ANURAG VAIDYA

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EDUCATION

PhD   Massachusetts Institute of Technology/ Harvard University (Expected 2026)
Doctor of Philosophy in Medical Engineering and Medical Physics
Computer Science concentration

BS   Bucknell University (2017-2021)   **GPA: 4.0/4.0**
Bachelor of Science in Biomedical Engineering (Honors)
Minors in Computer Science and Applied Mathematics
Thesis: Novel unsupervised generative algorithms for medical image translation

HONORS AND AWARDS

Oliver J Decker Prize (2021)
A prize for that member of the graduating class from the College of Engineering who has attained the highest average, all courses having been taken at Bucknell University.

University Prize for Men (2021)
Given to the man of the graduating class who, in the judgment of the president of the University, the vice president for academic affairs, and the dean of student life most embodies the highest qualities of manhood and the promise of a high degree of usefulness to society.

Harold W. Miller Prize (2021)
Awarded to one or two Honors graduates that best realize the aims of the Honors Program

James M. Pommersheim Research and Innovation in Engineering Award (2021)
Awarded to the engineering student who has achieved, through creative effort, outstanding work of scholarship or invention.

Bucknell Prize in Biomedical Engineering (2021)
Awarded to the student who has the highest academic achievement in the department of biomedical engineering.

Winner for Bucknell BizPitch (2021)
Bucknell University's annual shark-tank like business pitch competition

Finalist at Yale CBIT Healthcare Hackathon (2021)
Developed a machine learning based mobile app ("Kidney Beans") to help chronic kidney disease patients manage a strict diet. Finished in top 20 with more 500 participants from 36 countries.

President's Award for Distinguished Academic Achievement (2018, 2019, 2020, 2021)
Awarded annually to students demonstrating the highest level of academic achievement.

7th Place International Challenge of CT Diagnosis of COVID-19 (as of 1st August 2020)
An international challenge to develop and assess machine learning algorithms to diagnose COVID-19 using a public dataset of CT scans.

Mid-Atlantic University Housing Officers Academic Excellence Award (2020)
Awarded to resident assistants acquiring at least 3.75/4.00 GPA.

3rd Place Bachelor's Student Paper Competition, SB3C (2019)
B.S. paper competition at Summer Biomechanics, Bioengineering, and Biotransport Conference (paper titled "Effects of volumetric boundary conditions on the compressive mechanics and modeling of passive skeletal muscle").

Winner of StartUp Bucknell (2019)
Annual university-wide Shark-Tank style competition organized by Deloitte.

GRANTS AND SCHOLARSHIPS

Program for Undergraduate Research Grant (2018)
Grant to Fund one summer of full-time research at Bucknell University ($3,000)

Bucknell University Presidential Fellowship (2017-2021)
Bucknell University's most prestigious merit scholarship ($37,000 per year)

Davis United World College (UWC) Scholarship (2017-2021)
Awarded to UWC graduates matriculating in select US colleges ($10,000 per year)

Mitchell E. Blumenfeld Scholarship (2017-2021)
Bucknell University named scholarship ($30,000 per year)

PUBLICATIONS

Journal Publications

Vaidya, A. J., and Stough J. V., Patel A. A. "Perceptually improved T1-T2 MRI translations using conditional generative adversarial networks", SPIE Medical Imaging, 2021

Vaidya, A. J., and Wheatley B, B. "An experimental and computational investigation of the effects of volumetric boundary conditions on the compressive mechanics of passive skeletal muscle." Journal of the Mechanical Behavior of Biomedical Materials 102 (2020): 103526.

Grega, K. L., Segall, R. N., **Vaidya, A. J.**, Fu, C., & Wheatley B. B. "Anisotropic and viscoelastic tensile mechanical properties of aponeurosis: Experimentation, modeling, and tissue microstructure." Journal of the Mechanical Behavior of Biomedical Materials 110 (2020): 103889.

National conference talks and poster presentations

Vaidya, A.J. and Stough J.V., "Deep learning for early detection of diabetic retinopathy" Biomedical Engineering Society, October 2020. poster

Vaidya, A.J. and Wheatley, B.B., "Novel volumetric compression relaxation testing and modelling of skeletal muscles," Biomedical Engineering Society, October 2020. talk

Vaidya, A.J. and Wheatley, B.B., "Development and implementation of volumetric compression relaxation testing of skeletal muscles," Summer Biomechanics, Bioengineering, Biotransport Conference, July 2020. talk

Vaidya, A.J. and Wheatley, B.B., "Effects of boundary conditions on the compressive behavior of skeletal muscles," Summer Biomechanics, Bioengineering, Biotransport Conference, June 2019. poster

Vaidya, A.J. and Wheatley, B.B., "How is stress relaxation behavior of skeletal muscles affected by boundary conditions," Biomedical Engineering Society, October 2018. talk

