Curriculum Vitae

Akpudo Ugochukwu Ejike

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EDUCATION

2019 – 2021 **Master of Engineering (Research) (Mechanical Engineering)**
Mechanical, Aeronautic, and Electronic Convergence Engineering
Kumoh National Institute of Technology, South Korea.
Cumulative Grade Point Average (CGPA): 4.50 / 4.50

Thesis Topic: A Sensor Fusion Approach for The Remaining Useful Life Preparation of Solenoid Pumps

Details: Two-year Research-based program (full-time). Thesis length 20,334 words, Undertaken over Four semesters. Thesis included in the application. In this interdisciplinary research project, I designed a meta-heuristically optimized prognostics framework for the remaining useful life (RUL) prediction of solenoid pumps using vibration and pressure measurements from a run-to-failure experiment.

Supervisor: Hur Hang-Wook (Ph.D.), Professor

2007 – 2012 **Bachelor of Engineering (Taught) (Mechanical and Production Engineering)**
Enugu State University of Science and Technology, Nigeria.
Cumulative Grade Point Average (CGPA): 3.54/ 5.0

PROFESSIONAL EXPERIENCE

May 2015 – February 2019 **Machine Shop Assistant**
Maclisle Complex Limited, Enugu Nigeria.

Responsibilities: The role assisted the H.O.D. Production department on several tasks and projects. My core responsibilities included:

- Interpreting mechanical (and electrical) drawings to technicians,
- Planning and machine setup according to specification,
- Lathe, milling, drilling, and shaping machine operation,
- Carrying out cost analyses through process efficiencies.
- Data management and Project Report Preparation

July 2013 – April 2015 **Graduate Trainee**
Anambra Motor Manufacturing Company (ANAMMCO), Enugu Nigeria.

Responsibilities: In addition to shadowing various staff members, participating in learning experiences, attending meetings and workshops, and traveling to other working environments to gain practical experience, my responsibilities also included:

- Supervising laborers and technicians during work
- Automobile maintenance and repairs
- Servicing of workshop equipment
- Lathe, milling, drilling, and shaping machine operation

RESEARCH EXPERIENCE

October 2021 – Current

Preliminary Research under Professor Yongsheng Gao (and Dr. Xiaohan Yu)
Institute for Integrated and Intelligent Systems,
Griffith University, Queensland Australia

Responsibilities:

The role assists me on developing state-of-art algorithms for Computer Vision (Ultra-Fine Grained Visual Categorization). We intend to have a significant improvement on the existing methodologies (feature representation, dynamic modelling, optimization, and generality) with detailed plans on writing at least one high-Tier journal article as soon as we achieve significant contributions (with validations) to the existing knowledge/technology (hopefully within the next 6-8 months).

March 2019 – February 2021

Graduate Research Assistant to Professor Hur Jang-Wook
Defense Reliability Lab, School of Mechanical Engineering,
Kumoh National Institute of Technology, South Korea

Responsibilities:

The role assisted modeling, experimental setup, data collection, analysis, and reporting of several projects funded by Agency for Defense Development (RAM specialized laboratory, UD180018AD), MSIT (Ministry of Science and ICT), Korea, under the Grand Information Technology Research Center support program, and the National Research Foundation of Korea(NRF). These projects investigated the failure mode and effect analysis (FMEA) of mechanical and electronic components- rolling element bearings, brushless DC motors, and solenoid pumps for data-driven prognostics and health management (PHM) which entails fault detection and isolation (FDI) and remaining useful life (RUL) prediction. My responsibilities included:

- Conducting literature reviews on state-of-the-art methods
- Modeling and design of PHM frameworks
- Sensor installation, calibration, and management
- Data acquisition, management, and analysis
- Signal and image processing using statistical and AI-based techniques
- Coding, simulation, and meta-heuristic optimization
- Lead project teams for practical research
- Write and publish articles on SCI-indexed International journals
- Present research findings at international and domestic conferences
- Anchor domestic workshops for knowledge and skill transfer
- Practical use of machine learning and deep learning algorithms for FDI, RUL, anomaly detection, pattern recognition, and other applications.

