

Fred Park | Associate Professor Whittier College

Contact Information

Department of
Mathematics & Computer Science
Whittier College
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Citizenship

USA

Research Interests

Data Science: Machine Learning, Computer Vision, Mathematical Image Processing, and Scientific Computing

Education

Ph.D. in Applied Mathematics

University of California, Los Angeles, 2006

Dissertation Title: *Total Variation and Duality for Blind Image Deconvolution, Staircase Reduction, and Texture Extraction*

Thesis Advisor: Tony F. Chan

MA in Mathematics

University of California, Los Angeles, 2000

BS in Mathematics

University of California, Los Angeles, 1997

Academic Experience

Chair

Department of Mathematics & Computer Science, Whittier College, July 2021—

Associate Professor

Whittier College Department of Mathematics & Computer Science, 2018—
(Tenure approved Feb. 2018, effective Sept. 2018)

Lecturer

Paul Merage School of Business, University of California, Irvine,
MPAC Program: Spring 2020, MFIN Program: Winter 2019—

Visiting Associate Researcher

University of California, Irvine, Fall 2018–Spring 2019, Host: Jack Xin

Assistant Professor

Whittier College Department of Mathematics & Computer Science, 2012–2018

Visiting Researcher

University of California, Irvine, Summer 2013, Mentor: Jack Xin

Associate Research Scientist Level V (Researcher and Lecturer)

University of California, Irvine, 2011–2012, Mentors: Hongkai Zhao and Jack Xin

Postdoctoral Scholar and Lecturer

University of California, Irvine, 2009–2011, Mentor: Hongkai Zhao

Assistant Adjunct Professor

University of California, Los Angeles, 2007–2009

Postdoctoral Assistant Professor

University of Michigan, Ann Arbor, 2006–2007

Mentor: Selim Esedoglu

Academic Mentor

NSF PIC Math Program, 2019-2020

Academic Mentor

UCI Interdisciplinary Computational and Applied Mathematics Program (iCAMP) REU
Team Lead, Summer 2011 and 2012

Organizer

UCI Image Processing and Learning Seminar, Fall 2009–Fall 2012

Organizer

UCLA Tony F. Chan Research Group Seminar, 2002-2005

Courses Taught

Machine Learning, Whittier College

Industrial Problems in the Mathematical Sciences, Whittier College

Programming and Data Analysis for Business (graduate), UCI Paul Merage School of Business

Advanced Analytics (graduate), UCI Paul Merage School of Business

AI, Computer Vision, and Cognition, Whittier College
Data Structures in C++, Whittier College
Intro to Computer Science using Python, Whittier College
Elementary Statistics, Whittier College
Mathematical Modeling, Whittier College
Numerical Methods/Analysis, Umich Ann Arbor, Whittier College
Quantitative Reasoning, Whittier College
Honors Applied Calculus, Umich Ann Arbor
Single Variable Calculus, UCLA, Whittier College
Multivariable Calculus, UCLA, UCI, Whittier College
Linear Algebra and Applications, UCLA, Whittier College
Nonlinear Ordinary Differential Equations, UCLA
Ordinary Differential Equations, UCI, Whittier College
Shape Representation and Classification Tutorial, UCI
Undergraduate Independent Research, UCLA, UCI, Whittier College

Student Mentoring/Advising

Thesis Advising

Farrah Luu: *LASSO Regression and Applications to Home Price Prediction*
Julian Droetti: *Deep Neural Networks and Applications*
Ann Bailleul: *Machine Learning with Linear Regression, Logistic Regression, and Applications*
Lauren Gandi: *Variational Image Super-Resolution*
Patrick Hagman: *Nonlinear Conjugate Gradient Method and Non-linear Regression with Applications to Pokemon*
Crystabel Camacho: *Image Deblurring Using the Backward Heat Equation*
Callie Mitchell: *Image Denoising by Non-local Means*
Anastasia Bergara: *Variational Image Segmentation Utilizing the Chan-Vese Model with Applications to Medical Imaging*

Fellowship Advising

Andrasek and Groce Fellowship Advisor, Whittier College, Summer 2021
With Teresa Marchetti
Neural Networks with Applications to Credit Risk

