

# SICELUKWANDA ZWANE

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## EDUCATION

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**PhD Robotics and Artificial Intelligence**, *University College London* 2020 - 2024 (expected)  
Research Topic: Safe, Data-efficient Machine Learning for Real-world Robots.

**MSc Computer Science**, *University of the Witwatersrand* 2017 - 2019  
Research Topic: Using Mixture Density Networks to Model Continuous Action Priors

**BSc (Hons) Computer Science (With Distinction)**, *University of the Witwatersrand* 2013 - 2016  
Fourth Year Project: Developed an Autonomous Mobile Telepresence Robot. Key components included Dynamixel actuators, ASUS Xtion 3D cameras, and the TurtleBot mobile base. Utilized a range of ROS packages for SLAM implementation.

## WORK EXPERIENCE

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**PhD Research Intern - Mobile Robotics**, *AIST – Tokyo, Japan* Jan 2024 - Mar 2024

- Using generative models for safe motion planning with mobile robots in crowded spaces (shopping malls, science museums, etc).

**CTO and Co-founder**, *Amathambo AI – London, UK* 2023 - Present

- Led the development of an innovative AI software tool for generating medical staff rosters, which won the Mandela-Rhodes Award Prize (valued at \$38 000 USD) in 2023.
- Product management and full-stack development for company website and other software offerings.

**Postgraduate Teaching Assistant**, *University College London, UK* 2021 - 2023

- Co-supervising student dissertations (term projects) on robotics and reinforcement learning.
- Developing and assessing student coursework in C++ (Robot Sensing, Interaction, and Manipulation).

**Data Scientist**, *Explore AI, South Africa* 2019 - 2020

- Developed a data-science training course which compressed machine learning (regression, classification, and unsupervised learning) into 6 months.
- Led a team that developed a Twitter sentiment analysis tool and accompanying dashboard for a big South African bank.

**MSc Research Intern - Field Robotics**, *CSIR – Pretoria, South Africa* 2017 - 2019

- Developed and maintained software for control and perception of a mobile manipulator robot.
- Developed a simulated environment for the physical mobile manipulator robot in ROS, Rviz, and Gazebo.

## SKILLS SUMMARY

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<b>Robotics:</b>	Motion Planning and Control, Manipulation and Grasping, Robot Perception
<b>Simulation:</b>	Mujoco (and dm-control), Pybullet, Nvidia Isaac Sim
<b>Machine Learning:</b>	Generative modelling, Imitation Learning, Bayesian optimization, Reinforcement learning
<b>Cluster &amp; Compute:</b>	HPC (Slurm), GCP, Weights and Biases, Docker, Singularity
<b>Deep Learning:</b>	PyTorch, BoTorch, Tensorflow, GPFlow, Jax
<b>Programming:</b>	Python, C/C++, CUDA, ROS1, ROS2, Moveit!
<b>Languages:</b>	Zulu (Native), English (Full proficiency), Japanese (basic)

## RESEARCH & PUBLICATIONS

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### **Learning Dynamic Tasks on a Large-scale Soft Robot in a Handful of Trials, IROS 2024**

Zwane S, Cheney D, Johnson CC, Luo Y, Bekirolu Y, Killpack MD, Deisenroth MP

Developed a data-efficient learning-based controller for a large-scale soft robot using Bayesian optimization. Evaluated on hammering and throwing tasks in simulation (Mujoco) as well as on a physical soft robot.

### **A Unifying Framework For Variational Gaussian Process Motion Planning, AISTATS 2024**

Cosier L, Iordan R, Zwane S, Franzese G, Wilson JT, Deisenroth MP, Terenin A, Bekirolu Y

Introduced a framework for motion planning based on variational Gaussian Processes, which unifies various probabilistic-inference-based motion planning algorithms. Pybullet and real-robot evaluation.

### **Safe Trajectory Sampling in Model-based Reinforcement Learning, CASE 2023**

Zwane S, Hadjivelichkov D, Luo Y, Bekirolu Y, Kanoulas D, and Deisenroth MP

Learned a constraint-aware Gaussian process dynamics model, trained a safe policy on trajectories sampled from it, and deployed the resulting safe policy on a physical robot arm. Pybullet and real-robot evaluation.

### **One-Shot Transfer of Affordance Regions? AffCorrs!, CoRL 2022**

Hadjivelichkov D, Zwane S, Agapito L, Deisenroth MP, and Kanoulas D

One-shot transfer of robot affordance regions in a Vision Transformer (ViT) to novel scenes without fine-tuning. Capable of semantic one-to-many part correspondence. Isaac Sim and real-robot evaluation.

### **Safe Exploration in Deep Reinforcement Learning with Action Priors, NeurIPS 2018 Workshop**

Zwane S, Boloka T, Makondo N, and Rosman B

Imitation learning of action priors (the distribution over expert actions) using a Gaussian process and using it as an exploration policy for a deep reinforcement learning agent.

## AWARDS AND ACHIEVEMENTS

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### **2023 – Research Poster Award**

Deep Learning Indaba

*Awarded a book for a research poster at the Deep Learning Indaba 2023 in Ghana.*

### **2020 – DeepMind Full-Scholarship for PhD in Foundational AI**

University College London

*Awarded £125 000 full funding towards the pursuit of PhD in Robotics and AI.*

### **2019 – Machine Learning Summer School (MLSS) Travel Scholarship**

Element AI

*Awarded approx. \$3 000 to attend MLSS London, covering flights and accommodation.*

### **2018 – Google Cloud Credit Award**

Deep Learning Indaba

*Awarded \$1000 in Google Cloud Platform credits for a research presentation at the Deep Learning Indaba 2018.*

### **2017 – NeurIPS 2017 Praekelt Travel Award**

Deep Learning Indaba

*Awarded the travel prize for best poster at the Deep Learning Indaba 2017 to attend NeurIPS 2017 Conference in Long Beach, California, USA.*

### **2017 – NRF MSc Scholarship (declined)**

National Research Foundation

*Awarded approx \$2 500 towards the pursuit of a masters degree.*

### **2016 – SKA Masters Bursary (declined)**

Square Kilometer Array

*One of 10 individuals across 3 countries in Southern Africa to receive the SKA bursary for Masters studies. (approx. £20 000 over 3 years)*

### **2016 – Most Innovative Honours Research Project**

University of the Witwatersrand

*Awarded a cash prize of approx. \$50 for building a semi-autonomous mobile telepresence robot with face-tracking and autonomous navigation.*

### **2014 – University Council Merit Scholarship**

University of the Witwatersrand

*Awarded to continuing students for outstanding examination results.*

### **2014 – Deans List**

University of the Witwatersrand

*A list recognizing the achievement of the top 10% of students in each faculty.*

### **2013 – Liberty Life Bronze Medal for Computer Science I**

University of the Witwatersrand

*Awarded a medal for outstanding performance in Computer Science I*

**2013 – University Entrance Scholarship**

University of the Witwatersrand

*Awarded to students on the basis of outstanding matriculation results.***ACADEMIC SERVICE**

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- Lead organiser for the first African Robot Learning workshop held in Acraa, Ghana 2023. This included speakers from Oxford University, Nvidia Research, and University of Cape Town.
- Coding practical tutor for the Deep Learning Indaba conference since 2017, organizer for the IndabaX machine learning workshops for African ML researchers.
- Reviewer for ICRA, IROS, ICLR.