

# TONGSEOK LIM

◇ <https://tlim0213.github.io> ◇ lim336 at purdue dot edu ◇ March 17, 2022

## EDUCATION & EMPLOYMENT

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- **Purdue University, West Lafayette, IN, USA.** Aug 2020 – present.  
Assistant Professor in Quantitative Methods, Krannert School of Management  
Homepage: <https://tlim0213.github.io>
- **Fields Institute, Toronto, Canada.** Mar – Jul 2019 & Mar – Jul 2020.  
Fields Research Fellow
- **ShanghaiTech University, Shanghai, China.** Sep 2018 – Jun 2020.  
Assistant Professor of Mathematics
- **University of Oxford, Oxford, UK.** Oct 2016 – Aug 2018.  
Postdoctoral Research Assistant
- **Technische Universität Wien, Vienna, Austria.** May – Sep 2016.  
Postdoctoral Research Assistant
- **University of British Columbia, Vancouver, Canada.** Sep 2011 – May 2016.  
PhD in Mathematics (BSc from Yonsei University, Seoul, Republic of Korea.)

## RESEARCH INTERESTS

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(i) (Martingale–) Optimal Transport in multi-dimensions and its applications to Economics, Finance and Statistics, (ii) Analysis of Variational problems arising in Physics, Geometry and Data Science, and (iii) Cooperative Game Theory in light of combinatorial Hodge Theory on graphs.

## PUBLICATIONS

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- **On the structure of optimal martingale transport in higher dimensions.** *PhD thesis*. [Link](#)
- with N. Ghoussoub and Y-H. Kim. **Structure of optimal martingale transport in general dimensions.** *Annals of Probability*, 2019. [Journal](#)
- with M. Beiglböck and J. Oblój. **Dual attainment for the martingale transport problem.** *Bernoulli*, 2019. [Journal](#)
- **Optimal martingale transport between radially symmetric marginals in general dimensions.** *Stochastic Processes and their Applications*, 2020. [Journal](#)
- with N. Ghoussoub and Y-H. Kim. **Optimal Brownian stopping when the source and target are radially symmetric distributions.** *SIAM Journal on Control and Optimization*, 2020. [Journal](#)
- with S. Eckstein, G. Guo and J. Oblój. **Robust pricing and hedging of options on multiple assets and its numerics.** *SIAM Journal on Financial Mathematics*, 2021. [Journal](#) [arXiv](#)
- with K. Kang, H. Kim and G. Seo. **Uniqueness and characterization of local minimizers for the interaction energy with mildly repulsive potentials.** *Calculus of Variations and Partial Differential Equations*, 2021. [Journal](#) [arXiv](#)
- with R.J. McCann. **Geometrical bounds for the variance and recentered moments.** *Mathematics of Operations Research*, 2021. [Journal](#) [arXiv](#)
- with R.J. McCann. **Isodiametry, variance, and regular simplices from particle interactions.** *Archive for Rational Mechanics and Analysis*, 2021. [Journal](#) [arXiv](#)

- with R.J. McCann. **On Fejes Tóth's conjectured maximizer for the sum of angles between lines.** *Applied Mathematics and Optimization*, 2021. [Journal](#) [arXiv](#)
- with R.J. McCann. **Maximizing expected powers of the angle between pairs of points in projective space.** *Probability Theory and Related Fields*, 2022. [Journal](#) [arXiv](#)
- with R.J. McCann. **On the cardinality of sets in  $\mathbb{R}^d$  obeying a slightly obtuse angle bound.** *SIAM Journal on Discrete Mathematics*, in press. 2022. [arXiv](#)
- **Geometry of multi-marginal martingale optimal transportations and duality.** [arXiv](#)
- with C. Davis and R.J. McCann. **Classifying minimum energy states for interacting particles — Spherical shells.** *SIAM Journal on Applied Mathematics*, minor revision requested. 2022. [arXiv](#)
- with C. Davis and R.J. McCann. **Classifying minimum energy states for interacting particles — Regular simplices.** [Github](#) [arXiv](#)
- **A Hodge theoretic extension of Shapley axioms.** [Github](#) [arXiv](#) [SSRN](#)
- **Hodge theoretic reward allocation for generalized cooperative games on graphs.** [Github](#) [arXiv](#) [SSRN](#)
- **Stochastic integral representation of solutions to Hodge theoretic Poisson's equations on graphs, and cooperative value allocation of Shapley and Nash.** [Github](#) [arXiv](#)  
(This article combines the preceding two articles.)

