

CURRICULUM VITAE

WEI ZHU

**DEPARTMENT OF MATHEMATICS
UNIVERSITY OF ALABAMA**

Mail: Department of Mathematics
University of Alabama
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Tuscaloosa, AL, 35487

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Employment:

08/2014 – present

Associate Professor (tenured)
Department of Mathematics
University of Alabama, Tuscaloosa

08/2008 – 08/2014

Assistant Professor (tenure-track)
Department of Mathematics
University of Alabama, Tuscaloosa

09/2004 – 08/2008

Postdoctoral Researcher (Courant Instructor)
Courant Institute of Mathematical Sciences
New York University

Education:

06/2004

Ph.D. in Mathematics
University of California, Los Angeles
Advisor: Prof. Tony F. Chan
Thesis Title: Variational Models for Illusory Contours and Shape Prior Segmentation

07/1999

M.S. in Mathematics
Peking University, P.R. China
Advisor: Prof. Kung-Ching Chang
Thesis Title: The Realization and Comparison of Three Typical Image Segmentation Models

07/1994

B.S. in Mathematics
Tsinghua University, P.R. China

Areas of Research Interest:

- Image processing and computer graphics
- Computational neuroscience
- Mathematical modeling and simulation on active materials

- Partial differential equations and variational methods

Grants and Awards:

- NSF DMS-1016504 (2010-2014) entitled “Simulation of Liquid Crystal Elastomers”
- University of Alabama RGC Award (2010-2012) entitled “A variational model for cardiac segmentation”

Publications and Preprints:

1. Wei Zhu, **Image denoising using L^p -norm of mean curvature of image surface.** *Accepted by Journal of Scientific Computing, Apr. 2020.*
2. Sung Ha Kang, Xuecheng Tai, and Wei Zhu, **Survey of geometry inspired variational segmentation: interface model, curvature terms and fast computation.** *HNA - 19 & 20 Processing, Analyzing and Learning of Images, Shapes, and Forms Part 1 and 2, 2019.*
3. Wei Zhu, **A first-order image denoising model for staircase reduction.** *Advances in Computational Mathematics, 45, 3217-3239, 2019.*
4. Wenli Yang, Zhongyi Huang, and Wei Zhu, **Image segmentation using the Cahn-Hilliard equation.** *Journal of Scientific Computing, 79(2), pp. 1057-1077, 2019.*
5. Wenli Yang, Zhongyi Huang, and Wei Zhu, **An efficient tailored finite point method for Rician denoising and deblurring.** *Communications in Computational Physics, 24, pp. 1169-1195, 2018.*
6. Xuan He, Wei Zhu, and Xue-Cheng Tai, **Segmentation by elastica energy with L^1 and L^2 curvature: a performance comparison.** *Numerical Mathematics: Theory, Methods and Applications, doi: 10.4208/nmtma.OA-2017-0051.*
7. Wei Zhu, **A numerical study of a mean curvature denoising model using a novel augmented Lagrangian method.** *Inverse Problems and Imaging, 11(6), pp. 975-996, 2017.*
8. Maryam Yashtini, Sung Ha Kang, and Wei Zhu, **Efficient Alternating Minimization Methods For Variational Edge-weighted Colorization Models.** *Advances in Computational Mathematics, 45, 1735-1767 2019.*
9. Andy M. Yip and Wei Zhu, **Shape from shading using mean curvature.** *In preparation.*
10. Egil Bae, Xue-Cheng Tai, and Wei Zhu, **Augmented Lagrangian method for an Euler’s elastica based segmentation model that promotes convex contours.** *Inverse Problems and Imaging, 11(1), pp. 1-23, 2017.*

