Anthony Joseph (A.J.) Vetturini II

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Education

Carnegie Mellon University **Aug. 2022 – Present**
Ph.D. Candidate, Mechanical Engineering *Pittsburgh, PA*

Case Western Reserve University **Aug. 2015 – May 2019**
B.S.E Aerospace and Mechanical Engineering, Cum Laude *Cleveland, OH*

Research Interests

- DNA Nanostructures
- Self-assembly
- Generative Design
- Inverse Design
- Photonics
- Molecular Dynamics

Ph.D. Research

A generative design framework for DNA origami nanostructures **Aug 2022 – Present**
Ph.D. Candidate *Pittsburgh, PA*

- Member of Microsystems and MechanoBiology Lab (MMBL) and the Integrated Design Innovation Group (IDIG) in the Department of Mechanical Engineering at Carnegie Mellon Univeristy.
- Researching innovative design strategies for the self-assembly of DNA nanostructures
- Using generative design methodologies to systematically generate DNA nanostructures

Peer Reviewed Journal Publications

1. **Vetturini, A. J.**, Cagan, J., and Taylor, R. E., Generative design-enabled exploration of wireframe DNA origami nanostructures. Nucleic Acids Research, gkae1268 (2024). https://doi.org/10.1093/nar/gkae1268

2. **Vetturini, A. J.**, Cui, W., Liao, YT. et al. Flame Spread Over Ultra-thin Solids: Effect of Area Density and Concurrent-Opposed Spread Reversal Phenomenon. Fire Technol 56, 91–111 (2020). https://doi.org/10.1007/s10694-019-00878-w
   Selected as a top paper of the year and printed within the Editors' Choice of *Fire Technology*

Conference Presentations

1. **Vetturini, Anthony J.**, Cagan, Jonathan, and Taylor, Rebecca E. "Automated design of DNA nanostructures through cycle construction." International Design Engineering Technical Conferences, Design Automation Conference, 27 August 2025, Johns Hopkins University, Los Angeles, CA. Conference Presentation.

2. **Vetturini, Anthony J.**, Cagan, Jonathan, and Taylor, Rebecca E. "Design exploration of wireframe DNA origami through multiobjective optimization-driven generative design." DNA30, 16 September 2024, Johns Hopkins University, Baltimore, MD. Conference Presentation.

3. **Vetturini, Anthony J.**, Cagan, Jonathan, and Taylor, Rebecca E. "A Grammar-Enabled Generative Design Framework for Design Exploration of Deoxyribonucleic Acid (DNA) Nanostructures." International Design Engineering Technical Conferences, Design Automation Conference, 27 August 2024, JW Marriott, Washington, DC. Conference Presentation.

4. **Vetturini, Anthony J.**, and Liao, Ya-Ting. "Effects of Area Density on Thin Fuel Flammability." 34th Annual Meeting of the American Society for Gravitational and Space Research, 1 November 2018, Bethesda North Marriott Hotel and Conference Center, Bethesda, MD. Conference Presentation.

Invited Talks

1. "Using Coarse-Grain Molecular Dynamics for DNA origami", 1 October 2025, Carnegie Mellon University, Pittsburgh, PA.

Teaching Experience

Carnegie Mellon University **August 2024 – December 2024**
Teaching Assistant - 2D Mechanics *Pittsburgh, PA*

- Prepared materials and delivered recitation sections for a ∼150-student undergraduate section.
- Oversaw teams of 3 from ideation to physical demonstrations of 4-bar linkages for hexapod robot.

Carnegie Mellon University **August 2023 – December 2023**
Teaching Assistant - Product Design *Pittsburgh, PA*

- Guided ∼40 final-year student design teams from project ideation to a working prototype in their capstone engineering course by providing expertise in manufacturing, CAD, and testing
- Prepared lectures on materials and manufacturing processes selection.

PDSVISION US **June 2019 – August 2022**
Certified Creo Instructor *Middleburg Heights, OH*

- Certified instructor on Creo Parametric, Creo Simulate, and Windchill Manufacturing Process Management

Development of Engineering Standards Course **January 2018 – April 2018**
Teaching Assistant *Cleveland, OH*

- Researched and prepared presentations to be used in an engineering standards pilot course
- Worked in conjunction with Underwriters Laboratories (UL)

Industry Experience

PDSVISION US **June 2019 – August 2022**
Mechanical Engineer *Middleburg Heights, OH*

- Consulted on and implemented mechanical design software into companies of varying sizes (local to global corporations)
- Creo Parametric Professional Certification
- Specialized in running both FEA and CFD simulations in consulting projects requiring the ability to learn various concepts quickly to provide valid results
- Use educational background to perform engineering evaluations of customer models to offer design alternatives for customer requirements

Projects and Software

mango: a generative design framework for wireframe DNA origami

- Python package implementing grammars and optimization algorithms for the generative design of wireframe DNA origami
- Uses grammar-based generative design (i.e., Shape Annealing) to guide the generated design to a user-defined objective using designer-specific constraints
- GitHub Repo

BALK: Predictive baseball model for predetermined "edge" games

- Personal project with colleagues where we have developed a supervised machine learning model to predict baseball game outcomes
- Assisted in development of random forest algorithm to predict a game winner using sabermetrics
- Developed Python-based web scraper using BeautifulSoup to pull daily lineups and produce required data for algorithm input
- 2020 Season resulted in a model accuracy of 55.6% and a projected yielded return of 27 units compared to DraftKings odds

Undergraduate Research

Computational Fire Dynamics Laboratory **Summer 2017 – Winter 2018**
Research Assistant *Cleveland, OH*

- Studied effects of area density on flame spread using the Zero-G Drop Tower located at NASA Glenn Research Center at Lewis Field
- Prepared samples, observed tests, and composed original MATLAB code leveraging computer vision to track flame position and shape during and experiment

Honors & Awards

Department of Defense National Defense Science and Engineering Graduate Fellowship	2024 – 2027
Jochum-Moll Foundation Scholarship	2018 – 2019
Case Alumni Association Scholarship	2017 – 2019
All-Academic UAA Winter Team	2016

Technical Skills

Programming Languages: Python, MATLAB, R
Frameworks: Pandas, NumPy, SciPy, JAX, PyTorch, tidyverse
CAD: Creo Parametric, SolidWorks, OnShape
Cloud: AWS EC2, S3
FEA: Creo Simulate, ANSYS Mechanical
CFD: Simerics MP, ANSYS Fluent, OnShape SimScale
PLM: Windchill 11.0 – 12.0
Hardware: Mill, Lathe, 3D Printing

Professional Society Membership

American Society for Gravitational and Space Research (ASGSR)	2018 – 2020
American Society of Mechanical Engineers (ASME)	2024 – Present