Kale-ab Tessera

Website: kaleabtessera.com
Email: kaleabtessera@gmail.com
LinkedIn: kale-ab-tessera
GitHub: github.com/kaleabtessera
Google Scholar: Kale-ab Tessera

About me

Kale-ab is a Research Engineer with experience working on challenging theoretical and applied problems in deep learning and reinforcement learning. He considers an excellent work ethic, deep technical knowledge, and thinking innovatively as his greatest strengths.

He is also passionate about using technology to help the African continent. To this end, he has worked on projects that aim to have a high impact in Africa and has also worked on increasing diversity and representation in machine learning by serving as a committee member in the Deep Learning Indaba.

Experience

Research Engineer Johannesburg, South Africa
InstaDeep March, 2021 - Present

I currently work as a Research Engineer in Reinforcement Learning/Multi-Agent Reinforcement Learning (MARL). My work mainly focuses on cutting-edge scientific research, combined with software engineering to ensure this research can be applied to challenging real-world problems. Furthermore, I collaborate on projects that have a possible positive impact on Africa and society in general.

Achievements:

- Worked on locust breeding ground prediction for Africa - repo, paper and blog.
- One of three first authors on Mava, a scalable framework for Multi-Agent Reinforcement Learning - repo, paper and blog.

For details please refer to my papers/articles.

Machine Learning Engineer Johannesburg, South Africa
Multichoice Apr 2019 - Feb 2021

I worked on using Machine Learning to model and predict the behaviour of over 15 million customers. I was the founding member of the ML team in Customer Operations, the team is now comprised of 5 people.

Achievements:

- Statistical A /B testing of recommendation systems.
- Build a high dimensional clustering model, leveraging DBSCAN, which managed to cluster around 7 million customers, with over 300 features each.
- Build a logistic regression with L1 regularization model to predict customer payback behaviour. This model achieved approximately 75% accuracy. Other models tried - random forrest, svm, standard neural networks and LSTMs.
- Build a model showing public sentiment based on media articles, leveraging Watson Discovery News.

Intermediate Software Engineer Johannesburg, South Africa
Entelect Nov 2017 - March 2019

I built highly scalable, fast, responsive websites for major clients such as Cell C and Discovery.

Achievements:

- Build highly responsive websites used by tens of thousands of people.

Software Engineer Pretoria, South Africa
RetroRabbit Jan 2016 - Oct 2017

I built robust backend APIs with multiple system integrations.

Achievements:

- Led a team of 4 and designed the high level system architecture for a project.
- Solo developer for a highly responsive API, with many integration points.

Education

MSc in Computer Science, Focusing on Deep Learning, Distinction Johannesburg, South Africa
University of Witwatersrand 2018 –2020

- Thesis (*83%*): "On Sparsity in Deep Learning: The benefits and pitfalls of Sparse Neural Networks and how to learn their architectures"
- Coursework (*85%* Average): Adaptive Computation and Machine Learning, Reinforcement Learning, Robotics, Artificial Intelligence, Large Scale Optimization for Data Science and High Performance Computer and Scientific Data Management.

Honours in Computer Science, Distinction Pretoria, South Africa
University of Pretoria 2016

- Research Report (*82%*): "Automatically Generating Test Cases from Java Contracts"
- Took courses in theoretical computer science.

BSc. in Computer Science Pretoria, South Africa
University of Pretoria, GPA: 3.50/4.00 2013–2015

- The BSc (CS) degree emphasises the understanding of computer science fundamentals by offering a wide variety of computer science and mathematics courses.

Publications

[1] A. Pretorius, K.-a. Tessera, A. P. Smit, C. Formanek, S. J. Grimbly, K. Eloff, S. Danisa, L. Francis, J. Shock, H. Kamper, *et al.*, "Mava: A research framework for distributed multi-agent reinforcement learning", *arXiv preprint arXiv:2107.01460*, 2021.

[2] K.-a. Tessera, S. Hooker, and B. Rosman, "Keep the gradients flowing: Using gradient flow to study sparse network optimization", in *Sparsity in Neural Networks Workshop*, 2021.

[3] I. S. Yusuf, K.-a. Tessera, T. Tumiel, S. Nevo, and A. Pretorius, "On pseudo-absence generation and machine learning for locust breeding ground prediction in africa", in *AI + HADR 2021 and ML4D 2021 Neurips Workshops*, 2021.

