



# Kale-ab Tessera

## ML/RL Research Engineer



+27 766806878



kaleabtessera.com



kaleabtessera@gmail.com

## About me

Kale-ab is a young, bright and ambitious Research Engineer. He is adaptable and open to learning new concepts in Machine Learning and Reinforcement Learning to build on his previous knowledge. He considers an excellent work ethic, deep technical knowledge, and thinking innovatively as his greatest strengths.

## Skills

### Reinforcement Learning



### Deep Learning



### Pytorch, Scikit-learn



### Tensorflow, Keras



### Flask, Django



### Python



### SQL, NoSQL



### Amazon AWS, Google GCP



### Mathematics, Quantitative Reasoning



(\*)[The skill scale is from 0 (Fundamental Awareness) to 6 (Good Understanding).]

## Work Experience

### Research Engineer

March 2021 - Present

InstaDeep

Research Engineer in Reinforcement Learning, specifically focusing on Multi-Agent Reinforcement Learning.

### Machine Learning Engineer

April 2019 - Jan 2021

Multichoice

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 forest, svm, standard neural networks and LSTMs.
- Build a model showing public sentiment based on media articles, leveraging Watson Discovery News.

#### Libraries and Technologies:

- Scikit-learn - Logistic Regression, Random Forest.
- DBSCAN, HDBSCAN - High dimensional clustering.
- Pyspark, Databricks - Writing workflows to train distributed models.
- Keras - Neural Networks, LSTM.
- Cloud - Azure (Machine Learning and MLOps), AWS (EC2, RDS).

### Intermediate Software Engineer

Oct 2017 - March 2019

Entelect

Build 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.

#### Libraries and Technologies:

- Front-End: React, Redux, Redux Saga, Jest and Enzyme.
- Integration Layer/Backend: Spring Boot, Maven.
- Databases: MongoDB.
- DevOps: Docker, OpenShift, Jenkins, Linux.
- Data: I was tasked with managing a data catalog of tens of thousands of Mobile Phones (at Cell C). I had to collect this data from external sources via APIs, clean the data via automatic scripts, backup and recover the data using mongodump and provide search functionality on the data.

### Software Engineer

Jan 2016 - Oct 2017

RetroRabbit

Build 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.

#### Libraries and Technologies:

- Front-End: Angular JS 1, React and Redux.
- Integration Layer/Backend: .NET MVC 4.5.2, .Net Core 1.1.
- Databases: SQL Server, MySQL.
- DevOps: Amazon AWS - EC2 and RDS instances, Web Servers (IIS).
- Data: I had to write advanced SQL stored procedures and functions, which ran efficiently on large data.



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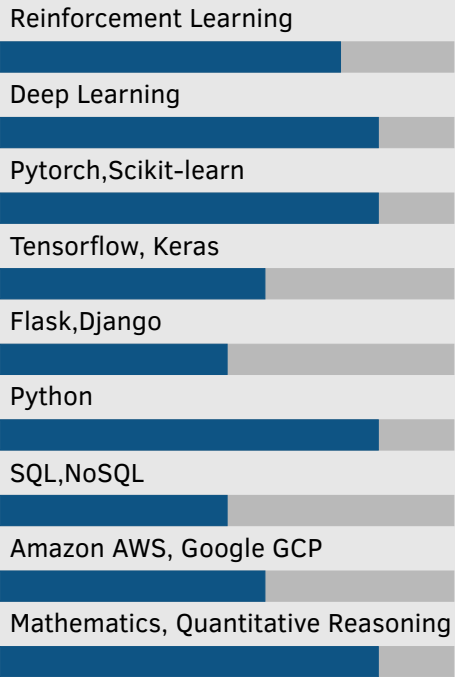
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## Skills



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**Internship**  
Sept 2015 - Nov 2015  
RetroRabbit  
Learned about various interesting topics including Source Control, Cloud Computing (Amazon AWS) and IoT.

**2 weeks vacation work**  
July 2015 - July 2015  
BBD  
Requirements - Android Application, use of .NET MVC 4.5 Framework for the backend and management of a SQL Server database.

