

# Umut Varolgunes

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## Employment

Postdoc positions

- Researcher at Bogazici University: November 2021 - present  
(under TUBITAK 2236 CoCirculation2; New Horizon 2020 Marie Skłodowska-Curie Actions Cofund Program, on leave Nov. 2021 - Feb. 2022 at University of Edinburgh)
- Researcher at University of Edinburgh: September 2021 - November 2021
- Szego Assistant Professor at Stanford University: September 2018 - June 2021

## Education

Graduate - Massachusetts Institute of Technology

- September 2013 - May 2018
- PhD. in Mathematics
- Advisor: Paul Seidel
- Thesis title: Mayer-Vietoris property for relative symplectic cohomology

Undergraduate - Massachusetts Institute of Technology

- September 2009 - May 2013
- Bachelor of Science degrees in Mathematics and Physics
- GPA: 4.8/5

## Research Interests

symplectic geometry, Floer theory, algebraic geometry

## Awards and Honors

Gold Medals in 2008 and 2009 International Mathematics Olympiads.  
MIT Praecis Presidential Fellowship 2013 - 2014

## Languages

Turkish (native), English (fluent)

## Publications

Locality of relative symplectic cohomology for complete embeddings (joint with Yoel Groman), accepted for publication in *Compositio Math.* (87 pages)

On homological mirror symmetry for chain type polynomials (joint with Alexander Polishchuk), accepted for publication in *Mathematische Annalen* (48 pages)

On certain quantifications of Gromov's non-squeezing theorem (joint with Kevin Sackel, Antoine Song and Jonathan Zhu), accepted for publication in *Geometry & Topology* (38 pages)

Quantum cohomology as a deformation of symplectic cohomology (joint with Nick Sheridan and Strom Borman), *JFPTA Viterbo* 60 Volume 24.2 (2022): 1–77

Seifert form of chain type singularities, *Kyoto Journal of Math* 63.1 (2023): 155–193

Super-rigidity of certain skeleta using relative symplectic cohomology (joint with Dmitry Tonkonog), *Journal of Topology and Analysis*, Volume No. 15 (2023), Issue No. 01, 57–105

Mayer-Vietoris property for relative symplectic cohomology, *Geometry & Topology* 25-2 (2021), 547–642

On the equatorial Dehn twist of a Lagrangian nodal sphere, *Proceedings of the 22nd Gokova Geometry/Topology conference* (2017), 112–137

## Preprints

Framed  $E_2$  structures in Floer theory (joint with Mohammed Abouzaid and Yoel Groman) - <https://arxiv.org/abs/2210.11027> (82 pages)

Closed string mirrors of symplectic cluster manifolds (joint with Yoel Groman) - <https://arxiv.org/abs/2211.07523> (52 pages)

A characterization of heaviness in terms of relative symplectic cohomology (joint with Cheuk Yu Mak and Yuhan Sun) - <https://arxiv.org/abs/2301.12625> (19 pages)

## Organizational Activity

Cofounder for Kylerec graduate student workshops

The first of these was organized in 2016 in New Orleans as a Talbot style event for symplectic geometry: <https://math.mit.edu/~kyler/workshop/main.html>. We used Emmy Murphy's funds along with a small NSF contribution. The next year we started using the name Kylerec and were able to get one year of funding from NSF to organize the second annual event in Truckee: <https://kylerec.wordpress.com/kylerec-2017/>. In the third year the organizers were able to secure NSF funding for three years based on the success of the first two events. After a COVID-19 related hiatus Kylerec continued with its fifth edition in 2022. For more information <https://kylerec.wordpress.com/>.

Organizer for Stanford Symplectic Geometry Seminar 2018-2020

Organizer for North California Symplectic Geometry Seminar 2018-2020

Organizer for the conference "Mirror symmetry for Looijenga interiors and beyond"

This was a two week hybrid event that consisted of a summer school at the Feza Gürsey Institute on 18-22 July, 2022 and a research conference on 25-29 July, 2022 at the Math Department of Bogazici University. Please see <https://umutvg.github.io/Looijenga.html> for details on the mathematical content including a complete set of notes and video recordings. We hosted a number of graduate students and speakers in Istanbul. Even when the speaker was not physically present their talk was watched together using a projection system. Feza Gürsey Institute had not been funded for a long period and we used this chance to revitalize the institute, buying many necessary appliances, computer equipment and so on.

