Jason Webster

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GitHub: github.com/jasonrobwebster/

Personal

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Languages

English: Mother tongue
Afrikaans: Basic Knowledge

Skills

Software	Expert: Python Experienced: AWS, Matlab, Mathematica, GDScript, LaTeX, SQL Novice: ActionScript, Delphi, C, C#, JavaScript, MongoDB
Research	Optics, Electron Microscopy, Statistical Mechanics, Wave Propagation and Dynamics, Natural Language Processing, Machine Learning
Soft	Writing, Communicating, Public Speaking, Presenting
Technical	Laser Design and Construction, Laser Operation, Cloud Computing
Web	Experienced: Alembic, Flask, Jinja, HTML Novice: Django, CSS

Work Experience

Mar 2020 - Present

Data Scientist at Percept Solve
Consulting

Provided mathematical analysis and machine learning solutions to a variety of business and government problems. Built and maintained full-stack web products for internal and client use. Worked in a diverse multi-disciplinary team of health economists, actuaries, and data scientists.

Jan 2019 – Mar 2020

Data Scientist at Explore-AI
Teaching and Consulting

Course facilitator for 100 data science students in Johannesburg. One of the AWS system administrators for the academy and facilitators. Designed and implemented curriculum for online courses. Supervised 4 teams of interns positioned at and consulting with a multitude of different companies. Organized a monthly meetup event (see Leadership).

Jun 2016 – Jul 2016

Research Collaborator at University of Oregon
Reference: Dr. Ben McMorran | mcmorran@uoregon.edu

Developed new methods of generating electron vortex beams, and was trained to operate a transmission electron microscope. Helped form new collaborations between my research group and that of Ben McMorran's.

Dec 2015 – Jan 2016 | Intern at the National Institute for Theoretical Physics (NITheP)
Reference: Prof. Michael Kastner | kastner@sun.ac.za
Studied a long-range highly constrained spin model that has shown equivalence to certain Bose-Einstein condensates. Learned to tackle extremely technical and challenging theoretical problems, and learned a great deal of quantum mechanics and statistical physics in the process.

Jul 2012 – Dec 2014 | Intern at the Council for Scientific and Industrial Research (CSIR)
Reference: Dr. Hermann Uys | hermann@sun.ac.za
Interned throughout various summer and winter vacations. Was tasked with a number of projects, including: building a large-scale ion trap for use in public demonstrations, simulating the motion of trapped ions, and investigating rotational broadening effects on molecular spectra.

Education

Dec 2018 | Master of Science in Physics, **Stellenbosch University**
With distinction, Summa cum laude
Thesis: "Towards Atomic Physics Using Spatially Structured Light"
Advisor: Dr. Hermann Uys | Thesis Link

Mar 2016 | BSc Honours in Physics, **University of the Witwatersrand**
With distinction, Summa cum laude
Thesis: "Electron Vortex Beams and Non-Radiating Accelerating Electrons"
Advisor: Prof. Andrew Forbes
Average: 91.1% | GPA 3.92/4 | Academic Record

Mar 2015 | BSc in Physics and Applied Mathematics, **University of the Witwatersrand**
With distinction, Summa cum laude
Average: 85.0% | GPA 3.84/4 | Academic Record

Dec 2012 | Highschool Certificate, **Curro Bankenveld**

Projects

Mar 2020 | ASSA Covid Model
Work Related Project – Technical Lead | Github Link
Mathematically modelled, built, and maintained the Acturial Society of South Africa's (ASSA's) Covid-19 model. This is an epidemiological model that is built to predict the number of infections, hospitalisations, icu usage, and deaths due to the Covid-19 pandemic in South Africa. The algorithm is built to operate at a national level, as well as a provincial level. This model was a culmination of a team effort of over 20 volunteer actuaries from multiple organisations.

