

Kossi Loic Mawunyegan Avegnon

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EDUCATION

- **Ph.D., Mechanical Engineering** GPA 3.764/4.00 May 2023
University of Nebraska, Lincoln, NE
 - Thesis: Machining-based Sensing in Hybrid Additive Manufacturing
 - Advisor: Michael Sealy, Ph.D.
- **B.S., Mechanical Engineering** GPA 3.81/4.00 Jun. 2017
University of Mines and Technology, Tarkwa, Ghana
Graduated with honors: Magna Cum Laude (First Class Honors)

HONORS/AWARDS

- **Research**, 2nd NSF National Nanotechnology Coordinated Infrastructure Image Contest, Most Stunning (Honorable Mention), Plenty of Beauty at the Bottom Oct. 2020
- **Research**, 1st Nebraska Center for Materials and Nanoscience NanoArt Competition, University of Nebraska-Lincoln Sep. 2020
- **Innovation**, 1st Innovation Award for an electronic waste 3D printer, University of Mines and Technology Innovation and Career Fair, Tarkwa, Ghana Apr. 2017

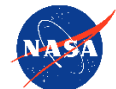
RESEARCH INTEREST

In-situ Process Monitoring: Development of an in-situ process monitoring method for the process performance assessment and understanding of defects formation of additively manufactured components (3D printed components) to improve quality control in the aerospace, and defense fields.

- Thermal imaging during printing
- Energy consumption during machining

RESEARCH EXPERIENCE

- **Research Assistant, Nebraska Eng. Additive Tech. (NEAT) Lab** Aug. 2019 - Present
University of Nebraska, Lincoln, NE
Advisor: Michael Sealy, Ph.D.
 - Fatigue Behavior of Metals from Additive Manufacturing
 - Investigated static and dynamic behavior of additively manufactured 316 SS and 630 SS
 - Measured surface integrity (e.g., topography, microhardness, residual stress, microstructure) of additively manufactured 316 SS, 630 SS, and Ti6Al4V
 - Investigated the impact of print parameters and print orientation on surface integrity and mechanical properties
 - In-situ Monitoring of AlSi10Mg during Additive Manufacturing by Thermal Imaging
 - Integrated an in-situ thermal imaging camera to measure porosity defects during powder bed fusion on a Lumex Avance 25 hybrid metal 3D printer
 - Successfully demonstrated closed-loop defect detection and removal using Lumex built-in CNC milling platform
 - Co-developed python code for communication between thermal camera and CNC component of Matsuura Lumex Avance-25
 - Machining-based Sensing of Metals in Hybrid Additive Manufacturing
 - Investigated energy-based process signature during dry hard milling by examining the basic relationships between spindle motor resistance during milling and surface integrity as process parameters and tool flank wear vary



Curriculum Vitae / K. L. M. Avegnon

- Demonstrated interlayer ultrasonic peening during additive manufacturing affects energy consumption in 316 SS and developed a tool to visually map energy data
- First to demonstrate 8.7% increase in net cutting specific energy when milling interlayer ultrasonic peened 316 SS as compared to continuously printed.
- Impact Testing of Football Helmets Incorporating Novel 3D Printed Spacers
 - Lead student investigator of helmet impact tests for commercial partner, Hardhead Helmets LLC
 - Successfully showed energy absorption increased by 20% based on National Operating Committee on Standards for Athletic Equipment (NOCSAE) for drop impact tests

INDUSTRY EXPERIENCE

- **Entrepreneur and Founder** Tarkwa, Ghana Jun. 2016 - Present
Klaks Technologies Ltd.
 - Lead designer and co-founder of 3D printing startup based on capstone design project
 - Raised approximately \$20,000 in venture capital funding in first five months
 - Built the first polymer 3D printer from electronic e-waste in West-Africa
 - Invited to the Ghana-British Council Innovation Exhibition (2018) to present on e-waste manufacturing to Ghana's President (Nana Akufo-Addo)
- **Engineering Intern, Mechanical Engineering** Tarkwa, Ghana Aug. 2018
University of Mines and Technology
 - Lead student safety auditor for the flotation blower and ball mill area at Golden Star Bogosso Ltd. mining company
 - Co-authored technical report on safety and maintenance measures needed to comply with The Minerals Commission Act in Ghana.
- **Engineering Intern, Manufacturing Department** Winneba, Ghana July. 2014
Great KOSA Vision Ltd.
 - Built a Vernier caliper to assess design and manufacturing skills along with equipment competency
 - Trained to use lathe, grinding wheels, mills, shaping machines
 - Assisted in the body construction of first locally made armored car