Research symposiums

Vaidya, A.J. and Wheatley, B.B., "Development and Implementation of Volumetric Compression Testing of Skeletal Muscles," Kalman Research Symposium, Bucknell University, March 2020. virtual talk

Vaidya, A.J. and Wheatley, B.B., "Boundary Conditions and Stress Relaxation in Skeletal Muscle: An Integrated Experimental and Computational Study," Kalman Research Symposium, Bucknell University, March 2019. talk

Vaidya, A.J. and Wheatley, B.B., "Effects of Boundary Conditions on the Stress Relaxation Behavior of Passively Compressed Skeletal Muscle," Susquehanna Valley Undergraduate Research Symposium, August 2018. **poster**

Independent Projects

Vaidya, A.J "Finding the value of fractional 2π: determining properties of fractional derivatives and integrals of trigonometric functions." OSF, November 2020, Web. (original date: May 2017)

RESEARCH

Automated Classification of Mosquito Species for Vector Control (2021-Present)
Advisor: Dr. Soumya Acharya, Center of Biomedical Innovation, Johns Hopkins University, MD
- Developed an ETL pipeline and fine-tuned transfer learning models to determine mosquito species in field images collected in Uganda and Ghana using a cheap custom-built MiScope.
- Used FGSM adversarial attacks to improve model robustness and leveraged Captum API to interpret models. Model tested on field in Uganda and Ghana.
- Deployed model on a web-based application for users in Uganda and Ghana to automate mosquito classification and better vector control.

Novel semi-supervised generative algorithms for T1-T2 MR translation (2020-2021)
Advisor: Dr. Joshua Stough, Department of Computer Science, Bucknell University, PA
- Established data sharing pipeline with Geisinger Hospitals radiology department to access longitudinal paired MRI data. Developed efficient data structures in SQL to save large image data.
- Implemented and validated empirical supervised (Pix2Pix) and unsupervised (cycleGAN) (in TensorFlow and Keras) for MRI sequence synthesis, using metrics like peak signal to noise ratio, structural similarity index, and learned patch similarity index.
- Developed novel loss functions that help models transfer stylistic features like texture between imaging modalities.

A New Transfer Learning Fine-Tuning Protocol for Covid-19 Detection In Lung CT (2020)
Independent Project
- Used PyTorch to design convolutional networks for binary classification of COVID-19 CT scans, achieving an accuracy of 86%.
- Designed a novel sequential learning based fine-tuning protocol to achieve higher accuracies for transfer learning models (DenseNet, VGG, and ResNet) for small datasets. Achieved AUC score 0.92, accuracy of 90%, and F1 score of 0.89.
- Ranked 7th in COVID-19 CT Scans challenge organized by Grand Challenges Organization based on AUC and F1 scores.

Early Diabetic Retinopathy Detection Using a Resnet Inspired Architecture (2020)
Advisor: Dr. Joshua Stough, Department of Computer Science, Bucknell University, PA
- Using pandas and numpy, established ETL pipeline (PyTorch based) for fundus photographs with diabetic retinopathy acquired from Kaggle.
- Designed a custom ResNet inspired CNN that performs both early detection and severity classification of diabetic retinopathy and validated 5-fold cross validation study, confusion matrices, and roc curves.
- Achieved accuracy of 98% on binary classification, 87% on early detection, and 83% on severity classification and presented at *BMES'20* as lead author.

Development Of Volumetric Compression Testing of Skeletal Muscles (2020)
Advisor: Dr. Benjamin Wheatley, Department of Mechanical Engineering, Bucknell University, PA
- Performed literature reviews to determine what current mechanical testing instrumentation for skeletal muscles lack.
- Iterated through designs to integrate digital image correlation software with mechanical testing of muscles on a table-top biaxial material testing device.
- Followed previous standard operating procedures to test skeletal muscles using the newly developed fixtures. Presented at *BMES'20* and *SB3C'20.*

Anisotropic And Viscoelastic Tensile Mechanical Properties of Aponeurosis (2019-2020)
Advisor: Dr. Benjamin Wheatley, Department of Mechanical Engineering, Bucknell University, PA
- Developed standard operating procedures to use MATLAB and Excel for pre-processing data from tensile tests on aponeurosis.
- Designed Prony series based non-linear viscoelastic models to characterize relaxation of aponeurosis under cyclic tensile load.
- Collaborated with colleagues to iterate on a journal manuscript and published in *JMBBM'20.*

