Max von Renesse – CV

(30^{th} Nov. 2022)

Personal Data

- Name: Max-Konstantin von Renesse
- Born: February 28, 1972 in Bochum, Germany, Nationality: German
- Married, five children (age 6 – 16)

Professional Career

- 1991 School leaving exam (Abitur) in Bochum
- 1991 – 1992 Civilian service in Bochum
- 1992 – 1997 Studies of Mathematics in Marburg, Bonn and St. Petersburg
- 1997 – 2002 Scientific Assistant with Prof. Dr. Karl-Theodor Sturm at Univ. Bonn, PhD in 2002
- 2002 In-House Consultant with IKB Deutsche Kreditbank AG, Düsseldorf
- 2003 -2004 PostDoc at TU Berlin
- 2005 PostDoc at Courant Institute, New York
- 2005– 2011 University Assistant (C1) with Prof. Dr. Jean-Dominique Deuschel at TU Berlin
- 2010 Habilitation at TU Berlin
- 2011-2012 W2 Professor at Univ. Munich (LMU),
  W2 Offer Univ. Paderborn (declined)
- Since 2012 W3 Professor at Univ. Leipzig,
  W3 Offer Univ. Jena (declined)

Scholarships and Awards

- German National Merit Foundation (Studienstiftung), 1994–1997
- German Academic Exchange Service (DAAD), 1996-1997
- Humboldt-Foundation Feodor-Lynen Scholarship, 2005-2006
- Hausdorff-Award of Bonn Faculty of Mathematics, 2004

Research Areas

- Stochastic Analysis (SPDE, Interacting Particle Systems, Diffusions on Manifolds)
- Analysis (Optimal Transport Theory & Mathematical Physics)
- Differential Geometry (Theory of generalized lower Ricci curvature bounds)
- Data Science (Applications of Optimal Transport in Data Science)

Supervision of PhD Students and PostDocs

PhD Students

- Dr. Sebastian Andres 2009, TU Berlin, now Lecturer Univ. Manchester
- Dr. Stefan Bachmann (2019), Univ. Leipzig
- MSc Tobias Lehmann (2022), Univ. Leipzig
- Dr. Tobias Weihrauch (2020), Univ. Leipzig
- MSc Marie Bormaann (since 2021, to date)
- MSc Fenna Müller (since 2022, to date)
- MSc Alexander Weiss (since 2021, to date)

PostDoc Mentorship (in alphabetical order)

- Dr. Robert Baumgarth
- Dr. Florent Barret, now Maitre der Conf. at Univ. Paris Nanterre
- Dr. Giovanni Conforti, now Maitre de Conf. at Ecole Polytechnique Paris
- Dr. Abdelhadi Es-Sarhir, now Professor at Univ. Agadir
- Dr. Martina Hofmanova, now Professor at Univ. Bielefeld
- Dr. Mark Kirstein
- Dr. Vitalii Konarovskyi, from 04/2023 Professor at Univ. Hamburg
- Dr. Victor Marx
- Dr. Jonas Tölle, now Lecturer at Aalto Univ. Helsinki

Published Papers in Peer Reviewed Journals

[1] Tobias Lehmann, Max-K. von Renesse, Alexander Sambale, and André Uschmajew. A note on overrelaxation in the sinkhorn algorithm. *Optimization Letters*, Dec 2021.

[2] Batu Güneysu and Max von Renesse. Molecules as metric measure spaces with Kato-bounded Ricci curvature. *C. R. Math. Acad. Sci. Paris*, 358(5):595–602, 2020.

[3] Vitalii Konarovskyi, Tobias Lehmann, and Max von Renesse. On Dean-Kawasaki dynamics with smooth drift potential. *J. Stat. Phys.*, 178(3):666–681, 2020.

[4] Vitalii Konarovskyi, Tobias Lehmann, and Max-K. von Renesse. Dean-Kawasaki dynamics: ill-posedness vs. triviality. *Electron. Commun. Probab.*, 24:Paper No. 8, 9, 2019.