**House Committee Member, Secretary, Head of IT and Communications**  
Sept 2014 - Sept 2015  
University of Pretoria  
I helped lead and mentor various residence, especially those who had academic difficulties and/or technical IT related issues.

**Teaching Assistant, COS 212**  
Feb 2015 - Jun 2015  
University of Pretoria  
As a teaching assistant for Data Structures and Algorithms it was crucial to identify and recognize all the classical data structures; implement them in different ways; know how to measure the efficiency of implementations and algorithms.

**Teaching Assistant, COS 110**  
Jul 2014 - Dec 2014  
University of Pretoria  
As a teaching assistant for Program design and Programming techniques, it was crucial to have good knowledge of object-oriented programming, inheritance, polymorphism, operator overloading, memory management and encapsulation.

## Papers

**Keep the Gradients Flowing: Using Gradient Flow to Study Sparse Network Optimization**  
2021  
Kale-ab Tessera, Sara Hooker, Benjamin Rosman

## Education

**Msc in Computer Science, Focusing on Deep Learning**  
2018 - Dec 2020  
University of Witwatersrand

**Research**  
Title - On Sparsity in Deep Learning.  
Topics - Theory of Deep Learning, Pruning, Regularization, Generalization, Neural Architecture Search and AutoML.  
Lab - Robotics, Autonomous Intelligence and Learning lab.  
Supervisor - Dr. Benjamin Rosman.  
**Tools and Skills**  
Deep Learning - Custom optimization (sparse network optimization) and training procedures written in Pytorch.  
Computing - Distributed computing (Ray, multi-core TPU training) , experiment logging (Comet-ML) and hyperparameter search using random search and Bayesian Optimization.  
Statistics - Comparing models using statistical hypothesis testing.

**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, Cum Laude**  
2016 - 2016  
University of Pretoria  
Honours in Computer Science.

**B.Sc. Computer Science**  
2013 - 2015  
University of Pretoria  
The BSc (CS) degree emphasises the understanding of computer science fundamentals by offering a wide variety of computer science and mathematics courses.

**PEPPS College**  
2008 - 2012  
Polokwane  
IEB Private School - 7 distinctions.



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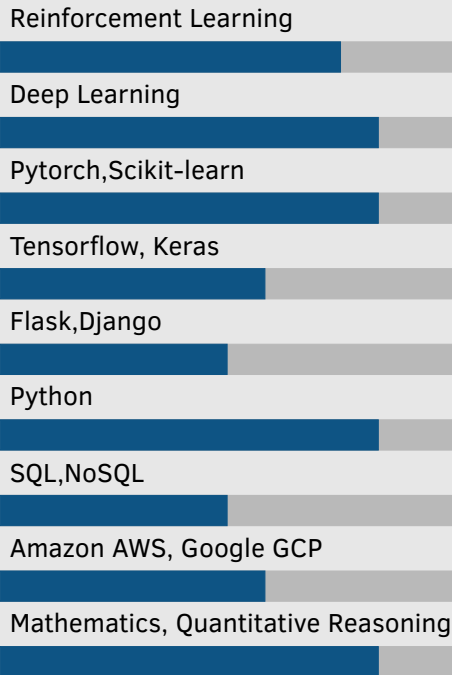
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## Committees

**Indaba Application and Selection Committee** 2020  
Part of the committee making decisions relating to improvements to the Deep Learning Indaba applications and selections process.

**Black in AI Reviewer** 2017, 2018  
Reviewed papers focused broadly on Machine Learning.

## 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).

## Research Presentations

- Presented a Spotlight talk at the Deep Learning Indaba 2019 - video, slides.
- Presented a poster at the Deep Learning Indaba 2019 - poster.
- Presentation on Neural Architecture Search for the Robotics, Autonomous Intelligence and Learning lab - slides.
- Presented a poster at MLSS London, 2019.

## Honours and Awards

**Baobab Prize** 2019  
Deep Learning Indaba  
For contribution to the Deep Learning Indaba applications website.

**Microsoft Prize - Best Poster at Deep Learning Indaba** 2019  
Deep Learning Indaba  
I received the prize for the best poster at the Deep Learning Indaba. This was the top prize out of 194 posters.

