Thabiso Robert Mabote

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Education

St. Olaf College, Northfield, MN   *Expected: May 2020*
  Majors: Bachelor of Arts in Physics and Computer Science
  GPA: 3.45

Waterford Kamhlaba UWCSA, Mbabane, Eswatini   *Nov. 2015*
  International Baccalaureate Diploma

Honors and Awards

Best Man-Machine Team in International Aerial Robotics Competition, Atlanta, GA   *2019*
Philip Overby Scholarship, Northfield, MN   *2019 – Present*
UWC Davis Scholarship, Northfield, MN   *2016 – Present*
International Student Grant, Northfield, MN   *2016 – Present*

Scientific Skills

Laboratory Proficiencies:
  3D Designing and Printing, Digital Oscilloscope, Function Generators, Electrical Circuit Design, LabVIEW Data Acquisition, HeNe and Diode Lasers, Muon detector, Fabry-Perot Interferometer, Photodiode and Photomultiplier Tube (PMT), Analyzer Polaroid, Optical Detector, Signal Processor/Lock-in Amplifier, Modern Interferometry, and Diode Controller

Computer Proficiencies:
  C++, C, Python, VPython, Linux, Arduino/Teensy, Octave, R, Mathematica, LaTeX, SolidWorks, Microsoft Visual Studio, Excel, LabVIEW Software, PASCO Capstone, Raspberry Pi, ROS, PX4, and Gazebo Simulation

Research Experience

Collaborative Undergraduate Research and Inquiry (CURI), St. Olaf College   *Summer 2019*
Positronium-Atom Collision Researcher, Advisor: Dr. Jason Engbrecht
- Worked independently to build experimental system for measuring Positronium (Ps) momentum-transfer cross section
- Used a High-Purity Germanium (HPGe) and two Sodium Iodide (NaI) detectors to capture radiation produced during creation of positron and annihilation radiation of Ps atom
- Adapted LabVIEW program to view and analyze real-time energy and time signals
- 3D designed and printed NaI detector holders to be mounted on an electromagnet
- Assembled Teensy-based device to monitor temperature of electromagnet

Independent Research, St. Olaf College   *Spring 2019*
Image Analysis researcher, Advisor: Dr. Rodrigo Sanchez-Gonzalez
- Adapted computational method for analysis of fluorescence images of Molecular Tagging Velocimetry experiments in R
- Employed mathematical tools of image analysis involving blob detection, intersection point extraction, intersection point coupling, relative length spline mapping, vector drawing, and bilinear interpolation
- Improved algorithm to analyze large datasets

Collaborative Undergraduate Research and Inquiry (CURI), St. Olaf College   *Summer 2018*
Photophysics of Toluene Researcher, Advisor: Dr. Rodrigo Sanchez-Gonzalez
- Built experimental system to measure temperature dependence of emission spectrum of toluene
- Captured fluorescence of toluene vapor excited at 266 nm using fourth harmonic from Nd:YAG laser
- Utilized Cary 100 UV-Vis spectrophotometer to obtain absorption spectrum of toluene at 296 K

Other Relevant Projects

Ethical Issues in Software Design, St. Olaf College   *Spring 2018*
Copernicus Mobile Phone Consultant, Advisor: Dr. Chuck Huff
- Collaborated with undergraduate team to evaluate privacy of Copernicus mobile phone application
- Researched privacy literature to ensure collection and transfer of data aligned with ethical standards with regards to user privacy
- Organized a focus group with first year students to review different types of privacy statements
- Co-authored report and delivered oral presentation to Copernicus at St. Olaf College, MN

Engineering Design Practicum , St. Olaf College   *Jan. 2018*
Compatible Technology International (CTI) Engineer, Advisor: Dr. Jason Engbrecht
- Led group of five classmates to improve power measuring device for CTI
- Enhanced C/C++ Arduino program on Teensy to fix inconsistencies with angular velocity measurements
- Created an adapter so that power measuring device could be used with thresher
- Used HC-05 Bluetooth serial pass-through module and Bluetooth Terminal/Graphics app to display real-time measurements
- Designed an improved casing of device using SolidWorks and 3D printed casing for housing gyroscope, clock, force sensor, bluetooth chip and Teensy microcontroller
- Acquired data on power needed to process different types of grains
- Co-authored report and delivered oral presentation to CTI in Minneapolis, MN

Teaching Experience

Classical Mechanics, Dept. of Physics, St. Olaf College   *Sept. 2019 – Present*
Physics Homework Grader
- Evaluate assignments and provide feedback on homework for class of 19 students

Multivariable Calc, Dept. of Mathematics, Statistics, and Computer Science, St. Olaf College   *Spring 2019*
Math Homework Grader
- Graded and provided feedback on homework for class of 18 students

