

AHILAN NAYANI

[linkedin.com/in/ahilan-nayani-773384333](https://www.linkedin.com/in/ahilan-nayani-773384333)

EDUCATION

Iowa State University, B.S. Mechanical Engineering | GPA: 3.5

Ames, IA | Sophomore | Expected Dec 2028

Relevant Coursework: Mechanical Engineering Design, Engineering Statics, Thermodynamics, Materials Science, Engineering Physics I & II, Multivariable Calculus, Differential Equations. Upcoming: Mechanics of Materials (Spring 2027)

LEADERSHIP & ACTIVITIES

Formula SAE Electric | Component Design & Structural Analysis

Iowa State University | Aug 2026 – Present

- Performed force, shear, and moment analysis to identify critical braking and side-loading conditions, including out-of-plane bending on the pedal assembly.
- Redesigned the 7075-T6 aluminum brake pedal connector in SolidWorks around fixed mounting interfaces, from an existing part and a subsystem lead's calculations, to 0.2144 lb. Designed and analyzed, not yet manufactured.
- Developed and compared truss, X-brace, and pocketed internal structures, using direct load paths and radiused transitions to remove material from low-load regions.
- Ran linear static FEA on the redesign for a single load case, giving 36.0 ksi maximum von Mises stress and a minimum factor of safety of 2.03, while sizing fillets to control stress concentrations and preserve machinability.
- Compared polyethylene, PTFE, and PEEK for a DOT 4 brake-fluid reservoir spacer on chemical compatibility, dimensional stability, and manufacturability, proposing unfilled PEEK 450G to the team lead.

Algorithmic Trading Club, Vice President

Iowa State University | Aug 2025 – Present

- Lead a 30+ member organization, running weekly technical seminars and coordinating project teams.
- Built Python trading algorithms with multi-factor signals and automated backtesting across 20+ strategies on a \$100K paper portfolio.

TECHNICAL PROJECTS

Low-Cost Post-Harvest Root Crop Washer | Mechanical Design Project

Fall 2026, in progress

- Designing a low-cost, hand-cranked root crop washer for smallholder farmers in Ghana, targeting cassava, yams, and sweet potatoes with no electricity required.
- Translated customer needs into engineering specifications using Quality Function Deployment, setting targets of $\geq 80\%$ soil removal, $< 1\%$ crop damage, ≤ 2 L water per load, ≤ 130 N operating force, and roughly \$100 manufacturing cost.
- Benchmarked manual methods against commercial rotary washers, then used functional decomposition and morphological charts to generate four concepts, selecting a hand-cranked rotating drum through a weighted decision matrix.
- Built mathematical models for crank torque, water consumption, gravity drainage, and unloading, predicting 5 kg batch capacity, 20 N·m crank torque, 6.3 min cycle time, and 47.7 kg/hr throughput.
- Developed a Design FMEA ranking insufficient water flow (RPN 96), drain blockage (84), and crank failure (64) as top risks, with mitigations feeding the next iteration ahead of CAD, BOM, and prototype fabrication.
- Developed a three-part prototype test plan covering water delivery, drain clogging, and cleaning effectiveness versus load mass.

Battery-Powered Speaker Cooler | Enclosure Design & Assembly

- Designed and assembled a battery-powered portable cooler in SolidWorks, engineering a multi-component enclosure that integrates audio hardware with thermal isolation features and speaker mounting interfaces.
- Applied design-for-assembly principles across the enclosure, mounting hardware, and thermal barrier components to keep a serviceable fit in a compact form factor, and produced engineering drawings for all custom parts.

Semi-Automatic Produce Slicer | Housing & Pusher Design

- Designed the housing and pusher of a team cam-follower slicer in SolidWorks (team of four), a mechanism that converts manual rotary input into a reciprocating cutting stroke.
- Modeled the housing as the central fixture of the slicing mechanism, with hexagonal mounting interfaces, slotted blade-path clearances, and an adjustable intake spacer system that sets cut thickness.

F1 Pit Stop Predictor | Python, XGBoost, LSTM

f1-pit-stop-predictor.streamlit.app

- Built a model predicting Formula 1 pit stop timing from 42,500+ laps of race data, engineering 19 inputs covering tire and opponent-tire context, circuit pit loss, and weather, and combining two model types to reach 0.93 ROC-AUC.
- Tuned XGBoost with stratified 5-fold CV on a stratified random lap hold-out; deployed with a strategy optimizer dashboard.

Battery Remaining-Useful-Life Predictor | Python, XGBoost, SHAP

- Built a pipeline predicting Li-ion remaining useful life from 15,000+ cycles across 14 cells; a cycle-counter-only linear baseline reaches 6.30 cycles mean absolute error (MAE) on held-out cells.
- Ran a sensor-only ablation (R^2 0.945, 56.7 cycles MAE) and used SHAP; leave-one-battery-out on the full model gave 5.90 cycles.

RESEARCH EXPERIENCE

Undergraduate Research Assistant | Kim Research Group, Iowa State University

Ames, IA | Aug 2026 – Present

- Develop Python machine learning and computer vision workflows for 3D segmentation and quantitative analysis of intestinal organoids imaged with label-free holotomography.
- Implement and evaluate u-Segment3D and related ML segmentation methods to reconstruct cellular and organoid structures from 3D refractive-index microscopy datasets.
- Benchmark segmentation algorithms on accuracy, robustness, and automation for measuring organoid morphology, volume, and growth.

TECHNICAL SKILLS

CAD & Analysis: SolidWorks, SolidWorks Simulation (FEA), Autodesk Inventor, Engineering Drawings, GD&T

Design & Manufacturing: DFM/DFA, Design FMEA, QFD, Material Selection, Trade-Off Analysis, Prototyping, BOM, Cost Analysis

Programming & Data: Python (pandas, NumPy, scikit-learn, XGBoost, SHAP), Machine Learning, Statistical Analysis, Git/GitHub, Excel