OLUGBENGA MOSES ANUBI

Electrical and Computer Engineering
FAMU-FSU College of Engineering
Florida State University
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Education

Ph.D in Mechanical Engineering (Minor: Mathematics), 2013
University of Florida, Gainesville, USA.

B.Sc in Systems Engineering, 2006
University of Lagos, Lagos,Nigeria.

O.N.D in Civil Engineering Technology, 2000
Lagos State Polytechnic, Lagos, Nigeria.

Appointments

Assistant Professor (Florida State University), Aug. 2018 –
Director: Resilient and Autonomous Systems Lab
FAMU-FSU Autonomous Systems Group
Affiliations: Center for Advanced Power System (CAPS)
Center for Intelligent Systems Control and Robotics (CISCOR)

- *Distributed machine learning*
- *Large-scale optimization*
- *Autonomous Vehicles*
- *Cyber-Physical Systems: Resilient Estimation and Control*
- *Control Systems*

Control Systems Engineer (GE Global Research), Jul. 2015 –Jul. 2018
Controls & Optimization Lab

- *Cyber-Physical Systems: Resilient Estimation and Control*
- *Real-time Optimization and Robust-Adaptive Control*
- *ML/AI for Asset Supervisory Control and Optimization*

Postdoctoral Scholar (UC Davis), Sept. 2013 –Jul. 2015
Hyundai Center of Excellence in Vehicle Dynamic Systems & Control

- *Vehicle dynamics and control*
- *Model predictive control*
- *Input-output approach to control of large scale multi-energy domain engineering systems*

Research Assistant (University of Florida), Aug. 2010–Dec. 2012
Center for Intelligent Machines and Robotics (CIMAR)

- *Variable stiffness suspension Design*
- *Vehicle suspension control and roll stabilization*
- *Nonlinear and Adaptive Control Design*

Honors and Awards

- Dushman Technology Excellence Award, GE Global Research, 2018
- Whitney Technology Excellence Award, GE Global Research, 2018
- Technical Achievement Award (*Connected Controls*), GE Global Research, 2015
- Physical + Digital Award (*Merging best of both worlds into a winning solution*), GE Global Research, 2015
- College of Engineering Achievement Award for New Engineering Graduate Students, University

of Florida, 2008
- Vice-Chancellors prize for the best all round performance in the faculty of Engineering, University of Lagos, 2006
- Faculty of Engineering Prize for the best all round performance at the degree level, University of Lagos, 2006
- Prof. Emeritus A.O. Adekola' s Prize for the best student in Systems Engineering, University of Lagos, 2006
- Best Year II/III student in Engineering Mathematics, University of Lagos, 2003

Professional Membership and Services

- *Organizer*, Invited Session on *"Concurrent Learning and Resilient Control Systems"*, ACC 2022.
- *IEEE Technical Committee*, Nonlinear Control.
- *Session Co-chair*, ACC 2016, ACC 2020, MECC 2021, DSCC 2020.
- *Member*, INFORMS, SIAM, ASME
- *Senior Member*, IEEE
- *Reviewer*, Automatica, Journal of the Franklin Institute, Optimal Control, Applications and Methods, Vehicle Systems Dynamics, ASME Journal of Mechanism and Robotics, IEEE Transactions on Systems, Man and Cybernetics, IEEE Transactions on Automatic Control,

Selected talks

Invited talks and Workshops

4. **DOE ASCR Workshop on Cybersecurity and Privacy of Scientific Computing Ecosystems** (2021) "Large-Scale Resilient Collaborative Machine Learning"
3. **QPRC: Data science and Statistics for Quality** (2021) "Concurrent Physics-Data-Driven Learning Methods for Resilient Cyber-Physical Systems"
2. **IEEE Power and Energy Society, Tallahassee Chapter** (2021) "Control challenges with increasing electrification of automotive powertrain"
1. **FSU Machine Learning Expo** (2019) "Algorithmic Security for Large Scale Cyber-Physical Systems"