[5] Vitalii Konarovskyi and Max-K. von Renesse. Modified massive Arratia flow and Wasserstein diffusion. *Comm. Pure Appl. Math.*, 72(4):764–800, 2019.

[6] Giovanni Conforti and Max Von Renesse. Couplings, gradient estimates and logarithmic Sobolev inequality for Langevin bridges. *Probab. Theory Related Fields*, 172(1-2):493–524, 2018.

[7] Martina Hofmanová, Matthias Röger, and Max von Renesse. Weak solutions for a stochastic mean curvature flow of two-dimensional graphs. *Probab. Theory Related Fields*, 168(1-2):373–408, 2017.

[8] Florent Barret and Max von Renesse. Averaging principle for diffusion processes via Dirichlet forms. *Potential Anal.*, 41(4):1033–1063, 2014.

[9] Philipp Fuchs, Ansgar Jüngel, and Max von Renesse. On the Lagrangian structure of quantum fluid models. *Discrete Contin. Dyn. Syst.*, 34(4):1375–1396, 2014.

[10] Sebastian Andres and Max-K. von Renesse. Uniqueness and regularity for a system of interacting Bessel processes via the Muckenhoupt condition. *Trans. Amer. Math. Soc.*, 364(3):1413–1426, 2012.

[11] Abdelhadi Es-Sarhir and Max-K. von Renesse. Ergodicity of stochastic curve shortening flow in the plane. *SIAM J. Math. Anal.*, 44(1):224–244, 2012.

[12] Abdelhadi Es-Sarhir, Max-K. von Renesse, and Wilhelm Stannat. Estimates for the ergodic measure and polynomial stability of plane stochastic curve shortening flow. *NoDEA Nonlinear Differential Equations Appl.*, 19(6):663–675, 2012.

[13] Max-K. von Renesse. An optimal transport view of Schrödinger's equation. *Canad. Math. Bull.*, 55(4):858–869, 2012.

[14] Max-K. von Renesse and Jonas M. Tölle. On an EVI curve characterization of Hilbert spaces. *J. Math. Anal. Appl.*, 385(1):589–598, 2012.

[15] Sebastian Andres and Max-K. von Renesse. Particle approximation of the Wasserstein diffusion. *J. Funct. Anal.*, 258(11):3879–3905, 2010.

[16] Nicolas Dirr, Federica Dragoni, and Max von Renesse. Evolution by mean curvature flow in sub-Riemannian geometries: a stochastic approach. *Commun. Pure Appl. Anal.*, 9(2):307–326, 2010.

[17] Max-K. von Renesse and Michael Scheutzow. Existence and uniqueness of solutions of stochastic functional differential equations. *Random Oper. Stoch. Equ.*, 18(3):267–284, 2010.

[18] Abdelhadi Es-Sarhir, Max-K. von Renesse, and Michael Scheutzow. Harnack inequality for functional SDEs with bounded memory. *Electron. Commun. Probab.*, 14:560–565, 2009.

[19] Max-K. von Renesse and Karl-Theodor Sturm. Entropic measure and Wasserstein diffusion. *Ann. Probab.*, 37(3):1114–1191, 2009.

[20] Max-K. von Renesse. On local Poincaré via transportation. *Math. Z.*, 259(1):21–31, 2008.

[21] Max-K. von Renesse, Marc Yor, and Lorenzo Zambotti. Quasi-invariance properties of a class of subordinators. *Stochastic Process. Appl.*, 118(11):2038–2057, 2008.

[22] Max-K. von Renesse and Karl-Theodor Sturm. Transport inequalities, gradient estimates, entropy, and Ricci curvature. *Comm. Pure Appl. Math.*, 58(7):923–940, 2005.

[23] Max-K. von Renesse. Intrinsic coupling on Riemannian manifolds and polyhedra. *Electron. J. Probab.*, 9:no. 14, 411–435, 2004.

