Osinachi Motivation Letter

I want to pursue a PhD in Animal Data Sciences (ADS) with a focus on early disease detection using computer vision. My motivation to pursue this PhD stems from my childhood experience working on the family poultry farm with little access to livestock technology. I experienced the full aspect of farm management, from egg incubation to old-layer management. At several points in this multi-year journey, I saw the devastating effect of preventable disease outbreaks like the bird flu on both the livestock and the farmer. The loss in production capacity of laying birds and the reduction in bird count served as a wake-up call for me that something had to be done. This motivation led me to study mechanical engineering at the undergraduate level, first to understand machines and secondly to build machines that could solve a variety of problems.

I have prior research experience in mechanical engineering and data sciences. This research was on the detection of masked armed bandits using a deep learning model. I picked up the required skills in data collection, cleaning, augmentation, and model training in order to train a YOLOv5 model that could detect 3 features in the curated dataset: masked bandits, rifles, and machetes. I worked in a team of 3 other students and a professor of mechanical engineering.

While carrying out the research, the major problem we encountered was getting the precision, measured via the mean Average Precision, to an acceptable level. At the initial stages of the project, this value hovered around 0.4 (max is 1.0). As we sourced more data and applied better augmentation, the value rose to 0.69. At this point, the model could not differentiate between masked persons and regular, unmasked persons. So we introduced unmasked persons into the dataset, leading the mAP to climb to 0.8.

Other problems we encountered were optimizing the model for accurate inference on a Jetson Nano. For this, we utilized a conversion pipeline of ONNX to TensorRT, making the model optimized for GPU inference.

In graduate school, I want to bring my skills in computer vision to solve early disease detection problems in for farmers and herders. I would love to work with

Dr James Chen at the lab of Animal Data Sciences at Virginia Tech. Dr Chen's research in developing low-cost sensors, detecting animal behavior from gait recognition, and novel agro-based software development sits at the right spot in what I would love to do in graduate school.

I would also be honoured to work with Dr. Azahar Ali in tackling research problems in the development of biomedical devices for livestock and MEMS. Dr Ali's use of 3D printing and machine learning in research strongly aligns with my skills in 3D printing from my undergraduate internships and machine learning from my undergraduate final-year project.

Overall, I see Virginia Tech as a safe haven to carry out important research in the Animal Sciences ecosystem and problem real problems that pertain to real farmers and herders in the US and across the world. This is why I chose to pursue a PhD here.

Relevant Pasture Management Experience

During my earlier years, my mother ran a poultry farm of varying capacities at different times. The bird count ranged from 500 to 2000. During this time, I helped with farm duties such as:

1. Water sourcing
2. Water replacement in-enclosure
3. Feed forecasting and distribution
4. Vaccination
5. Bird health inspection via egg health, fecal output, and overall agility

The farm raised birds from the chick stage to the old-layer stage, where they were sold for meat. I assisted in the overall bird management duties, mainly in vaccination, beak-cutting, and manure handling.

Open-source contributions

1. Documentation contribution to the A2A AI Agent communication protocol - https://github.com/a2aproject/A2A/pull/704
2. AI Agent protocol contribution to the Flare AI Kit - https://github.com/flare-foundation/flare-ai-kit/pull/76

Open-source projects on GitHub

1. **YoloWeb** (https://github.com/vicradon/yoloweb) - A web interface for running YOLO ONNX models on the browser
2. **Chess-Agent** (https://github.com/telexorg/chess-agent) - A simple AI agent interfacing with the Stockfish Chess engine that plays Chess over the A2A protocol
3. **Anon Message App** (https://github.com/vicradon/anon-msg-app) - A web application for receiving anonymous messages
4. **Robotcar** (https://github.com/vicradon/robotcar) - A ROS-based 4-wheeled robot with LIDAR capabilities

Chukwujama Osinachi Victor

MECHANICAL ENGINEERING GRADUATE

Lagos, Nigeria | osinachi.chukwjama@gmail.com | Personal Website | GitHub | +2348105487627

RESEARCH INTERESTS

Robotics. Edge AI. Machine Learning. 3D printing, and Computer Aided Design (CAD).

