

# Adrian Röllin

## Curriculum Vitae

### Education

- 11/2002–11/2006 **Ph.D. in Mathematics**, *University of Zürich, Switzerland*, under supervision of A. D. Barbour.
- 10/1996–10/2002 **M.Sc. in Mathematics**, *University of Zürich, Switzerland*, minor subjects: computer science, actuarial science.

### Positions

- since 07/2021 Professor, Department of Statistics and Data Science, NUS
- 01/2015–06/2021 Associate Professor, Department of Statistics and Applied Probability, NUS
- 07/2009–12/2014 Assistant Professor, Department of Statistics and Applied Probability, NUS
- 09/2008–06/2009 Postdoc, Department of Mathematics, NUS
- 05/2008–07/2008 Postdoc, Institute of Social and Preventive Medicine, University of Bern
- 04/2007–03/2008 Postdoc, Department of Statistics, University of Oxford

### Honorary appointments

- since 07/2018 Honorary appointment, Saw Swee Hock School of Public Health, NUS
- since 07/2016 Honorary appointment, Department of Mathematics, NUS

### Awards and recognitions

- 2019 IMS Fellow (Institute of Mathematical Statistics)
- 2019 ISI Elected Member (International Statistical Institute)
- 2019 Dean's Chair, Faculty of Science, NUS
- 2010 Young Scientist Award, Faculty of Science NUS
- 2007 PhD thesis awarded for scientific excellence from the Faculty of Science, University of Zürich

### Editorial Work

- since 01/2021 Associate Editor for Bernoulli Journal
- since 10/2020 Associate Editor for Applied Probability Trust (*Advances in Applied Probability* and *Journal of Applied Probability*)
- 2013–2021 Associate Editor of *Probability in the Engineering and Informational Sciences*

### Service appointments

- since 2021 Head of Department of Statistics and Data Science, NUS
- 2018–2021 Deputy Director, Institute for Mathematical Sciences, NUS
- 2018–2021 Deputy Head, Department of Statistics and Applied Probability, NUS
- 2018–2021 Faculty Promotion and Tenure Committee, Faculty of Science, NUS

### Professional committee work

- since 2020 Ethel Newbold Prize Committee, Bernoulli Society
- since 2020 Management Committee, Singapore Mathematical Society

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## Memberships in Professional Organisations

- American Mathematical Society
- Bernoulli Society
- Institute of Mathematical Statistics
- International Statistical Institute
- Singapore Mathematical Society

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## Research Interests

- Distributional approximations in probability and statistics via Stein's method
- Random graphs and other random combinatorial objects
- Epidemiological modelling
- Applied statistical modelling and analysis in life sciences
- Statistical applications of deep neural networks

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## Research Group

### *Postdocs*

- since 2022 Yuanfei Huang, under MOE Tier 2 research grant
- 2022–2023 Tianshu Cong, under MOE Tier 2 research grant
- 2020–2022 Van Hao Can, under MOE Tier 2 research grant
- 2019–2021 Zhuosong Zhang, under MOE Tier 2 research grant
- 2018–2021 Gursharn Kaur, under Faculty of Science RSB program
- 2019–2020 Arturo Jaramillo Gil, joint with *University of Luxembourg*, under Luxembourg NRF
- 2019–2020 Xiaochuan Yang, joint with *University of Luxembourg*, under Luxembourg NRF

### *Ph.D. students*

- since 2021 Ryo Imao, *Stein's method for multivariate translated Poisson approximation*
- since 2018 Shang Li, *Stein's method for total variation approximation with applications to analysis of computer algorithms.*
- 2016–2020 Wai Hoh Tang, *Deep learning in fluorescence spectroscopy.*
- 2010–2014 Daniel Paulin (co-supervised with Louis H. Y. Chen), *Stein's method for concentration of measure.*

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## Invited Talks and Invited Conference Sessions

### *Upcoming events*

- 03/2023 Invited speaker, *UK Easter Probability Meeting*, Manchester, United Kingdom
- 09/2022 Invited speaker, *Graph Limits, Non-Parametric Models, and Estimation*, Simons Institute, UC Berkeley

