Karim Al-Haffar

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Education

Tufts University Sept. 2021 – Dec. 2025 (Expected)

B.S. in Mechanical Engineering / Engineering Management Minor, GPA: 3.97/4.0 Medford, MA

Courses: Robotics, Thermodynamics, Materials and Manufacturing, Static and Dynamic Mechanics, Mechanics of Materials

Samuels Prize Recipient: Given to one junior in Mechanical Engineer for academic excellence

Clubs: Arab Student Association (President), Robotics Club, Tau Beta Pi Engineering Honor Society

Experience

Lexington Medical May 2025 – August. 2025

Mechanical Engineering Intern; Minimally Invasive Surgical Stapling Systems Bedford, MA

- Designed and validated a reload simulator electromechanical fixture with a closed-loop electronics system that mimicked surgical stapler firing and retraction force–displacement profiles, saving $140,000 per Design Validation test
- Implemented and tuned a PID control system to match target force–displacement profiles (load cell, Motor, Arduino, Lead-screw), successfully reproducing the required curves and meeting defined acceptance criteria
- Created and documented a test validation protocol, engineering test reports, BOM, drawings (GD&T), and ECOs

Amazon Robotics June 2024 – Dec. 2024

Hardware / Mechanical Engineering Co-op; World's Largest Fleet of Industrial Mobile Robots North Reading, MA

- Designed and developed a custom drive unit skateboard in SolidWorks by procuring and integrating components from two existing drive units (motors, batteries, and sensors) to enable box-stacking functionality a robotic arm mounted onto the skateboard. Designed the robotic arm's end-of-arm tool specifically for efficient box stacking
- Conducted thermal and IP testing on a pre-released sensor to validate Computational Fluid Dynamics simulations, ensuring functionality/reliability prior to mass production; recommended a redesign with DFMA improvements
- Investigated high wheel replacement rates in robots, performing root cause analysis and recommending solutions. Utilized Ansys for (FEA) to evaluate a failing part and suggested material alternatives for improved performance

Jaros, Baum & Bolles Consulting Engineers (JB&B) May 2023 – Aug. 2023

HVAC Intern; MEP Consulting Engineering Firm Boston, MA

- Utilized AutoCAD to create standardized companywide riser diagrams, calculators, and shop drawing

Tufts University, Mechanical Engineering Department Aug. 2022 – Present

Learning Assistant For 3 Classes: Engineering Design, Materials and Manufacturing, Robotics Medford, MA

- Led weekly lab for 20 students guiding in design prototypes using SolidWorks and hands-on projects such as Sand Casting, Drill Press, Sheet Metal Working, Horizontal and Vertical Bandsaw, Injection Molding, and Instron machines
- Ran weekly office hours on topics such as prototyping, microcontrollers, Python, SolidWorks, and sensor data analysis

Projects

Automated Latte Cafe: Robotic Barista Medford, MA

- Cross-functional collaboration with a 20+ interdisciplinary team to develop a fully automated robotic café
- Designed, prototyped, and programmed an pod insertion system using a Scotch Yoke Mechanism and a linear actuator, troubleshooting vibration issues, refining components, and implementing PID control using Raspberry Pi
- Delivered a fully operational robotic cafe, achieving end-to-end automation of latte preparation, including pod insertion, coffee brewing, milk frothing, and latte art application with minimal human intervention

LEADERSHIP EXPERIENCE

Tufts University Arab Students Association Sept. 2021 – Dec. 2024

President (September 2022), Treasurer (September 2021) Medford, MA

- Planned and led club events and meetings, coordinating with university administration and external vendors
- Managed a $17,000 annual budget, organizing multiple large-scale events (50+ attendees, $500–$5,000 each)

Skills

Software and Programming Languages: SolidWorks, Ansys (FEA), MATLAB, AutoCAD, Python, Stata, Stress Analysis, Finite Element Analysis (FEA), Creo, Google Suite, Microsoft Office, Geometric Dimensioning and Tolerancing (GD&T)

Technical Skills: Laser Cutting, Injection Molding, Injection Molding, 3D Print, Prototyping, machining, Casting