Seminars

5. **Seminar, GE Global Research** (2018) "The Geometry of Convergence: Closing the loop on Optimization Algorithms"
4. **Seminar, The Ohio State University** (2018) "Model-based Optimization and Control for Real-time Applications"
3. **Seminar, GE Global Research** (2018) "The Geometry of Convergence: Closing the loop on Optimization Algorithms"
2. **Seminar, Syracuse University** (2017) "Some Industrial Applications of Optimizing Control"
1. **Seminar, GE Global Research** (2015) "Towards the Hybridization of Control and Optimization"

Contracts and Grants

Contracts and Grants Funded

5. **Olugbenga Moses Anubi (PI)** (2020–2023) "Resilient Energy Delivery and Control System ", Funding Agency: Department of Energy. Total Award: $5,200,000.
4. Fang Peng (PI), Hui Li (Co-PI), **Olugbenga Moses Anubi (Co-PI)** and Yuan Li (Co-PI) (2021–2024) "Unified Universal Control and Coordination of Inverter-Based Resources, AI Forecasting, and Demonstration for PV+Battery Hybrid Plants", Funding Agency: Department of Energy. Total Award: $5,600,000.

3. **Olugbenga Moses Anubi (PI)** (2021 – 2022) "Degradation-aware Energy Management for Shipboard Power System", Funding Agency: Office of Naval Research via the Electric Ship Research Consortium (ESRDC). Total Award: $150,000.
2. **Olugbenga Moses Anubi (PI)** (2019) "Concurrent Data-driven and Model-based Algorithms for Resilient Cyber-Physical Systems", Funding Agency: FSU CRC. Total Award: $20,000.
1. **Olugbenga Moses Anubi (PI)** (2018–2021)"Start Up - O. Anubi", Funding Agency: FSU. Total Award: $47,162.

Publications

Book Chapters

2. Yu Zheng, and **Olugbenga Moses Anubi** "Resilient Observer Design for Cyber-Physical Systems with Data-Driven Measurement Pruning ", Security and Resilience in Cyber-Physical Systems, Edited by Ali Zemouche and Masoud Abbaszadeh, Springer, 2022.
1. **Anubi, O**, and Crane, C, "Equilibrium Analysis of Tensegrity Structures with Elastic Ties", Advances in Robot Kinematics: Motion in Man and Machine, (2010)263–272.

Journal

14. Sina Ameli, and **Olugbenga Moses Anubi** "Hierarchical robust control for variable-pitch wind turbine with actuator faults ", International Journal of Robust and Nonlinear Control. [Accepted], (2022).
13. Sina Ameli, and **Olugbenga Moses Anubi** "Hierarchical Robust Adaptive Control for Wind Turbines with Actuator Fault ", ASME. Letters Dyn. Sys. Control. 2022; 2(3): 031001.
12. Yu Zheng, Ali Sayghe and **Olugbenga Moses Anubi** "Algorithm Design for Resilient Cyber-Physical Systems using an Automated Attack Generative Model ", IEEE Transactions on Systems, Man and Cybernetics: Systems. [In review], (2022).
11. Sina Ameli, and **Olugbenga Moses Anubi** "Robust Control for a Class of Nonlinearly Coupled Hierarchical Systems with Actuator Faults ", International Journal of Robust and Nonlinear Control, IFAC-PapersOnLine (2021): 540-546.
10. Charalambos Konstantinou, and **Olugbenga Moses Anubi**, "Resilient cyber-physical energy systems using prior information based on gaussian process", IEEE Transactions on Industrial Informatics, (2021) 18(3):2160–2168.
9. Sandro Martin, Hui Li, and **Olugbenga Moses Anubi** "Modulated MPC for Arm Inductorless MVDC MMC with Reduced Computational Burden ", IEEE Transactions on Energy Conversion, (2021) 36(3): 1736–1786.
8. **Olugbenga Moses Anubi**, and Charalambos Konstantinou "Enhanced Resilient State Estimation Using Data-driven Auxiliary Models", IEEE Transactions on Industrial Informatics, (2019) 15:639-647.
7. Layne Clemen, **Olugbenga Moses Anubi**, and Donald Margolis "On the Performance Analysis of Regenerative Dampers using Bond Graphs and Model Predictive Control", ASME Journal of dynamic systems, measurement, and control, (2016)138–5.
6. **Olugbenga Moses Anubi**, and Layne Clemen, "Energy-Regenerative Model Predictive Control", Journal of the Franklin Instiitute, (2015)352–5
5. **Olugbenga Moses Anubi**, and Carl D. Crane III, "A New Active Variable Stiffness Suspension System Using a Nonlinear Energy Sink Based Controller", Vehicle System Dynamics (2013)1–15.
4. **Olugbenga Moses Anubi**, and Carl D. Crane III, "A New Semiactive Variable Stiffness Suspension System Using Combined Skyhook and Nonlinear Energy Sink-Based Controllers." Control Systems Technology, IEEE Transactions on 23.3 (2015): 937-947.
3. **Olugbenga Moses Anubi**, and Carl D. Crane III, "Roll Stabilization of Road Vehicles Using a Variable Stiffness Suspension System", Vehicle System Dynamics 12(2013) 51:1894-1917.