Effects Of Volumetric Boundary Conditions on Skeletal Muscle Mechanics (2017-2019)
Advisor: Dr. Benjamin Wheatley, Department of Mechanical Engineering, Bucknell University, PA
- Developed dissection protocol to extract tibialis anterior from porcine hind limbs.
- Used CAD and CNC machining to design and fabricate instrumentation to perform compression stress relaxation testing on skeletal muscles.
- Paired Monte Carlo and non-linear deterministic optimizations to find global minima of computational models' cost functions in MATLAB. Developed inverse finite element models using FEBio and Abaqus to estimate hyper-viscoelastic constitutive model parameters.
- Presented at *BMES'18, SB3C'19,* and published as first author in *JMBBM'20.*

Fabrication Of Reverse Vesicles for Drug Delivery In Mineral Oil Gels (2017-2018)
Advisor: Dr. Kenneth Mineart, Department of Chemical Engineering, Bucknell University, PA
- Aimed to develop novel drug delivery reverse vesicles to be used in mineral oil gels.
- Evaluated various reverse vesicle extrusion protocols gathered from literature. Calibrated and used an extruder to create reverse vesicles of various sizes and characterized shape by spectrophotometry.
- Managed a lab budget and an inventory as per the needs of research assistants.

Computational Modelling of Antibiotic Resistance Spread (2017)
Advisor: Dr. Jiajia Dong, Associate Dean of Natural Sciences and Math, Bucknell University, PA
- Develop computational models in MATLAB to study how initial conditions like birth and death rate and resistance to drugs affects the spread of antibiotic resistance in bacterial populations.
- Assisted in creating figures and reviewing initial manuscripts of a journal publication.

gARments, Co-Founder (2020)
Bucknell University, PA

- Co-founded gARments, an AR-based mobile application that allows customers try on clothes from local small businesses.
- Built a minimal viable mobile application that leveraged iPhone's LIDAR sensors and true depth camera to create life-like 3D renderings of clothes. Leveraged SnapChat's Lens Studio API to show how renderings can be imposed on customers.
- Successfully pitched business plan at Bucknell BizPitch 2021 and acquired $3,000 funding.

Backend Engineering Intern (May-August 2020)
Livongo Health, San Francisco, California

- Integrated Prometheus client libraries in a micro-services platform and designed custom filters in Scala to record telemetry metrics, while using GitHub for version control.
- Developed custom exporters to record MySQL and Kafka metrics, used PromQL to create interactive Grafana visualization dashboards, and created docker images of software.
- Using a CI/CD Jenkins pipeline, the software is now deployed on Livongo's architecture and helps in real-time monitoring of backend infrastructure.

Lead Resident Assistant (2020-2021)
Department of Residential Education, Bucknell University, PA

- Serve as a leader, role model, and supervisor to a staff of 25 resident assistants and a residential community of over 700 (first years and sophomores) spanning over four residential buildings.
- Plan and run staff meetings, educate staff about residential education policies and COVID-related health guidelines, and assist in organizing bi-yearly resident assistant training.
- Approve and maintain programming efforts to establish a safe and welcoming community.

Business and Technology Consultant (2019-Present)
Emoby Private Limited, Vadodara, India

- Emoby is an Indian startup that aims to bring shared electric scooters to Indian universities.
- As part of the core founder team, performed market analysis and successfully advocated that college students were primary market for shared electric scooters program to venture capitalists.
- Collaborated with company co-founders and software engineers to create specifications for an IOT system driving the Emoby application interface.
- Currently serve as an advisor to teams in design, marketing, and software development.

President of Biomedical Engineering Society (2019-Present)
Department of Biomedical Engineering, Bucknell University, PA

- Collaborate with faculty advisors and executive board to define goals and scope of the biomedical engineering society.
- Plan and execute weekly executive meetings and department bonding events.
- Responsible for official correspondence with the department and university.

Community Conduct Board (2019-Present)
Department of Student Conduct, Bucknell University, PA

- Study cases of academic dishonesty filed by professors and statements made by accused student.
- Hear the testimonies to understand the sequence of events and decide if the student should bear responsibility for their actions, and, if warranted, assign a penalty.

Kellyn Foundation
Trained as a cook and made plant-based whole food meals. Worked at a mobile market to sell healthy food options at food deserts in rural Pennsylvania.

E-NABLE
Lead teams of biomedical, mechanical, and chemical engineers to 3D print prosthetic limbs for children who cannot afford expensive prosthetics. Plan and run outreach events in the county to teach children rapid prototyping techniques, specifically 3D printing.

Alpha Phi Omega (service fraternity)
Participate in service events like community clean up, setting up YMCA libraries, and cheering on a bowling team for children with down syndrome. Lead at least one service event per semester.

Hurricane Harvey Houston response team
During Thanksgiving, volunteer with "All Hands and Hearts" teams to rebuild homes and hospitals in the underserved regions of Houston that were adversely affected by Hurricane Harvey in 2017.

After school tutoring program
Volunteer to help students ranging from 2nd to 9th grade in learning science, math, and English concepts. Help students improve artistic skills by running painting workshops.