Keck Fellowship Advisor, Whittier College, Summer 2019
With Jacob Householder
Sparsification of Deep Convolutional Neural Networks

HHMI SMART Fellowship Advisor, Whittier College, 2014-2015
The Howard Hughes Medical Institute (HHMI) funded Science and Math in Research and Teaching (SMART) Program
With Rachel Tegenkamp
Machine Learning Methods for Modeling Traffic Flow

Club/Organization

Pi Mu Epsilon (PME) Math Honor Society Advisor, Whittier College, 2013-2018, 2019–
Responsibilities include: Organizing the annual PME initiation ceremony, inviting guest speakers, and obtaining funding for PME.

Math Club Advisor, Whittier College, 2013-2018

Responsibilities include: Organizing events, talks, and facilitating the procurement of funding for these activities.

Honors and Awards

Springer-Verlag Best Paper Award, 15th International Symposium on Visual Computing (ISVC), 2020

Top 10% Paper in IEEE International Conference on Image Processing (ICIP) 2015

Distinguished Teaching Award, Paul Merage School of Business, Spring 2020

Robert Sorgenfrey Distinguished Teaching Award, UCLA Postdoctoral Award for Teaching Excellence, Spring 2009

Ranked #11 Overall in Teaching at UCLA, UCLA Bruinwalk Professor Evaluation Site, #11 overall for the entire UCLA campus across all different academic disciplines. Sept 2011–Sept. 2014

Daus Prize, UCLA Undergraduate Award in Mathematics, Spring 1997

Funding

Faculty Research and Development Grant, Whittier College, 2021.

Award: \$1088.33. For Computational Math Software.

NSF Preparation for Industrial Careers in the Mathematical Sciences (PIC Math) Grant, 2019-2020. Award: \$4000.00.

Faculty Research and Development Grant, Whittier College, 2019.

Award: \$4814.05 (Spring), \$4000 (Fall). For GPU machine, additional GPU, and cloud credits.

Amazon Web Services Cloud Computing Credits for Research Grant, 2019. Award: \$15000.00.

Google Cloud Computing Credits Grant, 2019. Award: \$5000.00.

Faculty Research and Development Grant, Whittier College, 2016. Award: \$786.28. For Computational Math Software and Computer.

Faculty Research and Development Grant, Whittier College, 2015. Award: \$849.38. For Computational Math Software.

Research Assistantship, Winter 2004-Summer 2006

Supported by research grants from the ONR under contracts N00014-03-1-0888 and N00014-96-1-0277, the NIH under contracts U54 RR021813 and MH65166, and the NSF under contract DMS-9973341.

