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