Kavindu Wijesinghe

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EDUCATION

Clarkson University, Potsdam, NY

Ph.D. in Materials Science and Engineering. GPA: 3.795/4.00 — Expected April 2025

Master of Science in Mechanical Engineering. — January 2020 – December 2022

(Clarkson Ignite Presidential Scholarship Receiver: 2020-Fall)

University of Moratuwa, Colombo, Sri Lanka

B.Sc. in Mechanical Engineering. GPA: 3.49/4.2 — August 2014 – December 2018

(Dean's List for Academic Excellence: 2017)

RELEVANT EXPERIENCE

Clarkson University, Potsdam, NY

Research Assistant — January 2020 – April 2025

- Revealing hierarchical deformation mechanisms of anisotropic DED Ti-6Al-4V: Performed material and microstructural characterizations with SEM, EBSD, Optical Microscopy, and XRD. In-situ SEM micro-tensile testing uncovered microscopic deformation and the hierarchical nature of deformation mechanisms. Introduced the intergranular compatibility deformation theory to explain strength anisotropy.
- Alloy design towards optimum tensile behavior: Fabricated multi-walled Ti-6Al-4V blocks with various hypo-eutectic Boron compositions (0.0 to 1.5 wt.%) using Directed Energy Deposition (DED). Conducted a series of uniaxial tensile tests using an Instron 4505 load frame under two loading directions, revealing non-monotonic tensile property variation. Found the optimum Boron concentration (0.05 wt.%) for isotropic tensile behavior and revealed underlying principles leading to the non-monotonic tensile behavior under increasing Boron concentration.
- Automated in-situ tensile testing system (patent pending): Designed and developed a 3-axis motorized stage integrated with precision stepper motors to support a 1000 lb micro-tensile tester positioned above an inverted optical microscope. Developed automation software using C++ (Arduino) and Python for feature tracking, autofocus, panoramic imaging, and post-processing (focus stacking and stabilization). The system captures high-resolution microscopic deformation (5X, 10X, 20X magnification) of metal coupon specimens in under 8.5 minutes.
- Residual Stress Measurement and Heat Treatments: Measured residual stresses in Selective Laser Melted (SLM) AlSi10Mg hollow blocks using strain gauges to validate a computational prediction. Stress relieving and solution annealing of DED SS 316L, DED Ti-6Al-4V and SLM Inconel 718 for various applications.
- Deep Learning Framework for microscopic strain measurement: Developed a deep learning-based framework for local strain measurement by segmenting and tracking microstructural features in extensive in-situ micro-tensile videos.
- Virtual in-situ tensile tester: Developing a generative AI framework for predicting microstructural deformation up to 20% macroscopic strain with latent diffusion modeling on solution annealed SS 316L (work is ongoing).

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

Chief Mechanical Engineer — January 2019 – December 2019

- Designed and fabricated (prototype model) a quadcopter (Mora-X) for areal mapping with topology optimization and enhanced aerodynamics using SolidWorks, Ansys, Fusion360 software and an Ultimaker S3 printer.

Camso Loadstar Pvt. Ltd. – Wheel Manufacturing Division, Ekala, Sri Lanka

Mechanical Engineering Intern — June 2017 – December 2016

- Designed an Automated Tire Runout Checking Device: Designed a fully automated industrial scale pneumatic actuated tire runout checking device for a Tire Assembly Facility for quality control within the production line.

Self-Employee of 3DMart 3D printing service & Freelancer at Fiver, Colombo, Sri Lanka
Self-Employee & Freelancer April 2018 – December 2019

- 3D modelling and 3D printing (using a Creality Ender 3 PLA printer) of custom designs upon customer requests. Offered several Mechanical Engineering related services including FEA/CFD simulations using Ansys software.

TECHNICAL SKILLS & LANGUAGES

Material Characterization: Scanning Electron microscopy (SEM), Optical microscopy (OM), In-situ/Ex-situ SEM/OM (at room temperature and high temperature), X-ray diffraction (XRD), Electron Backscatter Diffraction (EBSD), Energy Dispersive Spectroscopy (EDS), Atomic Force Microscopy (AFM), Nanoindentation, Uniaxial Tensile Testing, Metallic sample preparation (mechanical & electro-chemical polishing/etching), Digital Image Correlation (DIC), Surface roughness measurement, Heat treatment, Residual stress measurement using strain gages.

Manufacturing: Selective Laser Melting (SLM) of stainless steel 316L, Fused Deposition Modeling (FDM) of polymers (PLA), Manual machining (Lathe/Milling/Drilling), Arc welding, CNC programming, Laser cutting, Soldering.

Computer vision: Deep learning, Object detection/segmentation, Feature tracking, Algorithm development, Video stabilization, Focus stacking, Image enhancement, Feature extraction (Computer languages: Python & MATLAB)

Automation: Arduino, ESP32 & Raspberry Pi for mechatronics applications and industrial automation using Siemens PLC

Computer Software: Aztec Crystal & MATLAB MTEX tool for EBSD post processing, Ncorr for DIC, Ansys, AutoCAD, SolidWorks, CREO, Siemens NX, Photoshop, Visual studio, DaVinci Resolve, STEP5 (PLC programming)

LEADERSHIP & TEAMWORK

Mentor of 7 Clarkson Undergraduate Summer Research Students June 2022 – Present
Clarkson University Sri Lankan Students Association
Sports Event Organizer August 2022 – Present
University of Moratuwa Mechanical Engineering Society
Committee Member September 2018 – September 2019

PUBLICATIONS, PATENTS & CONFERENCE 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 Acta Materialia.*
- C. Herath, **K. Wijesinghe,** A. Iliopoulos, J. Stueben, J. G. Michopoulos, A. Achuthan, S. M. Arnold " A Study of the Deformation Mechanisms of (α + β) Ti Alloys with Near α Subgrain Structure Using a Microstructure-informed CPFE Constitutive Model", *Accepted for International Journal of Plasticity 2024.*
- H. Jayawardane, **K. Wijesinghe,** P. Wildeniya, J. R. Gamage "Design of a sustainable automotive turbocharger remanufacturing system", ***2020*** *Moratuwa Engineering Research Conference (MERCon).*
- 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.
- Conference presentations: Oral: **MS&T Conference, 2021 October**. Columbus, OH, **AIAA SciTech Forum, 2023 January**. National Harbor, MD, **TMS 2024 March**, Orlando, FL. Poster: **CAMP Conference, 2022 & 2023 March**