

# Lekan Molu

Robotics / Control Systems / ML

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

United States Permanent Resident.

2 Granite Road  
East Windsor, NJ 08520-3045

☎ +1-267-881-8844

✉ patlekano@gmail.com

---

## Education

- 2019 **PhD in Electrical and Computer Engineering**, *University of Texas at Dallas*, Richardson, USA  
“*A Multi-DOF Soft Robot Mechanism for Patient Motion Correction and Beam Orientation Selection in Cancer Radiation Therapy.*” Advisors: Nick Gans (University of Texas at Dallas) and Steve Jiang (UT Southwestern Medical Center.)
- 2013 **Master of Science in Engineering in Control Systems**, *The University of Sheffield*, Sheffield, United Kingdom. “*Autonomous Navigation of a Rotorcraft Unmanned Aerial Vehicle using Machine Vision.*”  
Advisor: Tony J. Dodd.

---

## Publications

Premier IEEE Robotics and Automation Society, Machine Learning, Algorithmic Foundations of Robotics, and Medical Physics publications (WAFR, IROS, NIPS, PhysMed, and ICRA) are highly selective venues for archival papers, similar to selective IEEE journals in visibility and strong scientific/engineering communications. Asterisks beside author names signify equal contributions.

### Recent preprints

Shaoru Chen, **Lekan Molu**, and Mahyar Fazlyab. [Learning Neural Network Barrier Functions with Termination Guarantees](#). (Under review at) *American Control Conference (ACC)*, 2023.

Shivakanth Sujit\*, Anurag Koul\*, Shaoru Chen, Ben Evans, Lili Wu, Byron Xu, Rajan Chari, Yonathan Efroni, Miro Dudik, **Lekan Molu**, John Langford, Alex Lamb. [PCLAST: Discovering Plannable Latent States](#). (Under review at) *International Conference on Learning Representations (ICLR)*, 2023.

**Lekan Molu**, Shaoru Chen, and Audrey Sedal. [Lagrangian Properties and Control of Soft Robots Modeled with Discrete Cosserat Rods](#). (Submitted to) *IEEE International Conference on Robotics and Automation (ICRA)*, September 2023.

Shaoru Chen, **Lekan Molu**. [Composite Fast-Slow Backstepping Design for Nonlinear Singularly Perturbed Newton-Euler Dynamics: Application to Soft Robots](#). (Submitted to) *IEEE Robotics and Automation Letters*, October 2023.

**Gilbert Bahati\***, **Lekan Molu\***, Joel Burdick, and Aaron Ames. [Boundary Control of Multisection Soft Manipulators: A Case Study in PDE Backstepping Design](#). (Submitted to) *IEEE Robotics and Automation Letters with IROS Option*, October 2023.

**Lekan Molu**. [LevelSetPy: A GPU-Accelerated Package for Resolving Hyperbolic Hamilton-Jacobi Partial Differential Equations](#). (Submitted to) *ACM Transactions on Mathematical Software*. April 2023.

Leilei Cui and **Lekan Molu**. [Robust Policy Optimization in Continuous-time Mixed  \$\mathcal{H}\_2/\mathcal{H}\_\infty\$  Stochastic Control](#), (Under final review at) *Transactions in Automatic Control*. June 2023.

Shaoru Chen, **Lekan Molu**, and Mahyar Fazlyab. [Learning Neural Network Barrier Functions with Termination Guarantees](#). (Submitted to) *American Control Conference*, September 2023.

### Publications

Alex Lamb, Riashat Islam, Yonathan Efroni, Aniket Didolkar, Dipendra Misra, Dylan Foster, **Lekan Molu**, Rajan Chari, Akshay Krishnamurthy, John Langford. [Guaranteed Discovery of Control-Endogenous Latent States with Multi-Step Inverse Models](#). *Transactions in Machine Learning Research*. February 2023.

**Lekan Molu**. [Mixed H2/H-Infinity Policy Learning Synthesis](#). *World Congress, International Federation of Automatic Control*, Yokohama, Japan. July 2023.

Tengyang Xie, Akanksha Saran, Dylan J Foster, **Lekan Molu**, Ida Momennejad, Nan Jiang, Paul Mineiro, and John Langford. [Interaction-Grounded Learning with Action-inclusive Feedback](#). *Neural Information Processing Systems (Neurips)*., New Orleans, La. May 2022.

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](#). *The International Journal of Medical Physics Research and Practice*, 2020.

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

**Olalekan Ogunmolu**, Xinmin Liu, Nicholas Gans, and Rodney Wiersma, [Mechanism and Model of a Soft Robot for Head Stabilization in Cancer Radiation Therapy](#). *IEEE International Conference on Robotics and Automation (ICRA 2020)*, 2020.

