James Akl

Scientist & Engineer

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SUMMARY

I bring a strong background in **Engineering** and **Mathematics**, with expertise in **Robotics**, **AI**, and **Autonomous Systems**.
I hold 5 years of experience in **R&D**, **rapid prototyping**, **technology demonstration**, and **commercialization** with emphasis on:

- **analyzing problems** and requirements, as well as devising **creative solutions** to address them.
- **software development**, **mathematical modeling**, autonomous **system design**, and **algorithm design**.
- **project leadership**, planning, and management in technical and R&D settings.

My work is **structured**, **meticulous**, and **rigorous** — I am routinely invested in raising and maintaining **high standards**.
I seek opportunities in **technology**, **research**, and **industry** to create value via autonomous and intelligent systems.

EDUCATION

PhD — **Robotics Engineering** — Worcester Polytechnic Institute — GPA 4.00/4.00 — **Aug 2019** **Aug 2023**
Dissertation: "Robot Autonomy for Scrap Cutting in Metal Recycling" · **Focus:** Autonomous robots and systems

MS — **Robotics Engineering** — Worcester Polytechnic Institute — GPA 4.00/4.00 — **Aug 2019** **May 2022**
Focus: Robot dynamics and control, Artificial intelligence, Machine learning, Applied mathematics, Data science

BEng — **Mechanical Engineering** — Lebanese American University — GPA 3.72/4.00 — **Sep 2015** **May 2019**
Thesis: "Robotic Manipulator for VR Haptic Feedback" · **Focus:** Robotics, Software, Control, Mechanics, Sensors

Minor — **Mathematics** — Lebanese American University — GPA 4.00/4.00 — **Sep 2015** **May 2018**
Focus: Analysis, Optimization, Linear algebra, Numerical analysis, Probability, Statistics, Modeling, Algorithms

EXPERIENCE

Postdoctoral Scientist · **Amazon Robotics** · Innovation Lab (BOS27)
Mar 2024 – **PRESENT**: Conducting **robotics/AI research** incorporating **robot learning**, **perception**, **control**, **manipulation**, **grasping**, **human–robot interfacing**. Leading a prototyping team and developing innovative **robotic fulfillment systems**.

Applied Scientist · **Amazon Robotics** · Innovation Lab (BOS27)
Aug 2023 – **Mar 2024**: Conducted **robotics R&D** to design/implement algorithms for autonomous fulfillment and logistics. Developed **robotic manipulation** capabilities using **3D perception**, **deep learning**, task and motion **planning**, and **control**.

Doctoral Researcher · **Worcester Polytechnic Institute** · Manipulation & Environmental Robotics Lab
Aug 2019 – **Aug 2023**: Solved challenging technical problems by developing **innovative solutions** and **novel algorithms**.

Managed and lead **research projects**, supervised MS students, and collaborated in multidisciplinary teams.
Developed **software** for prototypes, simulations, and experiments (C++, Python, ROS, Bash, Linux, Git, PCL, OpenCV, …).
Engineered **autonomous systems** for industrial applications using **robot vision**, **control**, **planning**, and **machine learning**.
My work resulted in **8 research publications** in top-tier conferences/journals, as well as **3 patents** filings.

Research Mentor · **Worcester Polytechnic Institute** · Robotics Engineering Department / NSF REM
May 2022 – **Jul 2022**: Mentored students in **research methodology**, **data collection/processing**, image processing, and **hands-on experiments**. Presented to the NSF REM Program my strategies for **effective mentoring** of research trainees.

Teaching Assistant · **Worcester Polytechnic Institute** · Robotics Engineering Department
Aug 2019 – **May 2020**: Assisted in **delivery**, **labs**, and **grading** of courses ('Actuation', 'Sensing', 'Introduction to Robotics').

Visiting Researcher · **University of Ottawa** · Mathematical Modeling & Physical Experiments
Jun 2018 – **Aug 2018**: **Modeled** the vibrations of ribbed plates, and **experimentally** evaluated **analytical models** against **numerical models**. My work resulted in **2 research publications** in reputable journals in the field of mechanical vibrations.

