Ilya Smirnov — Curriculum Vitae

BCAM – Basque Center for Applied Mathematics
Bilbao, Basque Country - Spain
Ikerbasque, Basque Foundation for Science
Bilbao, Basque Country - Spain

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http://www.bcamath.org/en/people/ismirnov

Education

University of Virginia, PhD in Mathematics **2013–2015**
Advisor: Craig Huneke

University of Kansas, PhD Candidate **2011–2012**
Moved to continue working with Craig Huneke.

Lomonosov Moscow State University, Diploma in Mathematics **2006–2011**

Employment

Basque Center for Applied Mathematics, Tenure-track **11. 2021–**
Ramón y Cajal and Ikerbasque Research fellowships

KTH Royal Institute of Technology, Research fellow **03–11. 2021**
Funded by the Swedish Research Council

Charles University in Prague, Researcher **10.2020–03.2021**

Stockholm University, Postdoktor **2018–2020**

University of Michigan, Visiting Assistant Professor **2015–2018**

Research interests

Commutative algebra at the intersection with algebraic geometry and singularity theory: positive characteristic methods, multiplicity theory, numerical invariants of singularities.

Funding and awards

Ministry of Science and Innovation, PID2024-156181NB-C31: 88000 € **2025–2029**
Co-PIs: Javier Fernandez de Bobadilla.

Joint AEI-DFG pilot call, PCI2024-155055-2: 205000 € **2025–2028**
Co-PIs: Javier Fernandez de Bobadilla, Manuel Blickle, and Duco van Straten.

Ministry of Science and Innovation, EUR2023-143443: 100000 € **2023–2026**

Ministry of Science and Innovation, PID2021-125052NA-I00: 36800 € **2022–2025**

Ministry of Science and Innovation, Ramón y Cajal fellowship: tenure-track **2022–2027**

Ikerbasque Foundation, Ikerbasque Research Fellowship: tenure-track **2021–2026**

La Caixa Foundation, Junior Leader Postdoctoral Fellowship: 292500 € **2021–2024**
Resigned on 09.2022 due to Ramón y Cajal

Swedish Research Council, Starting grant: 3,600,000 SEK **2021–2025**
Resigned in 2021 due to the move to Spain

Oberwolfach Research in Pairs **January 2020**

Stockholm Mathematics Center, Master class grant: 140,000 SEK **2019**
A week-long summer school, August 2022

European Mathematics Society, EMS Summer School grant: 4000 € **2020**
A week-long summer school, August 2022

Marie Skłodowska-Curie Seal of Excellence **2019**

Royal Swedish Academy of Science, Magnusons fond, Travel grant: 11,200 SEK **2019**

AMS–Simons Travel Grant: $4000 **2016–2018**

Mathematics Research Community, Participant and collaboration grant: $700 **2015**

Publications

Published & accepted

[1] Ilya Smirnov. Differential Krull dimension in differential polynomial extensions. *J. Algebra*, 344:354–372, 2011.

[2] Craig Huneke and Ilya Smirnov. Prime filtrations of the powers of an ideal. *Bull. Lond. Math. Soc.*, 47(4):585–592, 2015.

[3] Ilya Smirnov. Upper semi-continuity of the Hilbert-Kunz multiplicity. *Compos. Math.*, 152(3):477–488, 2016.

[4] Mordechai Katzman, Linquan Ma, Ilya Smirnov, and Wenliang Zhang. D-module and F-module length of local cohomology modules. *Trans. Amer. Math. Soc.*, 370(12):8551–8580, 2018.

[5] Craig Huneke, Ilya Smirnov, and Javid Validashti. A generalization of an inequality of Lech relating multiplicity and colength. *Comm. Algebra*, 47:2436–2449, 2019.

[6] Ilya Smirnov. Equimultiplicity in Hilbert-Kunz theory. *Math. Z*, 291(1-2):245–278, 2019.

[7] Patricia Klein, Linquan Ma, Pham Hung Quy, Ilya Smirnov, and Yongwei Yao. Lech's inequality, the Stückrad–Vogel conjecture, and uniform behavior of Koszul homology. *Adv. Math.*, 347:442–472, 2019.

[8] Hailong Dao and Ilya Smirnov. The multiplicity and the number of generators of an integrally closed ideal. *J. Singularities*, 19:61–75, 2019.

[9] Ilya Smirnov. Hilbert-Kunz multiplicity of the powers of an ideal. *Proc. Amer. Math. Soc.*, 147(8):3331–3338, 2019.

[10] Hailong Dao and Ilya Smirnov. On the generalized Hilbert-Kunz function and multiplicity. *Israel J. Math.*, 237(1):155–184, 2020.

