CURRICULUM VITAE

JIANXU CHEN

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Education

Ph.D. Computer Science, June 2017

University of Notre Dame, Notre Dame, Indiana

Thesis: *New Algorithms for Segmentation, Tracking, and Related Applications in Biomedical Image Analysis*

Advisor: Danny Z. Chen.

M.S. Computer Science, December 2015

University of Notre Dame, Notre Dame, Indiana

B.S. Mathematics, July 2011

University of Science and Technology of China, Hefei, China

Work Experience

Sep. 2021 — Present, Group Leader (PI)

Leibniz Institute for Analytical Sciences, Germany

Aug. 2017 — Aug. 2021, Scientist

Allen Institute for Cell Science, Seattle, WA, USA

May 2016 — Aug. 2016, Intern Imaging Scientist

Ventana Medical System, Mountain View, CA, USA

Refereed Journal Publications

1. K.A. Gerbin, T. Grancharova, R. Donovan-Maiye, M.C. Hendershott, H.G. Anderson, J. Brown; **J. Chen**, S.Q. Dinh, J.L. Gehring, G.R. Johnson, H.W. Lee, A. Nath, A. Nelson, M.F. Sluzewski, M.P. Viana, C. Yan, R.J. Zaunbrecher, K.R.C. Metzler, N.

Gaudreault, T. Knijnenburg, S.M. Rafelski, J.A. Theriot, and R.N. Gunawardane, "Cell States Beyond Transcriptomics: Integrating Structural Organization and Gene Expression in hiPSC-Derived Cardiomyocytes," accepted to *Cell Systems,* 2021.

2. C. Madukoma, P. Liang, A. Dimkovikj, **J. Chen**, S. Lee, D.Z. Chen, and J. Shrout, "Single Cells Exhibit Differing Behavioral Phases During Early Stages of *Pseudomonas aeruginosa S*warming," *Journal of Bacteriology,* Vol. 201, Issue 19, Oct. 2019, pp. e00184-19, DOI: 10.1128/JB.00184-19.

3. P. A. Brodskiy, Q. Wu, D. K. Soundarrajan, F. J. Huizar, **J. Chen**, P. Liang, C. Narciso, M. K. Levis, N. Arredondo-Walsh, D. Z. Chen, and J. J. Zartman, "Decoding Calcium Signaling Dynamics During Drosophila Wing Disc Development," *Biophysical Journal*, Vol. 116, Issue 4, Jan. 2019, pp. 725-740, DOI: 10.1016/j.bpj. 2019.01.007.

4. O. Kim, R. Litvinov, **J. Chen**, D.Z. Chen, J. Weisel, and M. Alber, "Compression-Induced Structural and Mechanical Changes of Fibrin-Collagen Composites," *Matrix Biology,* Vol. 60, July 2017, pp. 141-156, DOI: 10.1016/j.matbio.2016.10.007.

5. **J. Chen**, M. Alber, and D.Z. Chen, "A Hybrid Approach for Segmentation and Tracking of *Myxococcus xanthus* Swarms," *IEEE Transactions on Medical Imaging*, Vol. 35, No. 9, September 2016, pp. 2074-2084, DOI: 10.1109/TMI.2016.2548490 (Top journal in the field of Biomedical Image Computing; 2020 Impact factor 6.685)

6. D. Mehta, **J. Chen**, D.Z. Chen, H. Kusumaatmaja and D.J. Wales, "Kinetic Transition Networks for the Thomson Problem and Smale's Seventh Problem," *Physical Review Letters*, Vol. 117, No. 2, Article number: 028301, July 2016, DOI: 10.1103/PhysRevLett.117.028301. (Selected as PRL Editors' Suggestion. http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.117.028301)

7. **J. Chen**, F. Shen, D.Z. Chen, and P.J. Flynn, "Iris Recognition Based on Human-Interpretable Features," *IEEE Transactions on Information Forensics and Security*, Vol. 11, No. 7, July 2016, pp. 1476-1485, DOI: 10.1109/TIFS.2016.2535901.

Refereed Conference Publications

1. H. Wang, H. Zheng, **J. Chen**, L. Yang, Y. Zhang, and D.Z. Chen, "Unlabeled Data Guided Semi-supervised Histopathology Image Segmentation," in *Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Dec. 2020, Vol.1, pp. 815-820, DOI: 10.1109/BIBM49941.2020.9313428.

