

## Mgcini Keith Phuthi

BSc, Physics,  
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## Educational Qualifications

Year	Degree	Institute	CGPA
2015-2019	BSc Major-Physics Minor-Mechanical Engineering	Massachusetts Institute of Technology	4.6/5.0

## Professional Experience

1. *Data Science Intern*- Directorate of Science, Technology and Innovation, Freetown, Sierra Leone [June 2019 to Aug 2019]
2. *Research Intern*- Institut Néel, Grenoble, France [June 2018-August 2018]
3. *Chief Operating Officer*- ZimCode, Bulawayo, Zimbabwe [June 2016-June 2020]

## Awards/Achievements

- (2015) Best in Zimbabwe in GCE Advanced Level Physics (2015)
- (2015) Best in Zimbabwe in GCE Advanced Level Chemistry (2015)
- (2015) Best in Zimbabwe in GCE Advanced Level Biology (2015)
- (2015) Best results overall in Zimbabwe in GCE Advanced Level (2015)

## Publications and Patents

1. Leder, A., Anderson, A.J., Billard, J., Figueroa-Feliciano, E., Formaggio, J.A., Hasselkus, C., Newman, E., Palladino, K., **Phuthi, M.**, Winslow, L., Zhang, L., 2018. **Journal of Instrumentation**, Volume 13, P02004–P02004. [\[Link\]](#)

## Highlights

1. Data Science in Education Policy work in Sierra Leone featured in MIT News [\[Link\]](#)
2. Muon detector design featured in Physics Today [\[Link\]](#)

## Research Projects

1. **PhD Research, Carnegie Mellon University** [August 2019 to present]
  - *Developing a Machine Learning Potential for Lithium metal*: Generating a robust dataset using Density Functional Theory on which to train a Machine Learning Potential. Preliminary results show that the potentials trained can achieve the accuracy of Density Functional Theory with 4 orders of magnitude speed up in calculation for a variety of properties.

- *Machine Learning Potentials for accelerating Metal Hydride structure search algorithms:* Benchmarked existing Machine Learning potentials for replacing/supplementing computationally expensive Density Functional Theory calculations without loss in accuracy for superconducting metal hydride structure prediction. Found that existing methods are limited in their prediction of forces for multi-element systems and currently experimenting with new architectures. Determined the requirements for a Machine Learning Potential and the training dataset needed to accelerate structure search in various implementation schemes.
2. **Undergraduate Research, Massachusetts Institute of Technology** [May 2016 to June 2019]
    - *Design of a novel Indium based detector to measure the Neutrino mass:* Designed a low temperature bolometric detector with the potential to be the most accurate detector for Neutrino mass to date. Simulated detection events using CERN's GEANT4 software package to determine constraints on detector geometry, cross sections and characterize noise. Derived a theoretical model for the Indium beta decay spectrum for determining limits on detector accuracy using Bayesian Inference.
    - *Design of a cheap particle detector for remote detection:* Designed and built a solid scintillator based muon/neutron detector for measuring background radiation at the MIT Nuclear Reactor. Built in remote bluetooth control to allow using the detector at safe distances. Measured the effectiveness of concrete shielding at the MIT Nuclear Reactor.
  3. **Research Intern, Institut Néel, Grenoble, France** [June 2018 to August-2018]
    - *FPGA based Lock-in Amplifier:* Benchmarked the use of a Red Pitaya FPGA board as a cheap alternative to expensive industry standard lock-in amplifiers.
    - *Dilution Refrigerator Operator:* Operated, maintained and designed parts for a dilution refrigerator being built for continuous cooling at record temperatures below 1mK. Repaired a number of parts such as Superconducting Quantum Interference Devices and implemented changes that led to the record temperature for the lab at the time of 2mK and identified that the limiting heat source was room air leaking through gasket seals.

## Teaching Experience

1. *Teacher, MIT Educational Studies Program.* Have taught more than 30 classes at programs hosted by the Educational Studies Program every year to over 3,000 highschool and middle school students. Served as chair of the organization in 2017-2018. [November 2015 to present]
2. *Head Tutor, ZimCode, Bulawayo, Zimbabwe.* Designed curriculum and lead teaching team for a coding school as part of the founding team. The organization won a Davis Project for Peace prize in 2016. [June 2016 to December 2020]
3. *Tutor, MIT Office of Minority Education.* Tutored introductory classes to freshmen at MIT. [September 2017 to December 2017]

4. *Technical Instructor, MISTI Global Startup Labs, Johannesburg, South Africa.* Taught introductory Python and webdesign in Django to university entrepreneurs. [June 2015 to August 2015]

## **Software**

MATLAB, Python, Tensorflow, C++, Shell, Mathematica, Excel, Powerpoint, Word.

## **Interests**

1. Play and watch soccer, tennis and sports in general.
2. Always actively involved as a volunteer teacher/mentor in STEM for highschool and undergraduate students.