[11] Luis Núñez-Betancourt and Ilya Smirnov. Hilbert–Kunz multiplicities and F-thresholds. *Bol. Soc. Mat. Mex.*, 26(1):15–25, 2020.

[12] Linquan Ma, Pham Hung Quy, and Ilya Smirnov. Colength, multiplicity, and ideal closure operations. *Comm. Algebra*, 48(4):1601–1607, 2020.

[13] Ilya Smirnov. On semicontinuity of multiplicities in families. *Doc. Math.*, 25:381–399, 2020.

[14] Thomas Polstra and Ilya Smirnov. Continuity of Hilbert–Kunz multiplicity and F-signature. *Nagoya Math. J.*, 239:322–345, 2020.

[15] Linquan Ma, Pham Hung Quy, and Ilya Smirnov. Filter regular sequence under small perturbations. *Math. Ann.*, 378(1-2):243–254, 2020.

[16] Craig Huneke, Linquan Ma, Pham Hung Quy, and Ilya Smirnov. Asymptotic Lech's inequality. *Adv. Math.*, 372:107296, 33, 2020.

[17] Alessandro De Stefani and Ilya Smirnov. Decomposition of graded local cohomology tables. *Math. Z*, 297(1):1–24, 2021.

[18] Thomas Polstra and Ilya Smirnov. Equimultiplicity theory of strongly F-regular rings. *Michigan Math. J.*, 70(4):837–856, 2021.

[19] Jack Jeffries and Ilya Smirnov. A transformation rule for natural multiplicities. *Int. Math. Res. Not. IMRN*, 2022(2):999–1015, 2022.

[20] Jack Jeffries, Yusuke Nakajima, Ilya Smirnov, Kei-ichi Watanabe, and Ken-Ichi Yoshida. Lower bounds on Hilbert-Kunz multiplicities and maximal F-signatures. *Math. Proc. Cambridge Philos. Soc.*, 174(2):247–271, 2023.

[21] Alessandro De Stefani and Ilya Smirnov. Stability and deformation of F-singularities. *Israel J. Math.*, 264(1):1–35, 2024.

[22] Linquan Ma and Ilya Smirnov. Uniform Lech's inequality. *Proc. Amer. Math. Soc.*, 151(6):2387–2397, 2023.

[23] Ilya Smirnov and Kevin Tucker. The theory of F-rational signature. *J. Reine Angew. Math.*, 812:1–58, 2024.

[24] Linquan Ma, Pham Hung Quy, and Ilya Smirnov. Colength, multiplicity, and ideal closure operations II. *Michigan Math. J.* Accepted, available at https://arxiv.org/abs/2305.12469.

[25] Yairon Cid-Ruiz and Ilya Smirnov. Effective generic freeness and applications to local cohomology. *J. Lond. Math. Soc. (2)*, 110(4):Paper No. e12995, 31, 2024.

[26] Ilya Smirnov. An invitation to equimultiplicity of F-invariants. To appear in Contemporary Mathematics, a volume in honor of Hochster and Huneke.

Preprints

[27] Boris Shapiro, Ilya Smirnov, and Arkady Vaintrob. Around generalized zonotopal algebras of graphs. Available at https://arxiv.org/abs/2204.11331.

[28] Alessandro De Stefani and Ilya Smirnov. Tight closure of products and F-rational singularities. Available at https://arxiv.org/abs/2411.03167.

[29] Alessandro De Stefani, Luis Núñez-Betancourt, and Ilya Smirnov. The defect of the F-pure threshold. Available at https://arxiv.org/abs/2501.13613.

[30] Aldo Conca, Alessandro De Stefani, Luis Núñez-Betancourt, and Ilya Smirnov. F-singularities of polynomials with square-free support. Available at https://arxiv.org/abs/2501.16198.

[31] Igor Pak, Boris Shapiro, Ilya Smirnov, and Ken-ichi Yoshida. Hilbert–Kunz multiplicity of quadrics via Ehrhart theory. Available at https://arxiv.org/abs/2508.17915.

[32] Linquan Ma and Ilya Smirnov. Lech–Mumford constant and stability of local rings. Available at https://arxiv.org/abs/2508.19893.

Supervision

PhD Students:

Elías Guisado Villalgordo **2024–2028**

Joel Castillo Rey **2023–2027**

Postdocs:

Antonino Ficarra **2025–2027**
Funded by Juan de la Cierva fellowship JDC2023-051705-I

Devlin Mallory **2024–2028**
Funded by EUR2023-143443 and a Marie Skłodowska–Curie fellowship SIPOCAG

Kriti Goel **2023–2025**

Teaching experience

Lecture series:

RGAS School on Singularities in Seville **January 8-12, 2024**
"Hilbert–Kunz multiplicity as a measure of singularities", 4 lectures of 90 min.