2. P. Liang, **J. Chen**, Y. Zhang, H. Wang, H. Zheng, P. Gu, and D.Z. Chen, "InTracker: An Integrated Detector-Tracker Framework for Cell Detection and Tracking," in *Proceedings of the 33rd IEEE International Symposium on Computer-Based Medical System (CBMS)*, July 2020, pp. 332-337, DOI: 10.1109/CBMS49503.2020.00069.

3. P. Liang, **J. Chen**, H. Zheng, L. Yang, Y. Zhang, and D.Z. Chen, "Cascade Decoder: A Universal Decoding Method for Biomedical Image Segmentation," in *Proceedings of the 16th IEEE International Symposium on Biomedical Imaging (ISBI),* Venice, Italy, April 2019, pp. 339-342, DOI: 10.1109/ISBI.2019.8759430

4. H. Zheng, L. Yang, **J. Chen**, J. Han, P. Liang, Z. Zhao, C. Wang, and D.Z. Chen, "Biomedical Image Segmentation via Representative Annotation," in *Proceedings of 33rd AAAI Conference on Artificial Intelligence*, Honolulu, Hawaii, January 2019, Vol 33, No. 1, pp. 5901-5908, DOI: https://doi.org/10.1609/aaai.v33i01.33015901. (Acceptance rate: 16%)

5. P. Liang, **J. Chen**, P. Brodskiy, Q. Wu, Y. Zhang, Y. Zhang, L. Yang, J. Zartman, and D.Z. Chen, "A New Registration Approach for Dynamic Analysis of Calcium Signals in Organs," in *Proceedings of the 15th IEEE International Symposium on Biomedical Imaging (ISBI),* Washington, D.C., April 2018, pp. 934-937, DOI: 10.1109/ISBI.2018.8363724

6. **J. Chen**, S. Banerjee, A. Grama, W. Scheirer and D.Z. Chen, "Neuron Segmentation Using Complete Bipartite Network," in *Proceedings* of *the 20th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI),* Quebec, Canada, September 2017, Part II, pp. 21-29, DOI: https://doi.org/10.1007/978-3-319-66185-8_3. (Acceptance rate: 32%)

7. L. Yang, Y. Zhang, **J. Chen**, and D.Z. Chen, "Suggestive Annotation: A Deep Active Learning Framework for Biomedical Image Segmentation," in *Proceedings of the 20th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI),* Quebec, Canada, September 2017, Part II, pp. 399-407, DOI: https://doi.org/10.1007/978-3-319-66179-7_46. (<u>Selected as one of 29 oral presentations from 800+ submissions</u>)

8. Y. Zhang, L. Yang, **J. Chen**, M. Fredericksen, D. Hughes and D.Z. Chen, "Deep Adversarial Networks for Biomedical Image Segmentation Utilizing Unannotated Images," in *Proceedings* of *the 20th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI),* Quebec, Canada, September 2017, Part II, pp. 408-416, DOI: https://doi.org/10.1007/978-3-319-66179-7_47.

9. X. Chen, **J. Chen**, D.Z. Chen, and S.X. Hu, "Optimizing Memory Efficiency for Convolution Kernels on Kepler GPUs," in *Proceedings of the 54th ACM/EDAC/IEEE Annual Design Automation Conference (DAC),* Austin, TX, June 2017, Article No. 68. (Top 1 conference in Computer Hardware Design; Acceptance rate: 23.8%)

10. **J. Chen**, L. Yang, Y. Zhang, M. Alber and D.Z. Chen, "Combining Fully Convolutional and Recurrent Neural Networks for 3D Biomedical Image Segmentation," in *Proceedings of the 30th Annual Conference on Neural Information Processing Systems (NeurIPS)*, Barcelona, Spain, December 2016, pp. 3036-3044. (Top conference in Artificial Intelligence, h5-index=198; Acceptance rate: 21.9%.)