2. **Anubi, O. M**, Patel, D. R, and Crane II, C. D. "A new variable stiffness suspension system: passive case", Mechanical Sciences 4 (2013).1:139–151.
1. **Anubi, Olugbenga Moses** , Patel, Darsan, and Crane, Carl D."Passive Variable Stiffness Suspension System", ASME Early Career Technical Journal 11 (2012).

Submitted and under preparation Journal articles

6. **Olugbenga Moses Anubi**, and Sina Ameli "Robust stabilization of Inverter-based Resources using Virtual Resistance-based Control ", IEEE Control Systems Letters. [In preparation], (2022).
5. Ali Sayghe, Yu Zheng, and **Olugbenga Moses Anubi** "Adversarial MAchine Learning Design Against Learning-based Attack Detection Algorithms in Power Systems ", [In preparation], (2022).
4. Yu Zheng, **Olugbenga Moses Anubi**, and Warren Dixon "Resilient Observer Design using Pruned Support Prior, IEEE Transaction on Automatic Control [In preparation], (2022).
3. Yu Zheng, **Olugbenga Moses Anubi**, and Subhrajit Rowchowdhury"A Review of Concurrent Learning and Resilient Cyber-Physical System: Control Systems Perspective ", IEEE Open Journal of Control Systems. [In preparation], (2022).
2. Satish Vedula, **Olugbenga Moses Anubi** "Degradation-Aware Decentralized Model Predictive Energy Management Strategy for Hybrid Electric Vehicles ", IEEE Control Systems Letters. [In preparation], (2022).
1. Boluwatife Olabiran, Yu Zheng, AShwin Vadivel, Sridhar Mudhangula and **Olugbenga Moses Anubi** "Multi-modal Learning Pipeline for Smooth Georeferenced Tracking from an Uncalibrated Monocular Camera ", IEEE Transactions on Systems, Man and Cybernetics: Systems. [In preparation], (2022).

US Patents visible on Google Scholar

12. CYBER-ATTACK DETECTION, LOCALIZATION AND NEUTRALIZATION FOR UNMANNED AERIAL VEHICLES (US Patent No. 10931687, 2021)
▷ MESTHA, Lalit Keshav, **ANUBI, Olugbenga Moses**, and JOHN, Justin Varkey

11. VEHICLE CONVOY CONTROL SYSTEM AND METHOD (US Patent No. 10916146, 2021)
▷ SEENUMANI, Gayathri, SEHGAL, Hullas, BROOKS, James D, MATHEWS, Harry Kirk Jr, and **ANUBI, Olugbenga Moses**

10. DYNAMIC RESILIENT SENSING SYSTEM FOR AUTOMATIC CYBER-ATTACK NEUTRALIZATION (US Patent App. 16654319, 2021)
▷ DOKUCU, Mustafa Tekin, ROYCHOWDHURY, Subhrajit, **ANUBI, Olugbenga Moses**, ABBASZADEH Masoud, and JOHN, Justin Varkey

