NEIL LUTZ
Visiting Assistant Professor, Swarthmore College
Affiliate Assistant Professor, Iowa State · Lecturer, Penn

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Homepage
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ACADEMIC APPOINTMENTS

Swarthmore College Computer Science Department
Visiting Assistant Professor (2021–present)

Iowa State University Department of Computer Science
Lecturer (2019–2020); Affiliate Assistant Professor (2021–present); Graduate Faculty (2025–present)

University of Pennsylvania Department of Computer and Information Science
Postdoctoral Researcher (2017–2019); Lecturer (2020, 2022–present)

EDUCATION

Ph.D. in Computer Science, Rutgers University, 2017
Dissertation: *Algorithmic Information, Fractal Geometry, and Distributed Dynamics*
Advisor: Rebecca N. Wright

M.S. in Mathematics, Rutgers University, 2016
Committee chair: Michael Saks

B.S. in Mathematics with General Honors, University of Chicago, 2008

RESEARCH INTERESTS

Theoretical computer science; algorithmic information theory and algorithmic randomness, with interfaces to fractal geometry; coordination in resource-limited multiagent systems; algorithmic fairness.

TEACHING

Swarthmore College

- Theory of Computation, fall 2022, fall 2025
- Algorithms, fall 2021, spring 2023, spring 2024, spring 2025
- Special Topics: Quantum Computing, fall 2024
- Special Topics: Computational Geometry, fall 2023
- Special Topics: Algorithmic Game Theory, spring 2022
- Directed Reading: Algorithmic Randomness and Geometry, fall 2025
- Directed Reading: Machine-Assisted Proof, fall 2025
- Directed Reading: Algorithmic Mechanism Design, fall 2022

Iowa State University

- Introduction to Data Structures, spring 2020
- Theory of Computing, fall 2019

University of Pennsylvania

- Algorithms & Computation (graduate), spring 2019, summers 2022–2025
- Introduction to Algorithms (undergraduate), fall 2017, fall 2018, fall 2020
- Theory of Computation (graduate, co-taught with Sampath Kannan), spring 2018
- Course development for Penn Engineering Online Learning:
    - Algorithms & Computation (graduate, co-developed with Sampath Kannan and Anindya De)
    - Mathematical Foundations of Computer Science (graduate, co-developed with Val Tannen)

MENTORING & SUPERVISION

Swarthmore College

Undergraduate research assistants (5; 80% women): Projects—clustering by compression; effective Hausdorff dimension; Kakeya sets; fair resource allocation. Presentations—Sigma Xi; CS senior comprehensive; ACM Capital Region Celebration of Women in Computing. Outcomes—UW M.S. in Computational Linguistics; Northwestern CS Ph.D.; arXiv preprint coauthored with two RAs (under review).

Directed readings / independent studies: Algorithmic Randomness and Geometry; Machine-Assisted Proof; Algorithmic Mechanism Design. Outcome—one mentee held a predoctoral research position at the University of Chicago and is now a quantitative researcher at Jane Street.

Additional mentoring activities: Advises undergraduates on presentation venues, travel funding, external summer research, and graduate applications; also advises course staff on professional development (recent alumni to Columbia Ph.D., CMU M.S., Duolingo, and Palantir).

Other mentoring

Iowa State University: Co-advisor for a Ph.D. candidate (Xiaoyuan Li); expected Summer 2026. Supervised an honors project on effective dimension.

University of Pennsylvania: Mentored three undergraduates through Google exploreCSR on algorithmic fairness and college-admissions downstream effects; students presented at an end-of-semester workshop.

JOURNAL ARTICLES

J. H. Lutz and N. Lutz, "Algorithmically optimal outer measures," *ACM Transactions on Computation Theory (TOCT)*, May 2025, just accepted, ISSN: 1942-3454. DOI: 10.1145/3733607.

N. Lutz and D. M. Stull, "Projection theorems using effective dimension," *Information and Computation*, vol. 297, p. 105 137, 2024, ISSN: 0890-5401. DOI: 10.1016/j.ic.2024.105137.

J. H. Lutz, N. Lutz, and E. Mayordomo, "Dimension and the structure of complexity classes," *Theory of Computing Systems*, vol. 67, pp. 473–490, 2023. DOI: 10.1007/s00224-022-10096-7.

