



Recognising African Excellence in Machine Learning

The Inaugural Kambule and Maathai Awards

August 2018

The
**Deep Learning
Indaba**

Recognising African Excellence in Machine Learning: The Inaugural Kambule and Maathai Awards 2018

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A Personal Message

Reflecting on the outcomes of each of our programmes gives us the welcome and needed opportunity to examine our work with fresh eyes, to review how our programmes work together, and to think about what our programmes mean to us personally. For us, the creation of the Kambule and Maathai awards have been an instrument with which we could tell new types of African stories, and importantly, to celebrate the heroes that live within those stories. Nations throughout history subsist on their heroes. As we seek to support the united and pan-African community of the future, a pressing question arises: who will be the heroes of this hopeful future?

In reflecting on this question, we were able to discover, and rediscover, our broad continental history, and then create two new awards that we chose to name after two great heroes—activists, educators and truly inspirational Africans—Thamsanqa Kambule and Wangari Maathai. But more importantly, we were able to identify those people who have demonstrated excellence in research and application of machine learning and AI, and who provide an answer to that earlier pressing question. We are given the opportunity to celebrate their excellence, and as a wider community, to draw inspiration from their impact and rigour. This report is a commitment to the heroes of the future. And a celebration of the first cohort of Kambule and Maathai Award recipients: heroes who have inspired us and strengthened our commitment to Strengthening African Machine Learning.

*The Indaba Abantu,
August 2018*

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1. Introduction

It will not be surprising that, across our continent, machine learning is being developed and deployed in ways both fundamental and transformative. In both research and applications, African innovators continue to enhance our knowledge, and address the intractable challenges facing our societies and people: whether these be in the mathematical underpinnings of reasoning and control; in developing solutions for food security, public health, and water and disease management; or in unravelling the mysteries of the universe. This excellence often goes unnoticed, creating a clear need for platforms that recognise and celebrate this excellence. And it is to address this need that we have created two new awards, the Kambule and Maathai awards, to recognise the excellence in research and applications of machine learning and artificial intelligence by African researchers and technologists.

The Kambule and Maathai awards represent the third independent programme we run as the Indaba Organisation, and form a key part of our mission to Strengthen African Machine Learning and Artificial Intelligence. We see our three principal programmes, the Deep Learning Indaba, the IndabaX, and the Kambule and Maathai awards as forming part of an integrated system. The Deep Learning Indaba strengthens African AI *communities*, the IndabaX creates African *leadership* in AI, and the annual awards, the programme that is the subject of this report, create spaces of *recognition* and aspiration, allowing new stories of African AI innovation to be told. This interacting and reinforcing

trinity, of community and leadership and recognition, represents the concrete instantiation of our mission.