[24] Max-K. von Renesse. Heat kernel comparison on Alexandrov spaces with curvature bounded below. *Potential Anal.*, 21(2):151–176, 2004.

[25] M. K. Renesse. A counterexample to Hencky plasticity in the case of a thin plate under vertical load. Volume 97, pages 4306–4310. 1999. Problems of mathematical physics and function theory.

Books

[27] Max-K. v. Renesse. *Comparison properties of diffusion semigroups on spaces with lower curvature bounds*, volume 355 of *Bonner Mathematische Schriften [Bonn Mathematical Publications]*. Universität Bonn, Mathematisches Institut, Bonn, 2003. Dissertation, Rheinische Friedrich-Wilhelms-Universität Bonn, Bonn, 2001.

[28] Jean-Dominique Deuschel, Barbara Gentz, Wolfgang König, Max von Renesse, Michael Scheutzow, and Uwe Schmock, editors. *Probability in complex physical systems. In honour of Erwin Bolthausen and Jürgen Gärtner. Selected papers based on the presentations at the two 2010 workshops*, volume 11 of *Springer Proc. Math.* Berlin: Springer, 2012.

Preprints/Submitted

[29] Vitalii Konarovskyi and Max von Renesse. Reversible coalescing-fragmentating Wasserstein dynamics on the real line, 2017. arxiv.1709.02839

[30] Vitalii Konarovskyi, Victor Marx, and Max von Renesse. Spectral gap estimates for Brownian motion on domains with sticky-reflecting boundary diffusion, 2021. arxiv.2106.00080

[31] Fenna Müller and Max von Renesse. Adiabatic approximation of coarse grained second order response, 2022. arxiv.2204.10217

[32] Bernd Sturmfels, Simon Telen, Francois-Xavier Vialard, and Max von Renesse. Toric geometry of entropic regularization, 2022. arxiv.2202.01571

Five most important publications

[4] – First and mathematically rigorous analysis of the Dean Kawasaki-equation of fluctuating hydrodynamics, featuring a novel rigidity result for singular SPDE.

[7] – First mathematically complete existence result for stochastic mean curavture flow in dimension d=2.

[13] – Equivalence of the Schrödinger equation from Quantum Mechanics and Newton's second law of motion on Wasserstein space of mass distributions.

[19] – First construction of a Brownian motion on Wasserstein space.

[22] – First characterization of lower Ricci curvature bounds of Riemannian manifolds by means of displacement convexity of Boltzmann entropy.

Teaching (selection) since 2012

Lectures (in alphabetical order)

- *Finanzmathematik I* (Optionspreistheorie in diskreter Zeit) (4 SWS)
- *Geometrische Stochastische Prozesse* (4 SWS)
- *Linear Algebra for Physicists* (3 SWS)
- *Malliavin Calculus and Stochastic Analysis on Manifolds* (2 SWS)
- *Mathematik I und II für Wirtschaftswissenschaftler* (je 4 SWS)
- *Mathematische Grundlagen des Maschinellen Lernens* (2 SWS)
- *Mathematsche Statistik* (4 SWS)
- *Mathematische Statistische Mechanik* (4 SWS)
- *Optimaler Massentransport* (2 SWS)
- *Rough Paths* (4 SWS)
- *Stochastische Differentialgleichungen und Finanzmathematik in stetiger Zeit* (4 SWS)

- *Wahrscheinlichkeitstheorie I und II* (4 +4 SWS)
- *Stochastische Analysis* (4 SWS)
- *Stochastische Partielle Differentialgleichungen* (2 SWS)
- *Stochastic Processes I and II* (4+4 SWS, in person & online lecture, full set of video lectures available on youtube.)

