# Kizito Masaba

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## Objective

Seeking Opportunities in Environment monitoring, Autonomous Driving, Warehouse Automation and Assembly Production.

## Education

2017-present **Guarini School of Graduate and Advanced Studies at Dartmouth** Hanover, NH
*Candidate for PhD in Computer Science degree, June 2024*
*Advisor: Dr. Alberto Quattrini Li*
*Robotics, Machine Learning, Artificial Intelligence and Quantitative Methods*
*EE Just Graduate Fellowship*

2015-2016 **Carnegie Mellon University** Pittsburgh, PA
*Master of Science in Electrical and Computer Engineering, Magna cum laude*
*Renewable Energy, Embedded Systems, Cloud Computing*
Jeremiah Mpagazehe Rising Researcher Award

2009-2013 **Makerere University** Kampala, Uganda
*Bachelor of Science in Computer Engineering*
*Final Project: Embedded Systems for Food Preservation*

## Technical Skills

- **Programming Languages**: Python, Java, C++, C, C#, MATLAB, PHP, Python-Flask
- **Robotics**: Rigid body Transformations (coordinate frames), PID Controllers, *Localization* - Dead Reckoning, Kalman Filters, Particle Filters; *Path Planning* - Branch and Bound, Probabilistic Road Maps (PRM), Rapidly-exploring Random Trees (RRT), Depth/Breadth First Search, Dijkstra, Reinforcement Learning; *Active Learning* - Information theory (e.g. Entropy, Mutual Information, Fisher Information, Variance, Upper Covariance Bound, etc), Gaussian Processes
- **Robotics Hardware and Software:** Robot Operating System (ROS), Robot Control and Assembly, Robot Simulation
- **Computer Science Theory:** Set Theory, Probability Theory, Statistics, Linear Algebra, Data structures and Algorithms
- **Mathematical Optimization**: Bayesian Optimization, Linear Programming, Network flow theory, simulated annealing, constraint formulation, sensitivity analysis, Gaussian and Poisson Distributions
- **Machine Learning:** *Supervised* - linear regression, Random Forests, Support Vector Machines, Gaussian Process Regression, Neural Networks; *Unsupervised* - KMeans, KNN, Principal Component Analysis (PCA); *Time series Analysis* - Long Short-Term Memory (LSTM), Linear Dynamical Systems, Dynamic Mode Decomposition (DMD).
- **Artificial Intelligence:** Markov Chains, Hidden Markov Models (HMM), Min-Max Optimization, Adversarial Search, Satisfiability Problem (SAT) Solvers

## Graduate Research Experience

**Solving Challenges in Multi Robot Environment Exploration** (2018-2024) Hanover, NH

- Enhanced the efficiency of affordable robots across various robotic applications, such as environmental monitoring, autonomous driving, precision agriculture, and warehouse automation in a project funded by NSF with a 5.6M grant.
- Reduced the operational expenses of a group of economical mobile robots assigned to explore extensive environments, by partitioning the target environment into manageable subregions, enabling the robots to handle extensive datasets with minimal computational resources.
- Enabled robot teams to efficiently exchange information even in communication-limited environments, making them suitable for exploring remote areas like offshore and underwater regions.

**Machine Learning Modelling for Mental and Behavioral Health** (2017-2018) Hanover, NH

- Identified the causes of variation in performance amongst professionals in a workplace by conducting a 21-month, IARPA funded ($7.9M grant) longitudinal study in collaboration with other researchers from eight (8) US universities.
- Recruited 550 professionals from cognitively demanding occupations such as engineers and managers into the study.
- Developed data collection and visualization tools for the study with colleagues, including mobile and web apps.
- Identified patterns in collected data that are associated with high and low performance, in collaboration with domain experts.

## Teaching Experience

**Undergraduate Teaching Assistant** (2017-2020) Hanover, NH

- Assisted in teaching several Computer Science courses through mentorship, office hours and grading. Some of the courses include Object Oriented Programming (CS-10), Smartphone Programming (CS65/165), Database Systems (CS 61/161) and Senior Design and Implementation Project (CS98)

**Mentorship/Leadership**

- Interviewed Prospective Dartmouth Students through the Admissions Ambassador Program
- Participated in the Robotics Outreach Program, inspiring high school students to pursue careers in STEM.
- Mentored two undergraduate research interns in the Robotics Lab at Dartmouth College
- Mentored new African graduate students through the Afro-heritage Graduate Student Network at Dartmouth College

## Work Experience

**Software Engineer At Pivot Access (**2017-2017) Kigali, Rwanda

- Enhanced the existing prepaid electric meter token generation system in collaboration with the engineering team. This update incorporated cutting-edge token generation technology and adhered to the latest industry standards. As a result, our company achieved compliance with token generation standards and significantly reduced token generation latency.
- Pivot Access specializes in prepaid utility bill payments across Rwanda with software systems for purchasing tokens for prepaid electric meters.

**Mobile Applications Developer At True African (**2013-2015) Kampala, Uganda

- Designed and implemented Uganda's first-ever mobile banking application for Standard Chartered Bank together with the IT team. This initiative successfully facilitated the seamless transition of the bank's USSD customers to mobile applications, underscoring my contributions to enhancing the customer experience.
- True African is a prominent value added service provider of many corporations in East Africa.

## Memberships

- National Society of Black Engineers (NSBE)
- Institute of Electrical and Electronic Engineers (IEEE) Student Member
- Association of Computing Machinery (ACM) Student member
- Afro-heritage Graduate Student Network (AGSN) at Dartmouth College

## Publications

- **Masaba, Kizito,** Roznere, Monika, Jeong, Mingi and Alberto Quattrini Li. "Persistent Monitoring of Large Environments with Robot Deployment Scheduling in between Remote Sensing Cycles" International Conference on Robotics and Automation (ICRA). IEEE, 2024.
- **Masaba, Kizito,** and Alberto Quattrini Li. "Multi-Robot Adaptive Sampling based on Mixture of Experts Approach to Modeling Non-Stationary Spatial Fields." 2023 International Symposium on Multi-Robot and Multi-Agent Systems (MRS). IEEE, 2023.
- **Masaba, Kizito**, and Alberto Quattrini Li. "GVGExp: Communication-Constrained Multi-Robot Exploration System based on Generalized Voronoi Graphs." 2021 International Symposium on Multi-Robot and Multi-Agent Systems (MRS). IEEE, 2021.
- **Masaba, Kizito**, and Alberto Quattrini Li. "ROS-CBT: Communication benchmarking tool for the robot operating system." 2019 International Symposium on Multi-Robot and Multi-Agent Systems (MRS). IEEE, 2019.
- Mirjafari, S., **Masaba, K**., Grover, T., Wang, W., Audia, P., Campbell, A.T., Chawla, N.V., Swain, V.D., Choudhury, M.D., Dey, A.K. and D'Mello, S.K., 2019. Differentiating higher and lower job performers in the workplace using mobile sensing. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 3(2), pp.1-24.
- Wang, W., Harari, G.M., Wang, R., Müller, S.R., Mirjafari, S., **Masaba, K**. and Campbell, A.T., 2018. Sensing behavioral change over time: Using within-person variability features from mobile sensing to predict personality traits. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2(3), pp.1-21.
- **Masaba, Kizito**, Amini Ntakirutimana, and Taha Selim Ustun. "Design and implementation of a load scheduling embedded system for off grid solar power systems." 2016 IEEE PES Innovative Smart Grid Technologies Conference Europe (ISGT-Europe). IEEE, 2016.