J. H. Lutz, N. Lutz, and E. Mayordomo, "Extending the reach of the point-to-set principle," *Information and Computation*, vol. 294, p. 105 078, 2023, ISSN: 0890-5401. DOI: 10.1016/j.ic.2023.105078.

N. Lutz and D. M. Stull, "Dimension spectra of lines," *Computability*, vol. 11, no. 2, pp. 85–112, 2022. DOI: 10.3233/COM-190292.

N. Lutz, "Fractal intersections and products via algorithmic dimension," *ACM Transactions on Computation Theory (TOCT)*, vol. 13, no. 3, 14:1–14:15, 2021. DOI: 10.1145/3460948.

N. Lutz and D. M. Stull, "Bounding the dimension of points on a line," *Information and Computation*, vol. 275, p. 104 601, 2020. DOI: 10.1016/j.ic.2020.104601.

J. H. Lutz and N. Lutz, "Algorithmic information, plane Kakeya sets, and conditional dimension," *ACM Transactions on Computation Theory (TOCT)*, vol. 10, no. 2, 7:1–7:22, 2018. DOI: 10.1145/3201783.

A. D. Jaggard, N. Lutz, M. Schapira, and R. N. Wright, "Dynamics at the boundary of game theory and distributed computing," *ACM Transactions on Economics and Computation (TEAC)*, vol. 5, no. 3, 15:1–15:20, 2017. DOI: 10.1145/3107182.

J. H. Lutz and N. Lutz, "Lines missing every random point," *Computability*, vol. 4, no. 2, pp. 85–102, 2015. DOI: 10.3233/COM-150038.

J. L. Hilton III, N. Lutz, and D. Wiley, "Examining the reuse of open textbooks," *The International Review of Research in Open and Distributed Learning (IRRODL)*, vol. 13, no. 2, pp. 45–58, 2012. DOI: 10.19173/irrodl.v13i2.1137.

Refereed conference papers

J. H. Lutz, N. Lutz, and E. Mayordomo, "Extending the reach of the point-to-set principle," in *39th International Symposium on Theoretical Aspects of Computer Science (STACS 2022)*, ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 219, Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2022, 48:1–48:14. DOI: 10.4230/LIPIcs.STACS.2022.48.

C. Jung, S. Kannan, and N. Lutz, "Quantifying the burden of exploration and the unfairness of free riding," in *Proceedings of the 2020 ACM-SIAM Symposium on Discrete Algorithms (SODA)*, Philadelphia, PA: Society for Industrial and Applied Mathematics, 2020, pp. 1892–1904. DOI: 10.1137/1.9781611975994.158.

C. Jung, S. Kannan, and N. Lutz, "Service in your neighborhood: Fairness in center location," in *1st Symposium on Foundations of Responsible Computing (FORC 2020)*, ser. Leibniz International Proceedings in Informatics (LIPIcs), Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2020. DOI: 10.4230/LIPIcs.FORC.2020.5.

J. H. Lutz, N. Lutz, R. R. Lutz, and M. R. Riley, "Robustness and games against nature in molecular programming," in *2019 IEEE/ACM 41st International Conference on Software Engineering: New Ideas and Emerging Results (ICSE-NIER)*, 2019, pp. 65–68. DOI: 10.1109/ICSE-NIER.2019.00025.

N. Lutz and D. M. Stull, "Projection theorems using effective dimension," in *43rd International Symposium on Mathematical Foundations of Computer Science (MFCS 2018)*, ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 117, Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2018, 71:1–71:15. DOI: 10.4230/LIPIcs.MFCS.2018.71.

D. Dolev, M. Erdmann, N. Lutz, M. Schapira, and A. Zair, "Brief announcement: Stateless computation," in *Proceedings of the 2017 ACM Symposium on Principles of Distributed Computing (PODC)*, ACM, 2017, pp. 419–421. DOI: 10.1145/3087801.3087854.

J. H. Lutz and N. Lutz, "Algorithmic information, plane Kakeya sets, and conditional dimension," in *34th Symposium on Theoretical Aspects of Computer Science (STACS 2017)*, ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 66, Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2017, 53:1–53:13. DOI: 10.4230/LIPIcs.STACS.2017.53.

N. Lutz, "Fractal intersections and products via algorithmic dimension," in *42nd International Symposium on Mathematical Foundations of Computer Science (MFCS 2017)*, ser. Leibniz International Proceedings in Informatics (LIPIcs), vol. 83, Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2017, 58:1–58:12. DOI: 10.4230/LIPIcs.MFCS.2017.58.