Seminars (in alphabetical order)

- *Determinantal Point Processes*
- *Markov-Ketten und Anwendungen*
- *Maschinelles Lernen*
- *Maschinelles Lernen und Programmierung in R für Lehramt*
- *Neuronale Netze*
- Optimaler Massentransport
- *Unvollständige Märkte*
- *Quantum Field Theory and Regularity Structures*
- *Spektrale Graphentheorie*
- *Support Vector Machines*
- *Zufällige Graphen*

Supervision of undergraduate theses

Supervision of more than 30 diploma theses since 2012 (Math@ULeipzig still goes by the diploma degree) in mathematics, mainly in the areas of stochastic analysis, mathematical finance, optimization and statistics/machine learning.

Service to the Community

- Regular reviewer for various of major or mainstream math journals, mostly in the areas of stochastic analysis, geometry, PDE or statistics.
- Vice Dean (2014-2017) then Dean (2017-2019) of Leipzig's mathematics & computer science department.
- Reviewer for national funding agencies DFG, EPSRC, CRSNG, Humboldt-Foundation.
- External referee for PhDs in France, Germany, UK, Romania.
- External committee member or external reviewer for hiring of professorship positions (all levels) in Germany.
- Recent organization of conferences:
  - *"Berlin-Leipzig Workshop on Fluctuating Hydrodynamics"*, together with R. Kornhuber (FU Berlin), P. Friz (TU Berlin), N. Perkowski (FU Berlin), 2019
  - GAMM Activity Group workshop *"Computational and Mathematical Methods in Data Science"* in Leipzig together with A. Uschmaew (MPI Leipzig), 2020
  - Conference *"Geometry of Curves in Time Series and Shape Analysis"* with J. Diehl (Greifswald) and M. Ruddy (MPI Leipzig) in Leipzig, 2021
  - Session organizer *"Stochastic Analysis"* jointly with M. Beiglböck (Vienna), German Open Stochastics Days 2021,
  - Conference *"From Dirichlet Forms to Optimal Transport"* Hausdorff Center Bonn, together with M. Erbar (Bielefeld), M. Huesmann (Münster), E. Kopfer (Bonn), H. Weber (Münster), 2022.

Conference and seminar talks 2021–2022

- Oberwolfach Conference on *Optimal Transport*, 2021
- Oberseminar Analysis, Univ. Dortmund, 2021
- Stochastic Analysis Seminar, Ukrainian Academy of Sciences Kyiv, 2021
- Oberseminar Analysis, Fernuniv. Hagen, 2021
- Banff Workshop on *Entropic Regularization of Optimal Transport and Applications*, 2021
- Oberseminar Analysis TU Chemnitz, 2021
- Oberwolfach Mini-Workshop *Variable Curvature Bounds, Analysis and Topology on Dirichlet Spaces*, 2021
- *Romanian Probability Conference* Bucharest, 2022
- *German-Japanese Meeting on Stochastic Analysis* Münster, 2022
- Conference *Information Geometry for Data Science* Univ. Hamburg, 2022
- Conference *Geometric Hydrodynamics & Optimal Transport* Lisbon, 2022
- Stochastic Analysis Seminar Imperial College London, 2022

Current research projects

- Dean-Kawasaki models with singular particle interaction or nonregular initial data.
- Optimal Transport and Schrödinger Problem in the unbalanced regime.
- Unbalanced Sinkhorn algorithm with applications diffusion generative models/image denoising.
- Spectral theory and functional inequalities for diffusions on manifolds with singularities or quantum graphs.
- Entropic Regularization for Quantum Optimal Transport.
- Stability and intermittency of measure valued SPDE driven by singular noise.

Third Party Funding 2017 – 2022

- Humboldt-Fellowship Dr. Vitalii Konarovskyi, approx. 210.000 Euro
- DAAD Prime Fellowship Dr. Mark Kirstein, approx. 110.00 Euro
- PI in DFG Priority Program 2026 *Geometry at Infinity*, approx. 15.000 Euro
- Academic Fellow of IMPRS graduate school at Max Planck Institute for Mathematics in the Sciences (MPI-MIS) Leipzig
- One of 25 PIs in BMBF Funded *School of Embedded Composite AI (SECAI) Dresden/Leipzig* 2022 – 2027, 13.2 Mio. Euro