11. Wei Zhu, **Simulation on Liquid crystal elastomers using spectral method with a new preconditioner.** *Advances in Computational Mathematics*, 41(4) pp. 853-879, 2015.
12. Sung Ha Kang, Wei Zhu, and Jackie Shen, **Illusory Shapes via Corner Fusion.** *SIAM Journal on Imaging Sciences*, 7, pp. 1907-1936, 2014.
13. Wei Zhu, Xue-Cheng Tai, and Tony F. Chan, **A fast algorithm for a mean curvature based image denoising using augmented Lagrangian method.** *A. Bruhn et al. (Eds.): Global Optimization Methods, LNCS 8293*, pp. 104-118, 2014.
14. Wei Zhu, Xue-Cheng Tai, and Tony F. Chan, **Image segmentation using Euler's elastica as the regularization.** *Journal of Scientific Computing*, 57, pp. 414-438, 2013.
15. Andy M. Yip and Wei Zhu, **A fast modified Newton method for curvature based denoising of 1D signals.** *Inverse Problems and Imaging*, 7(3), pp. 1075-1097, 2013.
16. Wei Zhu, Xue-Cheng Tai, and Tony F. Chan, **Augmented Lagrangian method for a mean curvature based image denoising model.** *Inverse Problems and Imaging*, 7(4), pp. 1409-1432, 2013.
17. Wei Zhu, Sung Ha Kang, and George Biros, **A geodesic-active-contour-based variational model for short axis cardiac-MR image segmentation.** *International Journal of Computer Mathematics*, 90(1), pp. 124-139, 2013.
18. Wei Zhu and Tony F. Chan, **Image denoising using mean curvature of image surface.** *SIAM Journal on Imaging Sciences*, 5, pp. 1-32, 2012.
19. Wei Zhu, Michael Shelley, and Peter Palffy-Muhoray, **Modeling and simulation of liquid crystal elastomers.** *Physical Review E* 83, 051703 (2011).
20. Wei Zhu, Dajun Xing, Michael Shelley, and Robert Shapley, **Correlation between spatial-frequency and orientation-selectivity in V1 cortex: implications of a large-scale network model.** *Vision Research*, (2010) 50(22):2261-73.
21. Wei Zhu, Michael Shelley, and Robert Shapley, **A neuronal network model of primary visual cortex explains spatial frequency selectivity.** *Journal of Computational Neuroscience*. 26:2 (2009), pp. 271-287.
22. Wei Zhu and Tony F. Chan, **A variational model for capturing illusory contours using curvature.** *Journal of Mathematical Imaging and Vision*, 27(2007), pp. 29-40.
23. Wei Zhu, Tony F. Chan, and Selim Esedoglu, **Segmentation with depth: A level set approach.** *SIAM Journal on Scientific Computing*, 28 (2006), pp. 1957-1973.
24. Tony F. Chan and Wei Zhu, **Level set based shape prior segmentation.** *Proc. IEEE Conf. on Computer Vision and Pattern Recognition, CVPR (2)* pp. 1164-1170, San Diego, June 2005.

Presentations:

- *Image denoising via a novel deep neural network model*, Workshop on “Efficient Algorithms in Data Science, Learning, and Computational Physics” at Tsinghua Sanya International Mathematics Forum (TSIMF), China, Jan. 12-16, 2020.
- *Euler’s elastic based segmentation models and the fast algorithms*, Department of Mathematics, Iowa State University, Oct. 21, 2019.
- *Image denoising using L^p -norm of mean curvature of image surface*, The 5th Annual Meeting of SIAM Central States Section, Iowa State University, Oct. 19-20, 2019.
- *Image Denoising Using L^p -norm of Mean Curvature of Image Surface*, HDU Workshop on Optimization Methods for Imaging and Big Data Problems, Hangzhou Dianzi University (HDU), Hangzhou, China, May 24-25, 2019.
- *A first-order image denoising model for staircase reduction*, Yong Applied Mathematician Forum, Tsinghua University, China, May 11-12, 2019.
- *Fast algorithm for novel image denoising models using L^p -norm of mean curvature*, AMS Southeastern Sectional Meeting, Auburn University, Mar. 16, 2019.
- *A lower-order image denoising model for staircase reduction*, Department of Mathematics and Statistics, Georgia State University, Nov. 1, 2018.
- *Euler’s elastic based segmentation models and the fast algorithms*, Workshop “Flows, mappings and shapes”, Dec. 11-15, 2017, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom.
- *L^p mean curvature based image denoising models and the fast algorithms*, Department of Mathematics, Jiangsu Normal University, P.R. China, May 18, 2017.
- *A mean curvature based image denoising model and its fast algorithm*, Workshop on Image Processing and Numerical Methods, Jul. 29-30, 2016, North China Electric Power University, Beijing, China.
- *Image denoising using mean curvature of image surface*, SIAM Conference on Imaging Sciences (IS16), May 23-26, 2016, Albuquerque, New Mexico.
- *Augmented Lagrangian method for an Euler’s elastica based segmentation model that promotes convex contours*, SIAM Conference on Imaging Sciences (IS16), May 23-26, 2016, Albuquerque, New Mexico.
- *Augmented Lagrangian method for an Euler’s elastica based segmentation model that prefers convex contours*, The 40th SIAM Southeastern Atlantic Section Conference (SIAM-SEAS), University of Georgia, Athens, GA, USA, Mar.12-13, 2016.
- *Simulation on liquid crystal elastomers using spectral methods with a new preconditioner*, Department of Mathematics, Tsinghua University, P.R. China, May 21, 2015.
- *Augmented Lagrangian method for an Euler’s elastica based segmentation model that prefers convex contours*, Mathematics Department, Xi’an Jiaotong-Liverpool University, P.R. China, May15, 2015.
- *Simulation on liquid crystal elastomers using spectral methods with a new preconditioner*, International Workshop on Nonlinear PDEs and Applications, Xi’an Jiaotong-Liverpool University, P.R. China, May 14, 2015.
- *A variational model for shape from shading using mean curvature*, SIAM Southeastern Atlantic Section Conference (SEAS), University of Alabama at Birmingham, Mar. 20-22, 2015.

