

# Fredrick E. Park

2023 Mariposa Ln  
Fullerton, CA 92833  
(310) 922-7518

fpark@whittier.edu  
fredrick.park@gmail.com  
www.fredpark.com

## Education

- **Doctor of Philosophy in Applied Mathematics**  
University of California, Los Angeles  
Graduation: *August 2006*  
Thesis Title: *Total Variation and Duality for Blind Image Deconvolution, Staircase Reduction, and Texture Extraction*  
Thesis advisor: Tony F. Chan
- **Master of Arts (Mathematics), UCLA 2000**
- **Bachelor of Science (Mathematics), UCLA 1997**  
Cum Laude, College Honors and High Honors in Mathematics

## Professional Experience

**Associate Professor**, Whittier College, *2018–*  
(Tenure approved Feb. 2018, effective Sept. 2018)

**Assistant Professor**, Whittier College, *2012–2018*

**Visiting Researcher**, University of California at Irvine, *Summer 2013*, Mentor: Jack Xin

**Associate Research Scientist Level V (Researcher and Lecturer)**, University of California at 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

## Research Interests

### Image Processing, Computer Vision, and Scientific Computing

Image analysis and modeling using geometric, functional, and PDE based methods for image processing tasks including geometry preserving denoising, blind deconvolution, inpainting, texture extraction, and staircase reduction. In addition, development of fast and stable numerical methods including high order dual methods for staircase reduction in texture extraction and restoration models of image processing. Most recent interests are in variational shape prior segmentation using both explicit parametric and implicit level set based shape representations, surface reconstruction from unorganized point cloud data, non local methods for image and geometry processing, sparse recovery for image fusion, machine learning using neural networks, real time face tracking, and convex and convexified functional minimization.

## Publications

- *Convergence Analysis for Difference of Convex Algorithms Applied to Weighted Differences of Anisotropic and Isotropic Total Variation with Applications to Image Segmentation*, In preparation (with J. Xin and Y. Lou).
- *Radon Histogram Based Shape Prior Segmentation and Disocclusion Utilizing the Level Set Method*, In preparation. (with S. Esedoglu and H. Zhao).
- *A Color-Entropy Preprocessed Chan-Vese Model for Face Contour Detection and Tracking*, Submitted. (with X. Shi, L. Wang, J. Xin, and Y. Qi).

- *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).
- *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).
- *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). (<http://www.sciencedirect.com/science/article/pii/S0167819115001052>)
- *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).
- *Feature Identification for Colon Tumor Classification*, SIAM Undergraduate Research Online (SIURO) vol. 6, 2013. <http://dx.doi.org/10.1137/13S012212>. Undergraduate Research Publication (with M. Lim, A. Hou, N. Congdon, J. Chua, E. Esser, and A. Konstorum).
- *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).
- *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).
- *Recent Developments in Total Variation Image Restoration*. In "Handbook of Mathematical Models in Computer Vision", Chapter 2, pgs. 17-32. Springer Verlag, 2005. Edt. by: N. Paragios, Y. Chen, O. Faugeras. (with T. F. Chan, S. Esedoglu, and A. Yip).
- *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).
- *Data Dependent Multiscale Total Variation Based Image Decomposition and Contrast Preserving Denoising*, UCLA CAM Report 04-15, March 2004. (with T. F. Chan).
- *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).

### Conference Presentations

- *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
- *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
- *IEEE International Conference on Image Processing (ICIP)*  
Quebec City, Canada. *September 27th-30th, 2015*  
Show & Tell Demo: Shape Prior Image Segmentation and Disocclusion
- *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

- *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
- *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
- *Southern California Applied Mathematics Symposium (SoCAMS)*  
University of Southern California (USC), *April 24th, 2005*  
Poster Presentation: Image Decomposition Combining Staircase Reduction and Texture Extraction
- *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
- *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

## Responsibilities

**Team Lead: UCI iCAMP Program for the Malignant Tumor Classification Group, UCI, Summer 2012**

Responsibilities include: Team lead for 3 undergraduate research students and 1 advanced HS student for the UCI Interdisciplinary Computational and Applied Mathematics Program (iCAMP ). Duties include organizing and structuring program for the Malignant Tumor Classification group, lecturing and administering tutorials on shape modeling and classification, suggesting and overseeing research projects, training and mentoring students in research.