Publications

Journals/Proceedings

1. "Sparsification of Self-Attention Networks." In preparation (with K. Bui, S. Zhang, Y. Qi, and J. Xin).
2. "Transformed Total Variation for Image Segmentation." In preparation (with K. Bui, Y. Lou, and J. Xin).
3. "Weighted Anisotropic-Isotropic Total Variation for Poisson Denoising." IEEE ICIP 2023 (with K. Bui, Y. Lou, and J. Xin).
4. "A Proximal Algorithm for Network Slimming." In proceedings to 9th International Conference on Machine Learning, Optimization, and Data Science, 2023 (with K. Bui, S. Zhang, Y. Qi and J. Xin).
5. "Difference of Anisotropic and Isotropic TV for Segmentation Under Blur and Poisson Noise." *Frontiers in Computer Science*, 5:1131317, June, 2023; doi:10.3389/fcomp.2023.1131317.2023. (with K. Bui, Y. Lou, and J. Xin).
<https://arxiv.org/abs/2301.03393>
6. "An Efficient Smoothing and Thresholding Image Segmentation Framework with Weighted Anisotropic-Isotropic Total-Variation." To appear in *Communications on Applied Mathematics and Computation (CAMC)*, 2023 (with K. Bui, Y. Lou, and J. Xin).
<https://arxiv.org/abs/2202.10115>
7. "Clustering COVID-19 Lung Scans." *SIAM Undergraduate Research Online (SIURO)* vol. 15, Jan. 2022. DOI: 10.1137/20S1365053 (with J. Householder, J.P. Gomez-Reed, and A. Householder).
8. "Improving Network Slimming with Nonconvex Regularization." *IEEE Access*, vol. 9, pp. 115292-115314, August 2021. doi: 10.1109/ACCESS.2021.3105366 (with K. Bui, S. Zhang, Y. Qi and J. Xin).
9. "A Weighted Difference of Anisotropic and Isotropic Total Variation for Relaxed Mumford-Shah Color and Multiphase Image Segmentation." *SIAM Journal on Imaging Science (SIIMS)*, vol. 14, issue 3, pp. 1078-1113, July 2021.
<https://doi.org/10.1137/20M1337041> (with K. Bui, Y. Lou, and J. Xin).
10. "Structured Sparsity of Convolutional Neural Networks via Nonconvex Sparse Group Regularization." *Frontiers Appl. Math. Stat.* Feb. 2021, 6:529564. doi: 10.3389/fams.2020.52956 (with K. Bui, S. Zhang, Y. Qi, and J. Xin)
11. "Regularization for Network Slimming: Compressing CNNs Even More." In: *Bebis G. et al. (eds) Advances in Visual Computing. ISVC 2020. Lecture Notes in Computer Science*, vol 12509. Springer, Cham. https://doi.org/10.1007/978-3-030-64556-4_4 ****Springer-Verlag Best Paper Award for ISVC 2020****. (with K. Bui, S. Zhang, Y. Qi, and J. Xin)
12. "Geodesic Active Contours with Shape Priors for Disocclusion and Illusory Contour Capture." *SIAM Undergraduate Research Online (SIURO)* vol. 13, 2020. DOI: 10.1137/19S017621 (with J. Householder).

13. “A Weighted Difference of Anisotropic and Isotropic Total Variation for Relaxed Mumford-Shah Image Segmentation.” In Proceedings. IEEE International Conference on Image Processing (ICIP), Sept. 25-28th, Phoenix Arizona, USA, 2016. DOI: 110.1109/ICIP.2016.7533174 (with J. Xin and Y. Lou).
14. “Image Segmentation Using Clique Based Shape Prior and the Mumford Shah Functional.” In Proceedings. IEEE International Conference on Image Processing (ICIP), Sept. 27-30th, Quebec City, Canada, 2015. DOI: 10.1109/ICIP.2015.7351572
****Recognized as part of the Top 10% papers in ICIP 2015****.
15. “Parallelization of a Color-Entropy Preprocessed Chan-Vese Model for Face Contour Detection on Multi-Core CPU and GPU.” Parallel Computing, August 2015, pp. 28-49. DOI: 10.1016/j.parco.2015.07.002 (with X. Shi, L. Wang, J. Xin, and Y. Qi).
16. “Robust and Efficient Implicit Surface Reconstruction for Point Clouds Based on Convexified Image Segmentation.” Journal of Scientific Computing, vol. 54, issue 2-3, pgs. 577-602, Feb. 2013. DOI: 10.1007/s10915-012-9674-8 (with J. Liang and H. Zhao).
17. “Feature Identification for Colon Tumor Classification.” SIAM Undergraduate Research Online (SIURO) vol. 6, 2013. <http://dx.doi.org/10.1137/13S012212> (with M. Lim, A. Hou, N. Congdon, J. Chua, E. Esser, and A. Konstorum).
18. “A Fourth Order Dual Method for Staircase Reduction in Texture Extraction and Image Restoration Problems.” In Proceedings. IEEE International Conference on Image Processing (ICIP), Hong Kong, pgs. 4137-4140, 2010. DOI: 10.1109/ICIP.2010.5653199 (with T. F. Chan and S. Esedoglu).
19. “Image Decomposition Combining Staircase Reduction and Texture Extraction.” Journal of Visual Communication and Image Representation, vol. 18, issue 6, pgs. 464-486, 2007. (with T. F. Chan and S. Esedoglu).
20. “Recent Developments in Total Variation Image Restoration.” In “Handbook of Mathematical Models in Computer Vision”, Ch. 2, pgs. 17-32. Springer Verlag, 2005. Edt. by: N. Paragios, Y. Chen, O. Faugeras. (with T. F. Chan, S. Esedoglu, and A. Yip).
21. “Simultaneous Total Variation Image Inpainting and Blind Deconvolution.” International Journal of Imaging Systems and Technology, vol. 15:1, pgs. 92-102, 2005. (with T. F. Chan and A. Yip).

