Atabey Kaygun

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Contact Information

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Department of Mathematics
Istanbul Technical University
34469 Maslak Istanbul, Turkey

Research Interests Homological and homotopical algebra. Cyclic and Hochschild (co)-homology of algebras, coalgebras and Hopf algebras. Applied statistics, machine learning, statistical and topological data analysis.

Languages *Turkish (native), English (fluent), French (beginner).*

Work Experience

ISTANBUL TECHNICAL UNIVERSITY, Istanbul, Turkey
Professor Dec 2019 – Present
Associate Professor Feb 2016 – Dec 2019

QUEEN'S UNIVERSITY, Kingston, ON, Canada
Visiting Professor Jun 2019 – Dec 2020

BAHÇEŞEHIR UNIVERSITY, Istanbul, Turkey
Associate Professor Jun 2011 – Sep 2015
Assistant Professor Sep 2009 – Jun 2011

UNIVERSITY OF BUENOS AIRES, Buenos Aires, Argentina
Postdoctoral Researcher Feb 2009 – Jun 2009

MAX-PLANCK-INSTITUT FÜR MATHEMATIK, Bonn, Germany
Postdoctoral Researcher Jul 2008 – Feb 2009

THE OHIO STATE UNIVERSITY, Columbus, Ohio, USA
Ross Assistant Professor Sep 2007 – Jul 2008

KMMF-WARSAW UNIVERSITY, Warsaw, Poland
Postdoctoral Fellow Oct 2006 – Dec 2006

THE UNIVERSITY OF WESTERN ONTARIO, London, Ontario, Canada
Fields Postdoctoral Fellow Jul 2005 – Jul 2007

THE OHIO STATE UNIVERSITY, Columbus, Ohio, USA
Adjunct Lecturer Apr 2005 – Jul 2005
Graduate Teaching Assistant Sep 1996 – Apr 2005

INTERNATIONAL CENTER FOR THEORETICAL PHYSICS, Trieste, Italy
Diploma Fellow Aug 1995 – Aug 1996

Education

THE OHIO STATE UNIVERSITY, Columbus, Ohio, USA
Ph.D. Mathematics [2005] "Bialgebra cyclic homology with coefficients." Advisor: H. Moscovici

BOĞAZIÇI UNIVERSITY, Istanbul, Turkey
M.Sc. Mathematics [1995] "t-Motives." Advisor: I. K. Ikeda
B.Sc. Mathematics [1993]

Publications (in reverse order)

1. H. C. Kaya and A.Kaygun *A Model Categoric Equivalence for Crossed Simplicial Groups.* `arXiv:2402.19291` (Submitted.)
2. M. C. Aşkaroğulları and A. Kaygun *The Leibniz PROP is a crossed presimplicial algebra.* `arXiv:2404.10925` (Submitted.)

