Olalekan Ogunmolu

Robotics | Control Systems | ML

Rerum Cognoscere Causas: To know the causes of things.

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omitted intentionally
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Education

2014–2019 (expected) **PhD in Electrical Engineering**, *University of Texas at Dallas*, Richardson, USA. .
Advisors: Nick Gans (UTD) and Steve Jiang (*UT Southwestern Medical Center*)
• Beam orientation optimization in Intensity-Modulated Radiotherapy.
• Numerical and Continuum-based modeling and control of soft robots for automated patient positioning in Image-Guidance Radiation Therapy

2011–2012 **Master of Science in Engineering in Control Systems**, *The University of Sheffield*, Sheffield, United Kingdom. .
Advisor: Tony J. Dodd. Thesis: "*Autonomous Navigation of a Rotorcraft Unmanned Aerial Vehicle using Machine Vision*."

2000–2005 **Bachelor Of Science in Physics & Electronics**, *Adekunle Ajasin University*, Nigeria. .
Senior thesis advised by Ademola Amusa (*MS, Columbia University, PhD UIUC*).| Dissertation Grade: 85% ≡ A+ | Graduated Magna Cum Laude.

Experience

Research:

Summer '19 - **Postdoctoral Scholar**, The University of Chicago, Chicago, IL.
Postdoc for Dr. Rodney Wiersma, *Radiation and Cellular Oncology, , Division of Biological Sciences, Pritzker School of Medicine.*
Design and implementation of a 6-DOF Stewart Platform and a 16-assembly mode soft parallel robot for Patient Motion Correction in Radiation Therapy.

Summer '18 **Research Intern**, Preferred Networks, Otemachi, Chiyoda-ku, Tokyo, Japan.
"Preferred Networks is one of a tiny handful of Japanese 'unicorns', or technology startups valued at more than $1 billion." – The Wall Street Journal, 10/15/2018
Research Intern within the Robotics Team. Worked on stable learning of complex robot motion-planning/manipulation tasks.
Implemented Khansari-Zadeh's CLF-DM on the Tokyo Robotics 7-DoF Arm. Proposed a DP approach for better complex robot trajectory imitation.

Fall '17 - Present **Visiting Research Student**, Medical Aritificial Intelligence and Automation Laboratory, Division of Medical Physics and Engineering, Radiation Oncology Department, UT Southwestern Medical Center.
Research Assistant for Dr. Steve Jiang, Barbara Crittenden Professor of Cancer Research, UTSW Department of Radiation Oncology.
Developed a multidisciplinary approach (spanning Deep learning, optimal control, dynamic programming, and game theory) in order to solve the classic beam orientation optimization (BOO) problem.

Summer - Fall '17 **Research Assistant**, Dr. Tyler Summers, Mechanical Engineering, UT Dallas.
Dynamic Programming, Decision Theoretic Control, Machine/Reinforcement Learning.
Developed a conservative controller for mitigating the lack of robustness in multi-stage decision policies.

Fall '14 - Now **Research Assistant**, Dr. Nick Gans, Electrical Engineering, University of Texas at Dallas.
Control Systems, Systems Identification, State Estimation and Computer Vision.
Conceived the prototypical testbed, procured hardware, integrated components to simulate soft robot compensating systems for patients in intensity modulated radiotherapy.

Summer '16 **Hardware Integration Intern**, Amazon Robotics LLC.
SLAM, Software and Hardware Integration Intern.
Helped integrate the hardware and software for the P3-DX robot used as a recreational robot in the Amazon Robotics office.

Spring '16 **Hardware Integration Intern**, Advanced Robotics Lab, Amazon Robotics LLC.
Hardware Integration Intern.
Wrote the codebase for the line scanners used in tracking objects in amazon warehouse assembly lines.

Teaching:

Fall '14 - '16 **Teaching Assistant, Introduction to Robotics**, *University of Texas at Dallas*.
Guided students during laboratories in programming the Robai Cyton 300R2 Robot and graded homeworks.

