Aidan W. Murphy

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EDUCATION

Ph.D., Mathematics, Virginia Tech, 2022
M.S., Mathematics, Virginia Tech, 2020
B.S., Mathematics, S.U.N.Y. Geneseo, 2017

RESEARCH INTERESTS

coding theory, algebraic geometry codes, locally recoverable codes,
quantum error correcting codes, code-based cryptography

PROFESSIONAL EXPERIENCE

Johns Hopkins Applied Physics Laboratory
Senior Professional Staff, 2023-

Virginia Tech
Visiting Assistant Professor, 2022

PUBLICATIONS

- G.L. Matthews, T. Morrison, and A.W. Murphy, Curve-lifted codes for local recovery using lines, in review. Link here
- G. Micheli and A.W. Murphy. Locally recoverable codes and finding good polynomials. Springer Publishing, expected 2024.
- G.L. Matthews, A.W. Murphy, and W. Santos, Fractional decoding of r-Hermitian codes. Designs, Codes, and Cryptography, August 2023. Link here
- G.L. Matthews and A.W. Murphy. Norm-trace-lifted codes over binary fields. IEEE International Symposium on Information Theory (ISIT), July 2022. Link here
- A.W. Murphy. Codes from norm-trace curves: local recovery and fractional decoding. Ph.D. Thesis, April 2022. Link here
- G.L. Matthews and A.W. Murphy. Cryptography, in Mathematics in Cyber Research. CRC Publishing, February 2022. Link here
- G.L. Matthews, A.W. Murphy, and W. Santos. Fractional decoding of codes from the Hermitian curve. IEEE International Symposium on Information Theory (ISIT), July 2021. Link here
- W. Gerych, L. Buquicchio, K. Chandrasekaran, A. Abdulaziz, H. Mansoor, A. Murphy, E. Rundensteiner, and E. Agu. BurstPU: Classification of Weakly Labeled Datasets with Sequential Bias. IEEE BigData Conference, December 2020. Link here

GOVERNMENT PROJECTS

Johns Hopkins Applied Physics Laboratory

- Defensive Cyber Initiatives, January 2023-
  Technical Lead, August 2023-
  Description: Explored non-mathematical approaches to metrology, with a focus of improving understanding of resilience of cyberphysical systems.

- Cryptography, April 2024-
  Description: Securing the access of healthcare information through the development of modern cryptographic protocols into software.
- Unmanned Maritime Systems, January 2023-May 2024
  Description: Improved systems engineering processes with respect to security and autonomy of naval capabilities.
- Applied Quantum Communications, May 2023-January 2024
  Description: Worked on leveraging internal APL quantum channel models in tandem with modern quantum error correction methods.
- Cyber Anomaly Detection, February 2023-December 2023
  Description: Collaborated on formation of anomaly detection framework for military platform electronics buses, with an aim for near-future integration.

INVITED CONFERENCE TALKS

- Norm-trace-lifted codes. AMS Fall Central Sectional Meeting, Special Session on Coding, Storage, and Related Applications. Online (October 2021).
- Codes from curves and repair. CanaDAM 2021, Minisymposium on Algebraic and Combinatorial Approaches to Designs and Codes. Online (May 2021).

AWARDS AND RECOGNITION

Johns Hopkins Applied Physics Laboratory

- Asymmetric Operations Sector Peer Recognition Desk Award
  - Unmanned Maritime Systems Project, April 2023
    "For Leadership and Technical Excellence"

Virginia Tech

- "Thank a Teacher" Recognition, 2022

S.U.N.Y. Geneseo

- Edward P. Daniels Scholarship, 2016
  - "Awarded to a senior Math student with a solid academic record and who demonstrates leadership and integrity."

UNDERGRADUATE STUDENT MENTORING

Johns Hopkins Applied Physics Laboratory
Defensive Cyber Initiatives Intern, Summer 2023

TEACHING EXPERIENCE

Virginia Tech
Visiting Assistant Professor

- Math 1225: Calculus of a Single Variable: Fall 2022 (x2).
  Modalities: 2 in-person.

Graduate Teacher of Record

- Math 1225: Calculus of a Single Variable: Spring 2020, Fall 2020, Summer II 2021, Fall 2021, Spring 2022.
  Modalities: 2 in-person, 2 online, 1 transitioned mid-semester (COVID)
  Notes: 2 ESL sections, as part of the AdvantageVT Program
- Math 1226: Calculus of a Single Variable: Spring 2021.
  Modalities: 1 online.

Math GRE Tutor, VT PREP Program, Fall 2021
Grader, Math 2204: Introduction to Multivariable Calculus, Summer I 2020
Lab Instructor, Math 1026: Elementary Calculus, Spring 2019

Clemson University
Grader

- Math 4120: Algebra I, Spring 2018
- Math 3190: Introduction to Proof, Spring 2018

Teaching Assistant, Math 1080: Business Calculus II, Fall 2017

S.U.N.Y. Geneseo
Lab Instructor

- Physics 116: General Physics II Lab, Spring 2017
- Physics 114: General Physics I Lab, Fall 2016

ADDITIONAL PRESENTATIONS

Conference talks

- Fractional decoding of norm-trace-lifted codes, ACTiV(T) (Algebraic Coding Theory at Virginia Tech), Virginia Tech (November 2022).