3. A. Kaygun and S. Sütü. *Quantum van Est Isomorphism.* Journal of Noncommutative Geometry (2024).
DOI: 10.4171/JNCG/580
4. A. Kaygun. *Birational Equivalences and Kac-Moody Algebras*, Bulletin des sciences mathématiques 193 (2024).
DOI:10.1016/j.bulsci.2024.103451
5. A. Kaygun. *Birational equivalences and generalized Weyl algebras*,
`arXiv:2009.14801` (Submitted.)
6. İ. Güzel and A. Kaygun. *Classification of Stochastic Processes with Topological Data Analysis*, Concurrency and Computation, Practice and Experience.
DOI:10.1002/cpe.7732
7. İ. Güzel and A. Kaygun. *A New Non-archimedan Metric on Persistent Homology*, Computational Statistics (2022).
DOI: 10.1007/s00180-021-01187-z
8. B.A. Ergene and A. Kaygun. *Change Visible from a Distance: Digital Analysis of Ottoman Şeyhülislam's Fetvas in the Early Modern Era.*
International Journal of Middle East Studies, 1-20.
DOI:10.1017/S0020743822000460
9. E. G. Bayırlı, E. Öz and A.Kaygun. *Mathematics Assessment for Asia-Pacific Countries Using Educational Data Mining.*, Mathematics 2023, 11, 1318.
DOI:10.3390/math110613
10. A. Karan and A. Kaygun. *Time Series Classification via Topological Data Analysis*, Expert Systems with Applications, Volume 183, 2021, 115326.
DOI: 10.1016/j.eswa.2021.115326
11. B.A. Ergene and A. Kaygun. *The Textual Evolution of the Ottoman Şeyhülislams' Fetvas: A Cross-Corpora Computational Analysis.* Der Islam 2021; 98 (2).
DOI: 10.1515/islam-2021-0031
12. B.A. Ergene and A. Kaygun. *Semantic Mapping of An Ottoman Fetva Compilation: Fetavayı Ebussuud through a Textual-Computational Lens.* Journal of Islamic Studies, Volume 32, Issue 1, 1 January 2021, Pages 62–115.
DOI: 10.1093/jis/etaa032
13. A. Kaygun and S.Sütlü. *Homology of quantum linear groups.* Homology, Homotopy and Applications, Volume 23 (2021), Number 2, Pages: 9 – 31.
DOI: 10.4310/HHA.2021.v23.n2.a2
14. A. Kaygun and S.Sütlü. *On the Hochschild homology of smash biproducts.* Journal of Pure and Applied Algebra, Volume 225, Issue 2, 2021.
DOI: 10.1016/j.jpaa.2020.106506
15. A. Kaygun. *Noncommutative Fibrations*, Communications in Algebra, Volume 47, 2019 - Issue 8.
DOI: 10.1080/00927872.2018.1559850
16. P.M. Hajac, A. Kaygun and M. Tobolski. *A graded pullback structure of Leavitt path algebras of trimmable graphs.* Banach Center Publications 120 (2020), 47-52.
DOI: 10.4064/bc120-4
17. A. Kaygun and S.Sütlü. *The asymptotic characteristic map and the index cocycles*, Banach Center Publications 120 (2020), 221-244.
DOI: 10.4064/bc120-15

18. A. Kaygun and S. Sütlü *Hopf-Dihedral Cohomology and L-Theory*, Journal of Noncommutative Geometry 12 (2018), 69-106.
DOI: 10.4171/JNCG/271

19. M. Kanuni, A. Kaygun and S. Sütlü, *Hochschild cohomology of reduced incidence algebras*, Journal of Algebra and Its Applications, Vol. 16, No. 9. (2017)
DOI: 10.1142/S0219498817501687

20. A. Kaygun and S. Sütlü, *A characteristic map for compact quantum groups.* Journal of Homotopy and Related Structures, (2017) 12:549.
DOI: 10.1007/s40062-016-0138-y

21. A. Kaygun and S. Sütlü, *Hopf-Cyclic Cohomology of Quantum Enveloping Algebras*, Journal of Noncommutative Geometry; Volume 10, Issue 2, 2016, pp. 429–446
DOI: 10.4171/JNCG/238

22. B.A. Ergene and A. Kaygun *Log-linear Analysis of Intergenerational Mobility in Eighteenth-Century Ottoman Anatolia.* Journal of the Economic and Social History of the Orient, Vol. 57, (2014), pp 669-702.
DOI: 10.1163/15685209-12341361

23. M.M. Coşgel, B.A. Ergene and A. Kaygun *Temporal Analysis of Wealth and Inequality in Eighteenth-Century Ottoman Empire*. Continuity and Change, Volume 28, Issue 01 (May 2013), pp 1-26.
DOI: 10.1017/S026841601300009X

24. P.M. Hajac, A. Kaygun and B. Zielinski, *Finite closed coverings of compact quantum spaces*, Operator Algebras and Quantum Groups. Banach Center Publ. 98 (2012) P.M. Soltan and W. Pusz Eds.
DOI: 10.4064/bc98-0-8

25. P.M. Hajac, A. Kaygun and B. Zielinski, *Quantum projective space from Toeplitz cubes*, Journal of Noncommutative Geometry, Volume 6, Issue 3, 2012, pp. 603–621.
DOI: 10.4171/JNCG/100

26. A. Kaygun, *Jacobi-Zariski exact sequence for Hochschild homology and cyclic cohomology,* Homology, Homotopy and Applications, Vol. 14 (2012), No. 1, pp.65-78.
DOI: 10.4310/HHA.2012.v14.n1.a4
Erratum to "Jacobi–Zariski exact sequence for Hochschild homology and cyclic (co)homology", Homology Homotopy Appl. 21, No. 2, 301-303 (2019).
DOI: 10.4310/HHA.2019.v21.n2.a16