Spring '15 **Teaching Assistant, Linear Systems (M.S. Class)**, *University of Texas at Dallas*.
Responsible for helping Masters students with linear control theory applications; graded homeworks and midterms.

Spring '14 **Instructor, Analysis and Design of Digital Systems**, *Adekunle Ajasin University*.
Developed course modules, sole instructor for sophomore students, graded homeworks, designed and graded exams.

Summer '14 **Instructor, Digital Logic Design**, *Adekunle Ajasin University*.
Co-developed course modules, joint-instructor for junior students, graded homeworks, designed and graded exams.

Miscellaneous:

2009–2011 **Warehouse Manager, Apapa Plant**, *Coca-Cola Hellenic Bottling Company Plc*, Lagos,
Minimized glass breakages by 40%, assured efficiency in supply chain operations by coordinating with the Ikeja/Head Office Logistics teams, supervised 3 Coca-Cola mega warehouse managers leading to a reduction in waste by 35% after a 9-month stint at Apapa mega-plant. Introduced new standard operating procedures company-wide and country-wide to formalize waste minimization processes, and improve production supply chain processes. This led to the Apapa plant being the highest selling plant for all Coke categories for two consecutive quarters.

2007–2008 **Banking Assistant**, *First Bank of Nigeria Plc*, Lagos.

2005–2007 **System Engineer**, *DMT Technologies Limited*, KD, Nigeria.

Publications

Journals under prepraration

Olalekan Ogunmolu. Control of a 6-DOF Continuum Soft Robot Mechanism for Patient Motion Correction in Radiation Therapy. *International Journal of Robotics Research(IJRR)*. Fall 2019.

Olalekan Ogunmolu, Xuejun Gu, Nicholas Gans, and Steve Jiang. Kinematics and Dynamics of a 6-DOF Continuum Soft Robot Mechanism for Patient Motion Correction in Radiation Therapy. *Transactions on Robotics (T-RO).* Summer 2019.

Olalekan Ogunmolu, Xuejun Gu, Nicholas Gans, and Steve Jiang. Modeling and Validation of a Continuum Spherical Soft Actuator for Patient Motion Correction in Radiation Therapy. *Transactions on Robotics (T-RO).* Summer 2019.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. A Fast Deep Learning Approach for Beam Orientation Selection Using Supervised Learning with Column Generation on IMRT Prostate Cancer Patients. *Physics in Medicine and Biology (PMB)*, Spring 2019.

Olalekan Ogunmolu, Ayaka Kume, Jethro Tan. A stable Lyapunov approach for designing deep policies for complex robot motion tasks. Robotics and Automation Letters/International Conference on Robotics and Automation (RA-L). 2019.

Refereed Conference Papers

Top-tier IEEE, Algorithmic Foundations of Robotics, Radiation Therapy, Medical Physics, and Machine Learning conferences, i.e., WAFR, IROS, NIPS, and ICRA are highly selective venues for archival papers only, comparable to many IEEE journals in selectivity, visibility and impact.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. Deep BOO: Using supervised learning and guided Monte Carlo tree search for beam orientation optimization in radiation therapy. Under review at *International Conference on Medical Image Computing and Computer Assisted Intervention, XXII* (*MICCAI*), Shenzhen, China. October 2019.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. Deep Learning Neural Network for Beam Orientation Optimization. To appear in *International Conference on the use of Computers in Radiation Therapy XVI* (*ICCR*), Montreal, CA. June 2019.

Olalekan Ogunmolu, Azar Sadeghnejad Barkousaraie, Dan Nguyen, Nicholas Gans, and Steve Jiang. A Monte Carlo Tree Game for Beam Orientation Optimization. To appear in *International Conference on the use of Computers in Radiation Therapy XVI* (*ICCR*), Montreal, CA. June 2019.