11. **J. Chen**, Y. Cai, C. Wei, L. Yang, M. Alber, and D.Z. Chen, "Segmentation and Tracking of Pseudomonas aeruginosa for Cell Dynamics Analysis in Time-Lapse Images," in *Proceedings of the 13th IEEE International Symposium on Biomedical Imaging (ISBI),* Prague, Czech Republic, April 2016, pp. 968-971. (Selected for oral presentation)

12. **J. Chen**, S. Mahserejian, M. Alber, and D.Z. Chen, "A Hybrid Approach for Segmentation and Tracking of Myxococcus xanthus Swarms," in *Proceedings of the 18th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, Munich, Germany, October 2015, Part III, pp. 284-291. (Top conference in the field of Medical Image Computing; Acceptance rate: 32.5%)

13. **J. Chen**, F. Shen, D.Z. Chen, and P.J. Flynn, "Iris Recognition Based on Human-Interpretable Features," in *Proceedings of the 1st IEEE Conference on Identity, Security and Behavior Analysis (ISBA)*, Hong Kong, March 2015. DOI: 10.1109/ISBA.2015.7126352; ISBN: 978-1-4799-1974-1.

14. **J. Chen**, C. Harvey, M. Alber, and D.Z. Chen, "A Matching Model Based on Earth Mover's Distance for Tracking Myxococcus xanthus," in *Proceedings of the 17th International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, Boston, MA, September 2014, Part II, pp. 113-120. (Selected as the top 50 student papers for Student Travel Award; acceptance rate: 29%)

15. **J. Chen**, O. Kim, R. Litvinov, J. Weisel, M. Alber, and D.Z. Chen, "An Automated Approach for Fibrin Network Segmentation and Structure Identification in 3D Confocal Microscopy Images," in *Proceedings of the 27th IEEE International Symposium on Computer Based Medical Systems (CBMS)*, New York, NY, May 2014, pp. 173-178, DOI:10.1109/CBMS.2014.62 (Selected for long oral presentation)

Non-Refereed Publications

1. M.P. Viana, **J. Chen**, T.A. Knijnenburg, R. Vasan, Yan C, et al.. "Robust Integrated Intracellular Organization of the Human iPS Cell: Where, How Much, and How Variable?" bioRxiv. 2020 Jan 1. (under review by ***Nature***)

2. **J. Chen**, L. Ding, M.P. Viana, H.W. Lee, B. Morris, M.C. Hendershott, R. Yang, I.A. Mueller, and S.M. Rafelski, "The Allen Cell and Structure Segmenter: a New Open Source Toolkit for Segmenting 3D Intracellular Structures in Fluorescence Microscopy Images," bioRxiv, DOI: https://doi.org/10.1101/491035, 2018 (updated on Dec. 2020).

3. Q. Wu, P. Brodskiy, C. Narciso, M. Levis, **J. Chen**, P. Liang, N.A. Walsh, D.Z. Chen, and J. Zartman, "Intercellular Calcium Waves are Controlled by Morphogen Signaling During Organ Development," *bioRxiv*, DOI: https://doi.org/10.1101/104745, 2017.

4. **J. Chen** and C. Srinivas, "Automatic Lymphocyte Detection in H&E Images with Deep Neural Networks," *arXiv Preprint,* arXiv:1612.03217, December 9, 2016.

Manuscripts in Progress

1. **J. Chen**, et. al. "Building Computational Transfer Functions on 3D Light Microscopy Images: From a General Deep Learning Toolkit to Biology-Driven Validations"

Patent Applications

1. "Convolutional Neural Networks for Locating Objects of Interest in Images of Biological Samples", **Non-provisional** Patent application filed on November 15, 2017. Pub. No.: US 2020/0097701 A1.
2. "Building Computational Transfer Functions on 3D Light Microscopy Images using Deep Learning", **Non-provisional** Patent application filed on September 30, 2020.
3. "Segmenting 3D Intracellular Structures in Microscopy Images Using an Iterative Deep Learning Workflow That Incorporates Human Contributions". **Non-provisional** Patent application filed on October 30, 2019. Attorney Docket Number: 110286.402 and 110286.402WO.
4. "Biology Driven Approach to Image Segmentation using Supervised Deep Learning-Based Segmentation", **Non-Provisional** Patent application filed on October 30, 2020. Attorney Docket Number: 110286.405P1
5. "Systems, Devices, and Methods for Compound Screening Using Predictive Tagging", **Provisional** Patent application filed on July 30, 2020. Attorney Docket Number: 0119-0017PR1

Software Development

1. "The Allen Cell and Structure Segmenter: a new open source toolkit for segmenting 3D intracellular structures in fluorescence microscopy images", first release in Dec

2018 and still actively developing (including three different python packages).

