Anthony Joseph (A.J.) Vetturini

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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 *Cleveland, OH*

Research Interests

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

Ph.D. Research

Computational design methods for DNA origami metamaterials **Aug 2022 – Present**
Ph.D. Candidate *Pittsburgh, PA*

- Advised by Professor Rebecca E. Taylor and Jonathan Cagan in the Department of Mechanical Engineering at Carnegie Mellon University.

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 53, no. 2 (2025): gkae1268. 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 Technology 56, no. 1 (2020): 91–111. 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, 20 August 2025, 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. "Applying Coarse-Grain Molecular Dynamics via oxDNA 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 course.
- Oversaw teams of 3 from conceptualization to physical demonstrations of 4-bar linkages for class design challenge.

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 using Ashby charts.

PDSVISION US **June 2019 – August 2022**
Certified PTC 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*

- Prepared presentations to be used in an engineering standards pilot course. Topics included: Why Standards Exist, US Domestic versus International organizations, Regulatory Bodies, Materials and Manufacturing Standards.
- Worked in conjunction with Underwriters Laboratories (UL).

Industry Experience

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

- Customized and implemented mechanical design software into companies of varying sizes (local to global corporations).
- Consulted on FEA and CFD design projects to support client product design requirements.
- Implemented manufacturing process management workflows that enable complex engineering change notice pipelines.

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.
- Uncovered a relationship between fuel thinness and the flames structure being concurrent or opposed to air flow direction.
- Prepared ultra-thin fuel samples, observed drop tests, and composed original MATLAB code using computer vision to track flame position and shape during drop 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, R
Frameworks: Pandas, NumPy, SciPy, JAX, 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