KAVINDU WIJESINGHE

Mechanical Engineer | Materials Design | AI & Automation | Additive Manufacturing Expert

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• https://kkavindu.github.io/kavindu-webpages.github.io • Potsdam, NY

Summary

Eagerness to contribute to a mission focused on technological advancement is demonstrated through innovative solutions and a strong foundation in mechanical engineering, materials design, and AI integration. A proven track record of enhancing efficiency through automation and design optimization is highlighted. The commitment to advancing materials science, coupled with leadership in mentoring future scientists, aligns well with the emphasis on continuous improvement and cutting-edge innovation.

Key Achievements

- **Built Patent-pending Automated Tester**
  increasing efficiency by 2000% and streamlining material analysis
- **Developing AI Assistant for Materials Discovery**
  materials design using generative AI reducing design time
- **Unveiled Hierarchical Deformation Mechanisms of DED Ti64**
  advancing understanding of microstructure-property relationship
- **Mentored Emerging Scientists**
  guided 7 undergraduate research students in presenting at Clarkson's RAPS showcase
- **Developed a Quadcopter Prototype for Arial Mapping (Original Design)**
  with topology optimization & superior aerodynamics for aerial mapping
- **7+ peer-reviewed publications**
  in Q1 journals: Acta & Scripta Materialia, IJP, Materials & Design, etc. (the most prestigious/ top 25% in the field)

Experience

Clarkson University — Potsdam

Research Assistant — 01/2020 - Present

- **6+ peer-reviewed journal publications, a pending patent and 7 conference presentations**.
- Built a **patent-pending automated micro-tensile testing system** integrating a 3-axis motorized stage, high-resolution imaging, and a 1000lb micro-tensile tester, capturing material deformation in under 8.5 minutes. Developed automation software (C++/Python) for autofocus, feature tracking, and post-processing, increasing testing efficiency by 2000% and enabling faster material analysis.
- **Uncovered hierarchical deformation mechanisms in Directed Energy Deposited (DED) Ti-6Al-4V** through in situ uniaxial tensile testing. This study advanced understanding of anisotropy in additively manufactured titanium alloys.
- Additively manufactured a range of Ti-6Al-4V alloys with varied hypo-eutectic Boron concentrations (0.0 - 1.5 wt.%) using DED. In detailed plasticity analysis was performed for finding the optimal Boron concentration to achieve isotropic properties for **advanced material design**.
- Developed a **deep learning framework for precise strain mapping** and deformation analysis for additively manufactured metals, improving strain measurement accuracy by **over 30%** and enabling advanced material studies.
- **Mentored 7 undergraduate researchers**, training them on sample preparation, mechanical testing, data analysis, etc. Successfully guided students to present findings at Clarkson's RAPS showcase, developing future materials scientists.
- **Creating a generative AI framework to predict microstructural deformation** (up to 20% strain) in **Stainless Steel 304** using latent diffusion modeling. This innovation aims to reduce experimental costs and testing time by 40% for industrial material analysis.
- **Residual Stress Measured in Selective Laser Melted (SLM) AlSi10Mg builds** using strain gauges to validate a finite element simulation and **Heat treated Nickel based super alloys and Stainless Steel alloys** for manipulating phase fractions and microstructure morphology.

AHEAD UAV Laboratory (Startup Company) - Colombo, Sri Lanka — Colombo, Sri Lanka

Mechanical Engineer — 01/2019 - 01/2020

- **Designed and fabricated a prototype quadcopter** optimized for aerial mapping, achieving superior aerodynamics and weight efficiency. This innovation improved flight stability and data capture, laying the groundwork for future UAV product commercialization.

3DMart 3D printing — Colombo, Sri Lanka

Self-Employee & Freelancer — 04/2018 - 01/2020

- **Delivered customized 3D modeling and printing solutions** for diverse applications using Creality Ender 3 PLA printing. Achieved 100% client satisfaction through precision designs tailored to specific customer needs.
- Increased client retention by optimizing mechanical designs with FEA and CFD services.

Camso Loadstar Pvt. Ltd. – R&D Facility of Wheel Manufacturing Division — Colombo, Sri Lanka

Mechanical Engineering Intern — 01/2019 - 12/2019

- **Designed and implemented an automated tire run out checking device** using pneumatic actuation, enabling real-time quality control within the production line. This innovation reduced operational downtime by 15% and improved output consistency, enhancing manufacturing efficiency.