Seminar talks

- Norm-trace-lifted codes, Algebra Seminar, Virginia Tech (October 2021).
- Cyclic algebraic geometry codes (Part 2), Applied Algebra Research Group (AARG), Virginia Tech (September 2021).
- Cyclic algebraic geometry codes (Part 1), Applied Algebra Research Group (AARG), Virginia Tech (August 2021).
- Fractional decoding of codes from Hermitian curves (Part 2), Applied Algebra Research Group (AARG), Virginia Tech (March 2021).
- Fractional decoding of codes from Hermitian curves (Part 1), Applied Algebra Research Group (AARG), Virginia Tech (February 2021).
- Finding Tamo-Barg good polynomials with Galois theory (Part 2), Applied Algebra Research Group (AARG), Virginia Tech (February 2020).
- Finding Tamo-Barg good polynomials with Galois theory (Part 1), Applied Algebra Research Group (AARG), Virginia Tech (February 2020).
- Repair scheme of Guruswami and Wootters, Applied Algebra Research Group (AARG), Virginia Tech (October 2019).

Other professional talks

- Sponsor Brief, Unmanned Maritime Systems Project, Johns Hopkins Applied Physics Laboratory (February 2024).
- Sponsor Brief, Defensive Cyber Initiatives Project, Johns Hopkins Applied Physics Laboratory (October 2023).
- Sponsor Brief, Unmanned Maritime Systems Project, Johns Hopkins Applied Physics Laboratory (October 2023).
- Quantum error-correction, QK Tech Talk, Johns Hopkins Applied Physics Laboratory (September 2023).

High school level

- Thinking like a Mathematician, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2024).
- Error-correcting codes, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2024).
- Computational complexity, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2024).
- Cryptography, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2024).
- Error-correcting codes, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (August 2023).
- Computational complexity, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2023).
- Error-correcting codes, ASPIRE Program Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2023).

Undergraduate level

- Code-based cryptography, Part III: McEliece's cryptosystem, Resilient Military Systems (QCM) Brown-bag series, Johns Hopkins Applied Physics Laboratory (July 2023).
- Code-based cryptography, Part II: Computational hardness, Resilient Military Systems (QCM) Brown-bag series, Johns Hopkins Applied Physics Laboratory (May 2023).
- Code-based cryptography, Part I: Error-correcting codes, Resilient Military Systems (QCM) Brown-bag series, Johns Hopkins Applied Physics Laboratory (April 2023).
- How to Prove (in fewer pages than Bertrand Russell) that $1 + 1 = 2$, Math Club, Clemson University (September 2017).

Graduate level

- Locally recoverable codes, Virginia Tech Research Day, Virginia Tech (November 2022).
- Codes from the Hermitian curve (guest lecture), Mathematics 5114 (Topics in Algebra: Applied Algebra), Virginia Tech (April 2022).
- Algebraic geometry codes (guest lecture), Mathematics 5114 (Topics in Algebra: Applied Algebra), Virginia Tech (April 2022).
- Welch-Berlekamp decoding of Reed-Solomon codes, Mathematics 5114 (Topics in Algebra: Applied Algebra), Virginia Tech (February 2022).

- Reed-Solomon codes, Mathematics 5114 (Topics in Algebra: Applied Algebra), Virginia Tech (January 2022).
- Locally recoverable codes, Mathematics Senior Graduate Teaching Assistant (SGTA) Seminar, Virginia Tech (November 2020).

Graduate (other)

- Making progress on your dissertation, Mathematics Senior Graduate Teaching Assistant (SGTA) Seminar, Virginia Tech (February 2022).
- Workshop: Creating your own website, Mathematics Senior Graduate Teaching Assistant (SGTA) Seminar, Virginia Tech (August 2021).

LEADERSHIP

Cyber Analytics Capability Area, Johns Hopkins Applied Physics Laboratory

- Co-lead, March 2023 -

Graduate and Professional Student Senate, Virginia Tech

- Departmental Senator, Fall 2020 - Spring 2022
- Committee on Judicial and Internal Affiars, Fall 2020 - Spring 2022
  - Chair, Fall 2020 - Spring 2021
- Constitution Transition Committee, Summer 2021
- Subcommittee on Constitutional Overhaul, Fall 2020 - Spring 2021
  - Chair, Fall 2020 - Spring 2021
- Parliamentarian of the Senate, Fall 2020 - Spring 2021
- Elections Subcommittee, Spring 2021
  - Chair, Spring 2021

Programming and Data Science Club, S.U.N.Y. Geneseo

- Co-Founder
- Vice President, Fall 2016 - Spring 2017
- Treasurer, Fall 2016 - Spring 2017

DEPARTMENTAL SERVICE

Johns Hopkins Applied Physics Laboratory

Internal Paper Reviews

- 2023: June 14, September 22

Candidate Interviewer (2023-)

- 2024: January 24, February 9
- 2023: October 13, November 14, November 30

Combustion Grant Reviewer (2023-)

- 2024: Cycle 18 (x1)
- 2023: Cycle 17 (x1)

Sponsor Visit Organizer/Host (March 15, 2023)

Virginia Tech

Faculty Candidate Student Host

- Mathematics of Quantum Algorithms, Coding, or Cryptography (Spring 2022)
- Mathematics of Coding or Cryptography (Fall 2019)

VOLUNTEER WORK

MORE Undergraduate Workshop, Virginia Tech, (October 8-9, 2022)
Explore Physical Sciences Camp Professional Panelist (July 22, 2022)
MORE Undergraduate Workshop, Virginia Tech, (September 25-26, 2021)
MORE Undergraduate Workshop, Virginia Tech, (September 26-27, 2020)
MORE Undergraduate Workshop, Virginia Tech, (October 26-27, 2019)
Project WISE, Clemson University, (June 24-29, 2018)
MAA Southeastern Section Spring Meeting, Clemson University (March 23-24, 2018)
MAA Seaway Section Spring Meeting, S.U.N.Y. Geneseo (April 15-16, 2016)

Last Updated: 2024/07/08