## INVITED TALKS & LECTURES

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- Mar 2022. *Stochastic Mass Transports*. Banff International Research Station. [Link](#)
- Dec 2021. *Analysis & PDE seminar I & II*. Yonsei University, Korea.
- Oct 2021. *Game theory seminar*. College of business, KAIST, Korea.
- Sep 2021. *Mathematics & Economics joint seminar*. Washington University in St. Louis, USA. [Link](#)
- Dec 2020. *Canadian Mathematical Society Winter Meeting*. online. [Link](#) [Video](#)
- Oct 2020. *Four lecture series*. online. [Link](#)
- Feb 2020. *Colloquium*. Krannert School of Management, Purdue University, USA.
- Oct 2019. *Korean Mathematical Society (KMS) Annual Meeting*. Hong-Ik University, Seoul, Korea.
- Oct 2019. *Analysis & PDE Seminar*. Georgia Institute of Technology, USA. [Link](#)
- Apr 2019. *Analysis & Applied Math Seminar*. University of Toronto, Canada.
- Mar 2019. *Colloquium Seminar*. Pusan National University, Korea.
- Aug 2018. *Mathematics Seminar*. Seoul National University, Korea.
- Jun 2018. *Mathematical Finance Internal Seminar*. University of Oxford, UK.
- May 2018. *CMO Workshop 18w5080: Stochastic Analysis and its Applications*. Mexico. [Link](#) [Video](#)
- May 2018. *Mathematics Seminar*. University of Bath, UK.
- Apr 2018. *Mathematics Seminar*. University of Central Florida, USA.
- Dec 2017. *Vienna Seminar in Mathematical Finance and Probability*. University of Vienna, Austria.
- Dec 2017. *Mathematics Seminar*. Dublin City University, Ireland.
- Sep 2017. *Martingale Optimal Transport (and Friends)*. University of Oxford, UK. [Link](#)
- Jul 2017. *Stochastic Processes and their Applications (SPA) 2017*. Moscow, Russia. [Link](#)
- May 2017. *Oxford-Princeton Workshop on Financial Mathematics & Stochastic Analysis*. UK. [Link](#)
- Jan 2017. *Mathematics Seminar*. Strasbourg University, France.

- Jan 2017. *Advances in Financial Mathematics*. Paris, France. [Link](#)
- Jan 2017. *Mathematics Seminar*. Ecole Polytechnique, Palaiseau, France.
- Jan 2017. *Paris Bachelier Seminar*. Paris, France. [Link](#)
- Nov 2016. *Mathematical Finance Internal Seminar*. University of Oxford, UK. [Link](#)
- Nov 2016. *Model Uncertainty & Robust Finance*. University of Milan, Italy.
- Jul 2016. *Mathematics Seminar*. Scuola Normale Superiore, Pisa, Italy.
- Jun 2016. *Mathematics Seminar*. Yonsei University, Seoul, Korea.
- Apr 2016. *Optimal Transportation, Equilibrium, and Applications to Economics*. NYU, USA. [Link](#)
- Mar 2016. *Skorokhod embeddings, Martingale Optimal Transport and their applications*. UK. [Link](#)
- Feb 2016. *Vienna Seminar in Mathematical Finance and Probability*. TU Wien, Austria. [Link](#)
- Sep 2015. *Mathematics Seminar*. Ecole Polytechnique, Palaiseau, France.
- Sep 2015. *European Summer School In Financial Mathematics*. Le Mans, France. [Link](#)
- Aug 2015. *KIAS CMC minischool on Analysis, Geometry, and Optimal Transport*. KIAS, Korea. [Link](#)

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## ACADEMIC SERVICE & CONFERENCE ORGANIZATION

- Organizer for *ShanghaiTech-Yonsei Mathematics Conference*, 15-16 Nov 2019. [Link](#)

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## RESEARCH STUDENTS AND ALUMNI

### PhD supervision

- Marcelo Cruz de Souza (ongoing since Apr 2021)

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## TEACHING EXPERIENCE

### Krannert School of Management, Purdue University

*Assistant Professor in Quantitative Methods*

2020 – present  
West Lafayette, IN, USA

- MGMT 47400-001,002 : Predictive Analytics. Spring 2021.
- MGMT 47400-001,002 : Predictive Analytics. Fall 2021.
- MGMT 47400-001 : Predictive Analytics. Spring 2022.
- MGMT 69000 : Advanced Problems in Management – Optimal Transport Problems. Spring 2022.

### ShanghaiTech University

*Assistant Professor of Mathematics*

2018 – 2020  
Shanghai, China

- Stochastic Processes (for 3rd & 4th grades). 2019.
- Linear Algebra (for 2nd grades). 2018.

### University of Oxford

*Class Tutor*

2018  
Oxford, UK

- Class Tutor for B8.3 Mathematical Models of Financial Derivatives. 2018.

### University of British Columbia

*Teaching Assistant and Instructor*

2011 – 2016  
Vancouver, BC, Canada

- Instructor for MATH 101 (Integral Calculus with Applications to Physics and Engineering). 2016.
- Instructor for Workshops (Direct student groups towards solving math problems). 2015.
- TA for MATH 121 (Honours Integral Calculus). 2015.

- TA for MATH 441 (Mathematical Modeling: Discrete Optimization Problems). 2014.
- TA for MATH 424 (Classical Differential Geometry). 2012 – 2013.

## HONOURS & AWARDS

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- Fields Research Fellowship. Jul – Dec 2020. University of Toronto, Canada. [Link](#)
- Fields Research Fellowship. June 2019. University of Toronto, Canada. [Link](#)
- Four Year Doctoral Fellowship (4YF) recipient. 2011 – 2015. University of British Columbia, Canada.
- Kwanjeong Scholarship recipient. 2011 – 2016. Kwanjeong Educational Foundation, Seoul, Korea. [Link](#)
- Seoul Scholarship recipient. 2008 – 2010. Seoul Metropolitan Government, Korea.

## OTHERS

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### **Military service**

- Sergeant. Republic of Korea army. Nov 2000 – Jan 2003.

### **For the underprivileged**

- Supporting four unprivileged children in Tanzania, Nicaragua, Philippines and Mexico for their living and education through CompassionUK.org. 2006 – present.
- Weekly voluntary mathematics teaching for unprivileged children under the guidance of pastor Pyun. 2006 – 2011. Geoyeo-Dong, Seoul, Korea.

### **Hobbies**

- Basketball, Baseball, Snowboarding, Weight training, Playing Piano, Listening Music.