

CURRICULUM VITAE – SIMON LARSON

PERSONAL INFORMATION

Born: December 28, 1990 in Söraby, Sweden
Address: Department of Mathematics
 KTH Royal Institute of Technology
 Lindstedtsvägen 25
 SE-100 44 Stockholm, Sweden
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Languages: English, Swedish

RESEARCH INTERESTS

Spectral theory of partial differential, pseudodifferential and Fourier integral operators, asymptotic analysis, convex geometry, geometric measure theory and mathematical physics. In particular shape optimization in spectral theory, semiclassical spectral asymptotics, many-body quantum mechanics and sharp spectral and geometric inequalities.

EDUCATION AND EMPLOYMENT

2019–2021 Postdoc at California Institute of Technology, Pasadena USA, with Professor Rupert L. Frank. Funded by scholarship from the mathematics program of the Knut and Alice Wallenberg foundation (KAW).

2014–2019 Ph. D. in mathematics at KTH Royal Institute of Technology, Stockholm. Main advisor Professor Ari Laptev. Thesis defence 5th of June 2019.
 Thesis title: *Asymptotic and universal spectral estimates with applications in many-body quantum mechanics and spectral shape optimization*
 Opponent: Professor Stefan Steinerberger, Yale University.

2015–2017 Technical editor Acta Mathematica, Institute Mittag-Leffler Stockholm

2012–2014 M. Sc. in Engineering Mathematics and Computational Science at Chalmers University of Technology, Gothenburg. Master thesis concerning inequalities arising in convex geometry, advisor Professor Bo Berndtsson.

2009–2012 B. Sc. in Engineering Mathematics at Chalmers University of Technology, Gothenburg.

AWARDS & HONOURS

Recipient of postdoctoral scholarship from mathematics program of the Knut and Alice Wallenberg Foundation 2019. Financing a two-year postdoc position at Caltech and additionally two years upon returning to Sweden.

Recipient of the Stockholm Mathematics Centre Prize for Excellent Doctoral Dissertation 2019.

Recipient of award for the best poster in spectral theory session at *QMath14*, Aarhus 2019.

Recipient of Markussens Stipend for research studies 2018.

Grants for research visits, conferences, etc. have been awarded from:

- The Knut and Alice Wallenberg Foundation (2016 and 2019).
- The Magnussons fund of the Royal Swedish Academy of Sciences (2015, 2016, and 2017).

OTHER MATHEMATICAL ACTIVITY

- Referee for the following journals: Bulletin of Mathematical sciences, International Mathematics Research Notices, Journal of Mathematical Physics, Mathematika, and Revista Matemática Iberoamericana.
- Organizer of graduate student seminar in mathematics at KTH from 2016–2018.

PUBLICATIONS & PREPRINTS

- [10] (with T. Beck, B. Brandolini, K. Burdzy, A. Henrot, J. J. Langford, R. Smits, S. Steinerberger) *Improved bounds for Hermite–Hadamard inequalities in higher dimensions*, The Journal of Geometric Analysis (to appear).
- [9] (with R. L. Frank) *Two-term spectral asymptotics for the Dirichlet Laplacian in a Lipschitz domain*, Journal für die reine und angewandte Mathematik (published online).
- [8] (with D. Lundholm and P. T. Nam) *Lieb–Thirring inequalities for wave functions vanishing on the diagonal set*, preprint (2019).
- [7] *Maximizing Riesz means of anisotropic harmonic oscillators*, Arkiv för Matematik, vol. 57 (2019), no. 1, 129–155.
- [6] *Asymptotic shape optimization for Riesz means of the Dirichlet Laplacian over convex domains*, Journal of Spectral Theory, vol. 9 (2019), no. 3, 857–895.
- [5] (with D. Lundholm) *Exclusion bounds for extended anyons*, Archive for Rational Mechanics and Analysis, vol. 227 (2018), no. 1, 309–365.
- [4] (with K. Gittins) *Asymptotic behaviour of cuboids optimising Laplacian eigenvalues*, Integral Equations and Operator Theory, vol. 89 (2017), no. 5, 607–629.
- [3] *On the remainder term of the Berezin inequality on a convex domain*, Proceedings of the American Mathematical Society, vol. 145 (2017), no. 5, 2167–2181.
- [2] *Geometric Hardy inequalities for the sub-elliptic Laplacian on convex domains in the Heisenberg group*, Bulletin of Mathematical Sciences, vol. 6 (2016), no. 3, 335–352.
- [1] *A bound for the perimeter of inner parallel bodies*, Journal of Functional Analysis, vol. 271 (2016), no. 3, 610–619.

