Curriculum Vitae
Oscar Salomon Kivinen

Office Address:	MA B3 494
	EPFL, Institute of Mathematics
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Email Address:	oscar.kivinen@epfl.ch
Date of Birth:	October 22, 1992 (Helsinki, Finland)
Date of CV:	January 16, 2023

Education & Employment

9/2020 – **Researcher**, *EPFL*

9/2020 – 9/2021 **Postdoctoral fellow**, *University of Toronto*

7/2019 – 8/2020 **Olga Taussky and John Todd Instructor in Mathematics**, *Caltech.*

9/2015 – 6/2019 **PhD**, Mathematics, *University of California, Davis.*

1/2014 – 6/2014 **MSc**, Engineering Physics, *Aalto University.*

9/2012 – 1/2014 **BSc**, Engineering Physics, *Aalto University*

9/2012 – **Licentiate of Medicine** (Completed some coursework towards the degree), *University of Helsinki*

Scientific/Academic honors and grants

9/2020 – 6/2021 The Finnish Academy of Science and Letters grant for postdoctoral research abroad

9/2016 – 6/2019 The Vilho, Yrjö and Kalle Väisälä Foundation of the Finnish Academy of Science and Letters grant (25,000e yearly grant for graduate studies)

9/2015 – 4/2018 Departmental fellowship, UC Davis

9/2015 – 6/2020 Fulbright Graduate Grant

5/2014 Aalto University fast graduation award (for completing a BSc+MSc in < 2 years)

7/2010, 7/2011, 7/2012 International Chemistry Olympiad, three medals (2 bronze, 1 silver)

Publications

Papers

1. **Quadratic ideals and Rogers-Ramanujan recursions** (with Yuzhe Bai and Eugene Gorsky), *The Ramanujan Journal* (2018): 1-23.

2. **Hecke correspondences for Hilbert schemes of reducible locally planar curves**, *Algebraic Geometry (Foundation Compositio Mathematica)* 6.5 (2019).

3. **Unramified affine Springer fibers and isospectral Hilbert schemes**, *Selecta Mathematica (New Series)* 26, 61 (2020).

4. **Generalized affine Springer theory and Hilbert schemes on planar curves** (with Niklas Garner), *IMRN*, rnac038, (2022).

5. **Algebra and geometry of link homology** (notes from the 2021 IHÉS summer school, with Eugene Gorsky and José Simental Rodríguez). *Bulletin of the LMS* (2022).

Preprints

1. **Shalika germs for tamely ramified elements in** GL_n (with Cheng-Chiang Tsai). Submitted, available at arXiv:2209.02509.

2. **On the affine Springer fibers inside the invariant center of the small quantum group** (with Nicolas Hemelsoet and Anna Lachowska). Submitted, available at arXiv:2205.09700.

3. **The affine Springer fiber-sheaf correspondence** (with Eugene Gorsky and Alexei Oblomkov). Submitted, available at arXiv:2204.00303.

4. Appendix to **Affine Springer fibers, Procesi bundles, and Cherednik algebras** (with Pablo Boixeda Alvarez, Ivan Losev). Submitted, available at arXiv:2104.09543.

5. **Computations for binomial edge ideals and Koszul duality**, December 2014. Available at arXiv:1412.3542.

Book chapters and manuscripts

1. **Proof of the Hard Lefschetz Theorem** (with Gurbir Dhillon), 2018. Chapter 18 of *Introduction to Soergel bimodules*, *RSME Springer Series*. (2020)

Theses

1. **Affine Springer fibers, Hilbert schemes and knots** PhD Thesis, UC Davis, 2019, 104 pages.

2. **Koszul algebras and resolutions** Master Thesis, Aalto University, 2014, 45 pages.

3. **Steady states in chemical reaction networks** Bachelor Thesis, Aalto University, 2014, 20 pages.

Articles in progress (available on request)

1. **Quot schemes of nonreduced curves and the colored HOMFLY polynomial** (with Dori Bejleri).

2. **Cyclotomic generalized affine Springer fibers** (with José Simental Rodríguez).

3. **From invariant distributions to symmetric functions** (or "Local Character Expansions and the Link at Infinity").

Teaching experience

EPFL
9/2022 – 12/2022 TA for the course *Student seminar in pure mathematics* (MATH-563, topic: Knot Theory).
1/2022 – 6/2022 Lecturer for the course *Topics in algebraic geometry* (MATH-535).

