Osazee Ero

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Professional Summary

- Applied Research Scientist with 8+ years of experience in advanced image processing and computer vision solutions for industrial applications.
- PhD graduate with deep expertise in machine learning techniques for quality assurance in metal additive manufacturing.
- Electronics/Mechatronics Engineer with extensive academic experience in applying Artificial Intelligence to solve complex engineering problems.
- AI expert with a robust foundation in machine learning theories and Python object-oriented programming and design principles.
- Passionate software developer with a proven track record of embracing cutting-edge technologies and building practical applications.

Experience

Graduate Research and Teaching Assistant Sep. 2020 – Jun. 2024
Multi-Scale Additive Manufacturing Lab, Mech. & tron. Eng., University of Waterloo *Waterloo, ON*

- **NSERC Project**: Developed a novel machine learning framework for quality assurance for laser-powder bed fusion (LPBF) Additive Manfacturing (AM) process.
  - **Highlights**:
    Monitored the manufacturing process by collecting near-infrared optical tomography images for real-time quality assurance. Developed software to extract regions of interest and preprocess scientific image data. Analyzed the collected data using computer vision methods to identify abnormalities. Developed and implemented a custom U-Net deep learning model for defect detection in LPBF AM fabricated parts.
- **Voestalpine Additive Manufacturing Center**: Assisted in analyzing data obtained from the laser powder bed fusion (LPBF) process. Utilized advanced data analysis techniques to provide recommendations for process optimization, enhancing efficiency and product quality.
- Organized and tutored MTE262 - Introduction to digital logic and microprocessors, and MTE325 - Microprocessor systems and interfacing for Mechatronics Engineering laboratory experiments - to over 130 2nd and 3rd year Mechanical and Mechatronics Engineering Students for 5 academic terms.

Software Lead (Part-Time) Jan. 2023 – June 2024
Optifab Technologies, University of Waterloo *Waterloo, ON*

- Developed a prototype for a 3D application to generate smart scan patterns for metal additive manufacturing using Python.
- Debugged and tested software to ensure functionality and reliability.
- Recommended software solutions that successfully met project goals and enhanced overall performance.

Electronics Lecturer 2 Jul. 2013 – Aug. 2020
Electrical/Electronics Department, University of Benin *Benin, Nigeria*

- Taught a third, fourth, and fifth/final year undergraduate courses - High-level programming, Microprocessors and Microcontroller's, Measurements and Instrumentation, - and Electric circuits theory - to a combined number of 350+ electronics engineering students.

- Taught C programming courses to over 300 third year students.
- Course advised a third year electrical/electronics engineering class.
- Served as project supervisor to four final year electronics engineering students.
- Undertook research in intelligent control of autonomous system resulting in 2 published articles.

Education

University of Waterloo Waterloo, ON
Doctor of Philosophy (Ph.D.) in Mechanical and Mechatronics Engineering, *Sep. 2020 – Jul. 2024*

* **Thesis title:**In-Situ Monitoring and Quality Assurance Algorithms for Laser Powder-Bed Fusion using Optical Tomography
  Summary: The development of advanced in-situ defect algorithm using unsupervised machine learning techniques and computer vision to predict the probability of defects in laser powder bed fusion (LPBF)-additive manfacturing (AM) process.
  Relevant Courses: SYDE 671 (Advanced Image processing)-99/100, SYDE 675 (Pattern recognition)-94/100, ME 739 (Additive manufacturing)-96/100

University of Lagos Lagos, Nigeria
Masters of Science in Systems Engineering, GPA: 4.67/5.00 *May 2015 – Jun. 2016*

* **Thesis title:**Modeling and optimization of an electric power distribution network planning system using mixed binary integer
  Summary: The development of a mathematical model that addresses the electric distribution network expansion planning problem (EDNEPP) using a mixed binary integer programming (MBIP) approach that models the network's steady-state operation with nonlinear terms, which are linearized for compatibility with commercial optimization solvers.
  Relevant Courses: Artificial Intelligence, Optimization and Control, Knowledge-based Systems, Numerical methods

University of Benin Benin, Nigeria
Bachelor of Engineering in Electrical/Electronics Engineering, GPA: 4.36/5.00 *Nov. 2006 – Nov. 2011*

Technical Skills

Programming (12+ years): Python, JavaScript,C#, C++, Microcontroller programming (PIC and STM32)
Framework (5+ years): TensorFlow, PyTorch, OpenCV, Scikit-Learn, Pandas, Numpy, Scipy, Django
Developer Tools (2+ years): Git, Eclipse, VSCode, PyCharm

Awards

- OpenCV AI Competition 2021 Phase 1 Winner
- Iranian Student Memorial Engineering Graduate Scholarship based on academic excellence on June, 2024
- University of Waterloo Graduate Research Studentship, April 2017
- University of Waterloo International Doctoral Student Award, April 2017
- National Information Technology Development Agency (NITDA) Scholar, Nigeria, September 2020
- University of Lagos Second Best Graduating Student - Systems Engineering Graduate Class (4.67/5.00), June 2016