Education

Clarkson University — Potsdam, NY
Ph.D. in Materials Science and Engineering | GPA: 3.795/4.0 — 12/2022 - Present

Clarkson University — Potsdam, NY
Master of Science in Mechanical Engineering | GPA: 3.83/4.0 — 01/2020 - 12/2022

University of Moratuwa — Moratuwa, Sri Lanka
B.Sc. in Mechanical Engineering | GPA: 3.49/4.2 — 08/2014 - 12/2018

Awards

- MSE Department and Clarkson Graduate Student Association Travel Award Winner: 2024 & 2025
- Clarkson University Ignite Presidential Scholarship Receiver: 2020 - Fall
- Dean's List for Academic Excellence University of Moratuwa: 2017

Leadership

Event Organizer
Sri Lankan Association of Clarkson University - 2022/2024

Committee Member
Mechanical Engineering Society of University of Moratuwa - 2017/2018

Committee Member
Classical Music Society of University of Moratuwa - 2017/2018

Technical Skills

Material Characterization & Design:

Metallic sample preparation including mechanical/electrochemical polishing & etching, SEM, Optical Microscopy, AFM, XRD, EBSD, EDS, in situ/ex-situ tensile testing (room/high temperature), nanoindentation, Digital Image Correlation (DIC), metal heat treatment, residual stress measurement

Mechanical Design & Manufacturing:

2D/3D modeling (SolidWorks, ptc creo, Siemens NX, Fusion 360), 2D drawing (manual and AutoCAD), product animation (3DS Max), FEA (Ansys, COMSOL), CFD, additive manufacturing (metal: SLM & polymer: FDM), manual & CNC machining/programming, welding, laser cutting, GD&T, FMEA

Computer Vision, Automation & Troubleshooting:

Python, MATLAB, C++, AI frameworks (PyTorch, TensorFlow), predictive and generative AI, Arduino, ESP32, Raspberry Pi, PLC programming (STEP7), control system troubleshooting, equipment troubleshooting and maintenance, root cause analysis, follow standard operating procedures

Publications, Patents & Presentations

Wijesinghe K., Herath C., Michopoulos J.G., Arnold S.M. and Achuthan A., 2024. Hierarchical Anisotropic Material Response of Directed Energy Deposited (DED) Ti-6Al-4V alloy. Acta Materialia, p.120080.

Wijesinghe K., Wanni J., Banerjee N.K., Banerjee S. and Achuthan A., 2021. Characterization of microscopic deformation of materials using deep learning algorithms. Materials & Design, 208, p.109926.

Wanni J., Wijesinghe K. and Achuthan A., 2023. Columnar grain morphology and mechanical anisotropy of face-centered cubic metals and alloys. Scripta Materialia, 236, p.115684.

Wijesinghe K., B. Dayner, J. G. Michopoulos, S. M. Arnold, A. Achuthan "Boron Addition for Enhanced Mechanical Properties in Directed Energy Deposited Ti–6Al–4V: Underlying Mechanisms" (Submitted to MSEA).

Herath C., Wijesinghe K., Michopoulos J.G., Arnold S.M. and Achuthan A., 2024. Hierarchical Deformation and Anisotropic Behavior of (α+ β) Ti Alloys: A Microstructure-Informed Multi scale Constitutive Model Study. IJP, p.104163.

Wijesinghe K., Ashwin A., Wanni J., S. M. Arnold, A. Achuthan "Physics-Informed Generative AI for Predicting Material Deformation: Latent Diffusion Modeling from Undeformed Microstructures" (Under Preparation).

Jayawardane H., Wijesinghe K., Wildeniya P. and Gamage J.R., "Design of a sustainable automotive turbocharger remanufacturing system". In 2020 Moratuwa Engineering Research Conference (MERCon) (pp. 608-613) IEEE.

Pending Patent: Achuthan A., Banerjee N.K., Banerjee S., Wanni J. and Wijesinghe K. Invention title: Methods and apparatus for a mechanical testing system to characterize the heterogeneous deformation at microscale. Application No: 63344918.

Extensive presentation experience, including 5 talks, 2 posters, and 100+ research presentations, effectively created and delivered using Microsoft Office tools.