May 2015 – February 2019

Machine Shop Assistant
Maclisle Complex Limited, Enugu Nigeria

Responsibilities:

The role assisted the H.O.D. Production department on several tasks and projects; however, it also provided an opportunity to familiarize me with basic research skills including:

- Data Management (Storage, Analysis, and Reporting)
- Information Management and Communication (emails)
- Familiarity with spreadsheets, word processing, and desktop publishing.
- Professional presentation and Interpretation

SKILLS AND COMPETENCIES

- Extensive knowledge of Machine Learning and Deep Learning for pattern recognition, anomaly detection, and prognostics.
- Image/signal/audio processing (Wavelet, Fourier transforms, empirical mode decomposition, etc.)
- Experienced in Feature/Descriptor Engineering (extraction, selection, fusion, and processing) using statistical and

AI-based methods
- Competent in Big data analysis using Python, R, MATLAB
- Accurate, efficient, and productive with strong organizational technical and analytical skills.
- Flexibility and ability to perform tasks independently
- Proficient skills in Statistical data analysis
- Linear and non-linear system modeling, simulation, and coding
- Meta-heuristic optimization using bio-inspired algorithms (Genetic algorithm, particle swarm optimization, Ant colony optimization, etc.)
- Time-series forecasting using Bayesian and Machine learning-based methods
- Ability to create new data-driven insights for real-life applications
- Strong Research abilities with a proven capability for publishing SCI-level journal articles.

RESEARCH PUBLICATIONS

U. E. Akpudo and H. Jang-Wook, "An Explainable DL-Based Condition Monitoring Framework for Water-Emulsified Diesel CR Systems," in *Electronics, 10, 2522, 2021.*

Type of Publication:	Journal Article
Impact Factor:	**2.412** (Q2, SCI, *H-Index = 36*)
Refereed Publication:	Yes
ISSN:	2079-9292 (Online)
URL:	https://doi.org/10.3390/electronics10202522
DOI:	10.3390/electronics10202522
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

U. E. Akpudo and H. Jang-Wook, "D-dCNN: A Novel Hybrid Deep Learning-Based Tool for Vibration-Based Diagnostics," in *Electronics, 14, 5286, 2021.*

Type of Publication: Journal Article

Impact Factor:	**3.08** (Q2, SCI, H-Index = 93)
Refereed Publication:	Yes
ISSN:	1996-1073 (Online)
URL:	https://doi.org/10.3390/en14175286
DOI:	10.3390/en14175286
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

Akeem Bayo Kareem, **U. E. Akpudo,** and H. Jang-Wook, "An Integrated Cost-Aware Dual Monitoring Framework for SMPS Switching Device Diagnosis," in *Electronics, 10(20), 2487, 2021.*

Type of Publication: Journal Article

Impact Factor:	**2.412** (Q2, SCI, H-Index = 36)
Refereed Publication:	Yes
ISSN:	2079-9292 (Online)
URL:	https://doi.org/10.3390/electronics10202487
DOI:	10.3390/electronics10202487
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

Min-Seop Kim, **U. E. Akpudo,** and H. Jang-Wook, “A Study on Water-Induced Damage Severity on Diesel Engine Injection System Using Emulsified Diesel Fuels," in *Electronics, 10, 2285, 2021.*

Type of Publication: Journal Article

Impact Factor:	**2.412** (Q2, SCI, H-Index = 36)
Refereed Publication:	Yes
ISSN:	2079-9292 (Online)
URL:	https://doi.org/10.3390/electronics10182285
DOI:	10.3390/electronics10182285
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

Suju Kim, **U. E. Akpudo,** and H. Jang-Wook, “A Cost-Aware DNN-Based FDI Technology for Solenoid Pumps," in *Electronics, 10, 2323, 2021.*

Type of Publication: Journal Article

Impact Factor:	**2.412** (Q2, SCI, H-Index = 36)
Refereed Publication:	Yes
ISSN:	2079-9292 (Online)
URL:	https://doi.org/10.3390/electronics10192323
DOI:	10.3390/electronics10192323
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

U. E. Akpudo and H. Jang-Wook, "An Automated Sensor Fusion Approach for The RUL Prediction of Electromagnetic Pumps," in *IEEE Access*, vol. 9, pp. 38920-38933, 2021.

