)*, 2018.

S. Safavi, B. Joshi, G. França, J. Bento, “An explicit convergence rate for Nesterov’s method from SDP”, *IEEE International Symposium on Information Theory (ISIT)*, 2018.

G. França, J. Bento, “An explicit rate bound for the over-relaxed ADMM”, *IEEE International Symposium on Information Theory (ISIT)*, 2016.

J. Bento, N. Derbinsky, C. Mathy, J. Yedidia, “Proximal operators for multi-agent path planning”, *Proceedings of the 29th National Conference on Artificial Intelligence (AAAI)*, 2015.

J. Bento, N. Derbinsky, C. Mathy, J. Yedidia, “Proximal operators for multi-agent path planning”, *Proceedings of the 29th National Conference on Artificial Intelligence (AAAI)*, 2015.

C. Mathy, N. Derbinsky, J. Bento, J. Yedidia, “The boundary forest algorithm for online supervised and unsupervised learning”, *Proceedings of the 29th National Conference on Artificial Intelligence (AAAI)*, 2015.

D. Krishnan, B. Freeman, J. Bento, D. Zoran, “Shape and Illumination from Shading using the Generic Viewpoint Assumption”, In *Advances in Neural Information Processing Systems (NIPS)*, 2014.

J. Bento, N. Derbinsky, J. Mora, J. Yedidia, “A message-passing algorithm for multi-agent trajectory planning”, In *Advances in Neural Information Processing Systems (NIPS)*, 2013.

J. Bento, S. Ioannidis, S. Muthukrishnan, and J. Yan, “A time and space efficient algorithm for contextual linear bandits”, *Proceedings of the European Conference in Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD)*, 2013.

N. Derbinsky, J. Bento, J. Yedidia, “Methods for integrating knowledge with the Three-Weight optimization algorithm for hybrid cognitive processing”, *AAAI Fall Symposium on Integrated Cognition*, 2013.

- J. Bento, S. Ioannidis, S. Muthukrishnan, J. Yan, “Group recommendations via multi-armed bandits”, *Proceedings of the 21st International Conference on World Wide Web*, 2012.
- N. Damera, J. Bento, “Ad insertion in automatically composed documents”, *Proceedings of the 12th ACM Symposium on Document Engineering (DocEng)*, 2012.
- N. Damera, J. Bento, E. O’Brien, “Probabilistic document model”, *Proceedings of the 11th ACM Symposium on Document Engineering (DocEng)*, 2011.
- J. Bento, N. Fawaz, A. Montanari, S. Ioannidis, “Identifying users from their rating patterns”, *Proceedings of the 5th ACM Conference on Recommender Systems (RecSys)*, 2011.
- J. Bento, M. Ibrahimi, A. Montanari, “Information theoretic limits on learning stochastic differential equations”, *IEEE International Symposium on Information Theory (ISIT)*, 2011.
- M. Bayati, J. Bento, A. Montanari, “The LASSO Risk: asymptotic results and real world examples”, *In Advances in Neural Information Processing Systems (NIPS)*, 2010.
- J. Bento, M. Ibrahimi, A. Montanari, “Learning networks of stochastic differential equations”, *In Advances in Neural Information Processing Systems (NIPS)*, 2010.
- J. Bento, A. Montanari, “Which graphical models are difficult to learn?”, *In Advances in Neural Information Processing Systems (NIPS)*, 2009.

PAPERS ACCEPTED
TO
PEER-REVIEWED
WORKSHOPS

- G. França, J. Bento, “ADMM and Random Walks on Graphs”, *Workshops In Advances in Neural Information Processing Systems (NIPS)*, 2017.
- J. J. Zhu, J. Bento, “Generative adversarial active learning”, *Workshops In Advances in Neural Information Processing Systems (NIPS)*, 2017.
- G. França, J. Bento, “Markov chain lifting and the distributed ADMM”, *Workshops In Advances in Neural Information Processing Systems (NIPS)*, 2016.
- G. França, J. Bento, “Tuning the over-relaxed ADMM”, *Workshops In Advances in Neural Information Processing Systems (NIPS)*, 2016.
- N. Hao, A. Oghbaee, M. Rostami, N. Derbinsky, J. Bento, “Testing fine-grained parallelism for the ADMM on a factor-graph”, *Proceedings of the Sixth IEEE Workshop on Parallel Computing and Optimization (IPDPS)*, 2016.
- C. Mathy, F. Gonda, D. Schmidt, N. Derbinsky, A. Alemi, J. Bento, F. Delle Fave, J. Yedidia, “SPARTA: Fast global planning of collision-avoiding robot trajectories”, *Workshops In Advances in Neural Information Processing Systems (NIPS)*, 2015.