   URL: https://www.allencell.org/segmenter.html

2. "Napari Plugin for Allen Cell and Structure Segmenter", will be released on April 29, 2021.

   URL: https://github.com/AllenCell/napari-aicssegmentation

3. "Image Classifier 3D: A Python Package for 3D Image Classification using Deep Neural Network", released in Dec. 2020.

   URL: https://github.com/AllenCell/image_classifier_3d

4. "CVAPIPE: Cell Variance Analysis Pipeline", released in Dec. 2020.

   URL: https://github.com/AllenCell/cvapipe

5. "Deep Learning Based Computational Transfer Functions on 3D Light Microscopy Images", first release in Dec. 2020 and still actively developing.

   URL: https://github.com/AllenCell/aics_transfer_function

6. "AICS_TF_Registration: A Python Package for 3D image registration", first released in Nov. 2020 and still actively developing.

   URL: https://github.com/AllenCell/aics_tf_registration

7. "CMark: A Matlab Toolkit for Segmentation, Tracking, and Analysis of Cells in Time-lapse Images", Office of Technology Transfer, University of Notre Dame, 2017

   URL: http://notredametech.technologypublisher.com/technology/25207

8. "Iris Recognition Based on Human-Interpretable Features", Office of Technology Transfer, University of Notre Dame, August 2, 2016.

   URL: http://notredametech.technologypublisher.com/technology/22749

Awards and Grants

1. Outstanding Research Assistant Award, Department of Computer Science and Engineering, University of Notre Dame, April 2016.

2. NSF Travel Grant, October 2015.

   Awarded for oral presentation at *the 25th Fall Workshop on Computational Geometry (FWCG)* at the State University of New York at Buffalo. Presentation title: *A Geometric Matching Model Based on Earth Mover's Distance and Its Applications*

in Computer Vision.
http://www.cse.buffalo.edu/fwcg2015/assets/pdf/FWCG_2015_paper_4.pdf

3. Best Poster Award, Department of Computer Science and Engineering, University of Notre Dame, November 2014.
   Awarded for poster presentation *at the 9th Annual CSE Student Research Symposium Poster Contest*.

4. MICCAI Student Travel Award, September 2014.
   Awarded for top 50 student papers in *the 17th International Conference on Medical Image Computing and Computer-Assisted Intervention*. Paper title: *A Matching Model Based on Earth Mover's Distance for Tracking Myxococcus xanthus.*

5. Conference Presentation Grant, Graduate Student Union, University of Notre Dame, August 2014.

Academic Services

Program Committee Member:

1. The 6th Computer Vision for Microscopy Image Analysis (CVMI) Workshop, held in conjunction with IEEE conference on Computer Vision and Pattern Recognition (CVPR), June 25, 2021. Link: https://cvmi2021.github.io/

2. Hardware Aware Learning for Medical Imaging and Computer Assisted Intervention Workshop, help in congestion with MICCAI 2019 (Annual Conference of the Medical Imaging Computing and Computer Assisted Intervention Society), Oct 17, 2019. Link: http://www.cse.cuhk.edu.hk/~byu/HAL-MICCAI-2019/

3. 3D Quantitative Visualization of Fluorescently Labeled Cells, held in conjunction with the 2019 BioImage Informatics conference. Oct 1, 2019. Link: https://alleninstitute.org/what-we-do/cell-science/events-training/quantitative-visualization-workshop/

Editorial Board:

1. Journal on Emerging Technologies in Computing Systems, Special Issue on Hardware-aware learning for medical applications (Guest Editor since Aug. 2020)
2. Journal of Medical Imaging and Health Informatics (Associated Editor since September 2017)
3. Australian Physical and Engineering Science in Medicine, Special Issue on Advances in Artificial Intelligence in Biomedical Image Analysis (Guest Editor December 2017 - December 2018)

