Curriculum Vitae
Sinan G. Aksoy

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Research Interests

Network science and applied combinatorics, spectral and extremal graph theory, stochastic processes on graphs, mathematics of data science.

Education

2014 – 2017 **Ph.D., Mathematics**, University of California, San Diego.
Advisor: Fan Chung Graham

2012 – 2014 **M.A., Applied Mathematics**, University of California, San Diego.

2008 – 2012 **B.A., Mathematics, B.A., Economics** University of Chicago.
General Honors

Professional Experience

2017 – **Data Scientist**, Pacific Northwest National Laboratory

2016 Sum. **Intern**, Pacific Northwest National Laboratory.

2015 Fall **Visiting Scholar**, National Taiwan University, Mathematics Division NCTS.

2015 Sum. **Intern**, Sandia National Laboratories, Livermore.

Journal Articles

2020 13. S. Aksoy, E. Purvine, S. Young, *Importance measures for network flow using linear algebra*, submitted.

12. S. Aksoy, M. Kempton, S. Young, *Spectral threshold for extremal cyclic edge-connectivity*, submitted, arXiv:2003.02393

2019 11. S. Aksoy, P. Bruillard, S. Young, M. Raugas, *Ramanujan graphs and the spectral gap of supercomputing topologies*, submitted, arXiv:1909.11694

10. S. Aksoy, C. Joslyn, C. Ortiz-Marrero, B. Praggastis, E. Purvine, *Hypernetwork science via high-order walks*, submitted, arXiv:1906.11295

9. S. Aksoy, K. Nowak, E. Purvine, S. Young, *Relative Hausdorff distance for network analysis*, Applied Network Science, **4**(80), 2019, DOI: 10.1007/s41109-019-0198-0

8. S. Aksoy, K. Nowak, S. Young, *A linear-time algorithm and analysis of graph Relative Hausdorff distance*, SIAM J. Mathematics of Data Science, **1**(4):647–666, 2019, DOI: 10.1137/19M1248224

2018 7. S. Aksoy, F. Chung, M. Tait, J. Tobin, *The maximum relaxation time of a random walk*, Advances in Applied Mathematics, **101**:1–14, 2018, DOI: 10.1016/j.aam.2018.07.002

6. S. Aksoy, E. Purvine, E. Cotilla-Sanchez, M. Halappanavar, *A generative graph model for electrical infrastructure networks*, Journal of Complex Networks, DOI: 10.1093/comnet/cny016

2017 5. S. Aksoy, T. G. Kolda, A. Pinar, *Measuring and modeling bipartite graphs with community structure,* Journal of Complex Networks, **5**(4):581–603, 2017, DOI: 10.1093/comnet/cnx001

2016 4. S. Aksoy, F. Chung, X. Peng, *Extreme values of the stationary distribution of random walks on directed graphs,* Advances in Applied Mathematics, **81**:128–155, 2016, DOI: 10.1016/j.aam.2016.06.012

3. S. Aksoy, P. Horn, *Graphs with many strong orientations,* SIAM J. Discrete Math., **30**(2):1269–1282, 2016, DOI: 10.1137/15M1018885

2015 2. S. Aksoy, A. Azzam, C. Coppersmith, J. Glass, G. Karaali, X. Zhao, X. Zhu, *Coalitions and cliques in the school choice problem*, Involve, **8**(5):801–823, 2015, DOI: 10.2140/involve.2015.8.801

2012 1. S. Aksoy, S. Nelson, *Bikei, involutary biracks, and unoriented link invariants*, Journal of Knot Theory and Its Ramifications, **21**(6):13 pp., 2012, DOI: 10.1142/S0218216511009972

Refereed Conference & Workshop Proceedings

2019 5. Fan X., S. Aksoy, D. Wang, Q. Huang, J.P. Ogle, A. Tbaileh, R. Huang, *Automated Realistic Testbed Synthesis for Power System Communication Networks based on Graph Metrics*, to appear, 2020 IEEE Conference on Innovative Smart Grid Technologies North America

4. C. Joslyn, S. Aksoy, D. Arendt, L. Jenkins, B. Praggastis, E. Purvine, M. Zalewski, *High Performance Hypergraph Analytics of Domain Name System Relationships*, HICSS Symposium on Cybersecurity Big Data Analytics, 2019, PDF

2018 3. L. Jenkins, T. Bhuiyan, S. Harun, C. Lightsey, D. Mentgen, S. Aksoy, T. Stavenger, M. Zalewski, H. Medal, C. Joslyn, *Chapel HyperGraph Library (CHGL)*, 2018 IEEE High Performance Extreme Computing Conference (HPEC 18), DOI: 10.1109/HPEC.2018.8547520

2. E. Purvine, S. Aksoy, C. Joslyn, K. Nowak, B. Praggastis, M. Robinson, *A topological approach to representational data models*, In International Conference on Human Interface and the Management of Information, pp. 90–109. Springer, Cham, DOI: 10.1007/978-3-319-92043-6_8