9. DYNAMIC CONCURRENT LEARNING METHOD TO NEUTRALIZE CYBER ATTACKS AND FAULTS FOR INDUSTRIAL ASSET MONITORING NODES (US Patent No. 10728282, 2020)
▷ MESTHA, Lalit Keshav, **ANUBI, Olugbenga Moses**, and ACHANTA, Hema

8. SYSTEMS AND METHODS TO ACHIEVE ROBUSTNESS AND SECURITY IN MEDICAL DEVICES(US Patent App. 16142841, 2020)
▷ MESTHA, Lalit Keshav, ACHANTA, Hema, and **ANUBI, Olugbenga Moses**

7. GAS TURBINE DSIPATCH OPTIMIZER (US Patent App. 15/476,084, 2018)
▷ **ANUBI, Olugbenga Moses**, and MENON Anup, and KUMAR, Aditya

6. GAS TURBINE DSIPATCH OPTIMIZER REAL-TIME COMMAND AND OPERATIONS (US Patent No. 10452041, 2019)
▷ MENON, Anup, and VETUKURI, Sree Rama Raju, and **ANUBI, Olugbenga Moses**, and JOHN Justin, and LINDENMUTH, Marc Gavin, and KUMAR, Aditya, and SHI, Ruijie, and THATCHER, Jonathan

5. CYBER-ATTACK DETECTION AND NEUTRALIZATION (US Patent No. 10771495, 2020)
▷ MESTHA, Lalit Keshav, and **ANUBI, Olugbenga Moses**, and ABBASZADEH, Masoud

4. GENERIC FRAMEWORK TO DETECT CYBER THEREATS IN ELECTRIC POWER GRID (US Patent No. 10452845, 2019)

▷ MESTHA, Lalit Keshav, and VEDA, Santosh Sambamoorthy, and ABBASZADEH Masoud , and BAONE Chaitanya Ashok , and YAN, Weizhong , and MAJUMDER, Saikat RAY , BOSE, Sumit, and GIANI Annartia, and **ANUBI, Olugbenga Moses**

3. VARIABLE STIFFNESS MECHANISM (WO/2013/025510, PCT/US2012/050355, US Provisional Patent No. 61/586,624)
▷ **ANUBI, Olugbenga Moses**, and CRANE, Carl, David III, and RIDGEWAY, Shannon, C

2. VARIABLE STIFFNESS SUSPENSION SYSTEM 1 (US Provisional Patent No. 61/523,624)
▷ **ANUBI, Olugbenga Moses**, and CRANE, Carl, David III, and RIDGEWAY, Shannon, C

1. VARIABLE STIFFNESS SUSPENSION SYSTEM 2 (US Provisional Patent No. 61/698,105)
▷ **ANUBI, Olugbenga Moses**, and CRANE, Carl, David III, and RIDGEWAY, Shannon, C

Magazine

- Scott Varnhagen, **Olugbenga Moses Anubi** "Electric Avenues: The dynamic advantages of wheel-motored vehicles", Vehicle Dynamics International, Annual Showcase, 2014.