Explicit contributions include: processing in vitro malignant tumor data and learning descriptive features from the data that will aid cancer researchers in detecting dispersive tumors and rate of dispersion using machine learning techniques.

Outcome: National level undergraduate conference presentation talk and poster at the MBI Ohio State Undergraduate Research Capstone Conference (August 13-17, 2012) and publication in SIURO. *see: <http://mbi.osu.edu/eduprograms/upcapstone.html> and <http://math.uci.edu/icamp/summer/research/>*

**Team Lead: UCI iCAMP Program for the Shape Classification Group, UCI, Summer 2011**

Responsibilities include: Team lead for 6 undergraduate research students and 1 advanced HS student for the UCI Interdisciplinary Computational and Applied Mathematics Program (iCAMP ). Duties include organizing and structuring program for the shape classification group, lecturing and administering tutorials on shape modeling and classification, suggesting and overseeing research projects, training and mentoring students in research.

Explicit contributions include: designing/utilizing shape descriptors and machine learning algorithms for applications in shape classification, cancer cell clustering, and cancer cell detection/classification. *see: <http://math.uci.edu/icamp/summer/research/>*

**Organizer of the UCI Image Processing and Learning Seminar, UCI, Fall 2009–Fall 2012**

Responsibilities include: organization of the biweekly group meetings, special talks, activities, and the recruitment of guest speakers.

**Coordinator of Tony F. Chan's Research Group, UCLA, Summer 2002–Winter 2005**

Responsibilities include: organization of the weekly group meetings, special talks, activities, and the recruitment of guest speakers.

## Awards

**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*

**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.

**Daus Prize**, UCLA Undergraduate Award in Mathematics, *Spring 1997*

## Courses Taught

AI, Computer Vision, and Cognition (Whittier College)

Data Structures in C++ (Whittier College)

Intro to Computer Science using Python (Whittier College)

Mathematical Modeling (Whittier College)

Quantitative Reasoning (Whittier College)

Honors Applied Calculus (Umich Ann Arbor)

Numerical Methods/Analysis (Umich Ann Arbor, Whittier College)

Single Variable Calculus (UCLA, Whittier College)

Vector Calculus (UCLA, UCI, Whittier College)

Linear Algebra and Applications (UCLA)

Nonlinear Ordinary Differential Equations (UCLA)

Ordinary Differential Equations (UCI, Whittier College)

Shape Representation and Classification Tutorial (UCI)

Undergraduate Independent Research (UCLA and UCI)

## References

Tony F. Chan  
President and Professor of Mathematics &  
Computer Science and Engineering at  
HKUST  
tonyfchan@ust.hk  
(852) 2358 7460 ext 6101

Hongkai Zhao  
Professor and Chair of the Mathematics  
Department at UC Irvine  
zhao@math.uci.edu  
(949) 824 5420

Jack Xin  
Professor of Mathematics at UC Irvine  
jxin@math.uci.edu  
(949) 824 5309

Selim Esedoglu  
Associate Professor of Mathematics at the  
University of Michigan, Ann Arbor  
(734) 936 9926  
esedoglu@umich.edu

Sarah Eichhorn  
Lecturer SOE/Assistant Vice Chair  
Undergraduate Studies in Mathematics at  
UC Irvine  
sfrey@math.uci.edu  
(949) 824-5313

**Personal Information**

Citizenship: USA

Knowledge of spoken Korean and Spanish & written Spanish and French

Surfing and Martial Arts Enthusiast

Food and Wine Devotee