### *Past events*

- 04/2022 Invited speaker, *Advances in Stein's Method and its Applications in Machine Learning and Optimization*, BIRS Workshop, Banff, Canada
- 03/2022 Invited speaker (hybrid), *Workshop: Population Dynamics and Statistical Physics in Synergy*, Oberwolfach, Germany
- 10/2020 Invited speaker (online talk), *Stochastics Seminar*, Georgia Tech, USA
- 07/2020 Invited speaker (online talk), *Probability Victoria Seminar*, Australia
- 2020 Invited participant, *Discussion Meeting on Stochastic Analysis, Geometry, and Random Fields* at ISI Bangalore, India
- 2019 Invited to conduct 4-day mini-lecture series as part of graduate course *Introduction to Causal Inference and Stein's method*, Universities of Mannheim and Heidelberg, Germany
- 2019 Invited-session organiser, *ISI World Statistics Congress*, Kuala Lumpur, Malaysia
- 2019 Invited speaker, *Mathematical Colloquium*, Institute for Mathematics, University of Os-nabrück, Germany

- 2018 Invited speaker, *Workshop on High-Dimensional Phenomena in Probability*, Bochum, Germany
- 2018 Invited speaker, *Workshop in Honour of Carl-Gustav Esseen's 100th Birthday*, Uppsala, Sweden
- 2018 Invited participant, *AIM Workshop on Stein's Method and Applications in High-Dimensional Statistics*, San Jose, United States
- 2018 Invited-session speaker, *IMS Asia Pacific Rim Meeting*, Singapore
- 2018 Invited-session speaker, *9th International Workshop on Applied Probability*, Budapest, Hungary
- 2018 Invited speaker, *International Conference in Statistics and Probability in Memory of 125 P. C. Mahalanobis*, Kolkata, India
- 2017 Invited speaker at *Melbourne-Singapore Probability and Statistics Forum*, Melbourne, Australia
- 2017 Invited speaker, *Probability Meeting at ISI Bangalore*, Bangalore, India
- 2016 Invited-session organiser and invited-session speaker, *IMS Asia Pacific Rim Meeting*, Hong Kong
- 2016 Invited speaker, *Asian Mathematical Conference*, Bali, Indonesia
- 2015 Invited-session speaker, *Stochastic Processes and Applications*, Oxford, United Kingdom
- 2014 Invited-session speaker, *IMS Annual Meeting*, Sydney, Australia
- 2014 Invited speaker, *International Colloquium on Stein's Method, Concentration Inequalities, and Malliavin Calculus*, Nantes, France
- 2013 Invited speaker for lecture series at the University of Melbourne, Melbourne, Australia
- 2013 Invited speaker, *Workshop on New Directions in Probability*, ISI Bangalore, India
- 2013 Invited-session speaker, *IMS-China International Conference on Statistics and Probability*, Chengdu, China
- 2013 Invited-session speaker, *Statistics, Science, and Society: New Challenges and Opportunities*, international conference organised by the International Indian Statistical Association, Chennai, India
- 2012 Invited speaker of contributed session, *8th World Congress in Probability and Statistics*, Istanbul, Turkey
- 2012 Invited-session speaker, *International Workshop in Applied Probability*, Jerusalem, Israel

## Conference Organiser

### *Chair or co-chair of organising committee*

- 2022 *Stein's Method — The Golden Anniversary* (4-week program, 60 participants), Institute for Mathematical Sciences, NUS
- 2022 *A Tale of Rare Events — Symposium in Honour of Louis Chen on His 80th Birthday* (4 days, 30 participants), NUS
- 2022 *SASI — Singapore–Abu Dhabi–Shanghai–India Probability Meeting*, NYU Abu Dhabi Institute, Abu Dhabi
- 2019 *SASI — Singapore–Abu Dhabi–Shanghai–India Probability Meeting* (3 days, over 30 participants), Institute for Mathematical Sciences and Department of Mathematics, NUS
- 2016 *Second Melbourne–Singapore Probability and Statistics Forum* (1 day, 15 participants), Institute for Mathematical Sciences, NUS
- 2015 *Workshop on New Directions in Stein's Method* (2 weeks, around 70 participants), Institute for Mathematical Sciences, NUS

### *Member of organising committee*

- 2021 *SASI — Singapore–Abu Dhabi–Shanghai–India Probability Meeting*, NYU Abu Dhabi
- 2019 *Symposium in Memory of Charles Stein [1920 - 2016]* (2 weeks, around 70 participants), Institute for Mathematical Sciences, NUS

2010 *Workshop on Epidemiology of Infectious Diseases: Emerging Challenges* (1 week), Institute for Mathematical Sciences, NUS

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## Selected Publications

### Preprints

- [44] L. H. Y. Chen and A. Röllin. Stein couplings for normal approximation. arXiv:1003.6039.

### Accepted

- [43] A. Röllin and Z.-S. Zhang. Dense multigraphon-valued stochastic processes and edge-changing dynamics in the configuration model. To appear in *Ann. Appl. Probab.*, arXiv:2104.13024.