Azar Sadeghnejad Barkousaraie, **Olalekan Ogunmolu**, Steve Jiang, and Dan Nguyen. [Using Supervised Learning and Guided Monte Carlo Tree Search for Beam Orientation Optimization in Radiation Therapy](#). Appeared in *Artificial Intelligence in Radiation Therapy (AIRT). Lecture Notes in Computer Science, vol 11850. Springer Cham*, Presented at *International Conference on Medical Image Computing and Computer Assisted Intervention, XXII (MICCAI)*, Shenzhen, China. 2019.

**Olalekan Ogunmolu**, and Rodney Wiersma. [A Real-Time Patient Head Motion Correction Mechanism for MRI-Linac Systems](#). (*AAPM/COMP Meeting*). July 2020.

**Olalekan Ogunmolu**, Xinmin Liu, and Rodney Wiersma. [Paths Replanning for Head and Neck Motion Correction in Robotic Stereotactic Radiosurgery](#). *AAPM/COMP Meeting*. July 2020.

**Olalekan Ogunmolu**, [A Multi-DOF Soft Robot Mechanism for Patient Motion Correction and Beam Orientation Selection in Cancer Radiation Therapy](#). *PhD Thesis, University of Texas at Dallas, UT Southwestern Medical Center* 2019.

**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**, 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**, Dan Nguyen, Xun Jia, Weiguo Lu, Nick Gans, and Steve Jiang. [Automating Beam Orientation Optimization for IMRT Treatment Planning: A Deep Reinforcement Learning Approach](#). *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.

### Technical Reports

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

**Olalekan Ogunmolu**, Xuejun Gu, Steve Jiang, and Nicholas Gans. [Nonlinear Systems Identification Using Deep Dynamic Neural Networks](#). *arxiv PrePrints*, *arxiv ID:1610.01439*, Oct 2016.

### Patent applications

Alex Lamb, Riashat Islam, Yonathan Efroni, Aniket Didolkar, Dipendra Misra, Dylan Foster, **Olalekan Ogunmolu**, Rajan Chari, Akshay Krishnamurthy, John Langford. [Controllable Latent Space Discovery Using Multi-Step Inverse Model](#), Nov. 2022.

---

## Chronological Experience: Research, Teaching, Industry

### Research

- May '21 - **Senior Researcher**, [Microsoft Research](#), New York, NY, USA.  
Present Reinforcement Learning Group, NYC.
- Summer '19 - **Postdoctoral Scholar**, [The University of Pennsylvania](#), Philadelphia, PA, USA.  
Present Design, build, and control of a soft robot for assisted MRI-based 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 - **Research Assistant**, Medical Artificial Intelligence and Automation Laboratory, Division of  
Spring '19 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 - **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.  
Spring 19 *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.

### Teaching

- January 20 - **Adjunct Instructor, RBOT 250- Robot manipulation, planning and control**, [Brandeis University](#)  
Designing course outlines and 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 homework.
- 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 homework and midterms.

- Spring '14 **Instructor, Analysis and Design of Digital Systems**, Adekunle Ajasin University  
Developed course modules, sole instructor for sophomore students, graded homework, designed and graded exams.
- Summer '14 **Instructor, Digital Logic Design**, Adekunle Ajasin University  
Co-developed course modules, joint-instructor for junior students, graded homework, designed and graded exams.

---

## Experience: Leadership, Hardware, and Computing

- Collaborator/Team Leader** Experience leading/working with teams to create and execute plans to bring-up, and validate designs to achieve system level functionalities. Experience working closely with partnership teams (e.g. research and supply chain, industrial manufacturing), and external vendors by optimizing the manufacturing process for volume scale-up. Designing sensor integration, testing and calibration methodology for volume manufacturing at lowest cost, and iterating on ideas, prototype, test, refine cycle. Managing by positive influence.
- Innovation** Experience solving complex system issues, developing system requirements, driving technical innovation and roadmap. Experience gathering requirements, defining high level architecture, executing hardware design, and product validation. Experience in companies and universities (Europe, Asia, and Africa), across disciplines and industries.
- Hardware**
- Prototyping** Experience in components selection (including design and verification of programmable soft actuators, linear actuators, bike gear drivetrains, & braking systems), sensors (MEMs, liquid metals, & cameras and optical systems) selection and integration, microcontrollers integration (National Instruments, Raspberry Pi's, Arduinos), components specifications, schematic design, PCB layout and bring up.
- Embedded Systems** Experience with design of embedded systems, completing board layouts, assembling, testing, debugging, and integrating designs into opto-electro-mechanical systems. Communication protocols (e.g. SPI, I<sup>2</sup>C, TCP/IP, UDP), Linux/Python scripting, and C++. Enjoy being hands-on in the lab, in the details (soldering, oscilloscopes, data acquisition) and a thriving gusto for engineering.
- Computing**
- OS** OSX, Debian, Ubuntu, Windows, Raspian.
- Programming** C++, Python, Mathematica, MATLAB, LabVIEW.
- Learning** DNN, CNN, RNN, Gaussian Processes, CV/ML object detection etc.
- CAD** Solid Works, AutoDesk Inventor, Blender, Adobe Illustrator.
- ROS** Hydro, Indigo, Jade, Kinetic, and Melodic, Bouncy Bolson, Ubuntu Kame and Mate embedded distros.
- Libraries** Point Cloud, OpenCV, Eigen, Docker, PyTorch, Numpy, SciPy, Scikit-Learn, C++11/14/17.
- Web** HTML, Markdown.
- Select OpenSource Projects**
- Lyapunov-Learner** Python Implementation of "Learning Control Lyapunov Functions for Dynamical Systems". (Available at <https://github.com/robotsorcerer/LyapunovLearner>)
- 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/robotsorcerer/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/robotsorcerer/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/robotsorcerer/nn>).