Jan 2019 | Self-driving Car and GamePy
Personal Project | Github Link
I built a simulated self-driving car in the game "Burnout: Ultimate Paradise". I gathered data by recording myself playing the game and used this to train a convolutional neural network that mapped images to keystrokes. I managed to make this work using local hardware while being tightly constrained by my budget and GPU size. The result of this project was a general-purpose package dubbed "gamepy" that allows one to record themselves and their keystrokes while acting in a simulated environment. It also allows integration to the game environment to be able to then "play" the game using a prediction of the model. I wrote about my experiences building this in a blog post for OfferZen and can be read here.

Jun 2018 | AlphaZero Clone

Personal Project | Github Link

A clone of the alpha zero algorithm, written entirely by me. The algorithm was used by Google's Deepmind to beat the world's best Go player, as well as the best Chess engine (stockfish). The algorithm learns to play any perfect information board game entirely through self-play and reinforcement learning.

Nov 2017 | Variational Autoencoder

Personal Project | Github Link

Variational autoencoders (VAEs) are a neural network architecture that represent high dimensional data (e.g. images) in a low dimensional latent space. This is similar to principle component analysis, however, what makes a VAE different is that it learns the parameters of a probability distribution for each data point, allowing for the generation of new data points. I worked on duplicating this architecture at home, and can now implement a VAE, PixelVAE, and VQ-VAE in tensorflow and keras. The github link shows an example of a simple VAE.

Notable Awards

Dec 2018 | S2A3 Medal, **Stellenbosch University**

Awarded to the top MSc graduate in the natural sciences at Stellenbosch University.

Dec 2016 | Chancellor's Medal, **University of the Witwatersrand**

Awarded to the top overall graduating student across all fields of study at the university. Presented by Adam Habib, then Vice Chancellor of Wits.

Mar 2016 | Samuel Goodman Memorial Medal, **University of the Witwatersrand**

Awarded to the most distinguished Honours graduate across the Faculty of Science.

Mar 2016 | Jan Loubser Medal, **University of the Witwatersrand**

Awarded to the most distinguished Honours graduate across the Faculty of Science.

Mar 2016 | Element Six Diamond Research Lab and DST/NRF Centre of Excellence in Strong Materials Medal, **University of the Witwatersrand**

Awarded for outstanding performance in the Honours year of study in Physics.

Dec 2015 | William Cullen Medal, **University of the Witwatersrand**

Awarded to the most distinguished Bachelor of Science graduand in the Faculty of Science.

Publications

May 2020 | Neural machine translation for South Africa's official languages

L Martinus, **J Webster**, J Moonsamy, M Shaba, R Moosa, R Fairon, *Workshop paper at AfricaNLP, ICLR 2020*

Calculated a benchmark translation score for all of South Africa's official languages using state of the art neural machine translation techniques. These were the first such scores published at the time.

Apr 2019 | Coiling free electron matter waves

J Pierce, **J Webster**, H Larocque, E Karimi, B McMorran, A Forbes, *New Journal of Physics 21 (4), 043018*

Demonstrated the construction of a novel class of angularly accelerating electron beams. Provided the means to construct the beam, while my collaborators performed the experiment. Contributed to the theoretical analysis of the electromagnetic field during the electron's propagation. This paper was based on work from my Honours thesis.

Jun 2018 | Subexponentially Growing Hilbert Spaces and Nonconcentrating Distributions in a Constrained Spin Model
J Webster, M Kastner, *Journal of Statistical Physics 171.3 (2018): 449-461*
Studied a highly constrained long-range spin model for use in a specially prepared Bose-Einstein condensate experiment. Resulted from the work done during my internship at NITheP.

Jan 2017 | Radially dependant angular acceleration of twisted light
J Webster, C Rosales-Guzmán, A Forbes, *Optics letters 42.4 (2017): 675-678*
Developed a new technique of controlling the angular acceleration of laser light by using the Guoy phase in Laguerre-Gauss beams. This paper was featured as one of the top downloads on OSA's website during February 2017.

Conferences

Sep 2019 | Deep Learning Indaba 2019
Nairobi, Kenya
Poster: "On VAE Approximation Errors" | Poster Link

Sep 2018 | Deep Learning Indaba 2018
Stellenbosch, South Africa

Sep 2017 | International Conference on Optical Angular Momentum
Anacapri, Italy
Poster: "Angularly Accelerating Electron Waves"

Jul 2017 | SAIP 62nd Annual Conference
Stellenbosch, South Africa
Presentation: "Nano-fabricated Si3N4 holograms for probing matter with structured waves." | Awarded best Honours presentation in the Material Sciences Division.
Presentation: "Non-radiating accelerating electrons?"