Type of Publication: Journal Article

Impact Factor:	**4.48 (Q1, SCI, H-Index = 127)**
Refereed Publication:	Yes
ISSN:	2169-3536 (Online)
URL:	https://ieeexplore.ieee.org/document/9367131
DOI:	10.1109/ACCESS.2021.3063676
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

U. E. Akpudo and H. Jang-Wook, " A Cost-Efficient MFCC-Based Fault Detection and Isolation Technology for Electromagnetic Pumps," in *Electronics*, vol. 10, no. 4:439, 2021

Type of Publication: Journal Article

Impact Factor:	**2.412** (Q2, SCI, *H-Index = 26*)
Refereed Publication:	Yes
ISSN:	2079-9292 (Online)
URL:	https://www.mdpi.com/2079-9292/10/4/439/htm
DOI:	10.3390/electronics10040439
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

U. E. Akpudo and H. Jang-Wook, "A Multi-Domain Diagnostics Approach for Solenoid Pumps Based on Discriminative Features," in *IEEE Access*, vol. 8, pp. 175020-175034, 2020

Type of Publication: Journal Article

Impact Factor:	**4.48** (Q1, SCI, *H-Index = 127*)
Refereed Publication:	Yes
ISSN:	2169-3536 (Online)
URL:	https://ieeexplore.ieee.org/abstract/document/9203804
DOI:	10.1109/ACCESS.2020.3025909
Authorship Statement:	I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, and reported all findings to H. Jang-Wook. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article while H. Jang-Wook supervised the whole process.

U. E. Akpudo and H. Jang-Wook, "Towards bearing failure prognostics: a practical comparison between data-driven methods for industrial applications," *Journal of Mechanical Science and Technology*, vol. 34, pp. 4161–4172, 2020

Type of Publication:	Journal Article
Impact Factor:	**1.345** (Q2, SCI, *H-Index = 47*)
Refereed Publication:	Yes
ISSN:	1738-494X (Print), 1976-3824 (Online)
URL:	https://link.springer.com/article/10.1007/s12206-020-0908-7
DOI:	https://doi.org/10.1007/s12206-020-0908-7
Authorship Statement:	I (**U. E. Akpudo**) processed and analyzed the data from a run-to-failure experiment performed at NASA Ames Research Center and provided by the Intelligent Maintenance System (IMS) Center, University of Cincinnati. H. Jang-Wook was responsible for idea generation and supervision. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article.

U. E. Akpudo and H. Jang-Wook, "A feature fusion-based prognostics approach for rolling element bearings," *Journal of Mechanical Science and Technology*, vol. 34, pp. 4025–4035, 2020

Type of Publication:	Journal Article
Impact Factor:	**1.345** (Q2, SCI, *H-Index = 47*)
Refereed Publication:	Yes
ISSN:	1738-494X (Print), 1976-3824 (Online)
URL:	https://link.springer.com/article/10.1007/s12206-020-2213-x
DOI:	https://doi.org/10.1007/s12206-020-2213-x
Authorship Statement:	I (**U. E. Akpudo**) processed and analyzed the data from a run-to-failure experiment performed at NASA Ames Research Center and provided by the Intelligent Maintenance System (IMS) Center, University of Cincinnati. H. Jang-Wook was responsible for idea generation and supervision. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article.

H. Jang-Wook and **U. E. Akpudo**, "A Deep Learning Approach to Prognostics of Rolling Element Bearings," *International Journal of Integrated Engineering*, vol. 12, no. 3, pp. 78-186, 2020

Type of Publication:	Journal Article
Impact Factor:	**0.2** (Q3, ESCI, *H-Index = 7*)
Refereed Publication:	Yes
ISSN:	2229-838X (Print), 2600-7916 (Online)
URL:	https://publisher.uthm.edu.my/ojs/index.php/ijie/article/view/5346

DOI: 10.30880/ijie.2020.12.03.021

Authorship Statement: I (**U. E. Akpudo**) processed and analyzed the data from a run-to-failure experiment performed at NASA Ames Research Center and provided by the Intelligent Maintenance System (IMS) Center, University of Cincinnati. H. Jang-Wook was responsible for idea generation and supervision. I (**U. E. Akpudo**) conducted literature reviews, coding, and simulations, and produced the final draft article.