TEACHING EXPERIENCE

- **Instructor, University Hub (Private-Public Education Partnership)** Apr 2020
University of Mines and Technology and Klaks Technologies Ltd
 - Remote google classrooms instructor on SolidWorks for six students in Ghana
 - At the end of the course, students were expected to analyze 3D models, understand the basics of SolidWorks, and effectively create parts and assemblies using SolidWorks
- **Teaching Assistant, Mechanical and Materials Engineering Dept.** Aug. 2019 - Dec. 2019
University of Nebraska-Lincoln, Lincoln, NE
 - Graded homework for MECH 370: Manufacturing Methods and Processes
 - Held weekly office hours to assist students with manufacturing problem solving in materials, mechanics, casting, forming, machining, and welding
- **Instructor, Soko Aerial Centre for Unmanned Aerial Vehicles** Feb. 2019 - Jul. 2019
Ghana Army Signal Training School, Accra, Ghana
 - Primary drone instructor for quad-helicopters; lectured on drone components, safety, flight mechanics, maintenance, and drone defense
 - Developed the syllabus and content for a condensed one-week drone piloting course currently in use at the Centre

Curriculum Vitae / K. L. M. Avegnon

- Developed a multipurpose command vehicle for the Ghanaian army to assist in search and rescue as well as critical missions

- **Teaching Assistant, Mechanical Engineering Dept.** Aug. 2017 - May 2018
University of Mines and Technology, Tarkwa, Ghana
- Developed Industrial Maintenance course, including lecture content and handout materials, on work measurement and methods, ergonomics, time study and productivity.
 - Developed the course curriculum plan for the first Bachelors of Science degrees in Railway Engineering and Transport Management in Ghana

SKILLS

- **Modeling:** Abaqus, SolidWorkds, LumexCAM, MasterCAM, Fusion 360, Tekla Structures, AutoCAD
- **Programming:** Python, Matlab, Gcode for AM, Excel VBA
- **Hybrid Additive Manufacturing:** Directed energy deposition (Optomec LENS® + Milling); Powder bed fusion (Matsuura Lumex Avance-25 + Milling) Fused filament fabrication
- **Surface Treatments:** Laser shock peening, shot peening, ultrasonic peening
- **Characterization:** Scanning electron microscope, electron backscattered diffraction, energy dispersive X-ray spectroscopy, microhardness, optical microscopy, mechanical polishing, electrochemical polishing
- **Material testing:** Residual stress measurement (hole drilling), tensile testing, shear testing, fatigue testing, digital image correlation (strain measurement) energy, microhardness, optical microscopy, polishing
- **Languages:** English (fluent) French (fluent)

PUBLICATIONS

➤ Journal Articles

- [1] Anthony Simons, **Kossi L. M. Avegnon**, Cyrus Addy, 2019, "Design and Development of a Delta 3D Printer Using Salvaged E-Waste Materials," *Journal of Engineering*, 2019, pp. 1-9. doi: 10.1155/2019/5175323.
- [2] Anthony Simons, Daniel Amankwah, **Kossi L. M. Avegnon**, Adaze, E., (2018), "Finite Element Analysis of Electrically-Powered Cable Stripper," *Ghana Journal of Technology*, 3(1), pp. 1-8.

➤ Conference Proceedings

- [1] Anthony Simons, Daniel Amankwah, **Kossi L. M. Avegnon**, Ernest Adaze, 2018, "Design of Electrically Powered Cable Stripper for Nexans Kabel Metal (Gh) Limited," *Proceedings of the Fifth Biennial UMaT International Conference on Mining & Mineral Proceeding, "Expanding the Frontiers of Mining Technology,"* Aug. 1-4, 2018, Tarkwa, Ghana.
- [2] Anthony Simons, Merschak Ehurone, **Kossi L. M. Avegnon**, 2018, "Design of an Alignment Device for Undercarriage Track Link of Earthmoving Machines at Mantrac (CAT) Workshop (Kumasi)," *Proceedings of the Fifth Biennial UMaT International Conference on Mining & Mineral Proceeding, "Expanding the Frontiers of Mining Technology,"* Aug. 1-4, 2018, Tarkwa, Ghana.

SERVICE / LEADERSHIP

- **Reviewer Experience:** (Under Advisor's Supervision)
- ASME – J. Micro- and Nano-Manufacturing 1 paper since 2020
 - CIRP – J. Manufacturing Science and Technology 1 paper since 2020
 - IME – J. Engineering in Medicine 1 paper since 2020

Curriculum Vitae / K. L. M. Avegnon

- Mentored research team working on surface treatments of hybrid AM metal parts (2020)
- **Exhibitions & Educational Outreach in Additive Manufacturing**
 - Ghana-British Council Innovation Exhibition, Accra, Ghana Aug 2017
 - #3DPrint Africa Open Workshop, Accra, Ghana Jan 2017
Woelab, Lomé, Togo
 - Innovation Week at Advance Information Technology Institute-Kofi Annan Centre of Excellence, Accra, Ghana Sept. 2016
 - Technology & Innovation Fair, Ministry of environment, Accra, Ghana Sept. 2016

REFERENCES

- **Dr. Michael Sealy**
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