Scholarships and Awards

- **Postgraduate Merit Award**, University of Witwatersrand 2019–2020
  An award (with full tuition funding) given to top postgraduate students, who earn an average above 75%.
- **Microsoft Prize - Best Poster at Deep Learning Indaba**, Deep Learning Indaba 2019
  I received the prize for the best poster at the Deep Learning Indaba. This was the top prize out of 194 presented research posters. I received a trip to NeurIPS in Vancouver as part of this prize.
- **Baobab Prize**, Deep Learning Indaba 2019
  For contribution to the Deep Learning Indaba applications website - https://baobab.deeplearningindaba.com/.
- **Conference travel scholarships**, Deep Learning Indaba and MLSS 2019
  I received a full scholarship to attend Machine Learning Summer Schools (MLSS) London. This competitive summer school had a 11.75 % acceptance rate (1,200 applicants for 140 places) and of 140 attendees, only 21% were MSc students. I also received a travel grant and accommodation award to attend the Deep Learning Indaba in Kenya.
- **Academic Honorary Colours**, University of Pretoria 2017
  I was awarded Academic Honorary Colours by the University of Pretoria for achieving my honours degree with Cum Laude (I had an average of 80.75 %).
- **Amazon Prize for Best Mobile Application**, University of Pretoria 2015
  My team won the prize for best mobile application in our final year computer science module. The project involved creating a website and Mobile App that uses Computer Vision to automatically identify and tag different species of stink bugs.
- **Merit Certificate for Leadership**, University of Pretoria 2015
  I received this reward for leadership for my time as a House Committee member at university residence - Boekenhout.
- **Golden Key Honour Society**, University of Pretoria 2015
  I was selected to join the Golden Key Honour Society as a result of being in the top 15% of my degree
- **Deputy Head Boy**, PEPPS College 2012
  I was selected as deputy-head boy of my school in my matric year.
- **Matric Academics**, PEPPS College 2012
  Notable achievements include being in the Top 1% of IEB IT Matric Students and receiving 7 Distinctions with an average of 87%.

Research Presentations/Talks

- Presented a talk at the South African Indaba X titled "Playing Starcraft and Saving the World Using Multi-agent Reinforcement Learning"- video, slides and notebook. 2021
- Presented a talk at Deep Learning: Classics and Trends (DLCT) - slides. 2021
- Presented a talk at the Google Brain Sparsity Reading Group - slides. 2021
- Presented a Spotlight talk at the Deep Learning Indaba 2019 - video, slides. 2019
- Presented a poster at the Deep Learning Indaba - poster. 2019
- Presentation on Neural Architecture Search for the Robotics, Autonomous Intelligence and Learning lab - slides. 2019
- Presented a poster at MLSS London. 2019.

Projects

- Mava (github) - A library of multi-agent reinforcement learning components and systems.
- Pseudo Absence Generation and Locust Prediction (github) - Locust breeding ground prediction using pseudo-absence generation and machine learning.
- Baobab (github) - Baobab is an open source multi-tenant web application designed to facilitate the application and selection process for large scale meetings within the machine learning and artificial intelligence communities globally.

- DQN Atari (github) - Deep Q-Learning (DQN) implementation for Atari pong.

See a full list of projects on github or www.kaleabtessera.com/projects.

Skills

- **Research Interests:** My broader research interests include Deep Learning (specifically Pruning, Generalization and Neural Architecture Search) and Reinforcement Learning (specifically Policy Gradient methods and MARL).
- **Programming:** Python, JavaScript (React), C/C++.
- **Machine Learning:** TensorFlow 2+, Keras, Scikit-learn, Jax, Pytorch, Reverb.
- **Distributed ML:** Ray, Pyspark, Deepmind's Launchpad.
- **Tools/Cloud:** LaTeX, Git, Docker, Linux, Amazon AWS, Google GCP.

Volunteering & Mentoring

- Practicals Chair 2022
  Chair of the practicals/tutorials for the 2022 Deep Learning Indaba.
- Deep Learning Indaba Mentorship Committee 2021 - Present
  Part of the team that launched the Deep Learning Indaba Mentorship Programme - website.
- Deep Learning Indaba Baobab Committee 2020 - Present
  Part of the committee making decisions relating to improvements to Baobab - the current applications website.
- Deep Learning Indaba Application and Selection Committee 2020
  Part of the committee making decisions relating to improvements to the Indaba applications and selections process.
- Black in AI Paper Reviewer 2017,2018
  Reviewed papers focused broadly on Machine Learning.