- *A variational model for shape from shading using mean curvature*, Workshop “New Trends in Optimization for Imaging”, Tsinghua Sanya International Mathematics Forum, Sanya, P.R. China, Jan. 18-24, 2015.
- *Some Variational Models in Image Processing*, Department of Mathematics, University of Alabama, Oct. 17, 2014.
- *Simulation on liquid crystal elastomers using spectral methods with a new preconditioner*, Department of Mathematics, Michigan State University, Oct. 10, 2014.
- *A mean curvature based image denoising model and its fast algorithm*, Department of Mathematics, Jiangsu Normal University, P.R. China, Jun.16, 2014.
- *Some Variational Models in Image Processing*, Pi Mu Epsilon Talks, University of Alabama, Feb. 18, 2014.
- *Simulation on liquid crystal elastomers using spectral methods with a new preconditioner*, Twenty-Sixth Annual University of Alabama System Applied Mathematics Meeting, Nov. 3, 2013.
- *Image denoising using mean curvature of image surface*, Institute of Natural Sciences, Shang Hai Jiao Tong University, P.R. China, Jun.18, 2013.
- *Simulation on Liquid Crystal Elastomers Using Spectral Methods with a New Preconditioner*, SIAM Conference on Mathematical Aspects of Materials Science (MS13), Jun. 9-12, 2013, Philadelphia, Pennsylvania.
- *A Geodesic Active Contour Based Model for Short Axis Cardiac-MR Image Segmentation*, SIAM Conference on Imaging Science (IS12), May.20-22, 2012, Philadelphia, Pennsylvania.
- *Image denoising using mean curvature of image surface*, International Conference on Scientific Computing, Jan. 4-7, 2012, Hong Kong.
- *Modeling and simulation of nematic liquid crystal elastomers*, Mathematics and Statistics, Auburn University, Oct. 28, 2011.
- *Modeling and simulation of nematic liquid crystal elastomers*, SIAM Conference on Mathematical Aspects of Material Science (MS10), May.23-26, 2010, Philadelphia, Pennsylvania.
- *Mean curvature based image denoising*, SIAM Conference on Imaging Science (IS10), Apr.12-14, 2010, Chicago, Illinois.
- *Modeling and simulation of nematic liquid crystal elastomers*, Twenty-Second Annual University of Alabama System Applied Mathematics Meeting, Nov. 2009.
- *A fast and exact algorithm of minimizing the Rudin-Osher-Fatemi functional in one dimension*, School of Mathematics, Georgia Institute of Technology, Oct.12, 2009.
- *Modeling and simulation of nematic liquid crystal elastomers*, (poster presentation) the 5th International Liquid Crystal Conference, Sept. 24---26, 2009.
- *A neuronal network model of primary visual cortex explains spatial frequency selectivity*, (organizer and speaker) 2009 SIAM Conference on Dynamical Systems, Snowbird, Utah, May.17—May21, 2009.
- *A neuronal network model of primary visual cortex explains spatial frequency selectivity*, Neuroscience Annual Meeting 2008, Washington DC, Nov.18, 2008.
- *A neuronal network model of primary visual cortex explains spatial frequency selectivity*, (poster presentation) Sloan-Swartz Meeting 2008, Princeton University, Jul.22, 2008.
- *Modeling and Simulation of Liquid Crystal Elastomers*, Department of Mathematical Sciences, Kent State University, Kent, OH, Mar. 7, 2008.

