Chuangqi Wang, PhD

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Research Background

Computational modeling for cell imaging, systems biology and immunology in infectious disease

Deep learning and machine learning for time course analysis in biomedical data

Professional Experience

Postdoctoral Associate, Biological Engineering, **Massachusetts Institute of Technology (MIT)**, US

  Dr. Douglas Lauffenburger (MIT, Systems Immunology)   Oct. 2019 – Present

  Dr. Galit Alter (Ragon Institute of MGH, MIT and Harvard, System Serology/Infectious Disease)

Research Associate, **Worcester Polytechnic Institute (WPI)**, US   2014 – 2015

  Dr. Patrick Flaherty (now in Statistics Dep. in UMass Amherst, Statistical genomics)

Research Associate, Chinese Academy of Sciences, China   2012 – 2013

Education

Ph.D. in Biomedical Engineering, **WPI**, US   2015 – Oct. 2019

  "Machine learning for deconvolution of cellular and subcellular heterogeneity from cell imaging"

  Advisor: Dr. Kwonmoo Lee (now in Boston Children's Hospital/Harvard Medical School)

M.S. in Electronics Engineering and Computer Science, **Peking University (PKU)**, China   2009 – 2012

B.S. in Computer Science, **Jilin University**, China   2005 – 2009

Selected Publications

Systems Biology in Infectious Disease & Translational Medicine:

1. Y.C. Bartsch*, **C. Wang***, S. Fischinger, C. Atyeo, T. Zohar, J. Burke, A.G. Edlow, A. Fasano, …, L. R Baden, E. Wood Karlson, D.A. Lauffenburger, L.M. Yonker#, G. Alter#, Humoral signatures of protective and pathological SARS-CoV2 infection in children, *Nature Medicine*, 27(3), 454-462, 2021.

2. Chaillon*, **C. Wang***, …, D.A. Lauffenburger, D.M. Smith, B. Juegl, Tissue landscape of HIV antibody neutralization susceptibility, *Conference on Retroviruses and Opportunistic Infections (**CROI**)*, 2021.

3. T. Zohar*, C. Loos*, S. Fischinger*, C. Atyeo*, **C. Wang**, …, D.A. Lauffenburger#, G. Alter#. Compromised humoral functional evolution tracks with SARS-CoV-2 mortality. *Cell*, 183(6), 2020.

4. J. D. Herman*, **C. Wang***, C. Loos*, …, D.A. Lauffenburger, L. Profski, G. Alter. Functional Antibodies in COVID-19 Convalescent Plasma, *medRxiv*, 2021.

5. P. Kaplonek*, **C. Wang***, …, M. Filbin, N. Hacohen, D.A. Lauffenburger, G. Alter. Early cross-coronavirus reactive signatures of protective humoral immunity against COVID-19, *bioRxiv*, 2021.

6. M. J. Lee, **C. Wang**, M. Carroll, …, D.A. Lauffenburger. Computational interspecies translation between Alzheimer's Disease mouse models and human subjects identifies innate immune complement, TYROBP, and TAM receptor agonist signatures, distinct from influences of aging, In review, 2021.

Cell Imaging & Machine Learning:

7. **C. Wang**, H.J. Choi, L. Woodbury, K. Lee. Deep learning-based subcellular phenotyping of protrusion dynamics reveals fine differential drug responses at subcellular and single-cell levels, *bioRxiv*, 2021.

8. **C. Wang***, H. J. Choi*, S. Kim, …, K. Lee, Deconvolution of subcellular protrusion heterogeneity and the underlying actin regulator dynamics from live cell imaging, *Nature Communications*, 9(1), pp.1-17, 2018.

9. K. Vaidyanathan*, **C. Wang***, Y. Yu, A. Krajnik, M. Choi, B. Lin, J. Kolega, K. Lee#, Y. Bae#, Machine learning approach reveals heterogeneous responses to FAK and Rho GTPases inhibition on smooth muscle spheroid formation, In review, *bioRxiv* 927616, 2020.

10. J. Jang*, **C. Wang***, X. Zhang, H.Choi, X. Pan, B. Lin, …, K. Lee, MARS-Net: Deep learning-based segmentation pipeline for live cell time-lapse images using multiple microscopy datasets, *bioRxiv*, 2021.

11. H. Choi, **C. Wang**, X. Pan, M. Cao, J. Brazzo, Y. Bae, K. Lee, Emerging machine learning approaches to phenotyping temporally heterogeneous cellular processes, ***Physical Biology***, 2021.

12. F. Zhang, **C. Wang**, A. C. Trapp, P. Flaherty, A global optimization algorithm for sparse mixed membership matrix factorization new advances in statistics and data science, ***Contemporary Biostatistics with Biopharmaceutical Applications,*** pp 129-156, Springer, 2019.