Analytical Physics I and II, Dept. of Physics, St. Olaf College *Sept. 2018 – May 2019*
Physics Clinic Tutor
- Assisted 36 students interpret and understand physics concepts by leading weekly help sessions

Principles of Physics I, Dept. of Physics, St. Olaf College *Fall 2017*
Lab Teaching Assistant and Grader
- Provided students with hands-on, one-on-one assistance in physics lab to facilitate use of physics equipment and computer programs, including Vernier's Video Physics, curve.fit, and Capstone
- Graded lab notebooks for class of 21 students

Math and Physics, Dept. of Physical Science and Math, Ts'akholo HS, Lesotho *Jan. 2013 – Nov. 2013*
8th and 9th Grade Teacher
- Developed rigorous lesson plans, assignments, and exams for math and physics courses
- Managed three classes of 40+ students, introducing concepts in pre-algebra, algebra, trigonometry, Newtonian physics, and electricity and magnetism
- Collaborated with colleagues to maintain consistent lesson plans and exams

Oral Presentations

Mabote, T., Cain, N., Carlson, C., Dettmann, H., and Olson, A. "Copernicus Application Privacy Evaluation." Ethical Issues in Software Design Course, St. Olaf College, Northfield, MN. May 2019

Mabote, T., Gephart, K., Grimm-Howell, O., Spear, E., and Weber, O. "Improving a Power Measuring Device." Compatible Technology International Meeting, Compatible Technology International Headquarters, Minneapolis, MN. January 2019.

Poster Presentations

Mabote, T. "Positronium-Atom Collision Apparatus and Data Acquisition." Collaborative Undergraduate Research and Inquiry Poster Symposium, St. Olaf College, Northfield, MN. August 2019.

Mabote, T., and Johnson, B. "An Experimental System to Measure the Temperature Dependence of the Emission Spectrum of Toluene." 2018 Midstates St. Louis Physical Sciences, Mathematics and Computer Science Research Symposium, Washington University, St. Louis, MO. November 2018.

Mabote, T., and Johnson, B. "An Experimental System to Measure the Temperature Dependence of the Emission Spectrum of Toluene." Collaborative Undergraduate Research and Inquiry Poster Symposium, St. Olaf College, Northfield, MN. August 2018.

Papers in Preparation

Sparrow, Z., Pearce, M., Mabote, T., Richey, M. and Sanchez-Gonzalez, R. "stoBEST: An algorithm for increased spatial resolution in two-component Molecular Tagging Velocimetry." Review of Scientific Instruments. 2019.

Languages

Sesotho: Native
English: Fluent
French: Basic

Leadership Experience and Extracurricular Involvement

Society of Physics Students Treasurer, St. Olaf College   *Sept. 2019 – Present*
- Manage budget and meet biweekly to organize social and career advancing events

Physics Computer Assistant, St. Olaf College   *Sept. 2019 – Present*
- Selected to collaborate with St. Olaf IT to set up new computers, install updated software, and troubleshoot issues with existing programs

St. Olaf-Carleton Engineering Team Coding Sub-Team Lead, St. Olaf College   *May 2019 – Present*
- Direct weekly coding meetings and sessions for coding sub-team of 24 members
- Design and engineer autonomous drone that meets problem-solving requirements presented by the International Aerial Robotics Competition (IARC)
- Collaborate with 23 other students in coding sub-team to program drone using NVidia TX1/TX2, Raspberry Pi, PixHawk Flight Controller, Arducopter and Python

Intramural Sports Supervisor, St. Olaf College   *Sept. 2018 – Present*
- Oversee intramural sports to resolve conflicts amongst participants and between participants and officials
- Ensure availability and safety of equipment for different games

St. Olaf-Carleton Engineering Team Administrative Director, St. Olaf College   *May 2018 – May 2019*
- Elected to perform team administrative duties on St. Olaf College campus
- Met weekly with Carleton College administrative director to set meeting agendas and report team updates
- Managed budget and allocated funds to respective sub-teams

IT Assistant, St. Olaf College   *Sept. 2017 – Present*
- Communicate with students and staff to resolve technology issues in person, over the phone, and via email

Intramural Referee, St. Olaf College   *Sept. 2016 – Present*
- Referee intramural soccer, broomball, flag football, volleyball, and water polo
- Make quick decisions to enforce rules and ensure the safety of participants

Men's Collegiate Soccer Player, St. Olaf College   *Aug. 2016 – Sept. 2018*

Volunteer, Salvation Army in Mbabane, Eswatini   *Jan. 2015 – Oct. 2015*
- Cooked for 25 elderly people and packaged pills at Salvation Army clinic