Organizer for the "Dual perspectives" seminars

The goal of these 1-day events was to foster communication and collaboration between mathematicians and theoretical physicists. Meetings took place on Friday's at Feza Gürsey Center for Physics and Mathematics during Spring 2023 term. Please see <https://umutvg.github.io/dp.html> for details.

Organizer for the workshop "Geometry in İstanbul"

This was a two-day workshop that took place on 10-11 April, 2023 at the Feza Gürsey Institute. Please see <https://umutvg.github.io/geoistI.html> for details on the mathematical content.

Organizer for the workshop "Mirror symmetry and differential equations"

This was a week long workshop that took place on 10-14 July, 2023 at the Feza Gürsey Institute. Please see <https://umutvg.github.io/MSDE.html> for details on the mathematical content.

## Mentoring

During my graduate student years at MIT

- Lead a knot theory reading group for three high school students via the PRIMES program
- Conducted a guided reading with the undergraduate student Julian Chaidez on symplectic geometry via the DRP program
- Mentored the high school student Valerie Zhang on a project that involved programming and braid groups again via PRIMES
- Mentored the undergrad student Yuchen Fu on a project regarding Maslov indices of random paths in the group of symplectic matrices via UROP+, which lead to <https://arxiv.org/abs/1610.08614>

During my time as a postdoc at Stanford University :

- Conducted a summer guided reading with PhD student Daren Chen of Kontsevich's "Feynman diagrams and low dimensional topology"
- Acted as one of the mentors in the graduate student workshop Kylerec 2019 <https://kylerec.wordpress.com/kylerec-2019/>

At Bogazici University (present)

- Conducted a research project on computing skeleta inside complex projective line with the undergrad student Mert Akdenizli
- Guided reading on basic Floer theory with the master student Tolga Temiz
- Organized a week-long summer school before the conference "Looijenga interiors and beyond" for graduate students at the Feza Gursey Institute <https://umutvg.github.io/Looijenga.html>

**Teaching**

TA for 18.01/02A (Expedited single and multi variable calculus), Fall 2015, MIT

TA for 18.03 (Differential equations), Spring 2016, MIT

TA for 18.095 (Winter break lecture series), Winter 2018

Lecturer for Math 113 (Linear algebra with proofs, undergraduate), Winter 2019, Stanford

Lecturer for Math 215B (Differential topology, graduate), Winter 2019, Stanford

Lecturer for Math 257C (Hamiltonian Floer theory, advanced graduate), Autumn 2019, Stanford

Lecturer for Math 257A (Symplectic geometry, graduate) Fall 2019, Stanford

Lecturer for Math 147 (Differential topology, undergraduate) Fall 2019, Stanford

Lecturer for Math 53\* (Ordinary differential equations, undergraduate) Spring 2020, Stanford

Lecturer for Math 215B (Differential topology, graduate), Winter 2021, Stanford

Lecturer for Math 53\* (Ordinary differential equations, undergraduate) Spring 2021, Stanford

Lecturer for Math 113 (Linear algebra with proofs, undergraduate), Spring 2021, Stanford

Lecturer for Math 58J (Cohomology of manifolds I, undergraduate), Spring 2022, Bogazici University

Lecturer for Math 58T (Cohomology of manifolds II, undergraduate), Spring 2023, Bogazici University

Mini course on my thesis (4 lectures) - Columbia University, Spring 2017

Mini course on relative symplectic cohomology (8 lectures) - Edinburgh, Fall 2021

\*more than 100 students

**Invited talks**

Preprint seminar on symplectic geometry and related topics - Columbia University, October 12, 2015

23rd Gokova Geometry and Topology Conference - May 30 - June 4, 2016

Symplectic Geometry Seminar - Stanford University, January 30, 2017

Student Symplectic Seminar - Stanford University, February 9, 2017

Math-Physics Joint Seminar - UPenn, April 18, 2017

Symplectix seminar - Paris, September 15, 2017

Geometry/Physics seminar - Northwestern University, September 28, 2017

Topology and Symplectic Geometry / Math of Gauge Fields seminar - Stony Brook University, October 5, 2017

