Nicholas Corbin

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Education

University of California San Diego — La Jolla, CA
Ph.D. in Mechanical and Aerospace Engineering, GPA: 3.93/4.00 — Fall 2021–Present
Specialization in Linear and Optimal Control

Virginia Tech — Blacksburg, VA
M.S. in Engineering Mechanics, GPA: 3.92/4.00 — 2019–2021
Thesis: *Dispersion Curve Estimation for Longitudinal Rail Stress Measurement*

Virginia Tech — Blacksburg, VA
B.S. in Engineering Science and Mechanics, GPA: 3.93/4.00 — 2015–2019
Minor in Mathematics

Research and Work Experience

Kramer Research Group — La Jolla, CA
Graduate Research Assistant — September 2021–Present
Advisor: Dr. Boris Kramer

Vibrations, Adaptive Structures, and Testing Lab (VAST) — Blacksburg, VA
Graduate Research Assistant — May 2019–July 2021
Advisor: Dr. Pablo Tarazaga

- Dispersive wave propagation: researched structural health monitoring (SHM) technique using low-frequency dispersive flexural waves for non-destructive stress measurement for the Federal Railroad Administration.
- Data-driven modeling: investigated rational transfer function fitting for characterizing dispersion information and boundary conditions from modal test data.

Pratt and Whitney — East Hartford, CT
Core Structures Intern — May 2018–August 2018
Mentor: Ben Hall

- Sub-idle modal parameter estimation: analyzed nonlinear vibrations using test data from airfoils in gas-turbine engines during startup to extract sub-idle modal parameters using Python.
- CFD validation streamlining: created scripts for automatic CFD vibratory stress prediction validation to accelerate transition of software from experimental to production usage.

Mechanics of Thin Structures Group — Blacksburg, VA
Undergraduate Research Assistant — January 2016–August 2018
Advisor: Dr. James Hanna

- Ran experiments using tools including high speed imagery, particle image velocimetry, 3D-printing, and processed data using Matlab, Mathematica, and FFMPEG.

Publications

[1] **Corbin, N.**, Albakri, M., Tarazaga, P., "Reference-free longitudinal rail stress and neutral temperature measurement utilizing multidirectional elastic waves", Federal Railroad Administration, Washington, D.C., Tech. Rep., submitted 2021, available upon request.

[2] Bende, N. P., Yu, T., **Corbin, N. A.**, Dias, M. A., Santangelo, C. D., Hanna, J. A., Hayward, R. C., "Overcurvature induced multistability of linked conical frusta: How a 'bendy straw' holds its shape", *Soft Matter*, vol. 14, no. 42, pp. 8636–8642, 2018, ISSN: 1744-683X.

[3] **Corbin, N. A.**, Hanna, J. A., Royston, W. R., Singh, H., Warner, R. B., "Impact-induced acceleration by obstacles", *New Journal of Physics*, vol. 20, no. 5, p. 053 031, May 2018, ISSN: 1367-2630.

Conference Presentations

1. **N. Corbin,** M. Albakri, and P. Tarazaga, "Numerical evaluation of a low-frequency acoustoelastic technique for longitudinal rail stress measurement", *38th International Modal Analysis Conference (IMAC)*, February 2020.
2. K. Mize, **N. Corbin,** and P. Tarazaga, "A mass-normalized projection approach to component testing", *90th Shock and Vibrations Exchange (SAVE)*, November 2019.
3. **N. A. Corbin**, J. A. Hanna, W. R. Royston, H. Singh, and R. B. Warner, "V0022: Chain coiling and impinging", *Gallery of Fluid Motion, 70th Annual Meeting of the APS Division of Fluid Dynamics*, November 2017.

Teaching

- **Graduate Teaching Assistant** at Virginia Tech — Summer 2019
  Dynamics I (ESM 2304)

Relevant Coursework

- Real Analysis
- Functional Analysis
- Numerical Linear Algebra
- Linear Systems Theory
- Nonlinear Systems Theory
- Model Reduction of Dynamical Systems
- Continuum Mechanics
- Lagrangian Mechanics
- Hamiltonian Mechanics
- Vibrations of Mechanical Systems
- Perturbation Methods
- Intro to Theory of Finite Element Analysis

Computer Skills

- **Coding languages:** Matlab, Mathematica, Python, Bash, LaTeX
- **Finite Element Analysis (FEA):** Abaqus
- **Computer-aided Design (CAD):** Solidworks, Inventor

Hands-on Skills

- **Vibration Testing:** Siemens LMS, Polytec
- **Manufacturing:** 3D-printing, laser cutting, woodworking, composite-layups
- **Certification:** National Association of Rocketry (NAR) Level 1 High Power Rocketry certified
- **Languages:** English, Italian

Design Teams

ESM Rocketry Senior Design, NASA USLI 2019 — Blacksburg, VA
Payload Subteam Lead and Document Editor — January 2018–May 2019

- Co-founded and helped lead a team of 7 competing in NASA University Student Launch Initiative rocketry competition. The team designed and built a Level 2 high power rocket and deployable autonomous UAV payload system while adhering to NASA's rigorous schedule of technical reports and presentations.

