

NING ZHANG

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Education

MASc in ECE, University of British Columbia

GPA: 94.4/100

Sep 2019 – Current

Vancouver, Canada

Thesis: Attributed graph alignment: information-theoretic limits and efficient algorithms

BSc in Physics, Nankai University

GPA: 90.8/100 Ranking: 3/92 (3/15 in Poling class)

Sep 2015 – Jun 2019

Tianjin, China

Research Interest

graph theory, probability theory, algorithms, statistics, machine learning theory, optimization, spectral methods, operations research, statistical physics

Publications

- 1 Ziao Wang, **Ning Zhang**, Weina Wang, and Lele Wang. On the feasible region of efficient algorithms for attributed graph alignment. 2022 [[arXiv](#)]
- 2 **Zhang, Ning**, Weina Wang, and Lele Wang. Attributed graph alignment. In *2021 IEEE International Symposium on Information Theory (ISIT)*, pages 1829–1834, 2021 [[Conference paper](#)] [[Full version](#)]
- 3 Xin Zhou, Sina Maloufi, Daniel C. Louie, **Ning Zhang**, Qihao Liu, Tim K. Lee, and Shuo Tang. Investigating the depolarization property of skin tissue by degree of polarization uniformity contrast using polarization-sensitive optical coherence tomography. *Biomed. Opt. Express*, 12(8):5073–5088, Aug 2021
- 4 **Zhang, Ning**, Susan Francis, Rayaz A Malik, and Xin Chen. A spatially constrained deep convolutional neural network for nerve fiber segmentation in corneal confocal microscopic images using inaccurate annotations. In *2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI)*, pages 456–460. IEEE, 2020 [[Conference paper](#)] [[Code](#)]

Research Experience

Attributed graph alignment | Advisor: Lele Wang, ECE department, UBC

Sep 2020 – Current

Part 1. Study on information-theoretic limits

- Studied the exact alignment on graphs generated from our attributed Erdős–Rényi pair model as a statistical estimation problem and derived the corresponding Maximum a Posterior (MAP) estimator.
- Proved the regimes where exact alignment can be achieved by the MAP estimator with high probability using the method of generating function.
- Proved the regimes where no algorithm guarantees exact alignment by exploring the threshold phenomenon of indistinguishable vertex pairs.
- Extended our results to seeded graph alignment problem and aligning graphs generated from stochastic block model with known community label.

Part 2. Study on efficient algorithms

- Designed two polynomial-time algorithms for aligning attributed Erdős–Rényi graph pair.
- Separately proved the feasible regions where the two algorithms achieve exact alignment with high probability. One of the algorithms nearly achieved the information-theoretic limits proved in Part 1.

Biophotonics | Advisor: Shuo Tang, ECE department, UBC

Sep 2019 – Aug 2020

- Performed wavelength calibration in the spectral-domain optical coherence tomography system and explored image analysis and enhancement methods for moving objects, e.g., spackle variance, image registration...

Undergraduate research projects (funded by Poling program) **Jun 2016 – Jun 2019**

Image segmentation | *Advisor: Xin Chen, CS department, University of Nottingham* Oct 2018 – June 2019

- Proposed a dynamic kernel in a convolutional neural network model to impose a local smoothness constraint on the output prediction.
- Implemented the proposed idea on the TensorFlow framework and executed the experiments on both real dataset and the synthesized dataset created using image inpainting technique.

He-Ne laser stabilization[\[Poster\]](#) | *Advisor: Ben Sauer, Physics, Imperial College London* Jun 2017 – Sep 2017

- Implemented a feedback control circuit to automatically adjust the length of He–Ne laser cavity within one millimeter and stabilize its output frequency within a few megahertz.

Topological photonics [\[Poster\]](#) | Poling class research project Mar 2017 – Mar 2018

- Used the beam propagation method to simulate the Gaussian light propagation phenomenons in two different type of photonic lattices.

Awards

2021	IEEE North American School of Information Theory Best Poster Award (second prize, 2/50)
2020	Honorable Mention in Graph Attack and Defence Track of KDD Cup (Rank 14/106)
2019	Outstanding Graduate in Nankai University (top 3%)
2018	The First Prize Scholarship for Outstanding Student (top 5%)
2017	Gong Neng Award (top 10%)
2016	The Second Prize Scholarship for Outstanding Student (top 10%)
2015-2019	Poling Scholarship (National Top-talent Students Training Program)

Teaching

Fall 2021	Teaching assistant for STAT321 Stochastic Signals and Systems
Spring 2021	Teaching assistant for STAT321 Stochastic Signals and Systems
Fall 2020	Teaching assistant for STAT321 Stochastic Signals and Systems
Spring 2020	Lab assistant for ELEC291 Electrical Engineering Design Studio I

Talks and Activities

2021	IEEE International Symposium on Information Theory (ISIT) [Slides] IEEE North American School of Information Theory (NASIT) [Poster] UBC statistical learning theory reading group [Note1] [Note2] Existing graph alignment algorithm demos [Slides]
2020	IEEE International Symposium on Biomedical Imaging (ISBI) [Slides] UBC mathematical data science reading group [Note]

Relavent Skills

Language: TOEFL(iBT): Total 103 with reading 28, listening 27, speaking 24 and writing 24

Coding languages: MATLAB, Python, Mathematica, C++

Technologies/Frameworks: Linux, Github