Solomon Chibuzo Nwafor

Nationality: Nigerian (Nigeria) **Gender:** Male **Phone number:** (+34) 600961183

Email address: solomon.nwafor@unn.edu.ng **Email address:** u1999124@campus.udg.edu

GitHub: https://github.com/solonso

LinkedIn: https://www.linkedin.com/in/solomon-chibuzo-nwafor

Google Scholar: https://scholar.google.com/citations?user=NI_Xb70AAAAJ&hl=en

ORCID ID: https://orcid.org/my-orcid?orcid=0000-0003-4390-9874

ResearchGate : https://www.researchgate.net/profile/Solomon-Nwafor

Website: https://nwaforsolomon.netlify.app

Work: Department of Mechatronic Engineering, University of Nigeria, Nsukka, 410001 Nsukka (Nigeria)

Other: University of Girona, 17003 Girona (Spain)

ABOUT ME

I am a robotics researcher with a background in mechanical systems, autonomous control, and perception. My work addresses decision-making and motion in real environments, from lesion analysis in medical imaging to mobile manipulation in robotics.
My approach combines control theory, optimization, and data-driven modeling (machine learning). Experience comes from academic research, autonomous system projects, Kaggle competitions, and laboratory development.
I aim to connect low-level control with high-level reasoning to build systems that adapt and perform reliably in complex domains.

SKILLS

Python (NumPy, Pandas, PyTorch, TensorFlow, OpenCV), MATLAB / SolidWorks CAD / MATLAB Simulink / Arduino (C++) / LaTeX / Git / GPU server workflows

EDUCATION AND TRAINING

Erasmus Mundus Joint Masters in Intelligent Field Robotics System

University of Girona, Spain [09/2024 – Current]

Website: https://ifrosmaster.org/

Master of Engineering

University of Nigeria, Nsukka [2019 – 2023]

Address: Department of Electronic and Computer Engineering, University of Nigeria, Nsukka, 410001 Nsukka (Nigeria) | **Website:** https://unn.edu.ng | **Field(s) of study:** Control Engineering | **Final grade:** Distinction (5.0/5.0) | **Level in EQF:** EQF level 7 | **Thesis:** A Robust MPC-based Quadcopter Control with Feedback Linearization and Backstepping Control

Bachalor of Engineering

Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria [2012 – 2017]

Address: Department of Mechanical Engineering,Chukwuemeka Odumegwu Ojukwu Univeristy PMB 6059 Igbariam, Anambra State Nigeria, | **Website:** https://coou.edu.ng | **Field(s) of study:** Mechanical Engineering | **Final grade:** First Class (4.54/5) | **Level in EQF:** EQF level 6 | **Thesis:** An Automatic Sliding Door: Leveraging Locally Sourced Materials for Innovation

WORK EXPERIENCE

ViCOROB, University of Girona, Girona, Spain – Girona, Spain

City: Girona | **Country:** Spain

Machine Learning Intern– iToBoS (Intelligent Total Body Scanner)

[16/06/2025 – Current]

Responsibilities

- Developed and evaluated methods for lesion change analysis across multiple exploration dates using dermoscopic images.
- Implemented visual-language model pipelines (LLaVa-Med, GPT-4o-mini) and MedGemma for dermoscopic feature extraction and temporal comparison.
- Enhanced the iToBoS custom feature extraction system to improve change detection accuracy.
- Integrated segmentation and feature analysis outputs for collaborative verification with dermatologists.
- Contributed to the preparation of a journal publication and development of a predictive model for lesion progression.

University of Nigeria, Nsukka – Nsukka, Nigeria

Address: Department of Mechatronic Engineering, University of Nigeria, Nsukka, 410001 Nsukka (Nigeria)

Lecturer II

[04/2023 – Current]

Responsibilities

- Member of the University of Nigeria Mechatronics Research Group
- Teaching assigned undergraduate courses
- ICT administrator
- Student advising

University of Nigeria, Nsukka – Nsukka, Nigeria

Address: Department of Mechatronic Engineering, University of Nigeria, Nsukka, 410001 Nsukka (Nigeria) | **Name of unit or department:** Department of Mechatronic Engineering - **Business or sector:** Education