13. S. Kim*****, **C. Wang***, B. Zhao, H. Im, J. Min, N. Choi, C. M. Castro, R. Weissleder, H. Lee#, K. Lee#. Deep transfer learning-based hologram classification for molecular diagnostics. ***Scientific Reports***, 8:17003, 2018.

14. **C. Wang**, X. Zhang, Y. Chen, K. Lee. vU-net: Accurate cell edge segmentation in time-lapse fluorescence live cell images based on convolutional neural network, ***bioRxiv*** 191858, 2017.

15. **C. Wang**, S. Kang, E. Kim, X. Zhang, H. J. Choi, A. Choi, K. Lee, Edge detection of cryptic lamellipodia assisted by deep learning, ***bioRxiv*** 181263, 2017.

Robotics and Path Planning:

16. H. Liu, **C. Wang**. Collision probability based safe path planning for mobile robots in changing environments. ***Applied Mechanics and Materials***. vol. 197. pp. 401-408, (2012).

17. **C. Wang**, B. Chen and H. Liu. Path updating tree based fast path planner for unpredictable changing environments. IEEE International Conference on Robotics and Biomimetics (***ROBIO*** 2012). pp. 1529-1535. Guangzhou, China. Dec 11-14, (2012).

18. H. Liu, T. Zhang, **C. Wang**. A 'capacitor' bridge builder based safe path planner for difficult regions identification in changing environments. IEEE/RSJ International Conference on Intelligent Robots and Systems (***IROS***). pp. 3179-3186. Algarve, Portugal. Oct 7-12, 2012.

19. H. Liu, J. Wang and **C. Wang**. Sub-goal choosing and updating strategy based on hierarchy sampling strategy. Journal of Huazhong University of Science and Technology (Natural Science Edition). vol. 39. pp. 208-211, 2011(in Chinese).

20. **C. Wang**, H. Liu, Motion planning method for robots in dynamic environments based on improved particle swarm optimization, the 13nd China National Conference on Artificial Intelligence (CAAI 2009). pp. 393-399. Beijing, China. Oct 25-28, 2009 (in Chinese).

*Equal Contribution, #Co-corresponding authors.

Selected Talks

Workshop: "System Serology/Machine Learning", C. Loos, A. Nilsson & **C. Wang**	2020

A machine learning approach to devonolute the subcellular protrusion heterogeneity

Oral talk: Single Cell Biology Keystone Symposium, Colorado	January, 2019
Poster: International Society for computational biology (ISCB), Chicago	July, 2018
Poster: Graduate Research Innovation Exchange (GRIE), WPI	2017, 2018
Poster: ASCB/EMBO, Philadelphia	December, 2017

Path Updating Tree based fast path planner for unpredictable changing environments

Oral talk: IEEE International Conference on Robotics and Biomimetics (*ROBIO*)   December, 2012

Awards, Honors and Notable Service

Reviewer in Scientific Reports	2019
Graduate Travel Award, WPI	2017, 2018
Reviewer in New England Statistics Symposium (NESS)	2018
Reviewer in International Conference on Robotics and Automation (ICRA), IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)	2013
Session Chair of Motion Planning I in ROBIO	2012
Judge in Shenzhen Youth Robot Competition	2010, 2011
Studying Excellence Award, Peking University	2010
National Endeavor scholarship / National Endeavor scholarship, China Ministry of Education	2006 - 2008
Outstanding Student Scholarship, Jilin University	2007, 2006

Professional Skills

Computation/Statistics: representation learning (CNN, Autoencoder, LSTM), unsupervised learning (density peaks), supervised learning (MLP, SVM, RF), time series data analysis, convex and global optimization.
Programming: Proficient in R, Python, MATLAB and C++. Competent in ImageJ.

Patents

An Intelligent Education Robot (CN201320117097.5) J. Sun, **C. Wang**, P. Jiang, etc. Chinese Academy of Sciences/Shenzhen Institute of Advanced Integration Technology	2013
A Robot Path Planning Framework inspired by Bionics in Dynamic Environments (CN201310233773.X) Peking University. H. Liu, **C. Wang**, etc.	2013

Teaching Experience

Mentee, MIT

Melody Yu (Undergraduate Student, Biological Engineering, MIT)	2020 – Present

Mentee, WPI

Xiang Pan and Yudong Yu (MS student, Biomedical Engineering, WPI)	2018 – 2019
Tessa Curtis (REU program, Biomedical Engineering, UNC)	2019
Xitong Zhang (MS student, Data Science, WPI)	2017 – 2018
Lucy Woodbury (REU program, Biomedical Engineering, University of Arkansas)	2018
Yenyu Chen (Undergraduate student, Biomedical Engineering, WPI)	2017

Teaching Assistant, WPI   2015 - 2016

  Biomedical Data Analysis, Biomedical Engineering Design, Introduction of Biomedical Engineering

Teaching Assistant, Peking University   2010 - 2012

  Image Processing, Robot Technologies