**Travel Award to attend Deep Learning Indaba** 2019  
Deep Learning Indaba  
I received a travel grant and accommodation award to attend the Deep Learning Indaba in Kenya.

**Full scholarship to attend MLSS London** 2019  
MLSS  
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.

**Postgraduate Merit Award** 2019, 2020  
University of Witwatersrand  
Was awarded a Postgraduate Merit Award based on academic merit.

**Academic Honorary Colours** 2017  
University of Pretoria  
Was awarded Academic Honorary Colours by the University of Pretoria.

**Honours Cum Laude** 2016  
University of Pretoria  
80.75 % Average for Honours in Computer Science.

**Amazon Prize for Best Mobile Application - COS 301 Final Year Software Engineering Project** 2015  
Amazon, University of Pretoria  
Project involved creating a website and Mobile App that uses Computer Vision to automatically identify and tag species of Stink Bugs.

**Golden Key Honour Society** 2013-2015  
University of Pretoria  
Was selected to join the Golden Key Honour Society as a result of being in the top 15% of my degree.

**Merit Certificate for Leadership** 2015  
University of Pretoria  
I received this reward for leadership during my time as a House Committee member



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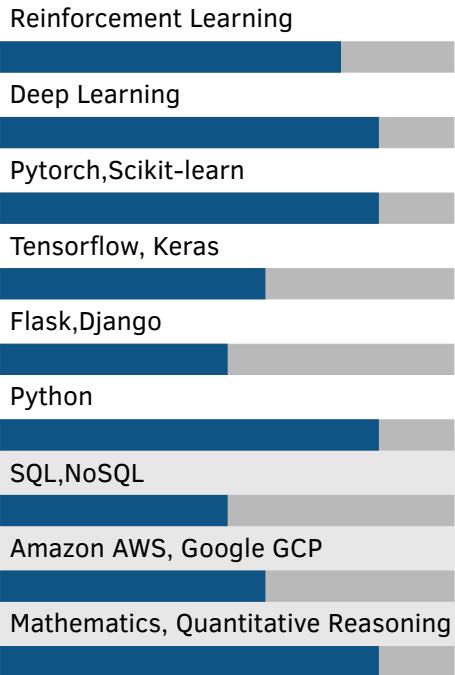
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at House Boekenhout.

### Matric Academics 2012

PEPPS College  
Notable achievements include being in the Top 1% of IEB IT Matric Students and receiving 7 Distinctions with an average of 87%.

### Deputy-Head Boy 2012

PEPPS College  
Was selected as deputy-head boy of my school in my matric year.

### Academic Honours and Cultural Colours 2012

PEPPS College  
Academic Honours were awarded for receiving Academic Colours (average above 80%) three years in a row. Cultural colours were awarded for excellence in various cultural activities such as chess and newspaper editing.

### Leadership

- Secretary, Head of IT and Communications- Boekenhout Residence, University of Pretoria.
- Deputy-head boy - PEPPS College.

### Summer Schools

**NeurIPS 2019**  
I attending NeurIPS 2019 as part of an award given by Microsoft. I attending workshops in Reinforcement Learning, Information Theory and Deep Learning.

### Deep Learning Indaba 2019

- I was the Front-End architect for the Applications system - Baobab.
- I was selected as a tutor for the following advanced level practicals - build your own TensorFlow, optimization for deep learning, convolutional networks and recurrent neural networks.

### MLSS London 2019

- The Machine Learning Summer School (MLSS) is a 12-day event where participants take intensive courses on a variety of topics in machine learning, ranging from optimization and Bayesian inference to deep learning, reinforcement learning and Gaussian processes.

### Deep Learning Indaba 2017,2018.

- One week intensive Summer School covering state of the art techniques in Machine Learning and AI.

### Skills

- Languages: Python, Java , Javascript, C# .
- Frameworks: Pytorch, Tensorflow, Keras, Scikit-learn, Flask, Django and React.
- Devops : Amazon AWS (EC2 and RDS), GCP, Docker, Openshift, Jenkins, Linux.
- Databases: Mongo, SQL Server and MySQL.

### Online Courses

- Introduction to Python for Data Science- Edx
- Machine Learning by Stanford- Coursera