Graduate Research and Teaching Assistant

[03/2019 – 04/2023]

Responsibilities

- Assisted in teaching undergraduate courses
- Conducted research under the supervision of the head of department
- Took on administrative activities assigned by the head of the department
- Member of the University of Nigeria Mechatronics Research Group

Petroleum Training Institute, Effurun – Effurun, Nigeria

Address: 1 PTI Road, Effurun, Delta State, Nigeria, Effurun (Nigeria) | **Website:** pti.edu.ng | **Name of unit or department:** Department of Mechanical Engineering - **Business or sector:** Education

Laboratory Instructor

[11/2017 – 10/2018]

Responsibilities

- Instructor of Mechatronics Laboratory
- Instructor of CAD/Automotive Laboratory
- Assisted in the invigilation of student examinations
- Took on administrative activities assigned by the head of department

PROJECTS

[06/2025 – Current]

Lesion Change Analysis using VLMs and Custom Models

iToBoS Project – ViCOROB, University of Girona

- Processed over 5000 lesion pairs using custom dermoscopic segmentation and change analysis pipelines; applied temporal feature extraction methods analogous to biomedical signal processing workflows.
- Applied LLaVa-Med + GPT-4o-mini, direct GPT-based feature analysis, MedGemma extraction, and custom iToBoS pipeline refinement.
- Collaborated with dermatologists for result verification and ground truth annotation.
- Co-authoring a paper on lesion change modeling and developing a predictive model for lesion progression.

[02/2025 – 06/2025]
Weakly Supervised Segmentation of Underwater Seafloor Data
University of Girona – Hands-on Perception Project

- Segmented side-scan sonar imagery into sand, mud, maerl, and rock without pixel-level ground truth.
- Used Class Activation Maps and pseudo-labels for weak supervision.
- Fine-tuned DeepLabv3 with loss functions (Cross-Entropy, Focal Loss, Lovasz-Softmax).
- Achieved the best mIoU using Lovasz-Softmax for metric-aligned optimization.

[12/2024 – 02/2025]
iToBoS 2024 – Skin Lesion Detection with 3D-TBP (Kaggle International Competition)
1st Place among 16 teams – Leaderboard score: **0.6731 mAP** (IoU 0.5–0.75)

- Developed a winning solution for detecting multiple skin lesions from clinical images using bounding box annotations.
- Designed a two-stage pipeline: YOLOv8 for lesion detection (leveraging its decoupled head for improved localization) and MedViT for classification (optimized for medical imaging).
- Balanced speed, detection accuracy, and robustness to real-world dermatological image noise.
- Led model training, hyperparameter tuning, and post-processing refinement, ensuring compatibility with competition constraints.
- Presented solution approach in the iToBoS competition workshop.

Link: https://www.kaggle.com/competitions/itobos-2024-detection

[04/2022 – 04/2024]
A Multipurpose Drone and Machine Vision System for Optimal Farmland Selection/Mapping, Crop Monitoring, and Weed Management
A two-year national research grant (TETFund 2020 NRF) attracted by the UNN Mechatronics Research Group

Using this grant, I carried out my master's degree thesis project, in which I
- Designed the UAV and some of its embedded systems using SolidWorks;
- Implemented the UAV's kinematics, dynamics, state space, controller algorithm, and simulation using Python;
- Developed a hybrid control technique by combining model predictive control (MPC), feedback linearization control, and backstepping control.

A manuscript on this project is currently under review for publication.

[2019]
LION OZUMBA 551 Electric Vehicle
University of Nigeria's Electric Vehicle Project (Nigeria's first locally manufactured electric vehicle)

While actively involved in the fabrication of the vehicle, I was the leader of the CAD team, in which capacity I oversaw the designing of the vehicle body and chassis using Solidworks.