University of Toronto
9/2020 – 4/2021 Lecturer for the course *Calculus and Linear Algebra for Commerce* (MAT 133Y).

Caltech
1/2020–4/2020 Lecturer for the course *Topics in representation theory* (Math 145b).
9/2019–12/2019 Lecturer for the course *Algebraic geometry I* (Math 130a).

UC Davis
10/2018–12/2018 Lecturer for the course *Calculus* (Math 21A).
10/2016-12/2016 TA for the course *Algebra* (Math 150A).
1/2016–3/2016 TA for the course *Calculus III* (Math 21C)
4/2016–6/2016 TA for the course *Ordinary differential equations* (Math 22B).
10/2015–12/2015 TA for the course *Calculus I* (Math 21A).
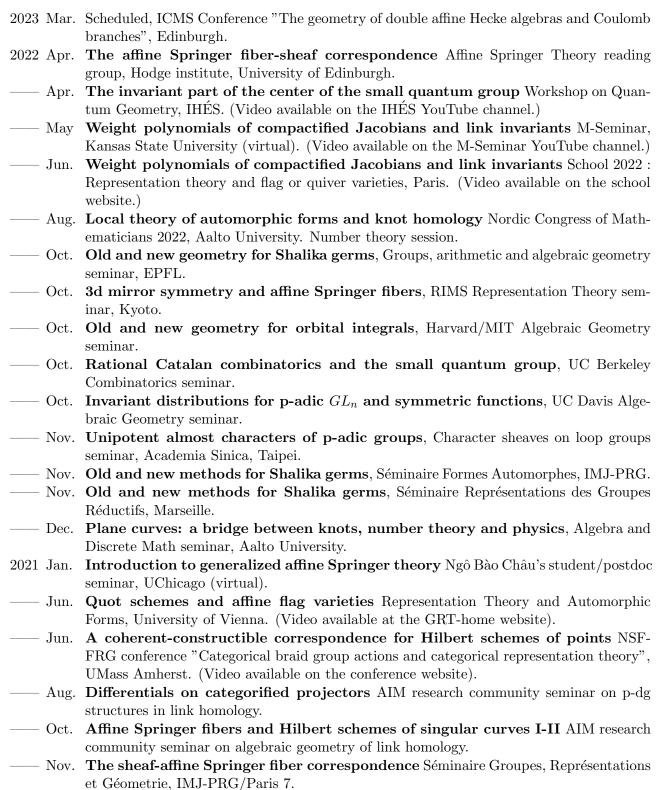
Aalto University
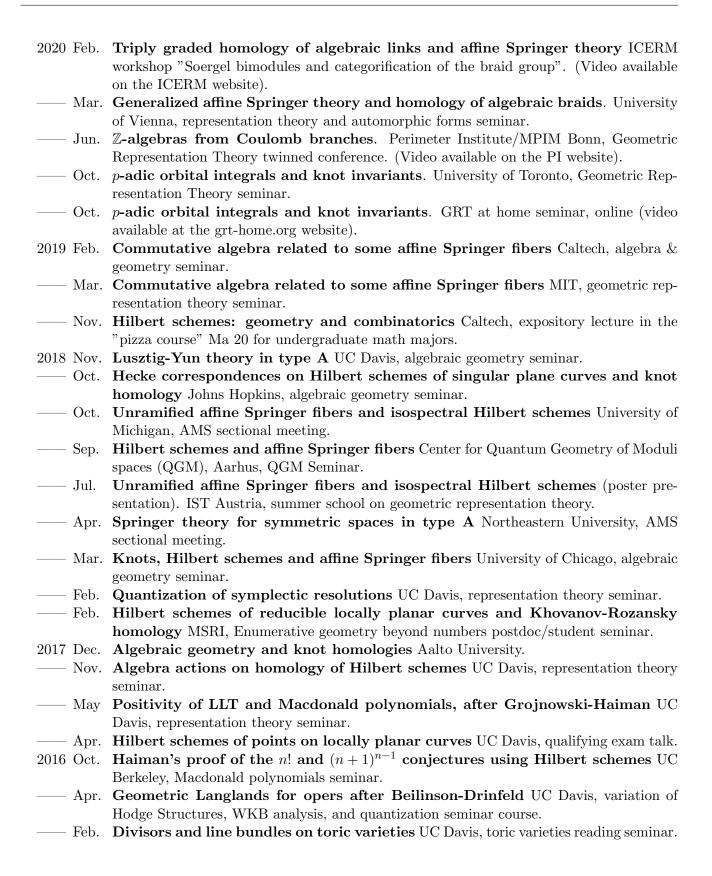9/2014–6/2015 Department head TA & calculus room coordinator.
9/2014–12/2014 TA for the course *Combinatorics* (MSc level).
1/2014–5/2014 TA for the courses *Partial Differential Equations*, *Calculus IV*, *Linear Algebra*.
9/2013–12/2013 TA for the courses *Calculus I-III*.