27. B.A. Ergene and A. Kaygun *Spouse Selection and Marital Mobility in the Ottoman Empire: Observations from Eighteenth-Century Kastamonu.* Historical Methods: A Journal of Quantitative and Interdisciplinary History, Volume 45, Issue 1, 2012.
DOI: 10.1080/01615440.2011.624984

28. A. Kaygun, *A survey on Hopf-cyclic cohomology and Connes-Moscovici characteristic map*. Contemporary Mathematics, Vol. 546 pp. 171-179 (2011)
DOI: 10.1090/conm/546

29. B.A. Ergene and A. Kaygun *Intergenerational Mobility in the in the Ottoman Empire: Observations from Eighteenth-Century*. The History of the Family, Volume 16, Issue 1, 15 March 2011, Pages 30-46.
DOI: 10.1016/j.hisfam.2010.10.003

30. A. Kaygun, *Uniqueness of pairings in Hopf cyclic cohomology*, Journal of K-Theory, Vol. 6 (2010), No. 1, pp.1-21.
DOI: 10.1017/is009007030jkt086

31. A. Kaygun and M. Khalkhali, *Bivariant Hopf cyclic cohomology*, Communications in Algebra, Vol. 38 (2010), No. 7, pp 2513-2537.
DOI: 10.1080/00927870903417695
32. A. Kaygun, *Products in Hopf cyclic cohomology*, Homology, Homotopy and Applications, Vol. 10 (2008), No. 2, pp.115-133.
DOI: 10.4310/HHA.2007.v9.n2.a17
33. A. Kaygun, *The universal Hopf cyclic theory*, Journal of Noncommutative Geometry, Vol. 2 (2008), No. 3, pp. 333-351.
DOI: 10.4171/JNCG/23
34. A. Kaygun, *Hopf-Hochschild (co)homology of module algebras*, Homology, Homotopy and Applications, Vol. 9 (2007), No. 2, pp.451-472.
DOI: 10.4310/HHA.2007.v9.n2.a17
35. A. Kaygun and M. Khalkhali, *Excision in Hopf cyclic cohomology*, K-Theory, Vol. 37 (2006), No. 1-2.
DOI: 10.1007/s10977-006-0002-7
36. A. Kaygun and M. Khalkhali, *Hopf modules and noncommutative differential geometry*, Letters in Mathematical Physics, Vol. 76 (2006) No. 1.
DOI: 10.1007/s11005-006-0062-x
37. A. Kaygun, *Bialgebra cyclic homology with coefficients*, K-Theory, Vol. 34 (2005), No. 2.
DOI: 10.1007/s10977-005-1501-7

Preprints (in reverse order)

İ. Güzel and A. Kaygun. *Persistent Homology, Matroids and Cobordisms.*
arXiv:2209.01099

A. Kaygun. *Enumerating Labeled Graphs that Realize a Fixed Degree Sequence*.
arXiv:2101.02299

M. Kanuni and A. Kaygun *Global dimension of some Artinian algebras.*
arXiv:math/1206.3726

A. Kaygun, *A Loday–Quillen–Tsygan theorem for coalgebras.*
arXiv:math/0411661

A. Kaygun, *Bialgebra cyclic homology with coefficients, Part II.*
arXiv:math/0409191

A. Kaygun, *Bialgebra cyclic homology with coefficients, Part I.*
arXiv:math/0408094

Projects

Scientific and Technological Research Council of Turkey, Grant 2219 (Aug 2020–Mar 2021)

Scientific and Technological Research Council of Turkey, Grant 2221 (Apr 2014-Sep 2014)