CONFERENCES/WORKSHOPS

U. E. Akpudo and H. Jang-Wook, " WIP: Towards Developing a Diagnostic Framework for Diesel Engine Injection Systems," *to be presented at The Asia Pacific Conference of the Prognostics and Health Management Society 2021,* September 08-11, 2021.

Participation mode: Oral

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also conducted the experiment, collected, processed, and analyzed the data, produced the final article, and will present the findings.

U. E. Akpudo and H. Jang-Wook, "A DNN-Based Fault Detection & Isolation Technology for Solenoid Pumps," *presented at The 2021 Korean Society of Mechanical Engineers Spring Conference,* PS8-5, June 24-26, 2021.

Participation mode: Poster

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also conducted the experiment, collected, processed, and analyzed the data, produced the final article, and presented the findings.

U. E. Akpudo and H. Jang-Wook, "An Empirical Investigation for Optimal Condition Monitoring Indicators for Failure Prognostics," *presented at The 2021 Winter Comprehensive Conference of the Korean Telecommunications Society (KICS),* pp. 319 - 320, February 03-05, 2021.

Participation mode: Oral

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also conducted the experiment, collected, processed, and analyzed the data, produced the final article, and presented the findings.

URL: https://www.dbpia.co.kr/journal/articleDetail?nodeId=NODE10547539

U. E. Akpudo and H. Jang-Wook, "MFCC-LLE-SVM*: A Robust Fault Diagnostics Tool for Solenoid Pumps," *presented at PHM Korea 2020,* vol. 12, no. 3, pp. 188, July 21-23, 2020.

Participation mode: Oral

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also conducted the experiment, collected, processed, and analyzed the data, produced the final article, and presented the findings.

L. Myeong Seok, **U. E. Akpudo**, and H. Jang-Wook, "WIP: Signal Denoising and HI Construction for Reliable Solenoid Pump Prognostics," *presented at PHM Korea 2020,* vol. 12, no. 3, pp. 198, July 21-23 2020.

Participation mode: Poster

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also conducted the experiment, collected, processed, and analyzed the data, produced the final article, and presented the findings. L. Myeong Seok generated the idea.

U. E. Akpudo and H. Jang-Wook, "Robust FD&I Methodology for Solenoid Pumps based on Discriminative Features," *presented at the Eastern European Machine Learning Summer School (EEML), Poland,* July 1-9, 2020.

Participation mode: Oral (Virtual)

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, produced the final article, and presented the findings.

U. E. Akpudo and H. Jang-Wook, "Intelligent Solenoid Pump Fault Detection based on MFCC Features, LLE and SVM", *presented at the Second International Conference on AI in information and Communication (ICAIIC 2020) Fukuoka Japan*, hosted by KICS, IEEE Communications Society, and IEICE-CS, February 19-21, 2020

Participation mode: Oral

ISBN: 978-1-7281-4986-8 (PoD), 978-1-7281-4985-1 (online)

URL: https://ieeexplore.ieee.org/abstract/document/9065282

DOI: 10.1109/ICAIIC48513.2020.9065282

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, produced the final article, and presented the findings.

U. E. Akpudo and H. Jang-Wook, "A Feature Fusion-Based Prognostics Approach for Rolling Element Bearings", *presented at the 5th International Conference on Materials and Reliability (ICMR), Jeju Island Korea*, hosted by The Korean Society of Mechanical Engineers (KSME), November 27-29, 2019

Participation mode: Oral

URL: http://icmr2019.ksme.or.kr/wp/pdf/190305.pdf

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, produced the final article, and presented the findings.

H. Jang-Wooka and **U. E. Akpudo**, "A Deep Learning Approach to Prognostics of Rolling Element Bearings", *presented at the 2019 International UNIMAS STEM 12th Engineering Conference (ENCON), Kuching Malaysia,* hosted by Universiti Malaysia Sarawak and IEEE Malaysia, August 28-29, 2019.

ISSN: 2229-838X (Print), 2600-7916 (Online)

DOI: 10.30880/ijie.2020.12.03.021

Participation mode: Oral

URL: https://publisher.uthm.edu.my/ojs/index.php/ijie/article/view/5346

Authorship Statement: I (**U. E. Akpudo**) setup the testbed including sensor installation and calibration. I also carried out the experiment, collected data, processed and analyzed the data, produced the final article, and presented the findings.