TECHNICAL
REPORTS

- A. Sheikholeslami, J. Bento, “The perfect phylogeny model with time difference regularization”, *in preparation*.
- N. Emirov, J. Bento, “Improved distributed averaging under arbitrary adversarial attacks via proximal algorithms”, *in preparation*.
- J. Bento, J. Wang, “Optimal Activation Functions for the Random Feature Regression Model”, *in preparation*.
- L. Mi, J. Bento, “Multi marginal optimal transport defines a generalized metric”, *arXiv:2001.11114 [cs. LG]*, 2021.
- D. Surujon, J. Bento, T. van Opijnen. “Boundary-Forest Clustering: large-scale consensus clustering of biological sequences”, *bioRxiv:065870 v1.*, 2020.
- S. Ray, B. Jia, S. Safavi, T. van Opijnen, R. Isberg, J. Rosch, J. Bento, “Exact inference under the perfect phylogeny model”, *arXiv:1908.08623 [q-bio.QM]*, 2019.
- Z. Zhu, D. Surujon, A. Pavao, J. Bento, T. van Opijnen, “Forecasting bacterial survival-success and adaptive evolution through multi-omics stress response-mapping, network analyses and machine learning”, *bioRxiv: 387910.*, 2018.

- G. França, J. Bento, “How is Distributed ADMM Affected by Network Topology?”, *arXiv:1710.00889 [stat.ML]*, 2017.
- J. Bento, J. J. Zhu, “A metric for sets of trajectories that is practical and mathematically consistent”, *arXiv:1601.03094v1 [cs.CV]*, 2016.
- N. Derbinsky, J. Bento, V. Elser, J. Yedidia, “An improved three-weight message-passing algorithm”, *arXiv:1305.1961 [cs.AI]*, 2013.
- J. Bento, “Learning graphical models, fundamental limits and efficient algorithms”, *PhD Dissertation*, 2012.
- J. Bento, A. Montanari, “On the trade-off between complexity and correlation decay in structural learning algorithms”, *arXiv:1110.1769 [stat.ML]*, 2011.
- “Multi marginal optimal transport defines generalized metric”, *Information Theory and Applications Workshop, San Diego*, February 2020.
- “How should we (correctly) compare graphs?”, *Computer Science Department, U. Mass Lowell*, September 2019.
- “Tractable n-metrics for multiple graphs”, *International Conference in Machine Learning, Spotlight, Long Beach*, June 2019.
- “How should we (correctly) compare graphs?”, *Open Data Science Conference, Boston*, May 2019.
- “Graph Metric Spaces”, *SIAM International Conference on Data Mining (SDM19), Calgary, Alberta Canada*, May 2019.
- “Distributed Averaging via ADMM, Random Walks on Graphs and Markov Chain Lifting”, *International Seminar & Workshop on Stochastic dynamics on large networks: Prediction and inference, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany*, October 2018.
- “Graph Metric Spaces”, *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, London, UK*, August 2018.
- “Networks and large-scale optimization”, *Open Data Science Conference, Boston*, May 2018.
- “An improved explicit rate bound for Nesterov’s accelerated method”, *Coordinated Science Laboratory, University of Illinois, Urbana Champaign*, March 2018.
- “ADMM and Random Walks on Graphs”, *School of Electrical and Computer Engineering, Purdue University*, March 2018.
- “ADMM and Random Walks on Graphs”, *Coordinated Science Laboratory, University of Illinois, Urbana Champaign*, October 2017.
- “An improved rate bound on Nesterov’s scheme using IQC”, *Electrical and Computer Engineering, Tufts University*, October 2017.
- “Phylogenetic Tree Inference from Time Series Data”, *School of Engineering, Porto University*, July 2017.
- “Markov chain lifting and the distributed ADMM”, *Information Theory and Applications Workshop, San Diego*, February 2017.
- “Markov chain lifting and the distributed ADMM”, *NIPS OPT Workshop, Barcelona*, December 2016.
- “A metric for sets of trajectories”, *Disney Research, Pittsburg*, July 2016.
- “An explicit rate bound for the over-relaxed ADMM”, *ISIT, Barcelona*, July 2016.
- “Testing fine-grained parallelism for the ADMM on a factor-graph”, *GPU Technology Conference*, April 2016
- “A metric for sets of trajectories”, *B-Spiral, Northeastern University*, March 2016.
- “An explicit rate bound for the over-relaxed ADMM”, *School of Engineering, Porto University*, February 2016.

