David Alvarez-Melis

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Research Interests

Machine Learning — Interpretability and transparency, structured prediction, domain adaptation.

NLP — Low-resource machine translation, distributional semantics.

Optimization — Submodular optimization, semi-definite programming, optimal transport.

Education

2014 – **Massachusetts Institute of Technology**, Ph.D in Computer Science.
- Advisor: Tommi Jaakkola.
- Area: Machine Learning and Natural Language Processing.

2011 – 2013 **Courant Institute, New York University**, New York, M.S. in Mathematics.
- Advisor: Dr. Mehryar Mohri.
- Thesis: *The Matrix Multiplicative Weights Algorithm for Domain Adaptation.*
- GPA: 3.975.

2006 – 2011 **Instituto Tecnologico Autonomo de Mexico**, Mexico City, B.S. (Licenciatura) in Applied Mathematics.
- Advisor: Dr. Carlos Bosch Giral
- Thesis: *The Lax-Milgram Theorem, Generalizations and Applications.*
- Grade: 9.74/10, highest honors, top 1% of class, valedictorian.

Relevant Graduate Coursework

MIT: 6.867 (ML), 6.883 (Adv. ML) NYU: NLP, Speech Reco., Math. Stats.

Research and Work Experience

2014 – **Research Assistant**, *MIT CSAIL*, Cambridge, MA, USA.
- Supervisor: Tommi Jaakkola.
- Projects: word embeddings through random walks, structured output decoding, interpretability in sequence-to-sequence models

05 – 08/2016 **Research Intern**, *Microsoft Research*, Redmond, WA, USA.
- Mentors: Scott Yih, Ming-Wei Chang, Kristina Toutanova, Chris Meek.
- Project: Multi-hop relation prediction for knowledge base question answering.

2013 – 2014 **Supplemental Researcher**, *IBM Research*, TJ Watson Center, NY, USA.
- Mentors: Michael Picheny & Ken Church (speech recognition group)
- Data mining, statistical modeling and machine learning for speech recognition data.
- Research on semi-supervised gender speaker identification with side information.

2009 – 2010 **Statistical Analyst**, *LasQuinceLetras Solutions*, Mexico City, Mexico.
- Designed and carried out statistical learning methods on large survey databases.
- Specialized on segmentation analysis, brand equity research and market trends.

2009 – 2010 **Research Assistant**, *ITAM*, Mexico City.
Under the supervision of Dr. Carlos Bosch. Projects: (i) the Lax-Milgram Theorem, (ii) Compiling a book with problems from the National Mathematical Olympiad.

Teaching Experience

Spring 2015 **Teaching Assistant**, *6.036: Introduction to Machine Learning*, MIT.

Spring 2013 **Adjunct Instructor (TA)**, *MATH-UA.121: Calculus I*, NYU.

Fall 2012 **Adjunct Instructor (TA)**, *MATH-UA.9: Algebra and Calculus*, NYU.

Spring 2012 **Grader**, *MATH-UA.326: Analysis II*, NYU.

2010 – 2011 **Teaching Assistant**, *Calculus I*, ITAM.

Spring 08/09 **Teaching Assistant**, *Economics III (Intermediate Microeconomics)*, ITAM.

Scholarships and Awards

2018 **Hewlett Packard Graduate Fellowship**, One-term PhD award.

2014 – 2018
2011 – 2013 **Fellowship for graduate studies abroad**, *CONACYT (Mexican Council of Science and Technology)*.

April 2013 **Threesis Academic Challenge**, *NYU*, Semifinalist.

March 2012 **Alumni Research Prize, Second Place**, *ITAM*, XVII Edition, Category: Undergraduate Thesis.

2012 – 2013 **Award for Graduate Studies Abroad**, *Mexican Ministry of Education*.

October 2011 **Sotero Prieto Prize, Second Place**, *Mexican Mathematical Society*, Yearly award for the best undergraduate theses in mathematics in the country.

2006 – 2009 **Academic Excellence Scholarship**, *ITAM*, For undergraduate studies.

Publications

Preprints

[1] **D. Alvarez-Melis** and T. S. Jaakkola. "Self-explaining Neural Networks". 2017.

[2] C. Li et al. "Distributional Adversarial Networks". In: *Prepr. arXiv1706.09549* (2017).

Peer-reviewed

[3] **D. Alvarez-Melis**, T. S. Jaakkola, and S. Jegelka. "Structured Optimal Transport". In: *NIPS Work. Optim. Transp. Mach. Learn.* 2017.

[4] **D. Alvarez-Melis** and J. Amores. "The Emotional GAN: Priming Adversarial Generation of Art with Emotion". In: *NIPS Work. Mach. Learn. Creat. Des.* 2017.

[5] **D. Alvarez-Melis** and T. S. Jaakkola. "A causal framework for explaining the predictions of black-box sequence-to-sequence models". In: *EMNLP*. 2017.

[6] **D. Alvarez-Melis** and T. S. Jaakkola. "Tree-structured decoding with doubly-recurrent neural networks". In: *ICLR*. 2017.

[7] **D. Alvarez-Melis** and M. Saveski. "Topic Modeling in Twitter: Aggregating Tweets by Conversations". In: *ICWSM*. 2016.

[8] T. B. Hashimoto, **D. Alvarez-Melis**, and T. S. Jaakkola. "Word Embeddings as Metric Recovery in Semantic Spaces". In: *TACL* 4 (2016).

[9] T. B. Hashimoto, **D. Alvarez-Melis**, and T. S. Jaakkola. "Word, graph and manifold embedding from Markov processes". In: *NIPS Work. Nonparametric Methods Large Scale Represent. Learn.* 2015.

Theses

[10] **D. Alvarez-Melis**. "The Matrix Multiplicative Weights Algorithm for Domain Adaptation". M.S. Thesis. New York University, 2013.

[11] **D. Alvarez-Melis**. "El Teorema de Lax Milgram, Generalizaciones y Aplicaciones". B.Sc. Thesis. Instituto Tecnologico Autonomo de Mexico, 2011.

Professional Activities and Service

Reviewer ACL-IJCNLP 2015 (outstanding reviewer), IJCNLP 2017, ACL 2016, ACL 2017

Other **MIT EECS Graduate Admissions Committee**, 2017

Other **Orientation Co-Chair**, MIT Graduate Student Council.

Other Activities

October 2015 Talk: *Word Embeddings and Neural Networks in NLP*, DeepLearn Seminar, MIT.

2007 – 2011 Private tutor for undergraduate students majoring in Economics and Mathematics.

May 2009/10 Graded exams of the National Mathematics Olympiad.

Professional Training

June 2017 **Machine Learning Summer School**, *Max Planck Institute for Intelligent Systems*, Tübingen, Germany.

July 2014 **Regularization methods for Machine Learning**, *University of Genova*, Genova, PhD summer course taught by Lorenzo Rosasco and Francesca Odone.

Computer Skills

Languages Python, Bash, Java, R, C++, Lua Libraries [Py]Torch, Theano, Tensorflow

Languages

Spanish	Native	
English	Fluent	*TOEFL (iBT) 113/120, IELTS 8.5/9, FCE, CAE both with Grade A.*
Italian	Advanced	*CILS-Tre Certificate.*
French	Conversational	*Mother's language, studied also at Alliance Française Bordeaux.*
German	Basic	*Completed levels A1 - A2 at Goethe Institut Mexiko.*

Professional Memberships

AMS (2012–), SIAM (2013–), ACL (2016–), AAAS (2017–)

Other Interests

Languages, architecture (van der Rohe, Le Corbusier), classical guitar (Albéniz, Sor), Italian cinema, soccer.