Invited talks and lectures at conferences or seminars

2023 Mar. Scheduled, ICMS Conference "The geometry of double affine Hecke algebras and Coulomb branches", Edinburgh.

2022 Apr. **The affine Springer fiber-sheaf correspondence** Affine Springer Theory reading group, Hodge institute, University of Edinburgh.

—— Apr. **The invariant part of the center of the small quantum group** Workshop on Quantum Geometry, IHÉS. (Video available on the IHÉS YouTube channel.)

—— May **Weight polynomials of compactified Jacobians and link invariants** M-Seminar, Kansas State University (virtual). (Video available on the M-Seminar YouTube channel.)

—— Jun. **Weight polynomials of compactified Jacobians and link invariants** School 2022 : Representation theory and flag or quiver varieties, Paris. (Video available on the school website.)

—— Aug. **Local theory of automorphic forms and knot homology** Nordic Congress of Mathematicians 2022, Aalto University. Number theory session.

—— Oct. **Old and new geometry for Shalika germs**, Groups, arithmetic and algebraic geometry seminar, EPFL.

—— Oct. **3d mirror symmetry and affine Springer fibers**, RIMS Representation Theory seminar, Kyoto.

—— Oct. **Old and new geometry for orbital integrals**, Harvard/MIT Algebraic Geometry seminar.

—— Oct. **Rational Catalan combinatorics and the small quantum group**, UC Berkeley Combinatorics seminar.

—— Oct. **Invariant distributions for p-adic GL_n and symmetric functions**, UC Davis Algebraic Geometry seminar.

—— Nov. **Unipotent almost characters of p-adic groups**, Character sheaves on loop groups seminar, Academia Sinica, Taipei.

—— Nov. **Old and new methods for Shalika germs**, Séminaire Formes Automorphes, IMJ-PRG.

—— Nov. **Old and new methods for Shalika germs**, Séminaire Représentations des Groupes Réductifs, Marseille.

—— Dec. **Plane curves: a bridge between knots, number theory and physics**, Algebra and Discrete Math seminar, Aalto University.

2021 Jan. **Introduction to generalized affine Springer theory** Ngô Bào Châu's student/postdoc seminar, UChicago (virtual).

—— Jun. **Quot schemes and affine flag varieties** Representation Theory and Automorphic Forms, University of Vienna. (Video available at the GRT-home website).

—— Jun. **A coherent-constructible correspondence for Hilbert schemes of points** NSF-FRG conference "Categorical braid group actions and categorical representation theory", UMass Amherst. (Video available on the conferénce website).

—— Aug. **Differentials on categorified projectors** AIM research community seminar on p-dg structures in link homology.

—— Oct. **Affine Springer fibers and Hilbert schemes of singular curves I-II** AIM research community seminar on algebraic geometry of link homology.

—— Nov. **The sheaf-affine Springer fiber correspondence** Séminaire Groupes, Représentations et Géometrie, IMJ-PRG/Paris 7.

2020 Feb. **Triply graded homology of algebraic links and affine Springer theory** ICERM workshop "Soergel bimodules and categorification of the braid group". (Video available on the ICERM website).

—— Mar. **Generalized affine Springer theory and homology of algebraic braids**. University of Vienna, representation theory and automorphic forms seminar.

—— Jun. **$\mathbb{Z}$-algebras from Coulomb branches**. Perimeter Institute/MPIM Bonn, Geometric Representation Theory twinned conference. (Video available on the PI website).

—— Oct. **p-adic orbital integrals and knot invariants**. University of Toronto, Geometric Representation Theory seminar.

—— Oct. **p-adic orbital integrals and knot invariants**. GRT at home seminar, online (video available at the grt-home.org website).

2019 Feb. **Commutative algebra related to some affine Springer fibers** Caltech, algebra & geometry seminar.

—— Mar. **Commutative algebra related to some affine Springer fibers** MIT, geometric representation theory seminar.

—— Nov. **Hilbert schemes: geometry and combinatorics** Caltech, expository lecture in the "pizza course" Ma 20 for undergraduate math majors.