Professional Certifications

1. **Machine Learning Engineer Nanodegree (Udacity) - November 2021**
   - **Highlights**: Link:https://www.udacity.com/certificate/LGFUAGKW
     Software Engineering Fundamentals.
     Machine Learning in Production using Amazon SageMaker.
     Training and deploying a Sentiment analysis and Plagiarism detection model based on XGBoost Neural networks and RandomForest classifier using Amazon sageMaker.
     Train a custom Convolutional Neural Network Model for distingishing between dog breeds.
2. **EOSTATE Exposure OT & MeltPool Monitoring Level 1&2 - April 2024**
   - **Highlights**:
     Completed comprehensive training on quality assurance methods using the EOS monitoring suite. Gained proficiency in utilizing EOSTATE Exposure OT and MeltPool Monitoring tools for real-time process monitoring and optimization in additive manufacturing. Acquired skills in data interpretation and application of monitoring insights to enhance manufacturing quality and efficiency.
3. **LEVEL 4: EBM Control- Arcam-EBM (a GE additive)**
   - **Highlights**:
     Gained knowledge on the scan strategy development for an EB-PBF process with a deeper understanding of spot melting, python codes, and simulation for Arcam EBM machine.

Recent Publications

DISSERTATION AND THESIS

Ph.D.: **O. Ero** (2024) "In-Situ Monitoring and Quality Assurance Algorithms for Laser Powder-Bed Fusion using Optical Tomography"

Supervisor: Prof. Ehsan Toyserkani

M.Sc.: **O. Ero** (2016) "Modeling and optimization of an electric power distribution network planning system using mixed binary integer programming"

Supervisor: Dr. Ladi Ogunwolu

RELATED JOURNAL PUBLICATIONS

1. **Ero, O**, Taherkhani, K., & Toyserkani, E. (2023) "Optical tomography and machine learning for in-situ defects detection in laser powder bed fusion: A self-organizing map and U-Net based approach." *Additive Manufacturing, 78, 103894*, https://doi.org/10.1016/j.addma.2023.103894
2. **Ero, O**, Taherkhani, K., Yasmine Hemmati & Toyserkani, E. (2024), "An Integrated Fuzzy Logic and Machine Learning Platform for Porosity Detection using Optical Tomography Imaging during Laser Powder Bed Fusion". *International Journal of Extreme Manufacturing.*
3. Taherkhani, K., **Ero, O**, O., Liravi, F., Toorandaz, S., & Toyserkani, E. (2023)."On the application of in-situ monitoring systems and machine learning algorithms for developing quality assurance platforms in laser powder bed fusion:A review.". *Journal of Manufacturing Processes, 99, 848-897.* https://doi.org/10.1016/j.jmapro.2023.05.048
4. Ibhadode, Osezua, Zhidong Zhang, Jeffrey Sixt, Ken M. Nsiempba, Joseph Orakwe, Alexander Martinez-Marchese, **Ero, O**, Shahriar Imani Shahabad, Ali Bonakdar, and Ehsan Toyserkani. (2023)."Topology optimization for metal additive manufacturing: current trends, challenges, and future outlook.". *Virtual and Physical Prototyping 18, no. 1.* https://doi.org/10.1080/17452759.2023.2181192

Conference Presentations

1. **Ero, O**, Taherkhani, K., & Toyserkani, Optical tomography and machine learning for in-situ defects detection in laser powder bed fusion: A self-organizing map and U-Net based approach (Poster). *Holistic Innovation in Additive Manufacturing, 1-2 June, 2021*
2. **Ero, O**, Taherkhani, K., Yasmine Hemmati & Toyserkani, An Integrated Fuzzy Logic and Machine Learning Platform for Porosity Detection using Optical Tomography Imaging during Laser Powder Bed Fusion (Oral). *Holistic Innovation in Additive Manufacturing, 27-28 June, 2023*

Volunteer Services

- I was the technical director of an Engineering Community Development Service during my National Youth Service in Bayelsa State, Nigeria between June 2012 and May 2013. Amongst several achievements, I led STEM awareness campaigns in local schools and communities, hosted programs discussing various issues including the well-being of corps members.

References

- **Professor Ehsan Toyserkani**
  Professor and Canada Research Chair in Additive Manufacturing,
  Director of Multi-Scale Additive Manufacturing Lab
  Department of Mechanical and Mechatronics Engineering
  200 University Avenue West Waterloo, ON, N2L3G1, Canada
  Phone: (519) 888-4567 x 37560
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  Lab Website: MSAM
- **Dr. Osezua Ibhadode**
  Assistant Professor in University of Alberta,
  Director of Multifunctional Design and Additive Manufacturing (MDAM) Lab
  Department of Mechanical Engineering
  Mechanical Engineering Building, North Campus, University of Alberta,
  Edmonton, T6G 1H9, Canada
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  Lab Website: MDAM