Journal Reviewer:
1. Nature Methods (since Oct 2019)
2. Scientific Reports (since May 2018)
3. IEEE Transactions on Medical Imaging (since June 2017)
4. IEEE Transactions on Biomedical Engineering (since August 2016)
5. Medical Image Analysis (since December 2017)
6. ACM Communication (since Nov 2020)
7. Cytometry part A (since June 2020)
8. APL Bioengineering (since Sep. 2020)
9. Pattern Recognition (since August 2016)
10. Journal of Biomedical and Health Informatics (since December 2016)
11. Computerized Medical Imaging and Graphics (since January 2018)
12. IEEE Access (since February 2018)

Conference Reviewer:
1. MICCAI 2021, International Conference On Medical Image Computing & Computer Assisted Intervention
2. MICCAI 2020, International Conference On Medical Image Computing & Computer Assisted Intervention
3. MICCAI 2019, International Conference On Medical Image Computing & Computer Assisted Intervention
4. MICCAI 2018, International Conference On Medical Image Computing & Computer Assisted Intervention

    5. Algorithms and Data Structures Symposium, 2014

    6. International Conference on Applied Algorithms, 2014

Supervision of Undergraduate Research Projects

1. Yiqing Cai, International Summer Undergraduate Research Experience (iSURE) at University of Notre Dame, "Development of Matlab GUI for Trajectory Visualization and Manual Annotation", July-September 2015, (now software engineer at Apple).
2. Chen Wei, International Summer Undergraduate Research Experience (iSURE) at University of Notre Dame, "Development of Matlab GUI for Manual Image Annotation", July-September 2015, (now software engineer at Oracle).

Media Coverage of Research Work

1. "Cell Exploration with ML at the Allen Institute w/ Jianxu Chen", This Week in Machine Learning (the TWIML AI Podcast), June 15, 2020, https://twimlai.com/twiml-talk-383-cell-exploration-with-ml-at-the-allen-institute-w-jianxu-chen/
2. "Animation, Segmentation, and Statistical Modeling of Biological Cells Using Microscopy Imaging and GPU Compute", Showcase at NVIDIA GTC 2020, https://developer.nvidia.com/gtc/2020/video/s21944-vid
3. "Machine Learning Lets Biologists Navigate Their Way Through a 3D Cell" online, *Artificial Intelligence Research*, July 31, 2019. https://www.onartificialintelligence.com/articles/17830/machine-learning-lets-biologists-navigate-their-way-through-a-3d-cell
4. "Your Research Matters," online, University of Notre Dame, September 2017. Selected as one of 27 featured graduate students with highlighted research. http://graduateschool.nd.edu/about-the-graduate-school/your-research-matters/

5. "Crowdsourcing A Better Understanding Of Bacteria," online, Notre Dame IDEA Center News, July 10, 2017. https://ideacenter.nd.edu/news-events/news/crowdsourcing-a-better-understanding-of-bacteria/

6. "Notre Dame Researchers Develop Iris Recognition Software using New Method," online, *Biometric Update*, November 16, 2016. https://www.biometricupdate.com/201611/notre-dame-researchers-develop-iris-recognition-software-using-new-method

7. "University Researchers Develop Iris-Recognition Technology," front page, *The Observer*, the newspaper of University of Notre Dame and Saint Mary's College, November 11, 2016.

8. "Notre Dame Researchers Develop Software For Potential Use By Law Enforcement," online, *Notre Dame Research*, October 26, 2016. https://research.nd.edu/news/developing-biometric-identification-for-the-eye/

9. "Researchers Chip Away at Smale's 7th Unsolved Problem in Mathematics," feature article online, *Phys.org*, July 15, 2016. https://phys.org/news/2016-07-chip-smale-7th-unsolved-problem.html

10. "Researchers at the University of Notre Dame, the University of Durham and the University of Cambridge Make Connections between an Unresolved Problem in Mathematics and Properties of Social Networks Using Energy Landscape Theory," online, Notre Dame CBE Department News, June 24, 2016. http://cbe.nd.edu/news/researchers-at-the-university-of-notre-dame-the-university-of-durham-and-the-university-of-cambridge-make-connections-between-an-unresolved-problem-in-mathematics-and-properties-of-social-networks-using-energy-landscape-theory