

## Levon Demirdjian

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### Education

- **University of California Los Angeles (UCLA)** Los Angeles, CA  
*Doctor of Philosophy, Statistics* September 2013 - June 2018
  - Thesis (Advisor: Prof. Ying Nian Wu): Statistical methods for analyzing mRNA isoform variation in large-scale RNA-seq data
  - Selected Coursework: Statistical Computing, Bayesian Statistics, Experimental Design, Probabilistic Models of the Visual Cortex, Computer Vision, Computational Biology, Causal Inference
- **California State University Northridge (CSUN)** Northridge, CA  
*Master of Science, Mathematics* September 2011 - June 2013
  - Thesis: Probabilistic classification with missing data
  - Selected Coursework: Real Analysis, Topology, Stochastic Processes, Partial Differential Equations, Numerical Methods, Multivariate Analysis, Time-Series Analysis, Regression Analysis
- Bachelor of Arts, summa cum laude, Economics* September 2008 - May 2010
  - Certificate of Excellence in Economics
  - Selected Coursework: Microeconomics, Macroeconomics, Money and Banking, Econometrics, Environmental Economics, International Economics

### Research Experience

- **Children's Hospital of Philadelphia (Philadelphia, PA)**  
**Center for Computational and Genomic Medicine** PI: Yi Xing  
*Analyzing mRNA isoform variation using single-cell RNA-seq data* Summer 2018 - Present
  - Developed a statistical model and bioinformatics pipeline for quantifying mRNA isoform variation using single-cell RNA-Seq to characterize tumor microenvironment heterogeneity.
  - Performed QTL analyses to identify GWAS-associated rare variants using population-scale RNA-Seq and genotype data.
  - Organized working groups for the Immuno-Oncology Translation Network's Bioinformatics and Computational Biology section.
  - Led an educational outreach program focusing on teaching data science to the broader medical and scientific community at Penn and CHOP.
  - Founding committee member of the CHOP Postdoctoral Association. In charge of developing programming, building community, and creating networking opportunities for over 200 postdocs.
- **University of California Los Angeles (Los Angeles, CA)**  
**Department of Statistics** with Prof. Ying Nian Wu and Prof. Yi Xing  
*Analyzing mRNA isoform variation in large-scale RNA-seq data* 2015 - 2018
  - Developed a statistical framework and computational algorithm for detecting allele-specific alternative splicing from population-scale RNA-seq data, with applications to cancer marker discovery.
  - Constructed a novel bioinformatics pipeline, rMATS-Iso, for quantifying mRNA isoform variation in complex, multi-isoform splicing modules with potentially ambiguous RNA-seq reads.
- Department of Statistics** with Prof. Ying Nian Wu and Prof. Ray-Bing Chen  
*Bayesian bi-level variable selection with overlapping groups* 2015 - 2018
  - Derived a Gibbs sampling scheme for identifying important groups of variables, as well as important variables within those groups, in the setting of high-dimensional regression.

- Center for Behavioral and Addiction Medicine** with Dr. Keith Heinzerling  
*Genetic determinants of Methamphetamine addiction* 2014 - 2016
- Performed a candidate gene study which identified a single-nucleotide polymorphism associated with both pre-treatment methamphetamine use as well as with treatment outcomes in males.
  - Utilized a genetic risk score to identify a set of single-nucleotide polymorphisms associated with both pre-treatment methamphetamine use as well as with treatment outcomes in females.
- **Blackthorn Therapeutics, Inc. (San Francisco, CA)**  
**Research Consultant** with Dr. Monika Mellem and Prof. Ariana Anderson  
*Statistical modeling of neuroimaging data* Fall 2016 - 2017
- Preprocessed and analyzed neuroimaging data. Performed functional connectivity analysis of resting state fMRI data for patients with various neuropsychiatric disorders.
  - Implemented deep/machine learning algorithms on large-scale neuroimaging data to model brain connectivity and identify patients likely to benefit from targeted therapeutic treatments.
- **NASA Goddard Space Flight Center (GSFC) (Greenbelt, MD)**  
**Climate and Radiation Laboratory (Code 613)** with Dr. Yaping Zhou  
*Developing an Extreme Precipitation Monitoring System* Summer 2016
- Completed intensive summer school in Python, FORTRAN, parallel processing, and high-performance computing as part of the ACES (Advanced Computing in Earth Sciences) program.
  - Refined the statistical modeling of the Tropical Rainfall Measuring Mission Extreme Precipitation Monitoring System.
  - Consolidated statistical results into interpretable average recurrence interval maps for the effective communication of the severity of precipitation events.
- **California State University Northridge (Northridge, CA)**  
**Department of Mathematics** with Prof. Majid Mojirsheibani  
*Probabilistic classification with missing data* 2011 - 2013
- Constructed asymptotically optimal kernel-based classifiers that could handle missing values in both the data and in the observation being classified.
  - Derived an optimal scheme for classifying observations as arising from one of several unknown regions in the presence of missing data.