Olalekan Ogunmolu, Michael Folkerts, Dan Nguyen, Nicholas Gans, and Steve Jiang. Deep BOO: Automating Beam Orientation Selection in Intensity Modulated Radiation Therapy. To appear at *Algorithmic Foundations of Robotics XIII, International Workshop* (*WAFR*), Mérida, Mexico. December 2018.

Olalekan Ogunmolu, Nicholas Gans, and Tyler Summers. Minimax Iterative Dynamic Game: Application to Nonlinear Robot Control Tasks. *IEEE/RSJ International Conference on Intelligent Robots and Systems* (*IROS*), Madrid, Spain. October 2018. DOI: 10.1109/IROS.2018.8594037

Olalekan Ogunmolu, Dan Nguyen, Xun Jia, Weiguo Lu, Nick Gans, and Steve Jiang. Automating Beam Orientation Optimization for IMRT Treatment Planning: A Deep Reinforcement Learning Approach.
Selected for Oral Presentation at the *John R. Cameron Young Investigators Symposium – 60th Annual Meeting of the American Association of Physicists in Medicine*, Nashville, TN (*AAPM*). July 2018.

Yara Almubarak, Joshi Aniket, **Olalekan Ogunmolu**, Xuejun Gu, Steve Jiang, Nicholas Gans, and Yonas Tadesse, Design and Development of Soft Robots for Head and Neck Cancer Radiotherapy. *SPIE: Smart Structures + Nondestructive Evaluation*, Denver, CO, U.S.A. March 2018.

Olalekan Ogunmolu, Adwait Kulkarn, Yonas Tadesse, Xuejun Gu, Steve Jiang, and Nick Gans. Soft-NeuroAdapt: A 3-DOF Neuro-Adaptive Pose Correction System For Frameless and Maskless Cancer Radiotherapy. *IEEE/RSJ International Conference on Intelligent Robots and Systems* (*IROS*), Vancouver, BC, Canada. September 2017. DOI: 10.1109/IROS.2017.8206211.

Olalekan Ogunmolu, Xuejun Gu, Steve Jiang, and Nick Gans. Vision-based control of a soft-robot for Maskless Cancer Radiotherapy. *IEEE Conference on Automation Science and Engineering (CASE)*, Fort-Worth, Texas, August 2016. DOI: 10.1109/CoASE.2016.7743378.

Olalekan Ogunmolu, Xuejun Gu, Steve Jiang, and Nick Gans. A Real-Time Soft-Robotic Patient Positioning System for Maskless Head-and-Neck Cancer Radiotherapy. *IEEE Conference on Automation Science and Engineering (CASE)*, Gothenburg, Sweden, August 2015. DOI: 10.1109/CoASE.2015.7294318.

Olalekan Ogunmolu, Autonomous Navigation of a Rotor-craft unmanned aerial vehicle using machine vision. .
MS Thesis, August. 2011. Advisor: Tony J. Dodd, University of Sheffield, England.

Olalekan Ogunmolu, Single Fractional Parentage Coefficients in the sd-Shell Nuclei .
BS Thesis, Nov. 2004. Advisor: Ademola Amusa, Adekunle Ajasin University, Nigeria.

Abstracts:

Olalekan Ogunmolu, Azar Sadeghnejad Barkousaraie, Dan Nguyen, and Steve Jiang, . An Approximate Policy Improvement Scheme for Beam Orientation Selection in Radiation Therapy. Under review at *John Cameron Young Investigators Symposium, American Association of Physicists in Medicine (AAPM) Annual Meeting*, San Antonio, TX, USA. July 2019.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. A Fast Deep Learning Approach for Beam Orientation Optimization. Under review at *American Association of Physicists in Medicine (AAPM) Annual Meeting*, San Antonio, TX, USA. July 2019.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. A Reinforcement Learning Application of Guided Monte Carlo Tree Search Algorithm for Beam Orientation Selection in Radiation Therapy. Under review at *American Association of Physicists in Medicine (AAPM) Annual Meeting*, San Antonio, TX, USA. July 2019.

