# Aagam Shah

aagam2@illinois.edu (+1) 217 213 2496 aagamshah228 aagamrshah.github.io

Seeking a co-op starting August 2023. Interested in data-driven additive manufacturing. Experience in statistical modelling, machine learning, materials synthesis, and metal 3D printing.

## EDUCATION

- **University of Illinois Urbana-Champaign (UIUC)** Aug '19 - May '24 (expected)
  Doctor of Philosophy (PhD) in Materials Science & Engineering GPA : 3.56 / 4
- **Indian Institute of Technology (IIT) Gandhinagar** Jul '15 - Jul '19
  Bachelor of Technology (BTech) with Honors in Materials Science & Engineering GPA : 8.49 / 10

## TECHNICAL SKILLS

- **AM Techniques:** FDM, SLA, LPBF
- **Languages:** Python, Bash, MATLAB, Javascript
- **Machine Learning:** Tensorflow, Scikit-learn, PyTorch
- **Tools:** Autodesk Fusion 360, Autodesk Inventor, SolidWorks, PyQt5, SQLAlchemy, JMP, LabVIEW, Quantum ESPRESSO, Materials Studio, FactSage, LaTeX

## MAJOR PROJECTS

- **Optimising Laser Powder Bed Fusion to identify stable manufacturing regimes** Jan '22 - *present*
  *Dr. Sameh Tawfick & Dr. Elif Ertekin, UIUC*
  - Built unsupervised image analysis techniques to help segmentation of cross-section images of single-track melt pools. Trained a neural network to perform the segmentation automatically with an **accuracy greater than 99%** and extract the melt pool features.
  - Using **Bayesian optimisation** to exploit the experimental results and find the region of the parameter space in conduction mode, while **employing the normalised enthalpy** to transition across different materials systems.
  - Building web applications to crowd-source data and publish software to analyse images.
- **Graphene Recipes for Synthesis of High-Quality Materials (Gr-ResQ)** Sep '19 - *present*
  *Dr. Sameh Tawfick & Dr. Elif Ertekin, UIUC*
  - Synthesised graphene using **chemical vapour deposition**. Varied specific reaction parameters - such as total gas flow rate and growth duration - using design of experiments and achieved high repeatability in the quality of graphene.
  - Performed active learning using Bayesian optimisation to exploit the experimental results and facilitate more efficient discovery of complex synthesis recipes. **Increased coverage** of graphene over 3 cycles of **active learning**. Extending the use of this model to **optimise domain size** by including **physics-based constraints**.
  - **Published software** on nanoHUB to enable crowd-sourcing of synthesis recipes and analysis of microscopy images and Raman spectra, with more than 750 total users worldwide.
  - Automated segmentation of scanning electron microscopy images of graphene with a **deep neural network** with **94.5% pixel-wise accuracy** using only 93 training images. Published the trained model, compatible with deepImageJ, at doi.org/10.5281/zenodo.7063245.
- **Biotemplating to synthesise inverse-gyroid photonic crystals** Jan '18 - Dec '18
  *Dr. Abhijit Mishra, IIT Gandhinagar*
  - Created the gyroid phase in a mixture of 1,2-Dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE) and 1,2-dioleoyl-sn-glycero-3-phospho-L-serine (DOPS) with Octa-arginine.
  - Attempted to create an inverse gyroid structure by crystallising CdS on the lipid gyroid template.

## EXPERIENCE

- **Intern, Texas A&M University (TAMU)** May '18 - Jul '18
  *Composite Fabrication using conventional and 3D printing methods* College Station, TX, USA
  - Built a filament winder (capable of b-staging with ultraviolet light) to produce prepreg and wind flywheel rotors for aerospace applications.
  - Produced high fibre volume fraction (52%) polymer matrix composite using the filament winder.
- **Intern, Japan Advanced Institute of Science and Technology (JAIST)** Jun - Jul '17
  *Electronic structure calculations using high-performance computing (HPC)* Nomi, Japan
  - Studied the energetics and plotted the emission spectra for adsorption of Nitrogen Monoxide (NO) gas on catalyst surfaces using DFT.
  - Implemented fully-automated scripts for carrying out DFT-based phonon calculations.

## PUBLICATIONS AND PRESENTATIONS

- **Shah, A.**, Schiller, J. A., et. al. (2023). Automated image segmentation of scanning electron microscopy images of graphene using U-Net Neural Network. *Materials Today Communications*, 35, 106127. DOI: 10.1016/j.mtcomm.2023.106127
- Schiller, J. A., Toro, R., **Shah, A.**, Surana, M., et. al. (2020). Crowd-sourced data and analysis tools for advancing the chemical vapor deposition of graphene: Implications for manufacturing. *ACS Applied Nano Materials*, *3*(10), 10144-10155. DOI: 10.1021/acsanm.0c02018
- Presented "Using Convolutional Neural Networks to Segment SEM Images of Graphene" at the **2022 MRS Spring Meeting**.
- Presented "Data-Driven Modelling of Graphene Synthesis" at the **TMS AIM 2022**.
- Presented "Experiments and Data-Driven Modeling of Graphene Synthesis by Chemical Vapour Deposition" at the **2021 MRS Fall Meeting**.
- Presented "Gr-ResQ — A Database for Graphene Synthesis Recipes" at the **2020 Virtual MRS Spring/Fall Meeting**.

## HONORS & AWARDS

- Selected as an **NSF Research Trainee** in the **DIGI-MAT** program.
- **Director's Silver Medal**, **IIT Gandhinagar** for for outstanding overall performance in Materials Science & Engineering.

## OTHER ACTIVITIES

- **Guest instructor** for 3 lectures in Intro to Digital Materials (MSE 598) at UIUC in Spring 2021 and Spring 2020. Taught the fundamentals of Gaussian process models and Bayesian optimisation.
- **Instructed two workshops** on supervised and unsupervised techniques for segmentation of microscopy images as part of the Hands-on Data Science and Machine Learning Training Series on nanoHUB, with over 200 participants from around the world.
- **Captain** of the **IIT Gandhinagar Aquatics team** from April 2018 to April 2019.
- **Led** the **Industry Relations & Projects Council**, which facilitates **collaboration between industry and academia** by enabling students to work on industry-funded projects.
- **Led the entire team** of Amalthea '16 (annual technical summit of IIT Gandhinagar) comprising over 100 members. **Raised $40,000** through corporate and government sponsorship.
- **Led the winning team** of the **UL Engineering Challenge 2015**; presented solutions for fire safety and shock hazards in rooftop photovoltaic installations.