Graduate Students

Deniz Gözen: *Hopkins-Levitzki Theorem for Cocommutative Coalgebras.*	(MSc 2012)
İrem Karaduman: *Using Graph Theory in Solving Problems in Bioinformatics.*	(MSc 2013)
Mehmet Emin Gönen: *Counting and Listing a Special Class of Directed Graphs.*	(MSc 2013)
Kadriye Dilek Tefenlili: *Categories of Graphs and Operations on Graphs.*	(MSc 2014)
Deniz Topuz: *A Survey in Machine Learning Algorithms and Anomaly Detection.*	(MSc 2014)
Betül Güvenç: *Machine Learning Methods in Natural Language Processing*	(MSc 2015)
Ecem Tuğçe Cesur: *Path algebra and monomial ideals*	(MSc 2016)
Mine Melodi Çalışkan: *Data stream analysis*	(MSc 2018)
Elif Altınok: *Linear algebraic methods for machine learning*	(MSc 2019)

Kerem Kabil: *Discrete classification and clustering algorithms in Machine Learning* (MSc 2019)

Alp Eren Yilmaz: *A taxonomy of artificial neural networks* (MSc 2020)

Ertan Sönmez: *Enumerating all knots up to six crossings.* (MSc 2023)

Hakan Erce: (with Ümit Işlak) *Machine Learning Methods in Time Series Analysis.* (MSc 2023)

İsmail Güzel: *Topological Data Analysis and Clustering Algorithms.* (PhD 2023)

Ezgi Gülenç (with Ersoy Öz): *PISA 2018 Matematik Ve Fen Başarılarının Makine Öğrenmesi Yöntemleri İle İncelenmesi.* (PhD 2023)

Burak Batıbay: *A Support Decision System For Predicting Rating Values Of Preproduction TV Content: An Explainable Machine Learning Approach.* (MSc 2024)

Conferences and Workshops Organized

1. *Noncommutative Geometry Days in Istanbul I*, IMBM, July 2010.
2. *Noncommutative Geometry Days in Istanbul II*, IMBM, July 2011.
3. *ESF Exploratory Workshop on Interfaces of Noncommutative Geometry with the Representation Theory of Hopf Algebras and Artin Algebras*, IMBM, August 2012.

Recent Presentations

- *Thematic Change in Ottoman Fetvas*. 7th Islamicate Digital Humanities Network Online Conference, May 2022.
- *Semantic Mapping of a Fetva Collection: Ebussuud Efendi's Jurisprudence Through A Computational Lens*. Great Lakes Ottomanist Workshop (Online), McGill University, Montreal, Canada; April 2022.
- *From filtered complexes to matroids to cobordisms: an unlikely story in three parts*. Bilkent University Math Department Seminar (Online). April 2021.
- *Noncommutative Geometry for Fun and Profit.* Colloquium, Queen's University. Kingston, Ontario, Canada. November, 2019.
- *Distributive Laws, Smash Biproducts and Hochschild Homology.* Geometry and Representation Theory Seminar, Queen's University, Kingston, Ontario, Canada. September, 2019.
- *Cohomology of topological algebras via coalgebras.* Noncommutative Geometry Seminar. Noncommutative Geometry Seminar. IMPAN, Warsaw; October 2017.

Teaching Experience

ISTANBUL TECHNICAL UNIVERSITY:

- *Math 381E*: Introductory Data Science — Spring 2022
- *Math 555E*: Statistical Data Analysis for Computational Sciences — Spring 2022
- *Math 388E*: Data Science for Fundamental Sciences — Autumn 2021
- *Math 485E*: Graph Theory — Spring 2019
- *Math 332E*: Real Analysis I — Autumn 2018
- *Math 355E*: Topology — Spring 2017

Professional service

Reviewer for *AMS Mathematical Reviews* and for *ZbMath*.

Refereed for the journals *Letters in Mathematical Physics*; *Communications in Mathematical Physics*; *Journal of Noncommutative Geometry*; *Journal of Algebra*; *Homotopy, Homology and Applications*; *K-Theory*; *Journal of K-Theory*; *Discrete and Continuous Dynamical Systems Series B.*; *Chaos*; *Turkish Journal of Mathematics.*

Computers and related experience

`python`, `R`, `common lisp`, `clojure`, `scala`, `julia`, `sage`, `scheme`, `perl`, `c and c++`, `fortran`, `octave`, `matlab`, `mathematica`, `maple`, `singular`, `maxima`, `GAP`, LaTeX. Moderate experience with `java` and `haskell`. Unix shell programming with `bash`, `ksh` and `csh`.