

# Curriculum Vitae

Tobias John Kenney

## Address:

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**Date of Birth:** 17th September 1979

**Citizenship:** Dual UK & Canadian citizen.

## Education:

- 1998–2001 B.A. (1st Class in all 3 years (parts IA, IB, and IIB of the Mathematical Tripos)), University of Cambridge
- 2001–2002 Certificate of Advanced Study in Mathematics (with Distinction), University of Cambridge
- 2002–2006 Ph.D. (Pure Mathematics and Mathematical Statistics), University of Cambridge  
*Thesis title:* Topics in Topos Theory  
*Supervisor:* Prof. P. T. Johnstone

## Actuarial Qualification

I have passed all five preliminary examinations for the Society of Actuaries.

## Employment History:

- 2006–2008 AARMS Postdoctoral Fellow, Dalhousie University  
*supervisors:* Prof. R. J. Wood and Prof. R. Paré
- 2008–2009 Postdoctoral Researcher, Matej Bel University
- 2010–2011 Postdoctoral Fellow, Dalhousie University  
*supervisor:* Prof. D. Pronk
- 2011–2016 Limited Term Assistant Professor, Dalhousie University
- 2016–Present Assistant Professor, Dalhousie University

## Students Supervised:

Honours Theses:

- Fuxi Wu (01/2019–04/2019) *The dependence of Pareto distribution and optimal reinsurance under TVaR risk measures*

- Cuiting Zhong (09/2018–12/2018) *Optimal Reinsurance Strategies*
- Yi Luo (09/2017–04/2018) *Risk Aggregation in Multivariate Dependent Pareto Distribution*
- Dimitri Duncombe (01/2016–05/2016) *The Hedging Effectiveness of the Swiss-Re Kotis Bond.*
- Weisi Si. (05/2015–12/2015) *Hierarchical Credibility Premium Estimation: One Class is A Non-negligible Proportion of the Whole Population*
- Yiqun Liu. (05/2015–12/2015) *Value-at-Risk and Tail-Value-at-Risk Estimation under Importance Sampling Distribution*
- Jorge Goldschmied-Chale. (09/2014–12/2014) *Topoi and Logic*

Master's Students:

- Wanru Jia (09/2018–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics). Topic: *Changepoint Detection in Microbiome Data.*
- Junqiu Gao, (09/2017–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics). Topic: *Temporal Dynamics of Microbiome Data.*
- Mingzhu Wang, (09/2016–04/2018). *The Influence of Utility Functions on Insurance Choices*
- Tianshu Huang, (09/2015–08/2017). Co-supervised with Hong Gu (Department of Mathematics & Statistics). *Semi-Parametric Principal Component Analysis for Poisson Count Data with Application to Microbiome Data Analysis.*
- Hao He, (09/2014–04/2016). Co-supervised with Hong Gu (Department of Mathematics & Statistics). *Robust Ranking and Selection with Heavy-tailed Priors and its Application to Market Basket Analysis*
- Yun Cai, (09/2013–08/2014). Co-supervised with Hong Gu (Department of Mathematics & Statistics). *Non-negative matrix factorisation for classification of metagenomic data.*
- Wei Dai, (09/2011–08/2013). Co-supervised with Hong Gu (Department of Mathematics & Statistics). *A new Test to Build Confidence Regions using Balanced Minimum Evolution.*
- Li Li, (09/2011–12/2015). Co-supervised with Hong Gu (Department of Mathematics & Statistics). *Recombination Detection Based on Likelihood and Clustering for DNA and Amino Acid Sequences.*

Ph.D. Students:

- Xinyue Zhang, (01/2019–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics).

- Shen Ling, (09/2014–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics) and Chris Field (Department of Mathematics & Statistics). Topic: *Machine Learning Automated Diagnosis from Emergency Room Data*.
- Yun Cai, (09/2014–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics). Topic: *Non-negative matrix factorisation for classification of metagenomic data*.
- Lihui Liu, (01/2014–Present). Co-supervised with Hong Gu (Department of Mathematics & Statistics). Topic: *Variable selection methods with application to microbiome data*.

