Yu-Chia **Chen**

Ph.D. candidate at the University of Washington

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Summary

Research Manifold learning, Geometric data analysis, Edge flow learning, Dynamic networks, Embedding.

Publications First author of 2 top-tier Machine Learning conference (NeurIPS, KDD) papers and 1 NeurIPS workshop poster.

Affiliations Institute for Pure and Applied Mathematics, Microsoft Corporation, University of Washington, National Taiwan University.

Programming Languages Python (Advanced), MATLAB (Advanced), JavaScript (Intermediate), C++ (Intermediate).

Languages English (Professional), Mandarin (Native), Taiwanese (Native).

Education

University of Washington — *Seattle, WA*

Ph.D. in Electrical Engineering — *Sep. 2016 - PRESENT*

- Advisor: Marina Meilă

National Taiwan University — *Taipei, Taiwan*

B.S. in Physics — *Sep. 2011 - Jun. 2015*

Publications

Referred Publications

[1] **Yu-Chia Chen** and Marina Meilă. Selecting the independent coordinates of manifolds with large aspect ratios. In *Advances in Neural Information Processing Systems 32*, pages 1086–1095, 2019

[2] Samson J. Koelle, Hanyu Zhang, Marina Meilă and **Yu-Chia Chen**. Manifold Coordinates with Physical Meaning. *Second Workshop on Machine Learning and the Physical Sciences (NeurIPS 2019)*, Vancouver, Canada, December, 2019

[3] **Yu-Chia Chen**, Avleen S. Bijral, and Juan Lavista Ferres. On Dynamic Network Models and Application to Causal Impact. In *Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, KDD '19, pages 1194–1204, New York, NY, USA, 2019. ACM

[4] **Yu-Chia Chen**, Dominique Perrault-Joncas, Marina Meilă, and James McQueen. Improved Graph Laplacian via Geometric Self-Consistency. *NIPS Workshop on NIPS Highlights (MLTrain), Learn How to code a paper with state of the art frameworks*, Long Beach, CA, December 2017

[5] Peifeng Jing, Kosuke Winston, **Yu-Chia Chen**, Benjamin S. Freedman, and Lih Y. Lin. Patterning and Colonizing Stem Cells with Optical Trapping. In *Optics in the Life Sciences Congress (2017), Paper OtM4E.2*, page OtM4E.2. Optical Society of America, April 2017

[6] **Yu-Chia Chen**, Cih-Su Wang, Tsung-Yuan Chang, Tai-Yuan Lin, Hsiu-Mei Lin, and Yang-Fang Chen. Ultraviolet and visible random lasers assisted by diatom frustules. *Optics Express*, 23(12):16224–16231, June 2015

[7] Cih-Su Wang, Chi-Shung Liau, Tzu-Ming Sun, **Yu-Chia Chen**, Tai-Yuan Lin, and Yang-Fang Chen. Biologically inspired band-edge laser action from semiconductor with dipole-forbidden band-gap transition. *Scientific Reports*, 5:8965, March 2015

Preprints/Under Review/Technical Reports

[8] **Yu-Chia Chen**, James McQueen, Samson J. Koelle, Marina Meilă, Stefan Chmiela and Alexandre Tkatchenko. Modern Manifold Learning Methods for MD data – a step by step procedural overview. `http://students.washington.edu/yuchaz/files/2020-md-manifold.pdf`

[9] Samson J. Koelle, Hanyu Zhang, Marina Meilă and **Yu-Chia Chen**. Manifold Coordinates with Physical Meaning. (Under review at JMLR)

Experience

Geometric Data Analysis Group (prof. Marina Meilă), University of Washington — *Seattle, WA*

Ph.D. Student Researcher — *Apr. 2017 - PRESENT*

- Selecting the independent coordinates of manifolds with large aspect ratios.
  - Efficient criterion based subset selection algorithm for finding independent coordinates that produce smooth embedding.
  - Paper [1] accepted to NeurIPS 2019 (acceptance rate 21.2%).
- Fast random projection based graph Laplacian construction algorithm for large scale manifold learning.
- Manifold learning for molecular dynamics (MD) simulation data [8].

Microsoft Research *Redmond, WA*

Research Intern *Jun. 2018 - Sep. 2018*

- Studied large scale dynamic network model based on stochastic block model (SBM) and the extension to causal impact on temporal graphs.
- Paper [3] accepted to KDD 2019 research track (acceptance rate 14.2%).

Psychological Warfare Group, Ministry of National Defense *Taipei, Taiwan*

Front-end Software Engineer (Compulsory Military Service) *Aug. 2015 - Jul. 2016*

- Lead engineer on cloud-based file exchanging platform, which enabled user to search, view and share streaming media.
- Technology used: JavaScript (*react.js*), HMTL/CSS.

