Yunhao (Henry) Xu

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EDUCATION

Carnegie Mellon University **Aug 2024 - May 2026**
M.S. in Materials Science | GPA: 3.9/4.0
Core Courses: Structure and Characterization of Materials, Thermodynamics of Materials, Advanced Polymer Science

Shanghai Institute of Technology **Sep 2020 - Jun 2024**
B.Eng. in Materials Science and Engineering | GPA: 3.9/5.0
Core Courses: Fundamentals of Materials Science, Polymer Physics, Polymer Chemistry, Polymer Processing Techniques

SKILLS

- **Programming and Tools:** SQL, Python, Tableau, Advanced Excel, CAD, ANSYS, MATLAB, Crystalmaker, JMP
- **Materials Science:** Wet lab experience, Polymer synthesis, Characterization (TEM, SEM, DSC), Finite Element Analysis, 2D & 3D model construction, 3D printing, Failure Analysis, Digital Tensile Tester, Rotational viscometer, Digital multimeter, Bursting strength tester, Hydrostatic head tester, Dry-state fiber shedding tester
- **Certificates:** Six Sigma White Belt, Design of Experiments (JMP), Accelerating End-to-End Data Science Workflows (NVIDIA)

PROFESSIONAL EXPERIENCE

Intern, Ocean Reviver [Irvine, CA] **Jun 2025 - Aug 2025**
- Acquired theoretical understanding of Direct Lithium Extraction technologies such as adsorption, membrane separation, and electrochemical methods.
- Analyzed datasets from real-world DLE implementations using Excel and Python, evaluating process flows, material properties, Li^+ selectivity, recovery rates, and cycle stability of companies including EnergyX and Lilac Solutions.
- Studied fundamentals of quantum computing, including qubits, quantum gates, superposition, and entanglement.
- Collaborated with team to optimize quantum models by tuning algorithm parameters and analyzing simulation outputs with Excel, NumPy, and Matplotlib to identify performance improvements.

R&D Intern, Shanghai Chest Medical Devices Co. [Shanghai, China] **Jul 2024 - Aug 2024**
- Created 2D and 3D CAD drawings of medical devices and generated 2D drawings for inner and outer packaging, ensuring design accuracy for downstream testing and analysis.
- Performed bursting strength, hydrostatic head, and dry state fiber shedding tests on medical devices, collecting structured datasets for quality evaluation.
- Analyzed over 150 test samples using Python (Pandas, NumPy) and Excel, applying statistical methods and visualization to identify key quality trends and reducing data processing time by **40%** through automation.
- Collaborated with R&D, QA, and Manufacturing teams to investigate test inconsistencies; applied root cause analysis and data-driven insights to resolve 2 major issues, reducing retesting frequency by **25%** and enabling faster design iterations.

RESEARCH EXPERIENCE

ML-Based Prediction of Mechanical Properties in Polymer-Grafted Nanoparticles, CMU **Aug 2025 – Present**
- Developed 8 regression models to predict Young's modulus of polymer-grafted nanoparticles from molecular structure parameters (degree of polymerization, grafting density).
- Implemented rigorous hyperparameter optimization using leave-one-out cross-validation with MAPE as the objective function, training models on PMMA dataset (80/20 train-test split).
- Demonstrated the models' capability to learn structure-property relationships in different polymer systems (PMMA data for training and PS for validation).
- Created comprehensive analysis framework with automated scripts for model training, performance benchmarking, cross-validation, and visualization generation, producing publication-ready figures and detailed performance metrics tables.

Role of Hyperuniformity in Self-Healing Hybrid Materials, CMU **Aug 2024 – Aug 2025**
- Optimized thin-film coating processes ($oSiO_2$–PMMA self-healing films via spin-coating with PAA sacrificial layers).
- Performed TEM analysis. Quantified hyperuniformity in microstructural patterns using Python and MATLAB.
- Designed workflows to track experimental parameters and discovered the correlation between coating conditions and healing performance.
- Established collaborations with advisors and cross-disciplinary peers to refine methodologies. Manuscript in preparation.

Water-Based Acrylate Pressure-Sensitive Adhesives, SIT **Jan 2024 - Jun 2024**
- Synthesized waterborne acrylic PSAs with varied structures using suspension polymerization.
- Characterized material properties through standardized tests: solid content (oven method), tack testing (rolling ball), shear adhesion, 180° peel strength (tensile tester), and viscosity (rotational viscometer).
- Established correlations between formulations and performance metrics, accelerating identification of optimal compositions.
- Designed Tableau visualizations to present structure-property relationships, enabling design improvements.
- Optimized formulations by tuning functional monomer/initiator types, soft–hard monomer ratios, Tg, and particle structures, achieving deeper understanding of structure–property-performance relationships in PSAs.