### Publications:

- W. Chen, T. Kenney, J. Bielawski, H. Gu. Testing Adequacy for DNA Substitution Models. *BMC Bioinformatics*, 20(2019) 349 (16 pages) \* — co-first authors.
- K. A. Dunn\*, T. Kenney\*, H. Gu and J. P. Bielawski. Improved inference of site-specific selection pressures under a generalized parametric model of codon evolution. *BMC Evolutionary Biology* 19(2019) 19:22 (19 pages). \* — co-first authors.
- Y. Cai, T. Kenney, H. Gu. Learning Microbial Community Structures with Supervised and Unsupervised Non-negative Matrix Factorization. *Microbiome* 5 (2017), doi 10.1186/s40168-017-0323-1 (27 pages).
- T. Kenney, Partial-Sup Lattices. *Theory and Applications of Categories* 30 (2015), 305–331.
- M. Abeysondera, T. Kenney, C. Field and H. Gu, Combining Distance Matrices on Identical Taxon Sets for Multi-Gene Analysis with Singular Value Decomposition. *PLoS ONE* 9 (2014), e94279. doi:10.1371/journal.pone.0094279 (14 pages)
- T. Kenney. Coxeter Groups, Coxeter Monoids and the Bruhat Order. *Journal of Algebraic Combinatorics* 39 (2014), 719–731
- T. Kenney, H. Gu. Hessian Calculation for Phylogenetic Likelihood based on the Pruning Algorithm and its Applications *Statistical Applications in Genetics and Molecular Biology*, 11 (2012), issue 4, article 14 (44 pages)
- T. Kenney and R. Paré. Categories as Monoids in Span, Rel and Sup, *Cahiers de Topologie et Géométrie Différentielle Catégoriques*, 52 (2011), 209–240
- T. Kenney. The Path Relation for Directed Planar Graphs, and its Relation to the Free Diad. *Discrete Mathematics* 311 (2011), 441–456
- T. Kenney. Injective Power Objects and the Axiom of Choice *Journal of Pure and Applied Algebra* 215 (2011), 131–144
- T. Kenney. Graphical algebras — a new approach to congruence lattices *Algebra Universalis* 64 (2010), 313–338

- H. Gu, T. Kenney and M. Zhu. Partial Generalized Additive Models: an Information-Theoretic Approach to Selecting Variables and Dealing with Concurvity. *Journal of Computational and Graphical Statistics* 19 (2010), 531–551
- T. Kenney. The General Theory of Diads *Appl. Cat. Struct.* 18 (2010), 523–572
- T. Kenney and R. J. Wood. Tensor Products of Sup Lattices and generalized sup-arrows. *Theory and Applications of Categories* 24 (2010), 266–287
- T. Kenney. Diads and Their Application to Topoi, *Appl. Cat. Struct.* 17 (2009), 567–590
- T. Kenney. Copower Objects and their applications to Finiteness in Topoi, *Theory and Applications of Categories* 16 (2006), 923–956
- T. Kenney. Generating Families in a Topos, *Theory and Applications of Categories* 16 (2006), 896–922

#### **Papers submitted or under revision**

- T. Kenney, H. He, H. Gu. Prior Distributions for Ranking Problems (Under Revision, 42 pages)
- L. Liu, T. Kenney, J. Van Limbergen, H. Gu. SuRF: a New Method for Sparse Variable Selection, with Application in Microbiome Data Analysis (Submitted in revised form, *Biometrics* 26 pages)
- T. Kenney, H. Gu, T. Huang. Correcting Poisson Measurement Error in PCA, with Application to Microbiome Data. (Submitted to *Journal of Computational and Graphical Statistics*, 40 pages)

#### **Papers in preparation**

- S. Ling, T. Kenney, C. Field, H. Gu. Model Combination for Block Missing Data.
- M. Wang, T. Kenney. The Influence of Utility Functions on Life Insurance Choices.
- T. Kenney. Consistency of Ranking Estimators.
- T. Kenney. Abstract Convexity Spaces and Completely Distributive Lattices.
- L. Xu, T. Kenney, H. Gu, D. Kong, X. Xu. Stochastic Generalised Lotka-Volterra Equations with Applications to Microbiome Data.

#### *Ongoing projects:*

- Y. Cai, H. Gu, T. Kenney. The Smoothing Spline Approach to Deconvolution.
- J. Gao, H. Gu, T. Kenney. Evidence of Mean-Reversion in Microbial Systems, and a Study of Necessary Sampling Frequencies.

**Teaching Experience:**

- 2000–2010 UKMT Mentoring Scheme: This involved receiving solutions (by post) to problems on monthly problem sheets from some of the brightest schoolchildren (usually ages 15–18) in UK, and returning them with comments. (Senior Mentoring Scheme: 2000–2004, Advanced Mentoring Scheme: 2004–2010)
- 2002–2006 Supervision of students for the University of Cambridge Mathematical Tripos
- 2006–2008 Lecturing courses at Dalhousie University — *Advanced Calculus* in the Fall Term 2006, *Discrete Structures I* in the Winter Term 2007, *Problems in Geometry* in the Fall Term 2007, and *Discrete Structures II* in the Winter Term 2008.
- 2010–present Lecturing courses at Dalhousie University — *Theory of Interest* in the Fall Term 2010, *Mathematics for Commerce* in the Winter Term, 2011. *Probability* in the Fall term 2011, 2012, 2013 and 2014, *Mathematics for Liberal Arts* in the Winter Term 2012, *Abstract Algebra (full-year course)* in the Fall and Winter terms 2012–2013, *Theory of Interest* in the Fall Term 2013 and 2014, *Intermediate Statistical Theory* in the Winter Term 2014, *Actuarial Models I* in the Winter term 2015, *Life Contingencies I* in the Winter term 2015 and 2016, *Actuarial Models II* in the Fall term 2015 and 2016, and *Life Contingencies II* in the Fall term 2015 and 2016.