PUBLICATIONS

Journal Publications

1. S. C. Nwafor, J. N. Eneh, M. I. Ndefo, O. C. Ugbe, H. I. Ugwu, and O. Ani, "An Optimal Hybrid Quadcopter Control Technique with MPC-based Backstepping Control," Archives of Control Sciences, vol. 34, no. 1, pp. 39-62, Mar. 2024. https://doi.org/10.24425/acs.2024.149651

2. S. C. Nwafor, C. C. Nwobi-Okoye, B. E. Okafor, K. K. Nwankwo, and C. Onwuchekwa, "An Automatic Sliding Door: Leveraging Locally Sourced Materials for Innovation", JERR, vol. 26, no. 3, pp. 197-207, Mar. 2024. https://doi.org/10.9734/jerr/2024/v26i31105

3. M. Benjamin, M., N. C. Igwe, **S. C. Nwafor**, and O. Ani, "An automated system for sorting of freshly harvested tomato fruits," Agricultural Engineering International: CIGR Journal, vol. 25, no. 3, pp. 258-267, Sep. 2023.

Corresponding Author.

4. M. I. Ndefo, **S. C. Nwafor**, C. C. Udeze, O. Akpeghagha, and O. C. Ugbe, "Performance Evaluation of Networks Using Gain Scheduling PID Networked Control System for Nonlinear Systems", JERR, vol. 25, no. 5, pp. 17-30, Jul. 2023. https://doi.org/10.9734/jerr/2023/v25i5908

Corresponding Author

5. T. K. Ukwueze, **S. C. Nwafor**, K. O. Ugwueze, E. C. Nnadozie, M. Odo, U. Ezechi, K. C. Chukwuma, K. Okafor, and O. Ani, "Design and Implementation of a UAV for Image Capture in Enterprise Farming," Nigerian Journal of Technology, vol. 43, no. 1, pp.150-158, Mar. 2024.

6. S. C. Nwafor, J. N. Eneh, C. C. Udeze, and O. Ani, "A Robust MPC-based Quadcopter Control with Feedback Linearization and Backstepping Control," Advanced Control for Applications: Engineering and Industrial Systems, vol. (), no.(), pp.()-(), 2024.

Under Review.

Conferences

1. M. Odo**, S. C. Nwafor**, H. I. Ugwu, M. I. Ndefo, and O. C. Ugbe, "PID Controller-Based Solar Intensity Tracking System with Feedforward Compensation" NIEEE Nsukka Chapter 4th National Engineering Conference on Engineering Advancement for Sustainable Development in Developing Nations, University of Nigeria, pp. 29-33 2023.

2. J. N. Eneh, **S. C. Nwafor**, E. C. Nnadozie and O. A. Ani, "Adaptive Fuzzy Sliding Mode Control for an Aerial Manipulator as a Payload on a Quadcopter," 2022 5th Information Technology for Education and Development (ITED), Abuja, Nigeria, pp. 1-6, 2022. doi: 10.1109/ITED56637.2022.10051598.

3. J. N. Eneh**, S. C. Nwafor**, O. C. Ugbe, T. O. Araoye, H. I. Ugwu, S. V. Egoigwe "An Optimized Model Predictive Control of a Hybrid Standalone Microgrid System" Interdisciplinary Conference on Mechanics, Computers and Electrics (ICMECE 2022), Barcelona, Spain, pp. 95-100, 2022.

4. Ukwueze T.K., **Nwafor S.C.**, Nnadozie E.C., and Ani O. An Unmanned Aerial Vehicle for Image Capture of Farms. Emerging Trends in Engineering for Sustainable Agriculture Development and Food Security 2022, Department of Agricultural and Bioresources Engineering, Faculty of Engineering, University of Nigeria, 2022.

Book and Book Chapters

1. Egbuhuzor, M., **Nwafor, S.**, Umunnakwe, C., & Egoigwe, S. (2023). Thin-Film Batteries: Fundamental and Applications. IntechOpen. doi: 10.5772/intechopen.109734

2. A. O. Ani and **S.C. Nwafor** (2021). "Introduction to Mechatronics Engineering". *Book Chapter Nine in Introduction to Engineering, Pages 190-208.* Printed in Nigeria by K & B Printing and Publishing Company, Lejja Park, Nsukka, Enugu State. ISBN 978-8137-13-X.

NETWORKS AND MEMBERSHIPS

Memberships
Member: Council for the Regulation of Engineering in Nigeria (COREN)
Member/Customer Number: R76973

Affiliate Member: Institution of Mechanical Engineers (IMechE)
Membership Number: 80243813

Affiliate Member: Nigeria Society of Engineers (NSE)