Technical Reports

1. “Data Dependent Multiscale Total Variation Based Image Decomposition and Contrast Preserving Denoising.” UCLA CAM Report 04-15, March 2004. (with T. F. Chan).
2. “Solution Dynamics, Causality, and Critical Behavior of the Regularization Parameter in Total Variation Denoising Problems.” UCLA CAM Report 03-59, November 2003. (with A. Yip).

Presentations

1. 9th International Conference on Machine Learning, Optimization, and Data Science (LOD) Grasmere, Lake District, England-UK. September 22-26th, 2023
15 minute talk: “A Proximal Algorithm for Network Slimming”
2. AMS Sectional Meeting
UC Riverside, California, USA. November 9th, 2019

- 30 minute talk: “Mentoring Undergraduates in Applied Mathematics and Computer Science Research”
3. UC Irvine Computer Science AI/ML Seminar
Irvine California, USA. November 5th, 2018
50 minute talk: “Image Segmentation and Tracking Utilizing a Difference of Convex Regularized Mumford-Shah Functional”
 4. IEEE International Conference on Image Processing (ICIP)
Phoenix Arizona, USA. September 25th-28th, 2016
Poster Presentation: “A Weighted Difference of Anisotropic and Isotropic Total Variation for Relaxed Mumford-Shah Image Segmentation”
 5. IEEE International Conference on Image Processing (ICIP)
Quebec City, Canada. September 27th-30th, 2015
Poster Presentation: “Image Segmentation Using Clique Based Shape Prior and the Mumford Shah Functional”
 6. IEEE International Conference on Image Processing (ICIP)
Quebec City, Canada. September 27th-30th, 2015
Show & Tell Demo: “Shape Prior Image Segmentation and Disocclusion”
 7. IEEE International Conference on Image Processing (ICIP)
Hong Kong, September 26th-29th, 2010
20 minute talk: “A Fourth Order Dual Method for Staircase Reduction in Texture Extraction and Image Restoration Problems”
 8. Computational Modeling of Objects Represented in Images
Fundamentals, Methods, and Applications (CompImage)
Coimbra, Portugal, October 20th-21st, 2006
Forty five minute talk: “High Order Dual Methods for Staircase Reduction in Texture Extraction Problems”
 9. 2006 SIAM Conference on Imaging Science
Minneapolis, Minnesota, May 15-17, 2006
Twenty five minute talk: “A Fourth Order Dual Method for Staircase Reduction in Texture Extraction and Image Restoration Problems”
 10. Southern California Applied Mathematics Symposium (SoCAMS)
University of Southern California (USC), April 24th, 2005
Poster Presentation: “Image Decomposition Combining Staircase Reduction and Texture Extraction”
 11. BIRS Workshop, Mathematical Image Analysis and Processing
Banff International Research Station (BIRS), Alberta, Canada, October 23-28, 2004
Forty five minute talk: “Simultaneous Total Variation Image Inpainting and Blind Deconvolution”
 12. Southern California Applied Mathematics Symposium (SoCAMS)
Harvey Mudd College, April 24th, 2004
Poster Presentation: “Data Dependent Multiscale Total Variation Based Image Decomposition and Contrast Preserving Denoising”

Professional Activities

Journal Referee

IEEE Transactions on Image Processing
Inverse Problems in Imaging
Mathematical Problems in Engineering
International Journal of Applied and Computational Mathematics
Nonlinear Analysis Series B: Real World Applications

Professional Organizations

AMS, MAA, IEEE, SIAM

Skills

C, C++, Matlab, R, Python
SciPy, NumPy, Pandas, Pytorch, Tensorflow, Keras

Personal

Knowledge of spoken Korean and Spanish & written Spanish and French
Surfing and Martial Arts Enthusiast
Food and Wine Devotee