**Prizes & Awards:**

- 2014–2019 NSERC Discovery Grant RGPIN-2014-04945, annual amount \$15,000
- 1998 Bronze medal at International Mathematical Olympiad

**Invited Lectures and Conference Presentations:**

- *Asymptotic and Finite-sample Comparison of Ranking Methods* — International Workshop on Perspectives on High-Dimensional Data Analysis IX, Uppsala, Sweden, 24/06/2019
- *Using Stochastic Differential Equations to Model Microbial Dynamics* — Workshop on Statistical Analysis and Machine Learning with Application in Medicine, Biology, Environmental Sciences, Halifax, Canada, 10/05/2019
- *The Adequate Bootstrap* — EcoSta2017, Hong Kong, 17/06/2017
- *Variable Selection in OTU Data* — Invited talk, Biostatistics Symposium 2017, Guelph, Canada, 17/05/2017
- *The Adequate Bootstrap — A new Method for Measuring Model Uncertainty* — International Conference on Robust Statistics 2016, Geneva, Switzerland, 07/07/2016
- *Credibility Classification with Missing Data* — International Federation of Classification Societies 2015, Bologna, Italy, 06/07/2015
- *Credibility Classification with Missing Data* — Statistics Society of Canada annual meeting 2015, Halifax, NS, Canada, 15/06/2015

- *Partial Sup-Lattices* (Poster) — CT2014 international category theory conference, Cambridge, UK, 02/07/2014
- *Graphical Composition* — Third International Symposium on Groups, Algebras and related topics, Beijing, China 12/06/2013
- *The Span Construction on Bicategories* — CT2011 international category theory conference, Vancouver, Canada 21/07/2011
- *Hessian Calculation for Phylogenetic Likelihood and its Application to Influence Analysis* — Invited Lecture, Liverpool University, UK, 2011
- *Influence Analysis in Phylogeny* — ICORS11 International Conference On Robust Statistics, Valladolid, Spain, 2011
- *A generalized codon-based Model of Nucleotide Substitution for Protein-coding DNA Sequences* — Statistics Society of Canada annual meeting 2011, Wolfville, NS, Canada.
- *COLD — Software for Likelihood-Based Phylogenetic Analysis* — CIHR Microbiomics Grant Workshop, Dalhousie University, Canada, 2011.
- *A generalized codon-based Model of Nucleotide Substitution for Protein-coding DNA Sequences* — Centre for Comparative Genomics and Evolutionary Bioinformatics, Dalhousie University, January 2011  
Also presented in a Statistics Colloquium, Dalhousie University, April 2011
- *Generalised Sup Arrows and the Totally Below Relation* — Categories OctoberFest, International Category Theory Conference, Halifax, Canada, 2010
- *Span, Span, SpanSpan, SpanSpan* — CT2010 International Category Theory Conference, Genoa, Italy, 2010
- *Graphical Algebras — a New Approach to Congruence Lattices* — SSOAS2009 Summer School on General Algebra and Ordered Sets, Stará Lesná, Slovakia 2009
- *Equivalence in terms of paths between inputs and outputs of a family of planar graphs* — GEMS2009 International Conference on Graph Embeddings and Maps on Surfaces, Talé, Slovakia 2009
- *The Free Diad* — PSSL88 Peripatetic Seminar on Sheaves and Logic, Conference in honour of the 60th birthdays of Martin Hyland and Peter Johnstone, Cambridge, UK 2009
- *Diads and their Application to Topoi* — CT2008 International Category Theory Conference, Calais, France, 2008  
(Slides at <http://saxo.univ-littoral.fr/CT08/slides/Kenney.pdf>)
- *Diads* — FMCS 2008 Formal Methods in Computer Science, Dalhousie University, Halifax, NS, Canada, 2008
- *The Connection Between Equivalence Relations and Subgroups* — CT07 International Category Theory Conference, Carvoeiro, Portugal, 2007  
(Slides at <http://www.mat.uc.pt/~categ/ct2007/slides/kenney.pdf>)

- *Injective Power Objects & the Axiom of Choice* — CT06 International Category Theory Conference, White Point, NS, Canada 2006
- *Copower Objects* — Summer School on Topos Theory, Haute Bodeux, Belgium, 2005

**Language Skills:**

French A-level