2018 Nov. **Lusztig-Yun theory in type A** UC Davis, algebraic geometry seminar.

—— Oct. **Hecke correspondences on Hilbert schemes of singular plane curves and knot homology** Johns Hopkins, algebraic geometry seminar.

—— Oct. **Unramified affine Springer fibers and isospectral Hilbert schemes** University of Michigan, AMS sectional meeting.

—— Sep. **Hilbert schemes and affine Springer fibers** Center for Quantum Geometry of Moduli spaces (QGM), Aarhus, QGM Seminar.

—— Jul. **Unramified affine Springer fibers and isospectral Hilbert schemes** (poster presentation). IST Austria, summer school on geometric representation theory.

—— Apr. **Springer theory for symmetric spaces in type A** Northeastern University, AMS sectional meeting.

—— Mar. **Knots, Hilbert schemes and affine Springer fibers** University of Chicago, algebraic geometry seminar.

—— Feb. **Quantization of symplectic resolutions** UC Davis, representation theory seminar.

—— Feb. **Hilbert schemes of reducible locally planar curves and Khovanov-Rozansky homology** MSRI, Enumerative geometry beyond numbers postdoc/student seminar.

2017 Dec. **Algebraic geometry and knot homologies** Aalto University.

—— Nov. **Algebra actions on homology of Hilbert schemes** UC Davis, representation theory seminar.

—— May **Positivity of LLT and Macdonald polynomials, after Grojnowski-Haiman** UC Davis, representation theory seminar.

—— Apr. **Hilbert schemes of points on locally planar curves** UC Davis, qualifying exam talk.

2016 Oct. **Haiman's proof of the $n!$ and $(n+1)^{n-1}$ conjectures using Hilbert schemes** UC Berkeley, Macdonald polynomials seminar.

—— Apr. **Geometric Langlands for opers after Beilinson-Drinfeld** UC Davis, variation of Hodge Structures, WKB analysis, and quantization seminar course.

—— Feb. **Divisors and line bundles on toric varieties** UC Davis, toric varieties reading seminar.

2015 Nov.   **Knizhnik-Zamolodchikov functors for rational Cherednik algebras** UC Davis, representation theory seminar.

2014 Dec.   **Koszul algebras and their identification** Aalto University, combinatorics seminar.

Professional activities

- Along with Anna Beliakova, Anna Lachowska, Louis-Hadrien Robert and Qi You, one of the main organizers of the biennial workshop "Quantum Topology Biennial" in Les Diablerets, Switzerland (first instance in January 2024)
- Along with Francesca Carocci and Sergej Monavari, one of the main organizers of the workshop "Categorified enumerative geometry and representation theory" at the Bernoulli Center, EPFL, September 2023.
- Along with Nicolle Gonzalez, Eugene Gorsky, Matthew Hogancamp, and Alexei Oblomkov, one of the main organizers of the AIM workshop "Algebra, Geometry, and Combinatorics of Link Homology", July 2023.
- Along with NG, EG, MH, AO, one of the main organizers of the AIM research community "Link homology", 2021–
- TA for the course "Algebra and geometry of link homology" at the IHÉS summer school 2021 "Enumerative geometry, physics, and representation theory".
- Visiting researcher at *Institut Henri Poincaré* in Spring 2017. Participant in the program *Combinatorics and Interactions*.
- Reviewed graduate applications for the math department at Caltech in 2019-2020.
- On the candidacy committee of Konrad Pilch (Caltech).
- Refereeing for Duke Math Journal, Algebraic Geometry (Foundation Compositio Mathematica), Representation Theory of the AMS, Transformation groups.
- Reviewer for zbMATH and MathSciNet.
- Department head teaching assistant 2014-2015 at Aalto University. Math tutoring room assistant and main organizer.

Seminars (co-)organized

6/2021–6/2022   Co-organizing the algebraic geometry seminar for the AIM research community "Link homology"

9/2020–4/2021   Main organizer of the University of Toronto Geometric Representation Theory seminar.

9/2019–6/2020   Main organizer of the Caltech Algebra & Geometry seminar.

9/2018–12/2018   Reading seminar on mixed Hodge polynomials of wild character varieties.