### Published

- [42] A. Röllin (2022). Kolmogorov bounds for the normal approximation of the number of triangles in the Erdős-Rényi random graph. *Probab. Engrg. Inform. Sci.*, **36**, 747–773.
- [41] J. Fulman and A. Röllin (2022). Stein's method, heat kernel, and linear functions on the orthogonal groups. *J. Algebra* **607**, 272–285.
- [40] L. H. Y. Chen, A. Röllin, A. Xia (2021). Palm theory, random measures and Stein couplings. *Ann. Appl. Probab.* **31**, 2881–2923.
- [39] G. Kaur and A. Röllin (2021). Higher-order fluctuations in dense random graph models. *Electronic J. Probab.* **26**, article no. 139, 1–36.
- [38] X. Fang, H. L. Gan, S. Holmes, H. Huang, E. A. Peköz, A. Röllin, and W. Tang (2021). Arcsine laws for random walks generated from random permutations with applications to genomics. *J. Appl. Probab.* **58**, 851–867.
- [37] S. Athreya, F. den Hollander and A. Röllin. Graphon-valued stochastic processes from population genetics (2021). *Ann. Appl. Probab.* **31**, 1724–1745.
- [36] W. H. Tang and A. Röllin (2021). Model identification for ARMA time series through convolutional neural networks. *Decis. Support Syst.* **146**, 113544.
- [35] J. Sankaran, H. Balasubramanian, W. H. Tang, X. W. Ng, A. Röllin, and T. Wohland (2021). Simultaneous spatiotemporal super-resolution and multi-parametric fluorescence microscopy. *Nature Communications* **12**, no. 1748.
- [34] L. H. Y. Chen, L. Goldstein and A. Röllin. Stein's method via induction (2020). *Electronic J. Probab.* **25**, article no. 132, 49 pp.
- [33] J. Fulman and A. Röllin (2020). Stein's method and Narayana numbers. *Statist. Probab. Lett.* **165**, article no. 108835, 1–9.
- [32] E. A. Peköz, N. Ross and A. Röllin (2020). Exponential and Laplace approximation for occupation statistics of branching random walk. *Electronic J. Probab.* **25**, article no. 55, 1–22.
- [31] A. K. J. Teo, K. Prem, M. I. C. Chen, A. Röllin, M. L. Wong, H. H. La and A. R. Cook (2019). Estimating the size of key populations for HIV in Singapore using the network scale-up method. *Sex. Transm. Infect.* **95**, 602–607.
- [30] A. D. Barbour, A. Röllin, and N. Ross (2019). Error bounds in local limit theorems using Stein's method. *Bernoulli* **25**, 1076–1104.
- [29] A. D. Barbour and A. Röllin (2019). Central limit theorems in the configuration model. *Ann. Appl. Probab.* **29**, 1046–1069.
- [28] E. A. Peköz, A. Röllin and N. Ross (2019). Pólya urns with immigration at random times. *Bernoulli* **25**, 189–220.
- [27] A. D. Barbour and A. Röllin (2018). A central limit theorem for the gossip process. *Electron. J. Probab.* **23**, article no. 123, 1–37.
- [26] A. Röllin (2018). On quantitative bounds in the mean martingale central limit theorem. *Statist. Probab. Lett.* **138**, 171–176