SELECTED TALKS

- 2019 *Exclusion bounds for extended anyons*, Nordita, Stockholm, Sweden.
- 2019 *Lieb–Thirring inequalities for wave functions vanishing on the diagonal set*, IST, Klosterneuburg, Austria.
- 2019 *Two-term spectral asymptotics for the Dirichlet Laplacian in a Lipschitz domain*, Spectral theory & semiclassical analysis workshop in program ‘Spectral methods in Mathematical physics’, Institut Mittag-Leffler, Stockholm, Sweden.
- 2019 *Maximizing Riesz means of harmonic oscillators*, kick-off conference for program ‘Spectral methods in Mathematical physics’, Institut Mittag-Leffler, Stockholm, Sweden.
- 2018 *Spectral theory, Schrödinger operators and mathematical physics*, overview of research topics at PhD-day in pure mathematics, Royal Institute of Technology, Stockholm, Sweden.
- 2018 *Asymptotic problems in spectral shape optimization*, Chinese-Swedish workshop in nonlinear PDEs, Royal Institute of Technology, Stockholm, Sweden.
- 2018 *Maximizing Riesz means of Dirichlet eigenvalues*, Institut Mittag-Leffler, Stockholm, Sweden.
- 2018 *Asymptotic shape optimization in spectral theory*, University of Stuttgart, Germany.
- 2018 *Asymptotic shape optimization in spectral theory*, Ludwig–Maximilians Universität, Munich, Germany
- 2017 *Optimal stretching in lattice point problems*, Graduate student seminar, Royal Institute of Technology, Sweden.
- 2017 *Asymptotic shape optimization for the Dirichlet Laplacian*, British Mathematics Colloquium 2017, Durham University, England.
- 2017 *Anyons – Energy bounds via local exclusion principles*, Université de Neuchâtel, Switzerland.
- 2016 *Two-term bounds for the Riesz eigenvalue means of the Dirichlet Laplacian*, Fields Institute, Toronto, Canada.
- 2016 *Second-order trace bounds for the Dirichlet Laplacian on convex domains*, Stockholm University, Sweden.
- 2016 *Convex bodies and Minkowski sums*, Graduate student seminar, Royal Institute of Technology, Sweden.
- 2016 *A geometrically sharp remainder term for the Berezin inequality on a convex domain*, University of Stuttgart, Germany.