2012 1. S. Aksoy, A. Azzam, C. Coppersmith, J. Glass, G. Karaali, X. Zhao, X. Zhu, *School Choice as a One-Sided Matching Problem: Cardinal Utilities and Optimization*, 2012 International Symposium on Artificial Intelligence, arXiv:1304.7413

Technical Reports

2020 3. S. Aksoy, J. Taft, *Connectivity, Centrality, and Bottleneckedness: On Graph Theoretic Methods for Power Systems*, Tech. Rep. PNNL-29662, PDF

2019 2. X. Fan, S. Aksoy, Q. Huang, J.P. Ogle, D. Wang, A. Tbaileh, and T. Fu, *Coordination of Transmission, Distribution and Communication Systems for Prompt Power System Recovery after Disasters Report*, Tech. Rep. PNNL-28598, PDF

1. Q. Huang, A. Tbaileh, S. Sharma, Q. Li, S. Aksoy, X. Fan, and R. Huang, *Mechanisms and data needed for coordinating restoration*, PNNL Tech. Rep. PNNL-28387

Software

- **Chapel Hypergraph Library** (Chapel) – Large-scale hypergraph generation and analysis.
- **HyperNetX** (Python) – Hypergraph visualization and exploratory data analytics.
- **Transactive Energy Simulation Platform** (Python) – Valuation and simulation of energy market mechanisms and participants.

Talks

2019 Sep. **AMS Fall Central Sectional** (Session on Combinatorics, Functions and Logic)
The maximum relaxation time of a random walk

2018 Jan. **AMS Joint Math Meetings** (Special Session: Applied and Computational Combinatorics)
Invited Talk: *A generative graph model for electrical infrastructure networks.*

2017 June **UC San Diego** (Final Defense)
Random walks on directed graphs and orientations of graphs.
Apr. **AMS Sectional**, Washington State University (Clustering of Graphs: Theory & Practice)
Invited Talk: *Measuring and modeling bipartite graphs with community structure.*
2016 Nov. **Purdue University** (Geometry Seminar)
Invited Talk: *Problems in the spectral theory of directed and oriented graphs.*
Oct. **AMS Fall Sectional**, University of Denver (Analysis on Graphs & Spectral Graph Theory)
Invited Talk: *Extreme values of the stationary distribution of random walks on directed graphs*.
Aug. **Pacific Northwest National Laboratory** (NSIP Symposium)
A generative graph model for the power-grid.
June **UC San Diego** (Stochastic Networks Conference: Short Talk & Poster Session)
Extreme values of the stationary distribution of random walks on directed graphs.
Feb. **Claremont Colleges** (Algebra, Number Theory, & Combinatorics Seminar)
Invited Talk: *Strong orientations of graphs and Cheeger's inequality.*
UC San Diego (Advancement to Candidacy Seminar)
Two problems on the spectral theory of directed graphs
Jan. **AMS Joint Math Meetings** (Special Session on Research from the GRWC)
Invited Talk: *Graphs with many strong orientations.*
2015 Sep. **Sandia National Laboratories, Livermore** (Seminar)
A generative bipartite graph model with affiliation structure.
2014 Aug. **University of Denver** (Graduate Research Workshop Open Problem Seminar)
The connectivity of randomly oriented graphs.
2010 July **Pomona College** (NSF-funded REU Seminar)
Game theory in school choice.

Teaching and Interns

evaluations at math.ucsd.edu/~saksoy/teaching.htm

2019– **Intern Supervisor**, Pacific Northwest National Laboratory
Mentees: Terran Mott (Grinnell), Summer 2019

2016–2017 **Head Teaching Assistant**, UC San Diego Math Department
Responsibilities: training and evaluating new TAs, serving as a first point of contact for conflicts and grievances, representing graduate students in departmental affairs.

2012–2016 **Teaching Assistant**, UC San Diego Math Department
12 Courses: Discrete Math & Graph Theory, Combinatorics, Complex Analysis, Mathematical Reasoning, Linear Algebra, Calculus and Analytic Geometry, Calculus I-III.

Fellowships and Awards

2019 **Author of the Year**, Pacific Northwest National Laboratory, National Security Directorate
2016 Jun. **Outstanding Poster Award**, Stochastic Networks Conference
2013–2014 **Graduate Student Research Fellowship**, UC San Diego
2012–2013 **Graduate Assistance in Areas of National Need Fellowship**, UC San Diego
2012–2013 **M. Salah Baouendi Graduate Fellowship**, UC San Diego
2012 Jun. **General Honors**, University of Chicago

Service

2020– **Reviewer**: Mathematical Reviews, MathSciNet

2013– **Referee**: Journal of Combinatorics, Theoretical Computer Science, Linear Algebra & Applications, Graphs & Combinatorics, SIAM J. Math Data Science, Journal of Algebraic Combinatorics, Ars Combinatoria

2015–2016 **Graduate Student Association Representative**, UC San Diego Math Department.

2014–2015 **Webmaster**, "Erdős' Problems on Graphs" website.

References

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