ICTP School on Commutative Algebra and Algebraic Geometry in Prime Characteristic **May 2-5, 2023**
"Singularity invariants in positive characteristic", 4 lectures of 50 min.

MSRI Graduate School attached to the Thematic program in Commutative Algebra and its interactions, University of Notre Dame **June 3-7, 2019**
TA for Linquan Ma's course, running exercise sessions in the afternoon.

BCAM - Basque Center for Applied Mathematics:

Introduction to Multiplicity theory **Spring 2023**
Severo Ochoa course, graduate level, 20 hours, hybrid format.

Charles University in Prague:

NMAI062: Algebra I for computer science **Fall 2020**
Tutorials on Zoom, 15 classes of 90 minutes in a semester for 8 students.

Stockholm University:

Math 3001: Mathematical Methods in Economics **Spring 2019, Fall 2019**
15 classes of 90 minutes in a semester for $30-40$ students.

University of Michigan:

Math 425: Introduction to Probability **Spring 2017, Spring 2018**
Fully in charge, 3 classes of 50 minutes per week, 35 (2017) and 70 (2018) students.

Math 116: Calculus II **Fall 2017**
Work in small groups, flipped classroom elements, 2 sections of 18 students meeting 3 times for 75 minutes per week.

Math 214: Applied Linear Algebra **Spring 2016, Fall 2017**
Lectures, 2 sections of 60 students meeting 4 times for 50 minutes per week.

Math 115: Calculus I **Fall 2015**
Work in small groups, flipped classroom elements, 2 sections of 18 students meeting 3 times for 75 minutes per week.

University of Virginia:

Applied Calculus I, II **Spring 2013, Fall 2013, Fall 2014**
Lectures with coordinated exams, 3 classes of 50 minutes per week.

University of Kansas:

Business calculus I **Spring 2012, Fall 2012**
Lectures with coordinated exams, 3 classes of 50 minutes per week.

Invited Talks (last 5 years)

- **University of Barcelona**, May 9, 2025.
- **Purdue University**, August 21, 2024.
- **Recent Developments in Commutative Algebra**, Joint AMS-UMI meeting, Palermo, July 25–26, 2024.
- **EPFL**, Lausanne, May 21, 2024.
- **Recent Developments in Commutative Algebra**, SLMath, April 15–19, 2024.
- **Nihon University**, Tokyo, December 14, 2023.
- **The 44th Japan Symposium on Commutative Algebra**, Tokyo, November 22-26, 2023.
- **Iberosing International Workshop 2023**, Granada, November 6-10, 2023.
- **The annual meeting of the Algebraic Geometry and Singularities Network in Spain**, Bilbao, January 10-13, 2023.
- **CMO Workshop: Mixed characteristic commutative algebra**, `https://www.birs.ca/events/2022/5-day-workshops/22w5174/videos`, May 9-13, 2022.
- **Stockholm University**, April 11, 2022.
- **VCAS, IIT Bombay**, `https://sites.google.com/view/virtual-comm-algebra-seminar/home`, March 18, 2022
- **Fellowship of the ring: Zoom seminar in Commutative Algebra hosted by MSRI**, `https://sites.google.com/view/fellowship-of-the-ring/home`, January 28, 2021.
- **Koç University**, February 11, 2020
- **Tulane University**, December 3, 2019
- **Freie Universität Berlin**, November 22, 2019
- **University of Osnabrück**, November 5, 2019

- **Workshop on singularities: semigroups, topology and valuations**, Universidad Complutense de Madrid, October 27-31, 2019
- **University of Genoa**, May 22, 2019
- **Johannes Gutenberg-Universität Mainz**, January 24, 2019
- **FACARD 2019**, University of Barcelona, January 16-18, 2019

Professional activities

- Co-organizer of the biannual BCAM-UPV colloquium since Spring 2025.
- Scientific committee of the Iberoamerican Congress on Singularities, 09 - 13 december 2025, Valparaíso, Chile.
- Co-organizer of a summer school on "Perfectoid techniques". La Cristalera, May 19–23, 2025. External funding by the Foundation Nagoya Mathematical Journal ($5000) and Clay Mathematics Institute ($2000).
- Co-organizer of a special session "Algebraic Geometry and Singularity theory" in the Biannual Congress of the Royal Spanish Mathematics Society. Pamplona, January 22–26, 2024.
- Co-organizer of the annual meeting of the Spanish Algebraic Geometry and Singularities network. Bilbao, January 10–13, 2023.
- Co-organizer, Stockholm Master Class "Local cohomology and related topics". Stockholm, August 1–5, 2022. External funding by the European Mathematical Society.
- Refereeing for La Caixa Foundation and multiple journals: Compositio, Crelle's, London Mathematical Society, American Mathematical Society, Math. Z., Nagoya Math. J., J. Algebra., etc.