

# Olalekan Ogunmolu

Robotics | Control Systems | ML

*Rerum Cognoscere Causas: To know the causes of things.*

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## Education

- 2014–2019 **PhD in Electrical Engineering**, *University of Texas at Dallas*, Richardson, USA. .  
(expected) Advisors: Nick Gans (UTD) and Steve Jiang (*UT Southwestern Medical Center*)
- Beam orientation optimization in Intensity-Modulated Radiotherapy (IMRT).
  - Numerical and Continuum-based modeling and control of soft robots for automated patient positioning in Image-Guidance Radiation Therapy (IGRT)
- 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%  $\equiv$  A+ | Graduated Magna Cum Laude.

## Publications

### Journals Under Review

**Olalekan Ogunmolu**, Michael Folkerts, Dan Nguyen, Nicholas Gans, Steve Jiang. [Deep BOO 2.0: End-to-End Training of Beam Orientation Selection Policies for Intensity Modulated Radiation Therapy](#). Under publication invitation review at *International Journal of Robotics Research (IJRR)*, 2018.

### Journals under prepration

**Olalekan Ogunmolu**, Michael Folkerts, Dan Nguyen, Nicholas Gans, Steve Jiang. [Deep BOO: End-to-end training of beam orientation selection policies for intensity modulated radiation therapy.](#). IEEE Transactions on Neural Systems and Rehabilitation Engineering. 2018.

**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.

**Olalekan Ogunmolu**, Nick Gans, Xuejun Gu, and Steve Jiang. [Simulation and control of a head and neck patient pose correction soft-robot mechanism in intensity modulated radiotherapy](#). Transactions on Robotics (T-RO) 2018/2019.

### 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 Learning Neural Network for Beam Orientation Optimization](#). Under review at *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](#). Under review at *International Conference on Monte Carlo Techniques for Medical Applications II* (MCMA), 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 *The 13th International Workshop on the Algorithmic Foundations of Robotics* (WAFR), Mérida, Mexico. December 2018.

**Olalekan Ogunmolu**, Nicholas Gans, 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 Kulkarni, 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.

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## Abstracts:

**Olalekan Ogunmolu**, Nicholas Gans, 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, 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**, 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, 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*, Anaheim, CA, USA. July 2015.

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## Tech Reports:

**Olalekan Ogunmolu**, Nicholas Gans, Tyler Summers. [Robust Zero-Sum Deep Reinforcement Learning](#). *arxiv PrePrints*, *arxiv ID:1710.00491*, Oct 2017.

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## Invited Talks

### Presentations:

- UC Berkeley [Deep BOO! Automating Beam Orientation Optimization in Intensity-Modulated Radiation Therapy](#).  
University of California, Berkeley, CA, USA. March 2019.
- 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](#).  
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.

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## Experience

### Research:

- 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 - **Visiting Research Student**, Medical Artificial Intelligence and Automation Laboratory, Division of Medical Physics and Engineering, Radiation Oncology Department, UT Southwestern Medical Center.  
 Present *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 - **Research Assistant**, Dr. Tyler Summers, Mechanical Engineering, UT Dallas.  
 Fall '17 *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 - **Research Assistant**, Dr. Nick Gans, Electrical Engineering, University of Texas at Dallas.  
 Now *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.

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## Awards and honors

◦ Google AI Travel and Conference Grant	October 2018
◦ IEEE RAS/IROS Travel Award (IROS 2018)	August 2018
◦ Finalist at the <a href="#">3rd Entrepreneurship Forum and Startup Competition</a> Sponsored by IEEE Robotics and Automation Society, KUKA AG, and Univ. Hamburg	August 2017
◦ <a href="#">NSF Doctoral Consortium Award (IROS 2017)</a>	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 ( <i>Declined</i> )	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	<b>Minimax Iterative Dynamic Game: Application to Nonlinear Robot Control Tasks.,</b> <i>IEEE International Conference on Robotics and Automation</i> Brisbane, Australia, May 2018.
NIPS '17	<b>An iterative dynamic game for robust deep reinforcement learning,</b> <i>Neural Information Processing Systems</i> Long Beach, CA, December 2017.
IROS '17	<b>Robustness Margins and Robust Guided Policy Search for Deep Reinforcement Learning,</b> <i>International Conference on Intelligent Robots and Systems</i> Vancouver, BC, Canada. September 2017.
Texas Systems Day	<b>A 3-DOF Neuro-Adaptive Pose Correction System For Frameless and Maskless Cancer Radiotherapy,</b> <i>Texas Systems Day, Texas A &amp; M University, College Station, TX, USA.</i> 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

### Journals/conferences peer reviewing activities

2018	<b>Reviewer,</b> <i>Neural Computing and Applications (Journal)</i> , Neuro-Adaptive Control.
2018	<b>Reviewer,</b> <i>IEEE International Conference on Robotics and Automation (ICRA) 2018.</i>
2018	<b>Reviewer,</b> <i>Institute of Physics: Measurement Science and Technology (Journal).</i>
2018	<b>Reviewer,</b> <i>IEEE International Conference on Intelligent Robots and Systems (IROS) 2018.</i>
2018	<b>Reviewer,</b> <i>Neural Computing and Applications (Journal)</i> , Neuro-Adaptive Control.
2017	<b>Reviewer,</b> <i>IEEE International Conference on Robotics and Automation (ICRA) 2018.</i>
2017	<b>Reviewer,</b> <i>American Control Conference (ACC).</i>
2017	<b>Reviewer,</b> <i>International Federation of Automatic Control World Congress (IFAC), Switched Systems Track.</i>



2017 **Open Reviewer**, *35th International Conference on Machine Learning (ICML)*, [OptNet: Differentiable Optimization as a Layer in Neural Networks](#).

### 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.

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## 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).

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## 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.

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## 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/rn>).
- 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>)

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## Languages

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

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## 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

Last updated: February 12, 2019