Research Assistant · **Lebanese American University** · Multiphysics Modeling & Numerical Simulation
Nov 2017 – **Mar 2019**: **Demonstrated** the functionality of the 'ionic buoyancy engine' for underwater propulsion using a multiphysics **numerical model**. My work resulted in a publication at a top-tier conference in the field of smart materials.

SKILLS

Software	C++ · Python · Bash · Git · Linux · CMake · OpenCV · PCL · Open3D · Eigen · OctoMap · NumPy · Pandas
	SciPy · PyTorch · scikit-learn · scikit-image · matplotlib · ROS/Gazebo · MATLAB/Simulink · Mathematica
3D Tools	Blender · MeshLab · Nvidia Omniverse · Meshmixer · Meshroom · F3D · Fusion 360 · SolidWorks
Robotics	Kinematics · Dynamics · Control · Motion planning · Calibration · Simulation · Manipulation & Grasping
	Bin picking / packing · Logistics / fulfillment · Metal cutting · Waste sorting · Soft robot control
AI & ML	Deep learning · Perception · Computer vision · Synthetic data · Search algorithms · Probabilistic reasoning
Platforms	Universal Robots · Franka Emika · Nvidia Jetson · Intel RealSense · Arduino · Raspberry Pi
Research	Surveys/reviews · Mathematical modeling · Simulations · Physical experiments · Field work
Publishing	LaTeX · Technical writing · Photo-editing · Illustration/diagrams · Video-editing · MS Office
Social	Presentations · Communication (technical, general) · **Collaboration** (cross-disciplinary)
Language	English (native fluency) · **French** (professional fluency) · **Arabic** (professional fluency)

PUBLICATIONS Preprints

[2023][1] **Cut Sequencing Algorithm for Safely Disassembling Large Structures** in ***IEEE CDC***
[2023][1] **Vision-based Oxy-fuel Torch Control for Robotic Metal Cutting** in ***IEEE IROS***
[2023][1] **CNN-based Task State Estimation for Safer Automation of Oxy-fuel Metal Cutting** in ***IEEE CASE***
[2023][1] **Feature-driven Next View Planning for Cutting Path Generation in Robotic Metal Scrap Recycling** in ***IEEE T-ASE***
[2022][7] **VisDA 2022 Challenge: Domain Adaptation for Industrial Waste Sorting** in ***PMLR/NeurIPS Competition Track***
[2022][4] **ZeroWaste Dataset: Towards Deformable Object Segmentation in Cluttered Scenes** in ***IEEE CVPR***
[2021][1] **Towards Robotic Metal Scrap Cutting: A Novel Workflow and Pipeline for Cutting Path Generation** in ***IEEE CASE***
[2021][2] **ECNNs: Ensemble Learning Methods for Improving Planar Grasp Quality Estimation** in ***IEEE ICRA***
[2020][1] **Comparing & Optimizing Analytical, Numerical & Experimental Vibration Models for […]** in ***IStructE/Elsevier Structures***
[2019][4] **Simplified Setup for the Vibration Study of Plates with Simply-supported Boundary Conditions** in ***Elsevier MethodsX***
[2019][1] **Ionic Buoyancy Engines: Finite Element Modeling & Experimental Validation** in ***SPIE Smart Structures***

[1–4] Superscripts indicate authorship position in co-authored publications.

PATENTS

Feature-driven Next View Planning of 3-Dimensional Surfaces · 18/119,547 · Filed Mar 9, 2023
Autonomous Robotic Cutting System · 63/413,739 · Filed Oct 6, 2022
Salvage Metal Cutting Robot · 17/721,553 · Filed Apr 15, 2022

VOLUNTEERING

Scholarly Reviewer · **IEEE** and **Sage Publications** · International Journals & Conferences

Jun 2021 – PRESENT: Conducting scholarly peer reviews for reputed journals (IJRR, RA-L, T-ASE, TMECH) and conferences (ICRA, IROS, CDC, CASE) in the areas of robotics, AI/ML, control, automation, mechatronics, and autonomous systems.

Faculty Candidate Reviewer · **Worcester Polytechnic Institute** · Robotics Engineering Department

Feb 2023 – Mar 2023: Attended **weekly seminars** of faculty candidates to the WPI Robotics Engineering Department. Submitted **written evaluations** of candidates' potential in research, teaching, supervision, funding, and inclusive work.