

# Osazee Ero

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## PROFESSIONAL SUMMARY

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- 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

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### Graduate Research and Teaching Assistant

Sep. 2020 – Jul. 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 Manufacturing (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 Developer (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

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### 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 manufacturing (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

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**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

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- 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

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### 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 distinguishing 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

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### 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. Ibadode, 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

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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

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- 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

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- **Professor Ehsan Toyserkani**  
Professor and Canada Research Chair in Additive Manufacturing,  
Director of Multi-Scale Additive Manufacturing Lab  
Department of Mechanical and Mechatronics Engineering  
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Lab Website: [MSAM](#)
- **Dr. Osezua Ibhado**  
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,  
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Lab Website: [MDAM](#)