RockSat-X @ Virginia Tech — Blacksburg, VA
Team Lead — September 2017–August 2018

- Led team of 15 in the design and manufacturing of a 15-pound sounding rocket payload for launch with apogee of 90 miles from NASA Wallops Flight Facility in August each year.
- Flat-sat platform: developed deployment, power, and telemetry platform for ejecting several PCB-based experiments from the sounding rocket.

Mechanical Subteam Lead — September 2016–August 2017

- Software-defined radio (SDR): demonstrated capabilities of SDR in space applications by tracking boats and planes, transmitting data to two ground stations, and receiving commands from the ground.

Entrepreneurship

UpStream Services LLC — Reston, VA

Startup Co-founder — January 2020–September 2021

- Startup innovating in waste management, last-mile delivery, ecommerce, and green technologies.

Mentorship and Outreach

Virginia Tech ESM senior design advisor — Blacksburg, VA

Team sponsor/advisor — August 2020–May 2021

- Sponsored and mentored a senior design team through UpStream Services LLC startup to develop innovative waste-measurement device.

VAST undergraduate research mentor — Blacksburg, VA

Student mentor — September 2019–January 2020

- Helped mentor undergraduate researchers in the VAST lab under Dr. Tarazaga. Guided and worked with Kam Mize to develop alternative approach to projection methods for component testing, resulting in SAVE conference presentation. Guided Tyler Pugh in design and fabrication of a rotating unbalance device for de-icing of outdoor netted structure.

Rocketry outreach — New River Valley, VA

Floyd Elementary School Outreach — February 2019

- Helped organize and run a day-long outreach event with Floyd Elementary School to expose 251 students (grades 1-5) to STEM and rocketry. Educated students with a short lesson relating their science class topics to rocketry, and subsequently helped students design and build their own "bubble rockets" powered by effervescent tablets as detailed in NASA's "Build a Bubble-Powered Rocket" lesson plan.

Blacksburg High School FlatSat Project — January 2018–August 2018

- Mentored and worked with three student teams at Blacksburg High School to ideate, design, build, and test three deployable experiments to launch on our RockSat-X payload platform to space from NASA Wallops. The Virginia Tech team, under my leadership, designed and built a deployment, power, and telemetry platform for small, PCB-based deployable experiments. We then partnered with Blacksburg High School to have students build the experiments of their choice, which ultimately were 1) a reaction-control experiment to try to control the positioning of the deployables, 2) a Geiger counter to measure radiation in the thermosphere, and 3) a spectrometry experiment to measure the makeup of the thermosphere.

Fellowships and Awards

- UCSD Powell Fellowship — 2021
  This award is given to outstanding doctoral students in UCSD's Jacobs School of Engineering.
- Liviu Librescu Memorial Fellowship — 2020
  This award is given to Virginia Tech Engineering Mechanics graduate students with outstanding academic records and who have demonstrated strong leadership potential and commitment to professional or community service.
- NSF GRFP Honorable Mention — 2020
  This award is given to meritorious applicants who do not receive GRFP Fellowship awards, and is considered a significant national academic achievement and provides access to cyberinfrastructure resources through the XSEDE.
- James H. Sword Award — 2019
  This award is given to Virginia Tech Engineering Science and Mechanics students in recognition of an Outstanding Senior Project.

Extracurricular Activities

- Honors Residential College at Virginia Tech 2015–2019
  Held Apartment Fellow leadership role in the HRC Honors community at Virginia Tech.
- Jazz Guitar 2007–Present

References

Contact information for the professors whom I have asked to write recommendations for me:

- **Dr. Boris Kramer**, Assistant Professor at UC San Diego,
  Department of Mechanical & Aerospace Engineering bmkramer@ucsd.edu
  Doctoral Advisor
- **Dr. Pablo Tarazaga**, Professor at Texas A&M,
  Department of Mechanical Engineering ptarazag@vt.edu
  Master's Thesis Advisor
- **Dr. James Hanna**, Associate Professor at University of Nevada Reno,
  Department of Mechanical Engineering jhanna@unr.edu
  Undergraduate Research Advisor, Mentor
- **Dr. Roger Chang**, Instructor at Virginia Tech,
  Department of Biomedical Engineering and Mechanics tchang@vt.edu
  Mentor
- **Dr. Serkan Gugercin**, Professor at Virginia Tech,
  Department of Mathematics gugercin@vt.edu
  Mentor
- **Dr. Shane Ross**, Professor at Virginia Tech,
  Department of Aerospace Engineering sdross@vt.edu
  Master's Thesis Committee Member