Semiconductor Laboratory (prof. Yang-Fang Chen), National Taiwan University *Taipei, Taiwan*

Undergraduate Researcher *Feb. 2014 - Jun. 2015*

- Investigated bio-photonics devices with wide spectrum range [6].
- Studied Perovskite and CdTe core shell quantum dots assisted random laser in bio-inspired materials [7].

Other Experience & Course Projects

Institute for Pure & Applied Mathematics (IPAM), UCLA *Los Angeles, CA*

Visiting Researcher *Sep. 2019 - Dec. 2019*

- Participant of the *Machine Learning for Physics and the Physics of Learning* long program.
- White paper: `https://www.ipam.ucla.edu/news/white-paper-machine-learning-for-physics-and-the-physics-of-learning/`

Department of Electrical & Computer Engineering, University of Washington *Seattle, WA*

Teaching Assistant *Jan. 2017 - Dec. 2017*

- Courses: Digital Signal Processing (graduate level), Devices And Circuits, Discrete Time Linear Systems, Fundamentals of Electrical Engineering.

Selfie Sensei: Convolutional Neural Network based selfie instructor *Seattle, WA*

Course Project *Apr. 2017 - Jun 2017*

- Built and trained the Google Inception-v3 model on 40 thousand selfies collected from twitter with hashtag *#selfie*.

Large scale medical subject heading (MeSH) term indexing *Seattle, WA*

Course Project *Jan. 2017 - Mar. 2017*

- Built a CNN trained with *skipgram* word2vec embedding to annotate 27k MeSH terms on 12M academic articles.

Photonics Lab, University of Washington *Seattle, WA*

Graduate Research Assistant *Sep. 2016 - Dec. 2016*

- Investigated high accuracy mass sensing using Nanostructure-enhanced laser tweezers and its application to stem cell patterning [5].

ScoreMaster Team *Taipei, Taiwan*

Co-founder *Dec. 2013 - Aug. 2014*

- Developed online tutoring platform that matched high school students and undergraduate tutors.

Honors & Awards

2019	**Student Travel Award**, NeurIPS 2019	*Vancouver, Canada*
2019	**Student Travel Award**, KDD 2019	*Anchorage, AK*
2019	**Travel Grant**, UW Department of Electrical & Computer Engineering	*Seattle, WA*
2013	**Scholarship**, Taipower Academic Scholarship	*Taipei, Taiwan*
2012	**Scholarship**, Taipower Academic Scholarship	*Taipei, Taiwan*
2010	**Second prizes**, Physics Scholastic Ability Contest	*Kaohsiung, Taiwan*

Selected Talks

Feb. 2020	**Seminar Talk**, UW Geometric Data Analysis Group, *Hodge Laplacians on graphs*.	*Seattle, WA*
Dec. 2019	**Poster Presentation**, NeurIPS'19, *Selecting the Independent Coordinates of Manifolds with Large Aspect Ratios*.	*Vancouver, Canada*
Oct. 2019	**Seminar Talk**, IPAM, *Selecting the Independent Coordinates of Manifolds with Large Aspect Ratios*.	*Los Angeles, CA*
Aug. 2019	**Poster Presentation**, KDD'19, *On Dynamic Network Models and Application to Causal Impact*.	*Anchorage, AK*
Sep. 2018	**Seminar Talk**, Microsoft, *On Dynamic Network Models and Application to Causal Impact*.	*Redmond, WA*
Jan. 2018	**Seminar Talk**, UW Geometric Data Analysis Group, *Improved Graph Laplacian via geometric self-consistency*.	*Seattle, WA*

Coursework

University of Washington

CSE 525 Randomized Algorithm; **EE 546** Learning and Game Theory; **STAT 512** Statistical Inference; **STAT 548** Machine Learning for Big Data; **STAT 538** Statistical Learning; **CSE 599** Interplay between Convex Optimization and Geometry; **MATH 515** Fundamental of Optimization; **EE 576** Computer Vision; **EE 595** Data Science for Sequencing; **CSE 517** Natural Language Processing; **EE 518** Digital Signal Processing.

National Taiwan University (Selected)

PHYS 8049 Introduction to Quantum Computation & Information; **PHYS 4001** Optics; **PHYS 3002** Group Theory; **PHYS 3001** Complex Analysis.

References

Marina Meilă

Department of Statistics, University of Washington — *mmp@stat.washington.edu*

Avleen S. Bijral

Microsoft Corporation — *avbijral@microsoft.com*

Les Atlas

Department of Electrical & Computer Engineering, University of Washington — *atlas@u.washington.edu*

Yang-Fang Chen

Department of Physics, National Taiwan University — *yfchen@phys.ntu.edu.tw*