N. Lutz and D. M. Stull, "Bounding the dimension of points on a line," in *Theory and Applications of Models of Computation (TAMC 2017)*, ser. Lecture Notes in Computer Science, vol. 10185, Springer, 2017, pp. 425–439. DOI: 10.1007/978-3-319-55911-7_31.

N. Lutz and D. M. Stull, "Dimension spectra of lines," in *Unveiling Dynamics and Complexity: Proceedings of the 13th Conference on Computability in Europe (CiE 2017)*, ser. Lecture Notes in Computer Science, vol. 10307, Springer, 2017, pp. 304–314. DOI: 10.1007/978-3-319-58741-7_29.

A. D. Jaggard, N. Lutz, M. Schapira, and R. N. Wright, "Self-stabilizing uncoupled dynamics," in *Proceedings of the 7th International Symposium on Algorithmic Game Theory (SAGT 2014)*, ser. Lecture Notes in Computer Science, vol. 8768, Springer, 2014, pp. 74–85. DOI: 10.1007/978-3-662-44803-8_7.

J. H. Lutz and N. Lutz, "Lines missing every random point," in *Language, Life, Limits: Proceedings of the 10th Conference on Computability in Europe (CiE 2014)*, ser. Lecture Notes in Computer Science, vol. 8493, Springer, 2014, pp. 283–292. DOI: 10.1007/978-3-319-08019-2_29.

Expository writing

J. H. Lutz and N. Lutz, "Who asked Us? how the theory of computing answers questions about analysis," in *Complexity and Approximation*, D.-Z. Du and J. Wang, Eds., Springer, 2020. DOI: 10.1007/978-3-030-41672-0_4.

N. Lutz, "Some open problems in algorithmic fractal geometry," *SIGACT News*, vol. 48, no. 4, 2017, Open Problems Column (ed. William Gasarch). DOI: 10.1145/3173127.3173134.

Preprints

P. Cholak, M. Csörnyei, N. Lutz, P. Lutz, E. Mayordomo, and D. M. Stull, "Algorithmic information bounds for distances and orthogonal projections," 2025. arXiv: 2509.05211 cs.CC.

X. Huang, X. Li, J. H. Lutz, and N. Lutz, "Multihead finite-state dimension," 2025. arXiv: 2509.22912 cs.IT.

X. Huang, J. H. Lutz, N. Lutz, and A. Migunov, "Algorithmic randomness in continuous-time markov chains," 2025. arXiv: 1910.13620 cs.IT.

N. Lutz, "Multihead finite-state compression," 2025. arXiv: 2510.17544 cs.IT.

N. Lutz, S. P. Martin, and R. White, "Lines in every direction with no ee-random points," 2025. arXiv: 2507.05475 cs.CC.

P. Cholak, M. Csörnyei, N. Lutz, P. Lutz, E. Mayordomo, and D. M. Stull, "Bounding the dimension of exceptional sets for orthogonal projections," 2024. arXiv: 2411.04959 math.CA.

Invited talks & tutorials

Algorithmic Information Bounds for Distances and Orthogonal Projections, Joint Mathematics Meetings (JMM 2026), AMS Special Session on New Directions in Geometric Measure Theory and Effective Methods, Washington, DC, Jan. 2026.

Applying Algorithmic Dimensions to Classical Problems, Computability in Europe (CiE 2023), Batumi, Georgia, Jul. 28, 2023.

Dimension and the Structure of Complexity Classes, Southeastern Logic Symposium (SEALS 2022), University of Florida, Gainesville, FL, Mar. 6, 2022.

The Point-to-Set Principle in Metric Spaces and Complexity Classes, Computability, Complexity and Randomness (CCR 2022), Isaac Newton Institute for Mathematical Sciences, University of Cambridge, Cambridge, UK, Jun. 7, 2022.

Algorithmically Optimal Outer Measures, ASL North American Annual Meeting 2021, Special Session on Computability Theory, University of Notre Dame, Notre Dame, IN, Jun. 25, 2021.

New Applications of Point-to-Set Principles, Southeastern Logic Symposium (SEALS 2020), University of Florida, Gainesville, FL, Feb. 29, 2020.

Algorithmic Dimensions of Projected Points, Joint Mathematics Meetings (JMM 2019), AMS–ASL Special Session on Algorithmic Dimensions and Fractal Geometry, Baltimore, MD, Jan. 16, 2019.