Peer-Reviewed Conference

22. Mehrzad Mohammadi Bijaieh, Satish Vedula, and **Olugbenga M. Anubi**, "Model and load predictive control for design and energy management of shipboard power systems", IEEE Conference on Control Technology and Applications 2021, San Diego, USA, 2021.
21. Mehrzad Mohammadi Bijaieh, Satish Vedula, and **Olugbenga M. Anubi**, "Low-bandwidth Modular Mathematical Modeling of DC Microgrid Systems for Control Development with Application to Shipboard Power Systems", 2021 IEEE Electric Ship Technologies Symposium (ESTS), 2021.
20. Mehrzad Mohammadi Bijaieh, Satish Vedula, Ellis Oti Boateng and **Olugbenga M. Anubi**, "Degradation Aware Predictive Energy Management Strategy for Ship Power Systems", 2021 IEEE Electric Ship Technologies Symposium (ESTS), 2021.
19. Yu Zheng, and **Olugbenga M. Anubi**, "Attack-Resilient Weighted ℓ_1 Observer with Prior Pruning", American control Conference, Boston MA, 2021.
18. Yu Zheng, and **Olugbenga M. Anubi**, "Attack-resilient observer pruning for path-tracking control of Wheeled Mobile Robot", ASME Dynamic Systems and Control Conference 2020, Pittsburgh, PA.
17. **Olugbenga M. Anubi**, Charalambos Konstantinou, Carlos Wong, and Satish Vedula "Multi-Model Resilient Observer Under False Data Injection Attacks", IEEE Conference on Control Technology and Applications 2020, Montreal, Canada, 2020.

16. Mehrzad Mohammadi Bijaieh, **Olugbenga M. Anubi**, and Charalambos Konstantinou "Distributed Adaptive AC Droop Control in D-Q Coordinates for Inverter-Based Microgrids", In IEEE PSGM 2020 (pp. 5), Virtual.
15. Ali Sayghe, **Olugbenga M. Anubi**, and Charalambos Konstantinou "Adversarial Examples on Power Systems State Estimation", In Innovative Smart Grid Technologies 2020 (pp. 5), Virtual.
14. Lalit Mestha, **Olugbenga M. Anubi**, Masoud Abbaszadeh "Attack Detection and Accommodation for Energy Delivery Systems", 1st IEEE Conference on Control Technology and Applications, Kohala Coast, Hawai'i, 2017.
13. Layne Clemen, **Olugbenga M. Anubi**, "Weighted Sliding Mode Control: Control of Multiple Surfaces via a Single Actuator", American control Conference, Boston MA, 2016.
12. Jose Velazquez, Donald Margolis, and **Olugbenga M. Anubi** , "A Hysteresis Tracking Model Reference Feedback Controller to Improve Steering Feel in Electric Power Steering Systems: A Bond Graph Approach", Proceedings of the 2014 International Conference on Bond Graph Modeling and Simulation, Monterey, California, 2014. (**Best Paper Award**)
11. Layne Clemen, **Olugbenga M. Anubi**, and Donald Margolis , "Model Predictive Control of Regenerative Dampers with Acceleration and Energy Harvesting Trade-Offs",Proceedings of the 12th International Symposium on Advanced Vehicle Control, Tokyo, Japan, 2014.
10. Scott Varnhagen, **Olugbenga Moses Anubi**, and Donald Margolis, "Development of Realizable and Adaptive Wheel Torque Allocation for the Control of Planar Vehicle Dynamics", Proc. ASME Dyn. Syst. Control Conf. San Antonio, Texas. 2014.
9. Scott Varnhagen, **Olugbenga Moses Anubi**, Zachary Sabato, and Donald Margolis, "Active Suspension for Improved Planar Vehicle Dynamics", Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics, San Diego, California, 2014.
8. **Olugbenga M. ANUBI** and Carl D. CRANE and Warren E. DIXON , "Variable Stiffness Semi-active Suspension System",Proceedings of the 11th International Symposium on Advanced Vehicle Control, Seoul, Korea, 2012.
7. **O. Anubi** and C. Crane and W. E. Dixon , "Nonlinear Disturbance Rejection For Semi-active MacPherson Suspension System", Proc. ASME Dyn. Syst. Control Conf. Fort Lauderdale, FL. 2012.
6. **Olugbenga Moses Anubi**, and Carl Crane, "Nonlinear Control of Semi-active MacPherson Suspension System", ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, IL. 2012.
5. **Anubi, Olugbenga M** and Crane III, Carl D, "A New Variable Stiffness Suspension Mechanism", ASME, 2011.
4. **Olugbenga Moses Anubi**, and Carl Crane, "Semi-global Output Feedback Asymptotic Tracking for an Under-actuated Variable Stiffness Mechanism", Proceedings of the 13th IFTOMM World Congress in Mechanism and Machine Science, 2011.
3. **Olugbenga Moses Anubi**, and Carl D. Crane, and Shannon Ridgeway, "Design and Analysis of a Variable Stiffness Mechanism", Proceedings IDETC/CIE2010. ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Montreal, Canada, 2010.
2. **Anubi, OM**, and Moon, Y and Koka, A and Crane III, CD, "Dynamic Modeling and Control of a Robotic Finger with Compliant Fingertip",IASTED Technology Conferences, 2010.
1. **Olugbenga Moses Anubi** and Carl D. Crane, "Vehicle Roll Stabilization Enhancement Using a Variable Stiffness Architecture: Kinematic Control", Proc. ASME Dyn. Syst. Control Conf. Stanford, CA. 2013 .

