Aagam Shah

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Seeking a full time opportunity starting January 2025 in experimental & data-driven materials science. Experience in statistics, machine learning, materials synthesis, and additive manufacturing.

EDUCATION

- **University of Illinois Urbana-Champaign (UIUC)** Aug '19 - Dec '24 (expected)
  Doctor of Philosophy (PhD) in Materials Science & Engineering GPA : 3.60 / 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

- **Languages:** Python, Bash, MATLAB, Javascript
- **Machine Learning:** Tensorflow, Scikit-learn, PyTorch
- **Tools:** Onshape, Autodesk Fusion 360, PyQt5, SQLAlchemy, JMP, LabVIEW, Quantum ESPRESSO, Materials Studio, FactSage, Autodesk Inventor, SolidWorks, LaTeX
- **Characterisation Techniques:** SEM, Raman, UV-vis, FTIR, XPS, XRD, DSC, DMA, TGA, AFM

MAJOR PROJECTS

- **Graphene Recipes for Synthesis of High-Quality Materials (Gr-ResQ)** Sep '19 - *present*
  Dr. Sameh Tawfick & Dr. Elif Ertekin, UIUC
  - **Built** a high-throughput **chemical vapour deposition (CVD)** system and synthesised graphene. Varied reaction parameters - such as gas flow rates and growth duration - using **Statistical Process Control** principles 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.
  - Designed a **custom kernel** for a Gaussian process model to simulate the CVD process and explain the balance between the **governing physical processes**.
  - **Published software** on nanoHUB to enable crowd-sourcing of synthesis recipes and analysis of microscopy images and **Raman spectra**, with **more than 1000 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.
- **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.
  - **Published software** (Python package) for image analysis of melt pool cross-sections.
- **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.
  - Engineered a novel method to create an inverse gyroid structure by crystallizing CdS on the lipid gyroid template.

EXPERIENCE

- **Print Process Intern, Formlabs Inc.** Sep '23 - Dec '23
  Statistical modelling for design optimisation & performance validation of Fuse Boston, MA, USA
  - Developed a **Standard Operating Procedure** (SOP) for collecting seed data using **design of experiments** to support a data-driven model.
  - Built an **active-learning model** to predict the **EAB**, **UTS**, and **modulus**, along with **experimental uncertainty** as a function of **optical and thermal inputs** for the SLS printers for PA12. This model explained the variability across printers with >96% accuracy, and is guiding optimisation efforts for the next generation of printers.
  - Characterised **thermal non-uniformity** within the print volume and built a predictive model for the same as a function of the optical and thermal inputs.
- **Research 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.
  - Manufactured flywheels with high fibre volume fraction (52%) polymer matrix composite.

PUBLICATIONS AND SELECTED 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.
- 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.
- **Shah, A.**, Weissbach, R., et al. (*under review*). Automated Segmentation of Microscopy Images of Laser Powder Bed Fusion Melt Tracks.
- **Shah, A.**, Surana, M., et al. (*in preparation*). Optimisation of graphene synthesis by chemical vapour deposition - a Bayesian approach.
- 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**.

HONORS & AWARDS

- Selected as an **NSF Research Trainee** in the **DIGI-MAT** program.
- **Director's Silver Medal**, **IIT Gandhinagar** 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 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.
- **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.