Leadership

Jun 2019 – Mar 2020 | Explore-AI Meetup Organizer
Started, organized, and maintained a meetup group for the public. Organized speakers for the event. More details can be found at https://www.meetup.com/Explore-AI-JHB-Meetup-Group/

Jan 2018 | Chris Engelbrecht Summer School Organisational Committee
Served as head of accommodation management. Ensured that a local python package repository was accessible to the attendees. Assisted in the set up of the venue.

Jan 2017 – Dec 2017 | Stellenbosch OSA Student Chapter Committee
Head of media in the student chapter organisational committee. Was placed in charge of designing posters/flyers for events. Designed a website for the committee.

Committees and Societies

Jan 2017 – Dec 2017	**Maties Underwater Club** Member of the Stellenbosch University scuba diving club.
Jan 2015 – Dec 2016	**Wits Astronomy Club** Member of the Wits University Astronomy Club. I've always had a passion for astronomy, and had briefly considered becoming an Astrophysicist at one stage in my life.
Jan 2016 – Dec 2018	**OSA Student Chapter Member** Maintained participation in outreach activities to local schools.
Jan 2014 – present	**International Golden Key Society** Invited due to the academic success in my 1st year of undergraduate studies.

Certificates

Apr 2018	NMISA Basic Laser Safety Course
May 2017	Writing for Peer Review

Personal Achievements

2018	**Modelled a self-driving car using deep learning** Built a self-driving car using a deep learning model, trained on recorded footage of myself playing "Burnout: Ultimate Paradise". Learned about convolutional neural networks, GPU memory management, and working in a simulated environment. An article on this project can be found at offerzen.com/blog/how-to-develop-a-self-driving-car-in-under-a-week.
2016	**Graduated from Wits University as one of the top performing students across all fields of study** Received the highest academic honour, the Chancellor's medal, for my academic performance at Wits.
2015	**Became a "professional" game developer** I developed a small web-based game using the ActionScript programming language, and received a pay cheque of $25 in advertising revenue from the website that hosted it.

Interests and Hobbies

Technology, Programming, Deep Learning, Machine Learning, Computer Vision, Reinforcement Learning
Physics, Optics, Quantum Mechanics, Quantum Field Theory, Astronomy
Art, Game Design, Digital Painting, 3D Rendering and Animation

Academic Record

BSc Honours in Physics

University of the Witwatersrand

Course	Credits	Mark	US Code
Quantum Mechanics	13	100	A
Statistical Physics	13	72	B+
Nuclear Physics	13	75	A
Electrodynamics	13	99	A
Solid State Physics	13	91	A
General Relativity	13	96	A
Introduction to Quantum Field Theory	13	96	A
Research Project	30	95	A
		Ave	91.1
		Gpa	3.92

Undergraduate BSc Physics and Applied Mathematics

University of the Witwatersrand

Course	Credits	Mark	US Code
Computational and Applied Mathematics I	36	77	A
Computer Science I	36	94	A
Algebra I	15	72	B+
Calculus I	21	85	A
Physics I (Major)	36	87	A
Computational and Applied Mathematics II	48	93	A
Basic Analysis II	16	71	B+
Differential Equations II	8	77	A
Multivariable Calculus II	24	56	C
Advanced Analysis II	8	92	A
Group Theory II	8	85	A
Linear Algebra II	8	83	A
Physics IIA (Major)	24	78	A
Physics IIB (Major)	24	86	A
Computational and Applied Mathematics III	48	93	A
Quantum Mechanics III	11	96	A
Quantum Mechanics and its Applications	11	100	A
Statistical Physics III	11	90	A
Waves and Modern Optics	11	90	A
Advanced Experimental Physics and Project	28	86	A
		Ave	85.0
		Gpa	3.84