- *Modeling and Simulation of Liquid Crystal Elastomers*, School of Mathematics, Georgia Institute of Technology, Atlanta, GA, Feb. 12, 2008.
- *Modeling and Simulation of Liquid Crystal Elastomers*, Department of Mathematics, University of Alabama, Tuscaloosa, AL, Feb. 4, 2008.
- *Modeling and Simulation of Liquid Crystal Elastomers*, Department of Mathematics, Louisiana State University, Baton Rouge, LA, Jan. 29, 2008.
- *Two Mathematical Problems in Vision*, Department of Mathematics, Washington State University, Pullman, WA, Mar. 20, 2007.
- *Two Mathematical Problems in Vision*, Department of Mathematics, University of Connecticut, Storrs, CT, Feb. 8, 2007.
- *Level Set Based Shape Prior Segmentation*, IEEE Computer Society Conference on Computer Vision and Pattern Recognition, San Diego, CA, Jun. 20-26, 2005.
- *Capturing Illusory Contours Using Curvature*, Department of Mathematics, Michigan State University, East Lansing, MI, Nov.15, 2004.
- *Image Denoising Using Mean Curvature Information*, Special Session on PDE Based Methods in Imaging and Vision, AMS Meeting, Pittsburgh, PA, Nov 6-7, 2004.
- *Segmentation with Depth: A Level Set Approach*, Minisymposium at SIAM Conference on Image Science, Salt Lake City, UT, May 3-5, 2004.
- *Capturing Illusory Contours: A Level Set Approach*, Minisymposium at SIAM Conference on Image Science, Salt Lake City, UT, May 3-5, 2004.
- *Segmentation with Depth: A Level Set Approach*, (Posters Presentation), 4th Southern California Applied Mathematics Symposium, Claremont Colleges, CA, April 24, 2004.
- *Capturing Illusory Contours Using Curvature*, Image Processing Seminar in Math Department of UCLA, April, 2004.
- *Illusory Contours Using Shape Information*, Image Processing Seminar in Math Department of UCLA, April, 2003.

Courses Taught:

- | | |
|--------------------------------------|---|
| Assistant/Associate Professor | University of Alabama, Tuscaloosa, 2008-present |
| | Calculus I, II, III, Applied Differential Equations, Theory of Ordinary Differential Equations (graduate level), Introduction to Linear Algebra, Numerical Linear Algebra (graduate level), Boundary Value Problems, Probability, Mathematical Statistics, Numerical Analysis (graduate level), Real Analysis, Partial Differential Equations (graduate level), Complex Variables |
| Courant Instructor | New York University, 2005-2006 |
| | Intensive Calculus, Calculus |
| Graduate Teaching Assistant | University of California, Los Angeles, 2000-2003 |
| | Calculus, Applied Numerical Methods, Mathematical Modeling, Optimization, Applied Ordinary Differential Equations |

Professional Service:

1. Reviewer for the following journals:

- SIAM Journal on Scientific Computing
- International Journal of Biomedical Imaging
- Journal of Mathematical Imaging and Vision
- Communications in Mathematical Sciences
- Inverse Problems and Imaging
- SIAM Journal on Imaging Sciences
- Advances in Computational Mathematics
- International Conference on Scale Space and Variational Methods in Computer Vision
- Journal of Microscopy
- Optics Express
- Applied Mathematical Modelling
- Signal Processing: Image Communication
- Journal of Scientific Computing

2. Committee Member

- Alex Barnes (Ph.D dissertation, Mathematics)
- Phylisicia Carter (Ph.D dissertation, Mathematics)
- Mingwei Sun (Ph.D dissertation, Mathematics)
- Noufe Aljahdaly (Ph.D dissertation, Mathematics)
- Zhihan Wei (Ph.D dissertation, Mathematics)
- Sijie Liu (Ph.D dissertation, Mathematics)
- Duc Nguyen (Ph.D dissertation, Mathematics)
- Yihan He (Master thesis, Mathematics)
- Yujing Sun (Ph. D dissertation, Physics and Astronomy)
- Adam Schweiger (Ph.D dissertation, Mathematics)
- Mahmoud DarAssi (Ph.D dissertation, Mathematics)
- Xingang Fu (Ph.D dissertation, Electrical and Computer Engineering)
- Yang Lin (Master thesis, Mathematics)
- Leighton W. Wilson (Master thesis, Mathematics)
- Rongchang Liu (Master thesis, Department of Geological Sciences)
- Yuhui Yao (Ph.D dissertation, Applied Statistics)
- Zhi Wang (Ph.D dissertation, Applied Statistics)
- Hongsong Feng (Ph.D dissertation, Mathematics)
- Linda Katherine Ford (Ph.D dissertation, Mathematics)
- Toai Luong (Ph.D dissertation, Mathematics)
- Fatoumata Sanogo (Ph.D dissertation, Mathematics, UAB)

3. Student Supervising

- Mengpu Chen (PhD, graduated 2016)
- Xuan He (PhD, graduated 2018)

- Ziteng Wang (MS, 2015)
- Emily Thurston (MS, 2018)