Olalekan Ogunmolu, Nicholas Gans, and Tyler Summers. Minimax Iterative Dynamic Game: Application to Nonlinear Robot Control Tasks. *IEEE International Conference on Robotics and Automation, Machine Learning for Planning and Control Workshop Extended Abstract* (*ICRA 2018*), Madrid, Spain. October 2018.

Olalekan Ogunmolu, Nicholas Gans, and Tyler Summers Minimax Iterative Dynamic Game: Application to Nonlinear Robot Control Tasks., *IEEE International Conference on Robotics and Automation, Late Breaking Result Abstract* Brisbane, Australia, May 2018.

Yara Almubarak, Joshi Aniket, **Olalekan Ogunmolu**, Xuejun Gu, Steve Jiang, Nicholas Gans, and Yonas Tadesse, Design and Development of Soft Robots for Head and Neck Cancer Radiotherapy. *SPIE: Smart Structures + Nondestructive Evaluation,* Denver, CO, U.S.A. March 2018.

Tyler Summers, **Olalekan Ogunmolu**, and Nicholas Gans. Robustness Margins and Robust Guided Policy Search for Deep Reinforcement Learning". *IROS 2017 Abstract Only Track*, Vancouver, BC, Canada. September 2017.

Olalekan Ogunmolu, Nick Gans, Steve Jiang, and Xuejun Gu. An Image-Guided Soft Robotic Patient Positioning System for Maskless Head-And-Neck Cancer Radiotherapy: A Proof-of-Concept Study. *American Association of Physicists in Medicine (AAPM) Annual Meeting*, Annaheim, CA, USA. July 2015.

Tech Reports:

Olalekan Ogunmolu, Nicholas Gans, and Tyler Summers. Robust Zero-Sum Deep Reinforcement Learning. *arxiv PrePrints, arxiv ID:1710.00491*, Oct 2017.

Invited Talks

UTARI — A Wearable Soft Robotic Modular System for Head and Neck Motion Correction in Intensity-Modulated Radiation Therapy.
University of Texas at Arlington Research Institute, Fort Worth, Texas, USA. February 2019.

Open Robotics — Soft-Robotic Position Correction Mechanisms in Intensity-Modulated Radiation Therapy.
Open Robotics Foundation, Mountain View, CA, USA. January 2019.

UChicago — Robotic Radiotherapy: Automating Position Correction in Intensity-Modulated Radiation Therapy.
Department of Radiation and Cellular Oncology, The University of Chicago, Chicago, IL, USA. November 2018.

Stanford University — Robotic Radiotherapy: Automating Position Correction in Intensity-Modulated Radiation Therapy.
Department of Energy Resources Engineering, Stanford University, Stanford, CA, USA. November 2018.

ATR CNS Labs — Minimax Iterative Dynamic Game.
Department of Brain Robot Interface, Computational Neuroscience Labs, ATR, Osaka, Japan. August 2018.

Preferred Networks — Neural Networks and Adaptive Control.
Preferred Networks Tech. Talk, Chiyoda-ku, Tokyo. Japan. August 2018.

Google — SoftNeuroAdapt: A 3-DoF Neuro-Adaptive Healthcare System.
Work presented by Nick Gans, Google Robotics, Mountain View, CA. USA. September 2017.

EFSC'17, Vancouver — Soft Robotic Modules as Position Correcting Mechanisms in Cancer RT.
3rd Entrepreneurship Forum & Start-up Competition, EFSC'17, Vancouver, BC, Canada. September 2017.

UTSW, Dallas, TX — A 3-DOF Neuro-Adaptive Patient Pose Correcting System For Frameless and Maskless Cancer Radiotherapy,
Physics Research Seminar Series, Radiation Oncology Department, UT Southwestern Medical Center, Dallas, TX, USA. March 2017.