## Publications

- L. Demirdjian**, Y. Xu, Y. Pan, S. Stein, Z. Xie, E. Park, Y.N. Wu, Y. Xing (2019). *Detecting allele-specific alternative splicing from population-scale RNA-seq data*. Am. J. Hum. Genet., Under Review.
- J. Phillips, Y. Pan, B. Tsai, Z. Xie, **L. Demirdjian**, W. Xiao, H. Yang, Y. Zhang, C. Lin, D. Cheng, D. Black, O. Witte, Y. Xing (2019). *Myc-dependent alternative pre-mRNA splicing regulates RNA processing in aggressive prostate cancers*. Proc. Natl. Acad. Sci., Under Review.
- H.S. Karagueuzian, **L. Demirdjian** (2019). *Mechanisms of U-shaped association between alcohol intake and the risk of sudden cardiac death*. J. Hear. Health, 5:1, DOI: 10.16966/2379-769X.149.
- L. Demirdjian**, M. Mojirsheibani (2018). *Classification on convex sets in the presence of missing covariates*. arXiv: 1805.00450v1 [math.ST]
- L. Demirdjian**, Y. Zhou, G.J. Huffman (2018). *Statistical modeling of extreme precipitation with TRMM data*. J. Appl. Meteor. Climatol. 57:1, DOI: 10.1175/JAMC-D-17-0023.1
- L. Demirdjian** (2017). *The Promise: When Truth Overshadows Power*. Significance Magazine, John Wiley & Sons Ltd., [www.significancemagazine.com/culture/575-when-truth-overshadows-power](http://www.significancemagazine.com/culture/575-when-truth-overshadows-power).

- E. Park, J. Guo, S. Shen, **L. Demirdjian**, Y.N. Wu, L. Lin, Y. Xing (2017). *Population and allelic variation of A-to-I RNA editing in human transcriptomes*. *Genome Biol.* 18:143, DOI: 10.1186/s13059-017-1270-7
- L. Demirdjian**, M. Mojirsheibani (2017). *Kernel classification with missing data and the choice of smoothing parameters*. *Statist. Papers*. DOI: 10.1007/s00362-017-0883-y
- K. Heinzerling, **L. Demirdjian**, Y.N. Wu, S. Shoptaw (2016). *Single nucleotide polymorphism near CREB1, rs7591784, is associated with pretreatment methamphetamine use frequency and outcome of outpatient treatment for methamphetamine use disorder*. *J. Psychiatr. Res.* 74:22-9, DOI: 10.1016/j.jpsychires.2015.12.008

## Selected Presentations

### **Detecting allele-specific alternative splicing from population-scale RNA-seq data,**

L. Demirdjian\*, Y. Xu, Y. Pan, S. Stein, Z. Xie, E. Park, Y.N. Wu, Y. Xing,  
Engineered Immunity and Parker Institute for Cancer Immunotherapy Retreat, Lake Arrowhead CA (Sep 2019)  
CHOP Research Scientific Symposium, Philadelphia PA (May 2019)  
MidAtlantic Bioinformatics Conference, Philadelphia PA (October 2018)

### **Comprehensive analysis of differential alternative splicing in multi-isoform splicing modules using RNA-seq,**

L. Demirdjian\*, S. Shen, Y. Gao, Y.N. Wu, Y. Xing, Joint Statistical Meetings, Denver CO (Aug 2019)

### **Statistical Modeling of Extreme Precipitation with TRMM Data,**

L. Demirdjian\*, Y. Zhou, G. J. Huffman, Oral presentation, American Meteorological Society Annual Meeting, Austin TX (January 2018)

### **When Truth Overshadows Power,**

L. Demirdjian\*, Invited talk, Royal Statistical Society Annual Conference, Glasgow Scotland (September 2017)  
*Finalist for the Statistical Excellence Award for Early-Career Writing*

### **Improving the Statistical Modeling of the TRMM Extreme Precipitation Monitoring System,**

L. Demirdjian\*, Y. Zhou, G. J. Huffman, Oral presentation, Asia Oceania Geosciences Society Annual Meeting, Singapore (August 2017)

### **PAIRADISE: Paired Analysis of Differential Isoform Expression in Replicate RNA-Seq Data,**

L. Demirdjian\*, S. Shen, Y. N. Wu, Y. Xing, Poster presentation, Joint Statistical Meetings, Baltimore MD (August 2017)

### **An RDoC Framework Integrating Structural MRI with Cognitive Control and Working Memory,**

A. E. Anderson\*, M. Mansolf, A. Rodriguez, S. P. Reise, S. Frei, L. Demirdjian, R. M. Bilder, Poster presentation, International Society for CNS Clinical Trials and Methodology, Washington D.C. (February 2017)

### **Improving the Statistical Modeling of the TRMM Extreme Precipitation Monitoring System,**

L. Demirdjian\*, Y. Zhou, G. J. Huffman, Poster presentation, American Geophysical Union Fall Meeting, San Francisco CA (December 2016)

