

# Haotian Li

<https://haotian127.github.io/>

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## EDUCATION

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- **University of California, Davis** Davis, CA  
*Ph.D. Candidate in Applied Mathematics; GPA: 3.94/4; Advisor: Naoki Saito Sep. 2016 – Jun. 2021 (expected)*
- **Sichuan University** Sichuan, China  
*Bachelor of Science in Mathematics; Major GPA: 95/100; Advisor: Xiaoping Xie Sep. 2011 – Jun. 2015*
- **Hong Kong University of Science and Technology** Hong Kong  
*Exchange program; GPA: 4.3/4.3; Dean's list in HKUST Jan. 2014 – Jun. 2014*

## WORKING & RESEARCH EXPERIENCE

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- **University of California, Davis** Davis, CA  
*Graduate Student Researcher Jan. 2017 - Present*
  - Construct and compare different metrics of graph Laplacian eigenvectors to better understand the dual domain in terms of graph Fourier transform.
  - Develop natural graph wavelet packets **Julia** package based on different eigenvector metrics, which is a great analysis tool of (vertex-varying) graph signal processing.
- **Adobe Inc.** San Jose, CA  
*Research Intern Apr. 2019 - Sep. 2019*
  - Solve imaging problems with other researchers by mathematical methods: linear and multilinear algebra, computer vision, lightfield, computed tomography, applied computational harmonic analysis, e.t.c.
  - Analyze data of different modalities such as images, video, lightfields.
  - Work independently for algorithm development and prototyping, e.g., applying computed tomography on lightfields and using POCS algorithm for inpainting and foreground enhancement.
  - Submit two papers to arXiv.

## PROJECTS

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- **Metrics of Graph Laplacian Eigenvectors** Sep. 2017 - Present  
Design and study the metrics of graph Laplacian eigenvectors, which measure the behavioral difference between the eigenvectors and provides meaningful ordering of eigenvectors. This work leads to design a multiscale basis on graphs.
- **Natural Graph Wavelet Packets** Sep. 2018 - Present  
Based on the metrics of graph Laplacian eigenvectors develop natural graph wavelet packets by Julia, which has great potential applications in graph signal processing, e.g., efficiently approximating graph signals and solving differential equations on graphs.
- **Earth Mover Distance and Ramified Optimal Transport** Sep. 2017 - Aug. 2018  
Study earth mover distance (EMD) and ramified optimal transport method. Perform numerical simulations by Julia. Tell the difference between the optimal solutions of the two methods based on theories and numerical results.
- **Machine Learning Classification Problem** Jun. 2018  
Solve the Stail/C-CORE Iceber Classifier problem in Kaggle by various ML methods (in Python): SVM; Low rank approximation + SVM ; Adaboost; Stochastic gradient boosting; Random Forest; Decision Tree; Nearest neighbors classification; Neural network; Convolutional neural network (Keras, LeNet-5). CNN has the best 83% accuracy.

## PAPERS

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- “Lightfield coordinates adapted to Asgeirsson’s theorem” arXiv preprint arXiv:1909.07923 (2019).
- “Metrics of graph Laplacian eigenvectors”, in Wavelets and Sparsity XVIII Proc. SPIE 11138, 2019.
- “John transform and ultrahyperbolic equation for lightfields” arXiv preprint arXiv:1907.01186 (2019).
- “Natural graph wavelet packets” (in preparation)

## TECHNICAL STRENGTH

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- **Languages and Tools:** Python, Julia, Matlab, C++, R, SQL, Git,  $\text{\LaTeX}$ , TensorFlow
- **Others:** Machine Learning (Deep learning), Optimization, (Graph) Signal Processing, Data Science