EDUCATION

Mechanical Engineering, Bachelor of Engineering   Imo, Nigeria
(Major: Industrial and Production Engineering)   Nov 2017 – August 2023
Federal University of Technology, Owerri, Nigeria (https://www.futo.edu.ng)
CGPA: **4.56/5.00**

RESEARCH EXPERIENCE

Design and Implementation of a Surveillance Drone with an Object Detection System using YoloV5
Undergraduate Final Project, Supervised by Prof. O.O. Obiukwu (Aug 2023)   MEE, FUTO
- Conducted a study on the lack of effective surveillance systems in Nigeria, identifying key gaps in current technologies
- Developed an image annotation workflow in Roboflow and a machine learning training pipeline on Google Colaboratory for training the machine learning model
- Trained a machine learning model based on the pre-trained YoloV5 model which is based on Pytorch
- Successfully integrated and configured the surveillance drone hardware with the machine-learning model
- The project was completed giving 70% accuracy in detecting masked bandits and riffles and 50% accuracy in detecting machetes
- The project is to be sold to the Nigerian government to improve the defense effort

Embedding and Optimizing Yolo Models for Object Detection on a Jetson Nano
Undergraduate Post-Defence Research, Supervised by Prof. O.O. Obiukwu (Mar 2024)   MEE, FUTO
- Performed optimization on the trained machine learning model, converting it from a PyTorch model to an Nvidia TensorRT model that utilizes the GPUs on the Jetson Nano
- Improved the training speed from 1 hour 30 minutes average to 50 minutes average, giving a 44% reduction

PUBLISHED WORKS

Quantum Computing in Artificial Intelligence: a Review of Quantum Machine Learning Algorithms
http://dx.doi.org/10.22178/pos.117-25   Path of Science
- This review paper analyses quantum-based machine-learning algorithms such as Quantum-Support Vector Machines (QSVM) and Quantum Neural Networks (QNN).
- The result of this analysis is a summary of the readiness of these algorithms in practical applications, as per their current limitations.

Secure and Resilient Industrial IoT Architectures for Smart Manufacturing: A Comprehensive Review
https://doi.org/10.9734/jerr/2025/v27i61548   Journal JERR
- This review paper analyses Industrial Internet of Things (IIoT) techniques and methods in relation to smart manufacturing. It goes over the key components, security implications, and techniques to build secure and resilient IIoT systems.
- It finally goes over open challenges and tradeoffs. Open challenges include the security risk of not using encryption to prevent latency issues, supply chain integrity, and human factors.

Clinical Applications of 3D-Printed Medical Implants
https://doi.org/10.69613/22dn3m33   JOPIR
- This review article analyzes 3D printed for medical applications, most especially in implants and reconstructions.
- It concludes with ethical considerations like data protection and intellectual property theft.

SKILLS

- Computer programming: proficient in Python, JavaScript, and intermediate proficiency in Go, and PHP.
- 3D design with expertise in Fusion 360 and familiarity with SOLIDWORKS
- 3D printing with high dexterity in using PLA filaments and a single prior experience in printing with ABS materials
- Robotic design of ground-wheeled robots using Arduino, Raspberry Pi, and Robot Operating System (ROS)
- Effective communication in English language
- Good teamwork from previous teams and projects

WORK EXPERIENCE

Software/DevOps Engineer.
Hotels.ng - Part-time

Lagos, Nigeria
June 2024 - Present

- Authored Continuous Integration and Continuous Deployment (CI/CD) workflows for application deployment, database migrations, and automated testing.
- Developed a highly concurrent Python/celery application for processing AI workloads in a distributed manner via a message broker communication with RabbitMQ.
- Authored new scripts for logging and log processing that increased monitoring by over 70% over manually checking for logs

Mechanical Technician Trainee.
Rite Foods - Graduate internship

Lagos, Nigeria
March 2024 - June 2024

- Carried out daily routine maintenance of baking and packaging machines to maintain a downtime of 20% or less
- Generated daily reports on maintenance activities to ensure that equipment and supplies are properly tracked
- Designed and 3D printed parts for machines that had no immediate replacement

Robotics & 3D Printing Industrial Trainee.
Generative CAD - Internship

Lagos, Nigeria
Apr 2024 – present

- Collected customer requirements and designed 3D models for additive manufacturing

- 3D printed designs using PLA and ABS materials to validate ideas

- Designed robots using the Robot Operating System (ROS) framework for path planning

- Simulated Robotics environments using Gazebo and RViz

HONOURS, AWARDS AND ACHIEVEMENTS

First Class Graduate, Mechanical Engineering Department, FUTO, 2023. Graduated in the 96th percentile in the department, emerging as the best-graduating student in the Industrial and Production Engineering option.

Petroleum Development Trust Fund (PTDF) Scholarship Recipient, 2018. Received this prestigious award for excellence in academic performance.

SELECTED TALKS/PRESENTATIONS

- **Design and Implementation of a Surveillance Drone with Object Detection System using YoloV5,** *Final Project Defence, Department of Mechanical Engineering, FUTO, August 2023.*

COMMUNITY SERVICE AND VOLUNTEERING

- **Microsoft Learn Student Ambassador.** Organized training and workshops on software engineering and cloud computing using Microsoft Azure and related technologies. Over 300 students were trained in such technologies and up to 50 students received cloud credits for self-exploration.