IEEE Arlington, TX — Towards automated accurate patient positioning in maskless cancer radiotherapy.
IEEE Computational Intelligence Society, UT Arlington, TX, USA. December 2015.

Awards and honors

- **Google AI Travel and Conference Grant** — October 2018
- **IEEE RAS/IROS Travel Award (IROS 2018)** — August 2018
- Finalist at the 3rd Entrepreneurship Forum and Startup Competition — August 2017
  Sponsored by IEEE Robotics and Automation Society, KUKA AG, and Univ. Hamburg
- **NSF Doctoral Consortium Award (IROS 2017)** — August 2017
- **Mary and Richard Templeton Graduate Fellowship** — August 2017
- **ROSCon Scholarship** (Open Software for Robotics Foundation) — July 2017
- President's **Teaching Excellence Award** for Teaching Assistants — Nom. Feb. 2017
- **Golden Key International Honour Society** — Inducted Dec. 2016
- **IEEE RAS/ISAM Travel Award (CASE 2016)** — August 2016
- **Ericsson Graduate Fellowship** — 2015 - 2016
- **Jonsson Scholarship** — 2014 - 2015
- **Achievement Award, University of Florida** *(Declined)* — Fall 2014
- **PTDF Overseas Scholarship Award, *£25,500+ for one year.*** (∼1.7% acceptance) — 2011
- **Federal Government (of Nigeria) Scholarship** (∼3.6% acceptance) — 2002
- **Ondo State (Nigeria) Scholarship** (∼10% acceptance) — 2004

Poster Presentations:

ICRA '18 — **Minimax Iterative Dynamic Game: Application to Nonlinear Robot Control Tasks.**,
IEEE International Conference on Robotics and Automation Brisbane, Australia, May 2018.

NIPS '17 — **An iterative dynamic game for robust deep reinforcement learning**,
Neural Information Processing Systems Long Beach, CA, December 2017.

IROS '17 — **Robustness Margins and Robust Guided Policy Search for Deep Reinforcement Learning**,
International Conference on Intelligent Robots and Systems Vancouver, BC, Canada. September 2017.

Texas Systems Day — **A 3-DOF Neuro-Adaptive Pose Correction System For Frameless and Maskless Cancer Radiotherapy**,
Texas Systems Day, Texas A & M University, College Station, TX, USA. March 2017.

Relevant Coursework

Convex Optimization
Nonlinear systems
Optimization theory and practice

Signal Processing and Estimation
Intelligent Systems
Robotics and Multisensor Systems

Select services and leadership

Jounals/conferences peer reviewing activities

2019 **Reviewer**, *Automatica Journal (IFAC)*.

2018 **Reviewer**, *Neural Computing and Applications (Journal)*, Neuro-Adaptive Control.

2018 **Reviewer**, *IEEE International Conference on Robotics and Automation (ICRA) 2018*.

2018 **Reviewer**, *Institute of Physics: Measurement Science and Technology (Journal)*.

2018 **Reviewer**, *IEEE International Conference on Intelligent Robots and Systems (IROS) 2018*.

2018 **Reviewer**, *Neural Computing and Applications (Journal)*, Neuro-Adaptive Control.

2017 **Reviewer**, *IEEE International Conference on Robotics and Automation (ICRA) 2018*.

2017 **Reviewer**, *American Control Conference (ACC)*.

2017, 2019 **Reviewer**, *International Federation of Automatic Control World Congress (IFAC)*, Switched Systems Track.

Miscellaneous

2017 **Invited Contributor**, *IEEE/RSJ International Conference on Robots and Intelligent Systems (IROS)*, Abstract Only Track, Vancouver, BC, Canada.

2017 – Now **Member**, **IEEE Robotics and Automation Society**.

2016–Now **Member**, *IEEE Boston*, Greater Boston, USA.