*Outstanding Student Paper Award*

### **Developing an Extreme Precipitation Monitoring System,**

L. Demirdjian\*, Y. Zhou, Poster presentation, NASA Goddard Space Flight Center Intern Poster Session, Greenbelt MD (August 2016)

### **PAIRADISE: Paired Analysis of Differential Isoform Expression,**

L. Demirdjian\*, S. Shen, Y. N. Wu, Y. Xing, Poster presentation, BWF-CHIP, GATP, SIB Research Symposium, Los Angeles CA (May 2016)

*Award for best poster*

**Candidate Gene Study of Methamphetamine Use Frequency and Treatment Outcome,**

K. Heinzerling, L. Demirdjian\*, Y.N. Wu, S. Shoptaw, Poster presentation, Pharmacogenetics in Psychiatry Meeting, Toronto CA (October 2015)

**Association of Gender and Genetic Ancestry with Frequency of Methamphetamine Use Among Methamphetamine Dependent Hispanic and Non-Hispanic Whites,**

K. Heinzerling, L. Demirdjian\*, Y.N. Wu, Poster presentation, BWF-CHIP, GATP, SIB Research Symposium, Los Angeles CA (May 2015)

**Bandwidth selection in kernel classification with missing covariates,**

L. Demirdjian\*, M. Mojirsheibani, Oral presentation, Sigma Xi Student Research Symposium, Northridge CA (April 2013)

\* = presenting author

## Teaching Experience

- **University of California Los Angeles (Los Angeles, CA)**

**Department of Statistics**

*Stat 413: Machine Learning - Teaching Assistant*

*Winter 2018*

- Instructed students in modern machine learning techniques and high dimensional statistics using R, Python, and TensorFlow
- Designed and graded weekly programming assignments and final computing project

*Stat 202A: Statistical Programming and Computing - Teaching Assistant*

*Fall 2015 - 2017*

- Instructed students in R, Python, and C++ in statistical computing and machine learning
- Designed and graded final computing project

*Stat 102C: Monte Carlo Methods - Teaching Assistant*

*Spring 2016*

- Organized weekly lab sessions on topics including rejection sampling, Gibbs sampling, MCMC
- Assisted in grading of homework and course exams

*Stat 100A: Applied Probability - Teaching Assistant*

*Spring 2015*

- Organized weekly lab sessions on topics including random variables, probability distributions, Central Limit Theorem
- Assisted in grading of homework and course exams

- **California State University Northridge (Northridge CA)**

**Department of Mathematics**

*Math 131: Math Ideas - Lecturer*

*2012 - 2013*

- Taught course on the history and fundamental ideas of mathematics
- Graded weekly quizzes and final written report

*Math 103: Business Mathematics - Teaching Assistant*

*Spring 2012*

- Taught fundamental concepts of algebra and calculus to business students

## Professional Affiliations

American Geophysical Union (AGU)  
American Meteorological Society (AMS)  
American Statistical Association (ASA)  
Royal Statistical Society (RSS)  
Society of Actuaries (SOA)

## Awards

Mack Technology Fellow, The Wharton School, University of Pennsylvania	2019
Dissertation Year Fellowship, Graduate Division, UCLA	2017-2018
Early Career Statistician Writing Competition Finalist, Significance Magazine	2017
Outstanding Student Paper Award, American Geophysical Union Fall Meeting, San Francisco	2016
Outstanding Student Poster Award, BWF-CHIP, GATP, and SIB Research Symposium, UCLA	2016
Burroughs Wellcome Fund Fellowship, Department of Epidemiology, UCLA	2014-2016
Most Promising Theoretical Statistician, Department of Statistics, UCLA	2014
Graduate Fellowship, Department of Statistics, UCLA	2013
Outstanding Graduate Student, Department of Mathematics, CSUN	2013
Research Fellowship, Interdisciplinary Research Institute of the Sciences, CSUN	2011-2013

## Skills

**Programming:** R, Python, scikit, Theano, Keras, TensorFlow, Matlab, MatConvNet, C/C++, Git, SAS, SQL, Hadoop, bash, Unix/Linux, Java, AFNI, FSL

**Bioinformatics:** Bulk/single-cell RNA-seq, alternative splicing, QTL analysis, GWAS analysis, genetic modeling, allele-specific alternative splicing

**Statistics:** Regularized regression, bayesian statistics, bayesian networks, dimension reduction, sampling, missing data, hierarchical models, model selection, latent variables, causal inference, multivariate analysis

**Deep/Machine learning:** Classification (CNN, LSTM, GAN, reinforcement learning, adaboost/xgboost, SVM, random forests), unsupervised learning (clustering, NMF, factor analysis), applications (bioinformatics, computer vision, neuroimaging)

**Certifications:** SOA exams P (Probability) and FM (Financial Mathematics)