- **Director of Research, Mechanical Engineering Department,** *FUTO.* Organized training and workshops on 3D printing, 3D design, microcontrollers, and machine learning for students and staff of the School of Engineering with a focus on the Department of Mechanical Engineering. Over 50 students and 5 staff participated in these training sessions and improved their awareness and use of these industry 4.0 technologies.

PROFESSIONAL AFFILIATIONS

- Graduate Member, Nigerian Society of Engineers (NSE)
- Graduate Member, IEEE
- Graduate Member, SPE

EXTRACURRICULAR INTERESTS AND HOBBIES

- Technical training of students in 3D design, embedded systems, software engineering, and cloud computing
- Calisthenics for fitness
- Physics simulations in areas like force interactions

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI.

OFFICE OF THE REGISTRAR

(Records & Statistics Unit)

P.M.B. 1526

Owerri Nigeria

STUDENT'S ACADEMIC TRANSCRIPT

Name of Student		Sex	Date of Birth	Reg. No.
CHUKWUJAMA, OSINACHI VICTOR		MALE	March 1, 2001	20171029203
Nationality		State of Origin	Date of Entry	Mode of Entry
NIGERIAN		ANAMBRA	2017/2018	UME
School		Department:	MECHANICAL ENGINEERING	
ENGINEERING & ENGINEERING TECHNOLOGY		Option:	INDUSTRIAL & PRODUCTION ENGINEERING	

Course Code	Title of Course	Units	Grade	Total Grade Points	Cum G.P.A.
	2017/2018 HARMATTAN SEMESTER				
ENG101	Workshop Practice I	1	A	5	
BIO101	Biology for Physical Science	3	A	15	
MTH101	Elementary Mathematics I	4	A	20	
ENG103	Engineering Drawing I	1	A	5	
CHM101	General Chemistry I	4	A	20	
PHY101	General Physics I	4	A	20	
GST101	Use of English I	2	B	8	
GST103	Humanities	1	A	5	
FRN101	Introduction to French I	1	C	3	
	2017/2018 RAIN SEMESTER				
CHM102	General Chemistry II	4	A	20	
ENG102	Workshop Practice II	1	A	5	
MTH102	Elementary Mathematics II	4	A	20	
ENG104	Engineering Drawing II	1	A	5	
GST102	Use of English II	2	A	10	
PHY102	General Physics II	4	A	20	
GST108	Social Science I	2	A	10	
GST110	Science, Technology & Society	1	A	5	
FRN102	Introduction to French II	1	B	4	
		41		200	4.88

GRADING SYSTEM

A - Excellent:	5 points	D - Pass:	2 points
B - Very Good:	4 points	E - Poor Pass:	1 point
C - Good	3 points	F - Failure:	0 points
I - Incomplete	W - Withdrew	WP - Withdrew Passing	WF - Withdrew Failing

TONY NJOKU

FOR: REGISTRAR

DATE

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Course Code	Title of Course	Units	Grade	Total Grade Points	Cum G.P.A.
	2017/2018	41		200	
	2016/2019 HARMATTAN SEMESTER				
ENG201	Workshop Practice III	1	A	5	
CSC201	Computer and Applications I	4	A	20	
MTH203	Mathematical Methods I	3	C	9	
GST201	Social Science II	1	B	4	
ENG207	Intro. to Engineering Materials I	2	B	8	
ENG203	Engineering Drawing III	1	A	5	
STA211	Statistics	3	A	15	
ENG217	Engineer in Society	1	B	4	
ENG209	Engineering Thermodynamics I	3	A	15	
ENG213	Engineering Mechanics I	2	B	8	
	2018/2019 RAIN SEMESTER				
MTH202	Mathematical Methods II	3	A	15	
ENG208	Intro. to Engineering Materials II	2	B	8	
ENG226	Introduction to Elect./Elect. Engineering	3	A	15	
ENG206	Workshop Practice IV	1	A	5	
MEE204	Engineering Thermodynamics II	3	B	12	
ENG212	Engineering Economy	2	B	8	
MEE206	Intro. to Computer & Mechanical Engineering	3	B	12	
ENG214	Computer Programming for Eng. Application	2	A	10	
ENG224	Engineering Mechanics II	2	B	8	
		83		386	4.65

DEGREE CLASSIFICATION - (1981 - 1990)

1st Class Honours :	4.50 - 5.00	Third Class :	2.00 – 2.49
2nd Class Honours (Upper Division) :	3.50 - 4.49	Pass :	1.00 – 1.99
2nd Class Honours (Lower Division) :	2.50 - 3.49	Fail :	0.00 – 0.99