Algorithmic Dimensions of Projected Points, Computability, Complexity and Randomness (CCR 2018), Santiago, Chile, Dec. 19, 2018.

Effective Dimensions of Projected Points, Computability and Complexity in Analysis (CCA 2018), Kochel am See, Germany, Aug. 7, 2018.

Talks at seminars, colloquia, & workshops (selected)

Algorithmic Information Properties of Points on Lines, Computer Science Research Colloquium, Iowa State University, Ames, IA, Sep. 3, 2025.

Applying Algorithmic Dimensions to Classical Problems, New England Recursion and Definability Seminar (NERDS 24.0), Wellesley College, Wellesley, MA, Oct. 14, 2023.

Applying Algorithmic Dimensions to Classical Problems, AIM Workshop: Effective Methods in Measure and Dimension, American Institute of Mathematics, San Jose, CA, Aug. 15, 2022.

Fractal Slices, Projections, and Products via Algorithmic Dimension, Midwest Computability Seminar, University of Chicago, Chicago, IL, Feb. 11, 2020.

Point-to-Set Principles, AIM Workshop: Algorithmic Randomness, American Institute of Mathematics, San Jose, CA, Aug. 14, 2020.

Algorithmic Dimensions of Projected Points, Iowa Colloquium on Information, Complexity, and Logic (ICICL), Grinnell College, Grinnell, IA, Oct. 3, 2019.

Free-riding with Bandits: Shirking the Burden of Exploration, Simons Institute Summer Cluster: Algorithmic Fairness, Simons Institute for the Theory of Computing, UC Berkeley, Berkeley, CA, Jul. 11, 2018.

Fractal Intersections and Products via Algorithmic Dimension, Continuity, Computability, Constructivity (CCC 2017), Nancy, France, Jun. 26, 2017.

Invited workshops & research programs

Effective Methods in Measure and Dimension. American Institute of Mathematics, San Jose, CA, Aug. 15–19, 2022.

Computability Theory. Oberwolfach Research Institute for Mathematics, Oberwolfach, Germany, Apr. 25–May 1, 2021.

Descriptive Set Theory and Computable Topology. Schloss Dagstuhl—Leibniz Center for Informatics, Wadern, Germany, Nov. 14–19, 2021.

Algorithmic Randomness. American Institute of Mathematics, San Jose, CA, Aug. 10–14, 2020.

Summer Cluster: Fairness. Simons Institute for the Theory of Computing, UC Berkeley, Berkeley, CA, May 30–Jul. 10, 2019.

Summer Cluster: Algorithmic Fairness. Simons Institute for the Theory of Computing, UC Berkeley, Berkeley, CA, Jul. 2–Aug. 10, 2018.

Nexus of Information and Computation Theories. CIRM (Marseille) & Institut Henri Poincaré (Paris), France, Jan. 25–Feb. 12, 2016.

Professional service

Program committees

- *Computability, Complexity and Randomness (CCR)* — 2026
- *Computability and Complexity in Analysis (CCA)* — 2022, 2019
- *ACM Conference on Fairness, Accountability, and Transparency (FAccT)* — 2021

Peer review

- *Information and Computation*
- *Theoretical Computer Science*
- *Symposium on Theoretical Aspects of Computer Science (STACS)*
- *ACM Symposium on the Theory of Computing (STOC)*

Grant proposal review

- Ministry of Education (Singapore)
- Eugene M. Lang Center for Civic and Social Responsibility

Grants & funding

- Associate Investigator, Marsden Fund grant 23-VUW-118: *Connections between Computability Theory, Effective Descriptive Set Theory, and Geometric Measure Theory* — Royal Society of New Zealand Te Apārangi; amount: NZ\$712,000 ($\approx$ US\$433,000)
- Structured Quartet Research Ensemble (SQuaRE) grant — American Institute of Mathematics, 2023–2024
- Aydelotte Curricular Grant, Swarthmore College — 2025
- Faculty Research Support Awards, Swarthmore College — 2021–2022; 2022–2023; 2023–2024; 2024–2025

Awards & honors

- Best Student Paper — *MFCS 2017* (Aalborg, Denmark)
- Travel support — French National Center for Scientific Research (CNRS), *Nexus of Computation and Information Theories* program (Marseille & Paris), Jan–Feb 2016
- Travel grant — Association for Symbolic Logic, *Computability in Europe (CiE 2014)*, Budapest, June 2014