2015 – 2016 **Science instructor**, *IEEE Dallas Shoulder of Giants Workshops*, Dallas, TX.
Participant at IEEE Dallas Young Professionals community outreaches in promoting STEM education and awareness in the Dallas/Fort-Worth Metroplex.

2015 **Summer Science Program**, *University of Texas at Dallas*, Richardson, TX.
Trained high-school kids in basic robots control and programming with the Berkeley Snap! kit and arduino.

2012 **Workshop participant**, *ILA Berlin Airshow*, Berlin, Germany.
Selected by Cassidian (an EADS company) for the *Aerospace Systems Engineering* workshop.

2012 **Workshop participant**, *Farnborough International Airshow*, NE Hampshire, England.
Selected by Airbus (an EADS company) among participants at the *UAV and Fighter Aircraft* workshop.

Mentoring

Undergraduate mentoring:

Summer 2017 Rachael Thompson. Plano High School Student. Currently an undergrad at MIT's CSAIL. Class of 2021

2016 - 2017 Alex Tomkovich. Computer Engineering Junior.

Spring 2015 Grant Carr. Computer Engineering Junior.

Masters mentoring:

2016 – 2017 Adwait Kulkarn. Mechanical Engineering Masters student (Currently at Drov Technologies, MN).

2015 Ajith Venkateswaran. Computer Engineering Masters student (Currently Senior Robotics Software Engineer, Samsung Research, America).

Computing

Programming C++, Python, Lua, MATLAB, LabVIEW.

Libraries Point Cloud Library, OpenCV, Torch7, Eigen, Docker, PyTorch, OpenAI Gym, MuJoCo, Numpy, SciPy, Scikit-Learn, C++11/14 standards.

OS OSX, Debian, Windows.

OSRF	ROS hydro, indigo, jade, kinetic, and melodic distros. ROS Bouncy Bolson.
Web	HTML, Markdown, socket.io, node.js, and express.js.

Select OpenSource Projects

Lyapunov-Learner	Python Implementation of "Learning Control Lyapunov Functions for Dynamical Systems". (Available at https://github.com/lakehanne/LyapunovLearner)
Awesome-NeuroControl	A curated list of neural applications in control theory and practice. (Available at https://github.com/lakehanne/awesome-neurocontrol)
Awesome-Screw Theory	A curated list of screw theory and practice in continuum, soft and semi-rigid robots. (Available at https://github.com/lakehanne/awesome-screw-theory)
PCL	Fix for segfault in our-cvfh algorithm in the point-cloud library. (Available at PR 1827)
GPS	Catkinized version of Levine et. al's guided policy search algorithm in ROS Indigo (Available at https://github.com/lakehanne/gps). Dockerized version available at gps-docker.
Keyence	Minimal source code for retrieving profile map from the keyence LJV-7000 series line scanners. (Available at https://github.com/lakehanne/keyence)
RBN	Recurrent Batch Normalization of Neural Networks in Torch7. (Available at https://github.com/element-research/rnn)
DICE	Sørensen-Dice coefficients in Torch7. (Available at https://github.com/lakehanne/nn).
FARNNs	Training of multilayer networks, simple recurrent neural networks, long short-term memory cells (with peep-hole connections), fast LSTMS, and recurrent batch normalized FastLSTMs to model the relationship between Borel measurable sets. (Available at https://github.com/lakehanne/FARNN)

Languages

English	Reads, writes, and speaks fluently	*Lived in Nigeria, United Kingdom and United States.*
Japanese	Basic proficiency	*Lived in Japan for 3 months.*
Yoruba	Reads, writes, and speaks fluently.	*Native Nigerian Language. Spoken at home.*

References

Nick Gans
Professor of Electrical Engineering
University of Texas at Dallas,
Richardson, TX, USA

Steve Jiang
Barbara Crittenden Professorship in Cancer Research
Vice Chair, Department of Radiation Oncology
Director, Div. of Medical Physics and Engineering
University of Texas Southwestern Medical Center
Dallas, TX, USA

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