Pre-Print

3. **Anubi, Olugbenga Moses**, and Mestha, Lalit, and Achanta, Hema. "Robust Resilient Signal Reconstruction under Adversarial Attacks" arXiv preprint arXiv:1807.08004 (2018).

2. **Anubi, Olugbenga Moses**, and Layne, Clemen. "Localization of Control Synthesis Problem for Large-Scale Interconnected System Using IQC and Dissipativity Theories." arXiv preprint arXiv:1504.03268 (2015).
1. **Anubi, Olugbenga Moses**. "Concurrent Learning Adaptive Model Predictive Control with Pseudospectral Implementation." arXiv preprint arXiv:1501.07641 (2015).

Teaching / Mentoring

Classes

7. EEL 5613: Foundation for Advanced Control Methods (Spring 2019, Spring 2020, Spring 2022)
6. EEL 5930: Intro. to Model Predictive Control (Spring 2022)
5. EEL 5930: Into. to Robust Control (Spring 2021)
4. EEL 5930: Intro. to Nonlinear Control (Spring 2019)
3. EEL 5905: Signals and Systems (Fall 2020)
2. EML 4316/5317: Advanced Design and Analysis of Control Systems (Spring 2020, Spring 2022)
1. EEL 3135: Signals and Systems Analysis (Undergraduate) (Fall 2021)

Postdoctrol Scholar

1. Mehrzad Mohammadi Bijaeih, *PhD* (Supervised: 2019 – 2020)

Current PhD Students

9. Ali Sayghe (*Projected graduation: Fall 2023*)
8. Yu Zheng (*Projected graduation: Fall 2023*)
7. Satish Vedula (*Projected graduation: Fall 2024*)
6. Sina Ameli (*Projected graduation: Fall 2023*)
5. Ellis Otis Boateng (*Projected graduation: Spring 2025*)
4. Boluwatife Olabiran (*Projected graduation: Fall 2024*)
3. Sridhar Mudhangula (*Projected graduation: Spring 202*)
2. Tarik Hawsawi (*Projected graduation: Fall 202*)
1. Ayobami Olajube (*Projected graduation: Fall 2025*)

Current Ms Students

2. Ashwin Vadivel (*Projected graduation: Spring 2022*)
1. Gabriel Omoniyi (*Projected graduation: Spring 2022*)

Doctoral Committee Member

10. Sandro Martin, *graduated 2020*
9. Gokhan Ozkan, *graduated. 2019*
8. Juan Ospina, *graduated 2019*
7. A.H.M Al-Taie, *graduated 2019*
6. Linyu Zhang, *graduated 2016, Georgia Institute of Technology*
5. X. Dong, *doctoral candidate*
4. S. Telikapalli, *doctoral candidate*

3. M.J.A Shohan, *doctoral candidate*
2. Zaid Shah, *doctoral student*
1. Tianze Wang, *doctoral student*

Ms Committee Member

5. Ojeda Pineiro, *graduated 2020*
4. T. Stamm, *graduated 2020*
3. S. Telikapalli, *graduated 2019*
2. R. Wu, *graduated 2019*
1. Cifuentes A.F Sanchez, *graduated 2019*