4/2018–6/2018   Reading seminar on noncommutative geometry of the quantum Hall effect (at UC Davis, with Eric Babson, Jerry Kaminker and Alvin Moon)

9/2017–12/2017   Knot homology seminar (at UC Davis, with Beibei Liu)

9/2017–6/2018   Main organizer of the student algebraic geometry seminar (at UC Davis, with Priya Kshirsagar)

1/2017–4/2017   Reading seminar on polygraphs and Macdonald polynomials (at UC Davis/UC Berkeley, with Maria Gillespie)

9/2016–12/2016   Reading seminar on combinatorial Hodge theory (at UC Davis, with Federico Castillo and Lang Mou)

1/2016–4/2016   Reading seminar on toric varieties (at UC Davis, with Federico Castillo)

1/2014–5/2014   Reading seminar on higher categories (at Aalto University, with Emanuele Ventura)

Conferences and workshops

2023	Feb.	Non-Archimedean methods in arithmetic and geometry, SwissMAP Research Station
2023	Jan.	Les Diablerets winter school on mathematical physics, SwissMAP Research Station
2022	Aug.	Nordic Congress of Mathematicians 28, Aalto University
2022	Aug.	Gauged maps, vortices, and their moduli, SwissMAP Research Station
2022	Jun.	School on representation theory of flag or quiver varieties, Paris
2022	May	Göran Gustafsson Symposium on Combinatorial Hodge Theory, Institut Mittag-Leffler
2022	Apr.	Workshop on Quantum Geometry, IHÉS
2022	Feb.	Vertex algebras and Poisson geometry, SwissMAP Research Station
2022	Feb.	Recent Advances in Link Homology, SwissMAP Research Station
2022	Jan.	Les Diablerets winter school on mathematical physics, SwissMAP Research Station
2021	Jul.	IHÉS summer school "Enumerative geometry, physics, and representation theory"
2021	Jun.	NSF-FRG conference "Categorical braid group actions and categorical representation theory", UMass Amherst
2020	Sep.	Strings, knots, symplectic geometry and dualitites, Institut Mittag-Leffler
2019	Jul.	String-math 2019, Uppsala University
2018	Oct.	AMS Central Sectional Meeting, University of Michigan
2018	Oct.	Categorified Hecke Algebras, Hilbert Schemes and Link Homology, AIM
2018	Aug.	WARTHOG 2018: Deligne-Lusztig Theory, University of Oregon
2018	Jul.	Summer School on Geometric Representation Theory, IST Austria
2018	Jun.	CIME School on Geometric Representation Theory and Gauge Theories, Cetraro
2018	Jun.	Southeastern Lie Theory Summer School, UGA
2018	May	Representation Theory, Geometry and Quantization (Kostant Memorial Conference), MIT
2018	May	Alexander Givental 60th Birthday Conference, UC Berkeley
2018	Apr.	AMS Northeastern Sectional Meeting, Northeastern University
2018	Jan.-May	Enumerative Geometry Beyond Numbers, MSRI
2017	Nov.	AMS Western Sectional Meeting, UC Riverside
2017	Aug.	WARTHOG 2017: Koszul duality for Higgs and Coulomb branches, University of Oregon
2017	Jul.	String-Math 2017, University of Hamburg
2017	Jun.	Summer School on Soergel Bimodules, MSRI
2017	Jun.	Workshop on Algebraic Geometry and Physics, SISSA
2017	Apr.	Scholze lectures on p-adic geometry, IHÉS
2017	Mar.	Workshop on Enumerative Geometry, Institut Henri Poincaré
2016	Nov.	Workshop on Hall Algebras, Enumerative Geometry and Gauge Theory, the Fields Institute
2016	Oct.	Workshop on Singularities and Motivic Integration, UC Davis
2016	Jul.	WARTHOG 2016: Hilbert Schemes, Knot Homologies and Cherednik Algebras, University of Oregon
2016	Dec.	Center for Quantum Mathematics and Physics Inaugural Conference, UC Davis
2016	Jun.	String-Math 2016, Collège de France
2015	Mar.	John Coates 70th Birthday Conference, Cambridge

2014	Nov.	Categorical Structures in Harmonic Analysis, MSRI
2014	Jun.	Antti Kupiainen 60th Birthday Conference, University of Helsinki
2014	Mar.	Applications of Real Algebraic Geometry, Aalto University
2013	Jun.	Summer School on Algebraic Statistics, Nordfjordeid

Skills

Languages	Finnish (native), English (fluent/C2), French (B2), Swedish (B1), Spanish (A2), Russian (A1)
Computer	Scala, Python, C, C++, MATLAB, Macaulay2, Sage, Mathematica, Maple, LaTeX