Symplectic Geometry Seminar - Stanford University, October 9, 2017

Seminar on Mirror Symmetry - UC Berkeley, October 13, 2017

Topology Seminar - Princeton University, October 19, 2017

Geometry/Topology Seminar - UC Davis, January 22, 2019

North Carolina Symplectic Geometry Seminar - Stanford, May 6, 2019

Mathematics seminar - Korean Institute of Advanced Study, Seoul, August 30, 2019

Symplectic seminar - Stony Brook University, September 12, 2019

Symplectic geometry, Gauge theory and Categorification Seminar - Columbia University, September 13, 2019

Simons Collaboration on Homological Mirror Symmetry Annual meeting - New York, November 14, 2019

Topology Seminar - University of Oregon, March 10, 2020

Geometry, Symmetry and Physics Seminar - Rutgers University (online), May 14, 2020

M-Seminar - Kansas State University (online), May 28, 2020

Western Hemisphere Symplectic Geometry Seminar (online) - June 26, 2020

UCGEN Seminar (online) - September 23, 2020

Montreal, Princeton/IAS, Paris, Tel-Aviv Symplectic Zoominar (online) - October 16, 2020

Boston University Geometry & Physics seminar (online) - March 24, 2021

Beijing-Novosibirsk seminar on geometry and mathematical physics (online) - April 15,

2021

Shafarevich Seminar - Steklov Institute, September 21, 2021

3CinG Annual Congress (online) - September 22, 2021

Friday seminar (?) - Higher School of Economics, September 24, 2021

Freemath (online) - September 28, 2021

Differential geometry and topology seminar - Cambridge University, October 27, 2021

Hodge Seminar - Bayes Center, Edinburgh, November 4, 2021

Geometry and dynamics seminar - Tel-Aviv University (online), November 10, 2021

Symplectic and Poisson geometry seminar - University of Illinois at Urbana-Champaign (online), November 29, 2021

Geometry and Topology seminar - Michigan State University (online), December 7, 2021

Workshop on Mirror symmetry and Related Topics - Kyoto (online), December 13, 2021

Global Youth Forum - USTC-IGP, Hefei (online), January 11, 2022

Nick Sheridan's postdoc seminar - Bayes Center, Edinburgh, January 19, 2022

GeNeSys: Geneva-Neuchâtel Symplectic geometry seminar, January 24, 2022

Montreal, Princeton/IAS, Paris, Tel-Aviv Symplectic Zoominar (online) - February 18, 2022

IMBM - Istanbul, February 17-22-25, 2022

Geometry and dynamics seminar (TIDY Distinguished Speaker) - Tel-Aviv University, April 27, 2022

Pure Maths Colloquium - Sheffield University (online), May 25, 2022

Math Department Colloquium - Koc University, October 20, 2022

Math Seminar - Bilkent University, November 16, 2022

Symplectic Geometry, Gauge Theory, and Categorification Seminar - Columbia University, December 16, 2022

Topology Seminar - University of Southern California, January 11, 2023

Symplectic geometry seminar - Stanford University, January 19, 2023

Symplectic Geometry, Gauge Theory, and Categorification Seminar - Columbia University, January 31, 2023

Geometria em Lisboa - IST (online), March 14, 2023

Hong Kong University of Science and Technology - Mirror symmetry via relative invariants, March-April, 2023 (6 hours)

M-Seminar - Kansas State University (online), April 7, 2023

Edge Seminar - Bayes Center, Edinburgh, May 17, 2023

The London Geometry and Topology Seminar - Imperial College, London, May 19, 2023

28th Gokova Geometry and Topology Conference, May 29 - June 3, 2023

29th Nordic Congress of Mathematicians (with EMS) at Aalborg University, July 3-7, 2023

Workshop on Symplectic Topology, University of Belgrade, August 21 - 25, 2023

GeoStaR 2 workshop, Basel, Switzerland, September 17-19, 2023

UMass Boston Math Colloquium, October 24, 2023