A workshop on Data-Driven PHM Methodologies- A Hands-on Application

Organizer: Defense Reliability Laboratory, Kumoh National Institute of Technology, South Korea.

Date: 18th – 23rd January 2021

Hosts: Prof. Hur Jang-Wook, **Ugochukwu Ejike Akpudo**, Lee Myeong Seok

A workshop on Solenoid Pump Fault Detection and Isolation (FDI)- A practical Approach

Organizer: Defense Reliability Laboratory, Kumoh National Institute of Technology, South Korea.

Date: 9th – 21st December 2020

Hosts: Prof. Hur Jang-Wook, **Ugochukwu Ejike Akpudo**, Lee Myeong Seok

A workshop on Neural Networks and its Applications

Organizer: Kumoh National Institute of Technology, South Korea.

Date: 3rd – 7th December 2019

Hosts: Prof. Kim Young-Shik and Nwakamma Cosmas Ifeanyi

A workshop on A VARMA-LSTM Approach to Li-ion Battery Prognostics- A practical Guide

Organizer: Future Communications Laboratory, Kumoh National Institute of Technology, Korea.

Date: 22nd – 28th July 2019

Hosts: Prof. Lim Wansu, Dr. Manuel Eugenio Morocho Cayamcela, and Angela Cabiao Caliwag

A workshop on LabVIEW programming and practice

Organizer: Intelligent Robotics Laboratory, Kumoh National Institute of Technology, Korea.

Date: 22nd – 24th May 2019

Host: Prof. Baeksuk Chu

GRANTS AND AWARDS

Best Paper Award

Provider: Brain Korea 21 (BK21) and Kumoh National Institute of Technology, Korea

Role Played: Published the journal article titled: "***An Automated Sensor Fusion Approach for The RUL Prediction of Electromagnetic Pumps***'', in IEEE Access, vol. 9, pp. 38920-38933, 2021.

Date: July 19, 2021

Excellent Thesis/Dissertation Award

Provider: Kumoh National Institute of Technology, Korea

Role Played: Wrote the thesis titled "A Sensor Fusion Approach for The Remaining Useful Life Prediction of Solenoid Pumps'' alongside other journal publications.

Date: February 19, 2021

Grand Information Technology Research support (IITP-2020-2020-0-01612)

Provider: MSIT(Ministry of Science and ICT), South Korea

Value: Two Million Korean Won (₩2, 000, 000.00) over four months

Role Played: With the Letter of Acceptance for Publication I received, I was able to apply for and acquire the support.

Date: September 2020

National Research Foundation of Korea(NRF) grant (No. NRF-2019R1I1A3A01063935)

Provider: MSIT(Ministry of Science and ICT), South Korea

Value: Fourteen Million Korean, Four Hundred Thousand Won (₩14, 400, 000.00) over 22 months

Role Played: With the Letters of Acceptance for Publication of two papers I received, I was able to apply for and acquire the grant.

Date: May 2019

Agency for Defense Development grant (UD180018AD)

Provider: RAM Specialized Laboratory, South Korea

Value: One Million Korean, Two Hundred Thousand Won (₩1, 200, 000.00) over 2 months

Role Played: With the Letter of Acceptance for the ENCON 2019 Conference in Malaysia I received, I was able to apply for and acquire the grant.

Date: March 2019

Type B (50%) KIT Graduate School Scholarship

Provider: Kumoh National Institute of Technology, South Korea

Value: 50% Tuition Cover- Four Million, Six Hundred and Fourteen Thousand Won(₩4, 614, 000.00) over four(4) semesters

Role Played: My English Language Proficiency (IELTS) score was made me eligible for the scholarship.

Date: March 2019

Type B (50%) Defense Reliability Lab Graduate School Scholarship

Provider: Defense Reliability Lab, Kumoh National Institute of Technology, South Korea

Value: 50% Tuition Cover- Four Million, Six Hundred and Fourteen Thousand Won(₩4, 614, 000.00) over four(4) semesters

Role Played: My research proposal to the lab was approved and upon enrollment to the department, I was awarded the scholarship.

Date: March 2019

REFEREES

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Williams Paul Nwadiugwu (Ph.D., Senior Research Scientist)

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