BILAL AYTEKIN

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EDUCATION

Boğaziçi University, Istanbul, Turkey   2018–2023
Computer Engineering B.Sc., Mathematics B.Sc.   GPA: 3.71

RESEARCH INTERESTS

Number theory, arithmetic geometry, algebraic geometry, formalization.

PREPRINTS

1. **An Alexandrov Topology for Maximal Cohen-Macaulay Modules** (with Mert Akdenizli, Baran Çetin, and Özgür Esentepe),
   submitted, arXiv:2210.03532

RESEARCH EXPERIENCE

Working Group on the Arithmetic of Elliptic Curves   June 6–November 1, 2022
Supervisor: Mohammad Sadek, Sabancı University   *Arithmetic Statistics*

· Determined the percentage of elliptic curves with root number 1 or -1 at each Kodaira type.
· I have implemented an algorithm in Sage to calculate the relative densities.
· This project started at the CIMPA Summer School on Applied Arithmetic. A report for the workshop is out, and a preprint concerning families of elliptic curves with fixed root number is to follow.

Research on Arithmetic Dynamics   March 2022 - June 2022
Supervisor: Alp Bassa, Boğaziçi University   *Arithmetic Dynamics*

· Worked on the iterative behavior of irreducible polynomials over finite fields by translating the question into one about the splitting behavior of prime ideals in extensions of algebraic function fields.

Counting Varieties with Complex Multiplication   October 2021–August 2022
Supervisor: Ayhan Günaydın, Boğaziçi University   *Arithmetic Geometry*

· After studying papers of Evertse, Evertse-Schlickewei-Schmidt, Wüstholz, and Pila-Wilkie, we turned to searching for an appropriate o-minimal point counting argument to count abelian varieties with CM.

Research Group on Cohomology Annihilators   September 2021–October 2022
Supervisor: Özgür Esentepe, University of Leeds   *Homological Algebra*

· Classified all matrix factorizations of ADE-type singularities and put a topology on their MCM-modules to determine their cohomology annihilator ideals. (arXiv:2210.03532)
· I have used Singular to calculate the annihilator ideals.

SERVICE

Grader for Introduction to Probability and Statistics for Computer Engineers, Fall 2022.

Assistant for Graduate Algebra II, Fall 2022.

Co-organized the Alternative Summer School, an unofficial summer school where each participant lectured about their favorite topic. Mine was algebraic geometry.

TALKS

Local and Global Root Numbers of Elliptic Curves June 10, 2022
Summer School on Applied Arithmetic, Midterm Presentations (video)

Torsion Subgroups of Elliptic Curves September 12, 2021
Directed Reading Program Turkey Symposium 2021

WORKSHOPS ATTENDED

Preliminary Arizona Winter School 2022 October 3–November 11, 2022
Southwest Center for Arithmetic Geometry *Arithmetic Geometry*

· 6-week long workshop to prepare for the Arizona Winter School 2022 on Unlikely Intersections.
· Took the *Heights in Diophantine Geometry* course given by Padmavathi Srinivasan, introducing heights on elliptic curves to prove the Mordell-Weil conjecture and to hint at Faltings' Theorem.

2022 Xena Project Undergraduate Workshop September 26–30, 2022
Imperial College London *Formal Mathematics*

· Formalized the solution sets of some Pell equations.

CIMPA Summer School on Applied Arithmetic June 6–17, 2022
Nesin Mathematics Village *Arithmetic Statistics*

· The workshop gathered master and Ph.D. students in small working groups on open questions.
· Attended plenary lectures by Aurel Page (Université de Bordeaux) on algorithmic number theory.

Research in Mathematics Program August 30–September 12, 2021
Istanbul Center for Mathematical Sciences

· Ten researchers introduced their research area in 4-lecture series yielding the collaboration above.

Tools and Software in Algebraic Geometry August 23–27, 2021
Istanbul Center for Mathematical Sciences *Algebraic Geometry*

· This CIMPA course gave an introduction to theta functions theory and algebraic curves.
· Manipulated the objects of discussion using Magma and Sage.

Directed Reading Program Turkey July 12–September 12, 2021
Supervisor: Irmak Balçık, University of Texas at Austin *Elliptic Curves*

· Studied *Torsion of Rational Elliptic Curves over Cubic Fields and Sporadic Points on $X_1(n)$* by Najman.

AUDITED COURSES

Graduate Algebra I & II Fall 2022 & Spring 2022
Instructor: Ayhan Günaydın, Boğaziçi University.

Graduate Algebraic Geometry I & II Fall 2021 & Spring 2022
Instructor: Özgür Kişisel, Middle East Technical University

REFERENCES

- Assoc. Prof. Alp Bassa, Boğaziçi University.
- Dr. Özgür Esentepe, University of Leeds.
- Assoc. Prof. Ayhan Günaydın, Boğaziçi University.
- Assoc. Prof. Mohammad Sadek, Sabancı University.