- [25] S. Athreya and A. Röllin (2018). Respondent driven sampling and sparse graph convergence. *Electron. Comm. Probab.* **23**, article no. 3,1–12.
- [24] H. L. Gan, A. Röllin, N. Ross. Dirichlet approximation of equilibrium distributions in Cannings models with mutation. *Adv. Appl. Probab.* **49**, 927–959.
- [23] E. A. Peköz, A. Röllin and N. Ross (2017). Joint degree distributions of preferential attachment random graphs. *Adv. Appl. Probab.* **49**, 368–387.
- [22] S. Athreya and A. Röllin (2016). Dense graph limits under respondent-driven sampling. *Ann. Appl. Probab.* **26**, 2193–2210.
- [21] E. A. Peköz, A. Röllin and N. Ross (2016). Generalized gamma approximation with rates for urns, walks and trees. *Ann. Probab.* **44**, 1776–1816.
- [20] X. Fang and A. Röllin (2015). Rates of convergence for multivariate normal approximation with applications to dense graphs and doubly indexed permutation statistics. *Bernoulli* **21**, 2157–2189.
- [19] A. Röllin and N. Ross (2015). Local limit theorems via Landau-Kolmogorov inequalities. *Bernoulli* **21**, 851–880.
- [18] L. H. Y. Chen and A. Röllin (2013). Approximating dependent rare events. *Bernoulli* **19**, 1243–1267.
- [17] E. A. Peköz, A. Röllin, and N. Ross (2013). Total variation error bounds for geometric approximation. *Bernoulli* **19**, 610–632.
- [16] A. Röllin (2013). Stein's method in high dimensions with applications. *Ann. Inst. Henri Poincaré Probab. Stat.* **49**, 529–549.
- [15] E. A. Peköz, A. Röllin and N. Ross (2013). Degree asymptotics with rates for preferential attachment random graphs. *Ann. Appl. Probab.* **23**, 1188–1218.
- [14] A. Röllin (2012). On magic factors and the construction of examples with sharp rates in Stein's method. *Probability Approximations and Beyond, Lecture Notes in Statistics 205*, Springer.
- [13] C. L. Althaus, J. C. M. Heijne, S. A. Herzog, A. Röllin and N. Low (2012). Individual and population level effects of partner notification for *Chlamydia trachomatis*. *PLoS ONE* **7**.
- [12] E. A. Peköz and A. Röllin (2011). Exponential approximation for the nearly critical Galton-Watson process and occupation times of Markov chains. *Electron. J. Probab.* **16**, 1381–1393.
- [11] S. Chatterjee, J. Fulman and A. Röllin (2011). Exponential approximation by Stein's method and spectral graph theory. *ALEA Lat. Am. J. Probab. Math. Stat.* **8**, 197–223.
- [10] E. A. Peköz, A. Röllin (2011). New rates for exponential approximation and the theorems of Rényi and Yaglom. *Ann. Probab.* **39**, 587–608.
- [9] C. L. Althaus, J. C. M. Heijne, A. Röllin and N. Low (2010). Transmission dynamics of *Chlamydia trachomatis* affect the impact of screening programmes. *Epidemics* **2**, 123–131.
- [8] G. Reinert and A. Röllin (2010). Random subgraph counts and U-statistics: multivariate normal approximation via exchangeable pairs and embedding. *J. Appl. Probab.* **47**, 378–393.
- [7] S. Tueckmantel, A. Röllin, A. E. Müller and C. Soligo (2009). Facial correlates of frontal bone pneumatization in strepsirrhine primates. *Mammalian Biology* **74**, 25–35.
- [6] E. A. Peköz, A. Röllin, V. Čekanavičius and M. Shwartz (2009). A three-parameter binomial approximation. *J. Appl. Probab.* **46**, 1073–1085.
- [5] G. Reinert and A. Röllin (2009). Multivariate normal approximation with Stein's method of exchangeable pairs under a general linearity condition. *Ann. Probab.* **37**, 2150–2173.
- [4] A. Röllin (2008). A note on the exchangeability condition in Stein's method. *Statist. Probab. Lett.* **78**, 1800–1806.
- [3] A. Röllin (2008). Symmetric and centered binomial approximation of sums of locally dependent random variables. *Electron. J. Probab.* **13**, 756–776.
- [2] A. Röllin (2007). Translated Poisson approximation using exchangeable pair couplings. *Ann. Appl. Probab.* **17**, 1596–1614.

- [1] A. Röllin (2005). Approximation of sums of conditionally independent variables by the translated Poisson distribution. *Bernoulli* **11**, 1115–1128.

## Teaching

- since 07/2009 Lecturing at the National University of Singapore  
 09/2008–06/2009 Teaching assistant at the National University of Singapore  
 04/2007–03/2008 Teaching assistant, supervision of MSc students and admission interviewing at the University of Oxford  
 11/2002–03/2007 Teaching assistant for lectures in mathematics, probability, statistics and bioinformatics, graduate and undergraduate level

### *Courses taught*

Acad. Year	Sem.	Module Code	Module Title
2019/2020	1	ST5214	Advanced Probability Theory
2018/2019	1	ST5214	Advanced Probability Theory
2017/2018	1	ST1131	Introduction to Statistics
2015/2016	2	ST5225	Statistical Analysis of Networks
2015/2016	1	ST5214	Advanced Probability Theory
2014/2015	2	MA4251/ST4238	Stochastic Processes II
2014/2015	1	ST5214	Advanced Probability Theory
2013/2014	2	GEM2900	Understanding Uncert. and Stat. Thinking
2012/2013	2	MA2216/ST2131	Probability
2012/2013	1	ST5214	Advanced Probability Theory
2011/2012	2	MA4251/ST4238	Stochastic Processes II
2011/2012	1	MA3238/ST3236	Stochastic Processes I
2010/2011	2	MA4251/ST4238	Stochastic Processes II
2010/2011	1	MA3238/ST3236	Stochastic Processes I
2009/2010	2	MA4251/ST4238	Stochastic Processes II
2009/2010	1	MA3238/ST3236	Stochastic Processes I