Ankit (Andy) Kapoor

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Education

Duke University, The Pratt School of Engineering — Durham, NC
M.S. in Materials Science & Engineering, and AI For Materials Certificate — Expected May 2026
Affiliations: Duke Materials Initiative, Materials Research Society, AI Hackathon, Duke aiM, Duke Quant, Golf Club

Concordia University Irvine — Irvine, CA
B.S. in Biochemistry, minor in Computer Science — 2021 - 2024
Affiliations: ODK National Honors, Tri-Beta Biological Honors, American Chemical Society Branch VP, PhiDE

Research

Metal-Carbon Composite and Carbon Nanotube Thin Film Fabrication for Aerospace Coatings

- Deposited TiAlC/SiO_2 ultradark coatings via Atomic Layer Deposition (ALD) for aerospace applications requiring broadband absorption and thermal cycling stability, optimizing conformal coverage on substrates.
- Fabricated carbon nanotube absorber films using Microwave Enhanced Chemical Vapor Deposition (CVD), for assessment against ALD coatings for broadband optical absorption performance.

Semiconductor Fabrication, Composition Characterization, and Bandgap Analysis

- Fabricated high-quality semiconductor thin films through Matrix Assisted Pulsed Laser Evaporation, on glass substrates.
- Elemental assessment of hybrid organic-inorganic Copper halide photonic semiconductors, after certification in Scanning Electron Microscopy, X-Ray Photoelectron Spectroscopy, and Fourier-Transformed Infrared Spectroscopy.
- Photoelectron spectral analysis to determine oxidation states of coordinated metals in hybrid semiconductor powders.

AI-Powered Paper Retrieval for Hybrid Semiconductor Research: HybriD3 Paper Similarity Search Tool

- Developed Python-based cosine similarity searches of SciBERT language model vector embeddings of scientific paper metadata, to enhance relevant paper retrieval from the Hybrid Cubed hybrid perovskite materials database.
- Enabled 4-component similarity scoring of sample metadata collected with a CrossRef API implementation.
- Developed a Flask-based interface, simplifying AI-powered similarity searches for researchers studying hybrid perovskites.

Experience

Computer Engineering Research Assistant - 3D Printing for Autonomous Drones — Irvine, CA
Concordia University Irvine — May 2023 - Dec 2023

- Completed flow optimization and durability testing of carbon fiber–infused filament for 3D printed custom drone frames.
- CAD modeled and resin 3D printed 4 iterations of custom support and mounting parts for autonomous drone components like the camera, flight controller, and antenna, resulting in improved long distance stability and performance.
- Improved control reliability by testing operating conditions for manual control, allowing more robust functionality.

Graduate Research Assistant - Novel Semiconductor Materials — Durham, NC
Duke University - Department of Mechanical Engineering and Materials Science — Aug 2024 - Present

- Machine Learning model training and verification using sampled semiconductor potential energy surface data from a quasi-Dirac spinor relativistic Density Functional Theory method applied against Langevin Molecular Dynamics results.
- Utilized the central difference and Richardson extrapolation methods in Python ASE to approximate interatomic forces.
- Phonon dispersion curve generation of metal halide perovskite semiconductors using scalar relativistic density functional theory, for comparison with experimental data.

IT & Informatics Employee — Costa Mesa, CA
Southern California Coastal Water Research Project — Sep 2023 - Jul 2024

- Automated custom data retrieval with Python-based NCBI Entrez scripts, significantly reducing manual workload.
- Led DNA sequence analyses with QIIME 2 on Linux servers for Environmental DNA studies, achieving statistical analyses and visualizations for publications using R and Python.
- Increased gene sequence match rates in alignments by over 30%, by creating custom reference libraries with rCRUX metabarcoding, to optimize sequence identification for coastal water samples.

Skills

Laboratory Instruments: Scanning Electron Microscopy, X-Ray Diffraction, UV-Vis/FTIR/Fluorescence/X-Ray Photoelectron Spectroscopy, Atomic Force Microscopy, Autoclave
Fabrication: 3D Printing (mSLA, FDM), Laser Cutter, PVD, CVD, UV Photolithography, Fusion360, MeshMixer
Programming: Python, Linux, BASH, R, Docker