“Learning stochastic differential equations”, *NIPS 2015 Workshop on Modeling and inference for dynamics on complex interaction networks: joining up machine learning and statistical physics*, Montréal, December 2015.

“Variations on the Alternating Direction Method of Multipliers”, *Graphical Models, Statistical Inference, and Algorithms workshop*, University of Minnesota, May 2015.

“Towards understanding the Boundary Forest algorithm”, *New England Machine Learning Day, Microsoft Research, Cambridge*, May 2015.

“Towards understanding the Boundary Forest Algorithm”, *School of Science, Porto University*, May 2015.

“A metric for sets of trajectories”, *School of Engineering, Porto University*, January 2015.

“The Three-Weight Algorithm: a method for large scale distributed optimization”, *Department of Electrical and Computer Engineering, Texas A&M University*, March 2014.

“The Three-Weight Algorithm: a method for large scale distributed optimization”, *Center for Information and Systems Engineering, Boston University*, January 2014.

“Message-passing algorithms for general-purpose optimization based on ADMM ”, *Information System Lab. Colloquium, Stanford University*, August 2013.

“Improved message-passing algorithm incorporating uncertainty information”, *New England Machine Learning Day, Microsoft Research, Cambridge*, May 2013.

“Algorithms and fundamental limits in learning stochastic differential equations”, *Electrical and Computer Engineering Department, Boston University*, April 2013.

“A time and space efficient algorithm for contextual linear bandits”, *School of Science, Porto University*, January 2013.

“Which graphical models are difficult to learn?”, *Information Theory and Applications Workshop*, February 2012.

“Learning stochastic differential equations”, *Coordinated Sciences Laboratory, University of Illinois UC*, October 2011.

“Learning graphical models: results and challenges”, *ECE Back To Basics Colloquium, Porto University*, September 2011.

PATENTS AND INVENTIONS

Method and device for multi-agent path planning (US10579926B2, Granted)

Method and Device For Three-Weight Message-Passing Optimization Scheme (US9639813B2, Granted)

Method and Device For Three-Weight Message-Passing Optimization Scheme Using Splines (US10572807B2, Granted)

Method and apparatus for contextual linear bandits (US20150095271A1, Published)

Method and apparatus for identifying users from rating patterns (WO2013025460A1, Published)

A method of recommending items to a group of users (WO2013133879A1, Published)

Parallel-automated document composition (US20120304042A1, Published)

Automated document composition using clusters (WO2013013335A1, Published)

MENTORING EXPERIENCE

Boston College, Newton, Massachusetts, USA

Post-doctoral advisor

January 2021 – Present

Worked with Dr. Nazar Emirov on developing and analyzing novel algorithms for distributed optimization under adversarial network attacks.

Post-doctoral advisor

January 2021 – Present

Worked with Dr. Josiah Couch on developing and analyzing novel algorithms for dynamic graph matching.

Post-doctoral co-advisor **September 2020 – Present**
Worked with Dr. Dmitry Leshchiner on developing frameworks for systematically exploring the predictive power of different algorithms.

Undergraduate advisor **July 2021 – Present**
Worked with Yu Zhu, doing her Bachelor of Science in Biochemistry, on developing frameworks for systematically exploring the predictive power of different algorithms.

Senior-thesis student advisor **March 2020 – Present**
Worked with Jianxin Wang, doing his Bachelor of Science in Computer Science, on developing optimal activation functions by studying the Random Feature Regression model.

Co-advisor of Ph.D. student **August 2019 – Present**
Co-advised Stephen Hummel on algorithms for the automatic design of optimally-binding molecular complexes.

Post-doctoral advisor **October 2019 – August 2021**
Worked with Dr. Azadeh Sheikholeslami on developing novel algorithms to infer phylogenetic trees and mine biological networks.

Senior-thesis student advisor **February 2020 – April 2021**
Worked with Andres Rivera, doing his Bachelor of Science in Computer Science, on developing network models embeddings for biological networks.

Advisor for visiting Ph.D. student **June 2020 – September 2020**
Worked with Alireza Javani on developing novel algorithms to build network models from data.

Advisor for visiting Ph.D. student **October 2019 – May 2020**
Worked with Liang Mi on developing novel algorithms to solve the optimal transport problem.

Advisor for visiting Ph.D. students **May 2019 – August 2019**
Worked with Erin Teeple, and Neshat Mohammadi on graph data mining methods with applications to biology.

Thesis committee and co-advisor **January 2019 – December 2020**
Member of the thesis committee of Ph.D. student Defne Surujon from Boston College, being advised by Professor Tim van Opijnen. Co-advisor of Defne on several of her Ph.D. projects.