DEGREE CLASSIFICATION - (1991 - DATE)

1st Class Honours :	4.50 - 5.00	Third Class :	1.50 - 2.39
2nd Class Honours (Upper Division) :	3.50 - 4.49	Pass :	1.00 – 1.49
2nd Class Honours (Lower Division) :	2.40 - 3.49	Fail :	0.00 – 0.99

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Course Code	Title of Course	Units	Grade	Total Grade Points	Cum G.P.A.
	2018/2019	83		386	
	2019/2020 HARMATTAN SEMESTER				
MEE305	Machine Drawing	2	B	8	
ENS301	Industrial Studies I	2	B	8	
SIW200	Industrial Attachment	2	A	10	
AME305	Mechanics of Machines I	3	B	12	
MEE303	Manufacturing Processes	3	A	15	
ENG305	Strength of Materials I	3	B	12	
ENG309	Fluid Mechanics I	3	A	15	
ENG307	Engineering Mathematics I	3	A	15	
ENG311	Machine Design I	2	B	8	
ENG317	Engineering Report Writing & Presentation	2	F	0	
	2019/2020 RAIN SEMESTER				
AME304	Machine Design II	2	A	10	
ENS302	Entrepreneurship Studies II	2	C	6	
AME306	Mechanics of Machines II	2	B	8	
MEE302	Dynamics of Physical Systems	3	B	12	
ENG304	Heat and Mass Transfer	4	B	16	
ENG308	Engineering Mathematics II	3	B	12	
ENG310	Fluid Mechanics II	3	B	12	
		127		565	4.45

GRADING SYSTEM

A - Excellent:	5 points	D - Pass:	2 points
B - Very Good:	4 points	E - Poor Pass:	1 point
C - Good:	3 points	F - Failure:	0 points
I - Incomplete	W - Withdrew	WP - Withdrew Passing	WF - Withdrew Failing

_____
TONY NJOKU
FOR: REGISTRAR

29/6/24
DATE

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Course Code	Title of Course	Units	Grade	Total Grade Points	Cum G.P.A.
	2019/2020	127		565	
	2020/2021 HARMATTAN SEMESTER				
MEE411	Machine Design III	3	A	15	
MEE401	Measurements and Instrumentation	3	B	12	
ENG405	Engineering Management & Law	2	A	10	
SIW300	Industrial Attachment	2	B	8	
IPE403	Workshop Study and Productivity	3	A	15	
IPE405	Machine Tool & Analysis & Cutting Tool Design	2	A	10	
IPE409	Gear and Cam Design & Manufacture	2	B	8	
IPE411	Manufacturing Process II	3	A	15	
	2020/2021 RAIN SEMESTER				
SIW400	Industrial Attachment	6	A	30	
		153		688	4.50

DEGREE CLASSIFICATION - (1981 - 1990)

1st Class Honours :	4.50 - 5.00	Third Class :	2.00 - 2.49
2nd Class Honours (Upper Division) :	3.50 - 4.49	Pass :	1.00 - 1.99
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DEGREE CLASSIFICATION - (1991 - DATE)

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ENGINEERING & ENGINEERING TECHNOLOGY	**Option:**	INDUSTRIAL & PRODUCTION ENGINERING	

Course Code	Title of Course	Units	Grade	Total Grade Points	Cum G.P.A.
	2020/2021	153		688	
	2021/2022 HARMATTAN SEMESTER				
MEE503	Entrepreneurship II	1	B	4	
IPE507	Manufacturing Processes III	2	A	10	
IPE503	Operations Research	3	A	15	
MEE501	Maintenance of Engineering System	2	A	10	
MEE505	Computer Aided Design & Manufacturing	3	A	15	
IPE509	Numerical Control Design Tools	3	A	15	
IPE501	Facility Design	3	A	15	
ENG317	Engineering Report Writing & Presentation	2	C	6	
	2021/2022 RAIN SEMESTER				
MEE504	Entrepreneurship III	1	A	5	
IPE502	Production Planning and Control	3	B	12	
MEE506	Control Systems Design	3	A	15	
IPE522	Quality Control Machine Tools	3	A	15	
IPE504	Tools and Die Designed	3	A	15	
MEE500	Project I & II	6	A	30	
MEE502	Maintenance of Engineering Systems	2	A	10	
		193		880	4.56

CGPA : 4.56
FIRST CLASS HONOURS

GRADING SYSTEM

A - Excellent: 5 points   D - Pass;   2 points
B - Very Good: 4 points   E - Poor Pass: 1 point
C - Good;   3 points   F - Failure: 0 points
I - Incomplete   W - Withdrew   WP - Withdrew Passing   WF - Withdrew Failing

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