---

## Invited Talks

- Open Robotics [Soft-Robotic Position Correction Mechanisms in Intensity-Modulated Radiation Therapy](#). **Open Robotics Foundation**, Mountain View, CA, USA. January 2019.
- Stanford University [Robotic Radiotherapy: Automating Position Correction in Intensity-Modulated Radiation Therapy](#). Department of Energy Resources Engineering, **Stanford University**, Stanford, CA, USA. November 2018.
- 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.
- 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.
- UTARI, Fort Worth, TX [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. May 2019.
- EFSC'17 Vancouver, BC [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.

---

## Mentoring

### PhD mentoring:

- 2022 – MSR NYC Postdocs: Shaoru Chen (UPenn), Anurag Koul (Oregon State), Akanksha Saran (UT Austin), Hosein Hasanbeig (Oxford).
- 2022 – MSR NYC Interns: Leilei Cui, NYU PhD Student; Harley Wiltzer, McGill PhD Student; Present Thomas Zhang, UPenn PhD Student; Shivakanth Sujit, MILA PhD Student.

### PhD Studentship Mentoring

- 2016 – 2019 Iretiayo Akinola. Columbia University. NVIDIA Research Scientist; Adwait Kulkarn. Mechanical Engineering Masters student (Currently at Drov Technologies, MN). Ajith Venkateswaran. Computer Engineering Masters student (Currently Senior Robotics Software Engineer, Samsung Research, America). Rachael Thompson. Plano High School Student. Currently an undergrad at MIT's CSAIL. Class of 2021. Now PhD Student at Brown.

---

## Select Leadership

### Professional Organizations

- 2020-2022 **NYAS**, *The New York Academy of Sciences*, Member
- 2017-Present **IEEE RAS**, *The IEEE Robotics and Automation Society*, Member

### Peer Reviewing Activities (Research)

- '20 **ICLR**, *The International Conference of Learning Representations*, A 1% publication avenue for cutting-edge research on all aspects of deep learning used in the fields of artificial intelligence, statistics and data science, as well as important application areas such as machine vision, computational biology, speech recognition, text understanding, gaming, and robotics
- '19 **JBHI**, *An IEEE Journal of Biomedical and Health Informatics Access*
- '19 **External Grants Reviewer**, *AI for Species Discovery*, [National Geographic Society](#)
- '18,'19 **Automatica**, *The International Federation of Automatic Control (IFAC)*
- '17, '18, '19 **Access**, *IEEE Access Journal*
- '17, '18, '19 **NCAA**, *Springer's Neural Computing and Applications*
- '17, '20 **ICML**, *International Conference on Machine Learning*
- '18,'19,'20 **CDC**, *IEEE International Conference on Decision and Control*, Flagship Control and Decision-Making Control Conference Proceedings in the World
- 2017-Present **DSCC**, *American Society of Mechanical Engineers (ASME) Dynamic Systems and Control Conference*, Conference Proceedings
- '17-'20 **ICRA**, *IEEE International Conference on Robotics and Automation*, Flagship IEEE Robotics and Automation Society Conference in the World
- '17-'20 **IROS**, *IEEE/Robotics Society of Japan (RSJ) International Conference on Intelligent Robots and Systems*, Flagship IEEE/RSJ Conference on Robotics
- '17, '18,'19 **ACC**, *IEEE American Control Conference*, Premiere American Control Conference Venue
- '17, '18 **The IFAC World Congress**, *The International Federation of Automatic Control*, A worldwide, interdisciplinary congress of scientists and engineers to share up-to-date, complete and universal view of control and analysis techniques
- [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.