

# Nikolay Grantcharov

• nikolayg@uchicago.edu • US Citizen

## EDUCATION

### University of Chicago

- Ph.D. in Mathematics, advised by Victor Ginzburg

Sep 2019-

### University of California, Berkeley

- B.A. in Mathematics
  - Graduated with highest honors

Aug 2015 – May 2019

## ACADEMIC AWARDS

- NSF Graduate Research Fellowship \$102,000 2020 – 2023
- Dorothea Klumpke Roberts Prize in Mathematics May 2019  
UC Berkeley department prize awarded to seniors who have demonstrated truly exceptional scholarship in mathematics
- UC Berkeley Regents' and Chancellor's Scholarship, \$10,000 2015 – 2019  
Awarded to 200 undergraduates each year, most prestigious scholarship offered by UC Berkeley.
- UC Berkeley Dean's Honors List Aug 2015– May 2017  
Top 4% of UC Berkeley College of Letters and Science Undergraduates.

## RESEARCH EXPERIENCE

My primary research interests are representation theory and algebraic geometry. Currently I am studying the infinitesimal structure to the moduli space of principal  $G$  bundles on a curve over an arbitrary algebraically closed field. Previously, I worked on the representation theory for Cherednik algebras in positive characteristic (with divided powers).

### Extension Quiver for Lie Superalgebra $\mathfrak{q}(3)$

May 2017–May 2019

- *SIGMA*, **16** (2020), 141, 32 pages <https://www.emis.de/journals/SIGMA/2020/141/>
- Together with V. Serganova, we used standard representation theoretic techniques such as highest weight theory, induction and restriction functors, and Bott-Borel-Weil theory to compute the cohomological  $\text{Ext}^1$  group between all finite-dimensional simple  $\mathfrak{q}(3)$ -supermodules.

### Support Varieties for Simple Classical Lie superalgebras

May 2017–Oct 2018

- *Advances in Mathematics*, **381** (April 2021), 107647, 44 pages <https://arxiv.org/pdf/1810.06980v3.pdf>
- With collaborators D. Nakano, D. Grantcharov, and J. Wu, we introduced a class of parabolic superalgebras which allowed us to prove a support variety conjecture for all simple classical Lie superalgebras  $\mathfrak{g} = \text{Lie}(G)$ . As a byproduct, we computed the higher sheaf cohomology  $R^j \text{ind}_P^G \mathbb{C}$  using data from the Bott-Borel-Weil theorem.

### Galois Representations valued in Reductive Groups and their Centralizers

Jun 2018–Aug 2018

- Preprint available at UMich REU website.
- With Michigan REU advisor T. Kaletha and student W. Reeves, we classified certain Galois representations - depth-zero supercuspidal Langlands parameters - which arise from the local Langlands correspondence. This was accomplished by studying the root system and Weyl group of a complex reductive group and group cohomology.

## TEACHING

### University of Chicago Instructor

Sep 2021 – Jun 2022

- Spring 2022: Math 133 Calculus III.
- Winter 2022: Math 132 Calculus II
- Fall 2021: Math 131 Calculus I.

### University of Chicago College Fellow

Sep 2020 – Jun 2021

- Spring 2021: Math 259 Honors Basic Algebra III, taught by F. Calegari.
- Winter 2021: Math 244 Introduction to Algebraic Geometry, taught by S. Filip.
- Fall 2020: Math 254 Basic Algebra I, taught by P. Tosteson.

### AwesomeMath Summer Program Instructor

Jun 2017 – Today

- AwesomeMath is a 3 week long summer program for gifted high school students training for math olympiads such as USAMO and IMO.
- Taught and prepared course material daily for Geometry 2.5 (intermediate) in multiple camps during Summers of 2017 - 2020 and Geometry 3 (advanced) Summer 2021.
- Developed course curriculum and wrote course notes for new Geometry course (2021)

## SEMINARS ORGANIZED

### The BunG seminar.

Jan 2023 – Today

- Co-founded the BunG seminar <http://math.uchicago.edu/bundles/> with Aaron Slipper in Winter 2023 quarter.