Thesis committee and co-advisor **January 2018 – Present**
Member of the thesis committee of Ph.D. student Armin Moharrer from Northeastern University, being advised by Professor Stratis Ioannidis. Co-advisor of Armin on some of his Ph.D. projects.

Research Undergraduate Fellowship advisor **September 2016 – July 2017**
Working with Dr. Babak Momeni, and undergraduate students Lorin Niehaus, Kevin Chen, Minghao Liu, and Kaitlin Chaung, to understand the emergence of bacterial communities.

Post-graduate advisor **September 2016 – October 2019**
Worked with Ray Suryendu on algorithms for predicting the emergence of antibiotic resistance.

Thesis committee **December 2018**
Took part in the thesis committee of Ph.D. student Amir Bayegan from Boston College, being advised by Professor Peter Clote.

Senior-thesis student advisor **May 2018 – May 2019**
Worked with Shikun Wang on distributed algorithms for graph matching.

Post-doctoral advisor **January 2018 – April 2019**
Worked with Dr. Sam Safavi on algorithms for graph matching and algorithms for predicting the emergence of antibiotic resistance.

Post-doctoral advisor **September 2017 – June 2018**
Worked with Dr. Bei Jia on algorithms for predicting the emergence of antibiotic resistance.

Thesis committee **December 2017**
 Took part in the thesis committee of Ph.D. student Sam Safavi from Tufts University, being advised by Professor Usman Khan.

Advisor for visiting Ph.D. students **May 2017 – September 2017**
 Worked with Elaheh Noursadeghi, Sam Safavi and Tomislavon Petrovic on information theory bounds for time-series reconstruction, accelerated optimization methods and bayesian inference algorithms for phylogenetic tree reconstruction.

Thesis committee **September 2016**
 Took part in the thesis committee of Ph.D. student Chenguang Xi from Tufts University, being advised by Professor Usman Khan.

Post-doctoral advisor **January 2016 – August 2017**
 Worked with Dr. J.J. Zhu on active learning, their application to biology and computer vision algorithms for evaluation of tracking performance.

Advisor for visiting Ph.D. students **May 2016 – September 2016**
 Worked with Mohammad Rostami, Bikash Joshi and Elaheh Noursadeghi on active learning, accelerated optimization methods and complexity bounds for learning time series.

Post-doctoral advisor **October 2015 – May 2016**
 Worked with Dr. Guilherme França on distributed optimization.

Advisor for visiting Ph.D. students **May 2015 – August 2015**
 Worked with AmirReza Oghbaee and Mohammad Rostami on optimal control and active learning using distributed algorithms.

Post-doctoral advisor **September 2014 – January 2015**
 Worked with Dr. Ning Hao on distributed optimization and artificial intelligence.

Disney Research Boston, Cambridge, Massachusetts, USA

Intern advisor for Ph.D. student **Summer 2013 and Summer 2014**
 Worked with Caglayan Dicle on computer vision (parallel) algorithms for multi-object tracking.

Stanford University, Stanford, California, USA

Teaching assistant **Fall 2007, Summer 2008**
 Teaching assistant for graduate course in statistical signal processing (EE278). Grading position for graduate course in stochastic processes (STATS 217/218).

INDUSTRY
EXPERIENCE

Amazon Robotics Innovation Hub, Boston, Massachusetts, USA

Amazon Visiting Scholar **2020-present**
 Researched movement optimization and congestion management on robotic warehouses;
 Supervisor: jeremy.l.wyatt@gmail.com

Technicolor Labs, Palo Alto, California, USA

Summer intern **2011**
 Researched and implemented algorithms for identifying accounts used by multiple users in recommendation systems: Identified the problem as an important step in improving the accuracy of recommendation systems; Developed and compared in real data different algorithms for identifying users in a household from their rating patterns; Contributed for a project concerning recommendation for groups when feedback about their satisfaction is given and groups change over time; Co-Authored two patent application and two papers; Supervisor: stratis.ioannidis@technicolor.com.

Hewlett Packard Labs, Palo Alto, California, USA

Summer intern

2010

Researched and implemented algorithms for automated document composition based on mixed continuous/discrete Bayesian inference; Provided a clear understanding of the theory and computational tradeoffs underlying various HPLabs automated document composition algorithms; Derived fast parallel algorithms for implementation on GPU/server clusters; Implemented algorithm on GPU achieving a speedup of 2000x over reference MatLab implementation; Briefed and transferred knowledge to remote teams in China; Co-authored two patent applications and two papers; Supervisor: niranjan.damera-venkata@hp.com.

REFERENCES

Contact information provided upon request.