- 2015 *A geometric uncertainty principle*, Graduate student seminar, Royal Institute of Technology, Sweden.
- CONFERENCES, SCHOOLS & SCIENTIFIC VISITS**
- Aug. 2019 Swedish Summer PDEs, Royal Institute of Technology, Stockholm, Sweden.
- Aug. 2019 QMath14: Mathematical Results in Quantum Physics, Aarhus University, Denmark.
- Jun. 2019 Shape optimization with surface interactions, American Institute of Mathematics AIM, San José, USA.
- Mar. 2019 Mathematical physics of anyons and topological states of matter, Nordita, Stockholm, Sweden. (Invited speaker)
- 2019 Spectral methods in Mathematical physics, spring program at Institut Mittag-Leffler, Stockholm, Sweden. Including the workshops:
- Program kick-off conference (Jan. 14–18)
 - Spectral theory & semiclassical analysis (Feb. 11–15)
 - Many-body theory, effective equations & PDE's (Mar. 18–22)
 - Many-body theory, random operators & matrices (Apr. 8–12)
- Nov. 2018 Nonlinear phenomena in Stockholm: Kinetic meets Dispersive, Royal Institute of Technology, Stockholm, Sweden.
- Aug. 2018 Chinese-Swedish workshop in nonlinear PDEs, Royal Institute of Technology, Stockholm, Sweden. (Invited speaker)
- July 2018 International Congress of Mathematical Physics, Montreal, Canada.
- May 2018 Nonlocal interactions in partial differential equations and geometry, Institut Mittag-Leffler, Stockholm, Sweden.
- May 2018 Eigenvalues and inequalities, Institut Mittag-Leffler, Stockholm, Sweden. (Invited speaker)
- Dec. 2017 Mini-conference in PDEs, Royal Institute of Technology, Stockholm, Sweden.
- Sep. 2017 Harmonic analysis, spectral theory and PDE's, Sapienza Università di Roma, Italy.
- Apr. 2017 Spectral days 2017, University of Stuttgart, Germany.
- Apr. 2017 British Mathematical Colloquium, Durham University, England. (Invited speaker)
- Nov. 2016 Shape Optimization and Isoperimetric and Functional Inequalities, Centre International de Rencontres Mathématiques (CIRM), Marseille, France.
- Aug. 2016 Conference on Methods of Modern Mathematical Physics, A young Researchers Symposium on the Occasion of the 70th birthday of Barry Simon, Fields Institute, Toronto, Canada. (Invited speaker)
- Aug. 2016 Summer School on Various Aspects of Mathematical Physics, Euler International Mathematical Institute, St. Petersburg, Russia.
- Aug. 2016 Operator Theory, Analysis and Mathematical Physics, Euler International Mathematical Institute, St. Petersburg, Russia.
- July 2016 Calculus of Variations, Optimal Transportation, and Geometric Measure Theory: From theory to Applications, Université Claude Bernard Lyon 1, France.
- Mar. 2016 27th Nordic Congress of Mathematicians, Stockholm University & Royal Institute of Technology, Sweden.
- Mar. 2016 Spectral Theory and Applications (In memory of Boris Pavlov), Stockholm University, Sweden.
- Feb. 2016 Winter school on Mathematical Challenges in Quantum Mechanics, Casa della Gioventù Universitaria, Bressanone, Italy.
- Aug. 2015 Summer school on current topics in Mathematical Physics, Federico Santa María Technical University, Viña del Mar, Chile.
- July 2015 International Congress of Mathematical Physics, Santiago, Chile.
- June 2015 PDEs, Potential Theory & Function Spaces (In honour of Lars Inge Hedberg), Linköping University, Sweden.
- May 2015 Calculus of Variations and Nonlinear Partial Differential Equations, The University of Texas at

Austin, USA.

TEACHING EXPERIENCE

- 2014–2015 SF1666 Applied Linear Algebra I. (KTH)
Teaching assistant. Introductory course in linear algebra, vector geometry and numerical methods for bachelors program in Simulation Technology.
- 2014–2015 SF1667 Applied Linear Algebra II. (KTH)
Teaching assistant. Introductory course in linear algebra, vector geometry and numerical methods for bachelors program in Vehicle Engineering.
- 2014–2016 SF1668 Mathematical and Numerical Analysis I. (KTH)
Teaching assistant. Introductory course in one variable calculus and numerical analysis for bachelors programs in Vehicle Engineering and Simulation Technology.
- 2017–2018 SF1626 Calculus in several variables (KTH)
Teaching assistant. Basic course in differential and integral calculus for functions of several variables for a number of different bachelors programs.
- 2018 SF0003 Introductory mathematics course (KTH)
Teaching assistant. Two-week introductory course in mathematics for bachelors program in Engineering Physics.
- 2018 SF1673 Analysis in one variable (KTH)
Teaching assistant. Basic course in differential and integral calculus in one real variable for bachelors program in Engineering Physics.
- 2018 SF1674 Calculus in several variables (KTH)
Teaching assistant. Basic course in differential and integral calculus for functions of several variables for bachelors program in Engineering Physics.