- WORK EXPERIENCE**
- UChicago Math Homework Grader** Sep 2022 –Today
    - Grader and TA for graduate Algebra I Fall 2022, Fall 2023.
    - Grader for undergraduate Algebra II Winter 2023.
  - UChicago Math DRP Mentor** Sep 2022 –Today
    - Mentored C. Chang in a representation theory for finite groups and Lie algebras reading course
  - UChicago REU Mentor** Jun 2020 – Aug 2020
    - Helped run the apprentice program and mentored J. Yang on project “Super five of Ramsey Theory” and G. Graham “The ring of symmetric polynomials”
  - Berkeley Math Circle Assistant** Jul 2015 – Jul 2016
    - Managed BMC Website (<http://mathcircle.berkeley.edu>).
    - Handled email communication with BMC instructors, parents and students.
    - Helped with selection process for 400 applicants.
  - Berkeley Math Homework Grader** Jan 2017 – May 2019
    - Grade weekly homework assignments for Abstract Algebra (113) for 40 students in the following terms: Spring 2017, Summer 2017, Fall 2017, Spring 2018, Spring 2019.
    - Grade for graduate level Commutative Algebra (250B) Spring 2019 term.
  - AwesomeMath Summer Program Teaching Assistant** Jun 2014 – Aug 2016
    - In charge of problem sessions, held office hours, and graded exams for two courses per camp.
    - Throughout 7 camps, I was a TA for: Algebra 2.5, 3.5; Geometry 1.5, 2.5; Number Theory 2.5.
- CONFERENCE TALKS**
- AMS Fall 2023 Sectional, Mobile Alabama, “Infinitesimal Structure of BunG” (20 minutes), October 15, 2023.
  - AMS Spring 2023 Sectional, Cincinnati Ohio, “Infinitesimal Structure of BunG” (20 minutes), April 15, 2023.
  - Workshop on Supergeometry, Fields Institute, Toronto, Ontario, “Finite-dimensional representations of the queer Lie supergroup  $Q(n)$ ” (25 minutes), March 21, 2022.
  - Southeast Lie Theory XII, Charleston, South Carolina, “BBW parabolics for classical Lie superalgebras” (15 mins), October 16, 2021.
  - Representation Theory and Integrable Systems conference, Zurich, Switzerland, “Extension quiver for Lie superalgebra  $q(3)$ ” (15 mins), August 14, 2019, Slides.
- SEMINAR TALKS**
- UChicago BunG seminar, “Local and Global Hitchin Map”, October 18, 2023.
  - University of Bath representation theory seminar, “Mini-lecture series on Cherednik Algebras”, August 12-15, 2023.
  - UChicago BunG seminar, “Infinitesimal structure of BunG”, March 28, 2023.
  - UChicago student representation theory seminar, “A Compactification of a configuration space for curves”, May 27, 2022.
  - UChicago student representation theory seminar, “Haiman’s proof of the  $n!$  conjecture, parts I and II”, (90 mins each), October 20 and 27, 2021.
  - Columbia University student seminar on category  $\mathcal{O}$  (online), “Projective Functors” (90 mins), April 2, 2021.
  - Columbia University student seminar on category  $\mathcal{O}$  (online), “Parabolic Category  $\mathcal{O}$ ” (90 mins), February 12, 2021.
  - Superalgebra Theory and Representations seminar (online), Weizmann institute, “Finite-dimensional representation theory of the queer Lie superalgebra  $q(n)$ ” (75 mins), December 2, 2020.
  - Columbia University student seminar on category  $\mathcal{O}$  (online), “Translation functors for BGG category  $\mathcal{O}$ ” (90 mins), September 18, 2020.
  - Global Langlands over function fields seminar, UC Berkeley, April 4, 2019. “Excursion operators” (90 mins).
  - Math Monday undergraduate seminar, UC Berkeley, April 22, 2019. “Symmetric Polynomials and Representation Theory” (60 mins).
- SELECTED CONFERENCES**
- Quantized symplectic singularities and applications to Lie theory. MIT, 13-17 June 2022.
  - Lie Theory and Poisson Geometry. CIRM, 10-14 January 2022
  - Graduate Summer school on geometry and modular representation theory of algebraic groups, Stony Brook, NY, August 19-23, 2019.

**SERVICE**                   • Reviewer for AMS Mathematical Reviews, 2021 – today.

**LANGUAGES**           English (Fluent), Bulgarian (Fluent),

**SKILLS**                 Python, HTML, Scheme, L<sup>A</sup>T<sub>E</sub>X, Java.

**REFERENCES**         Available upon request.

*CV updated on 2023-10-26*