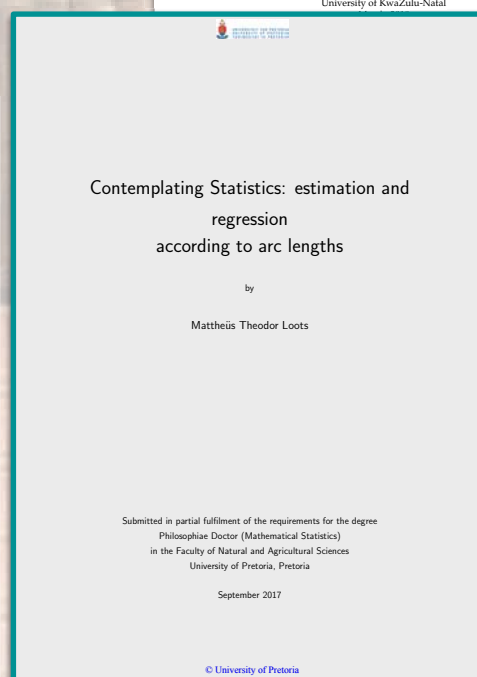
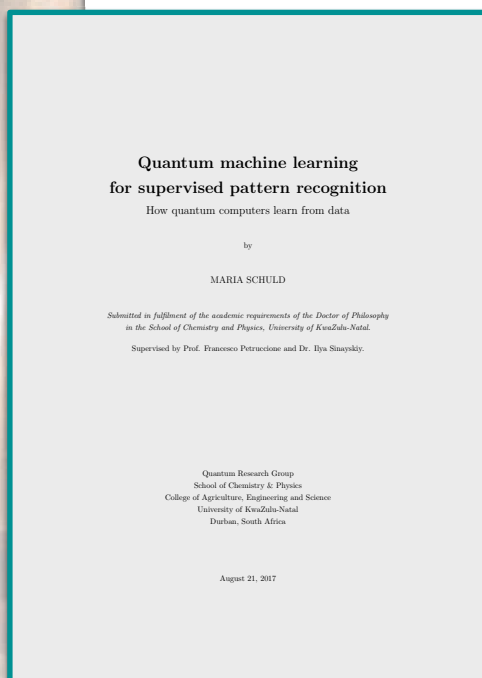
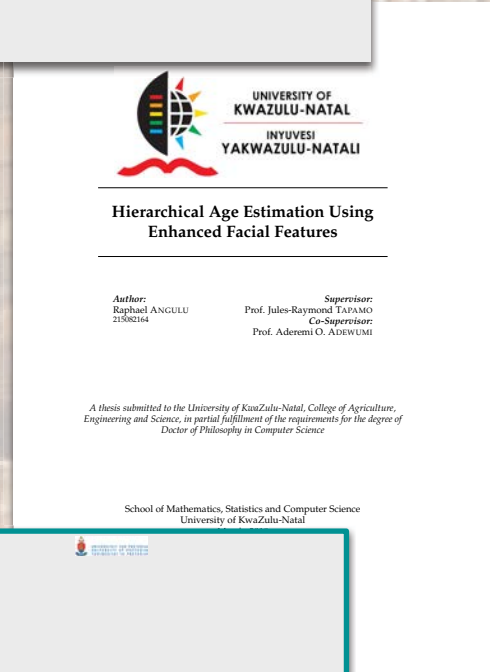
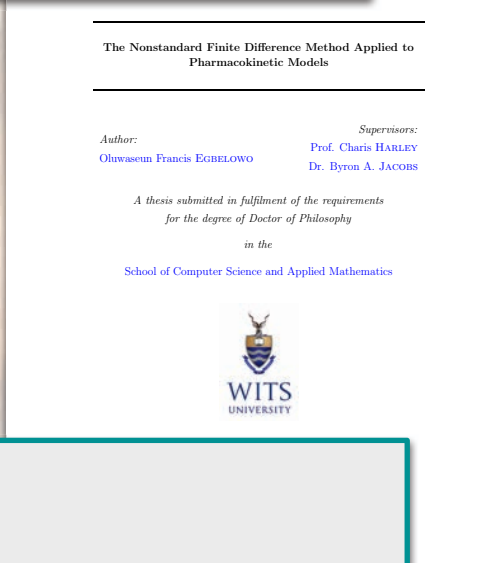
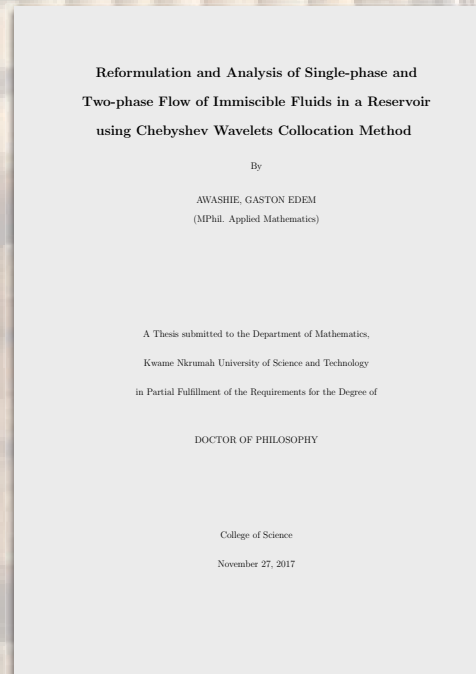
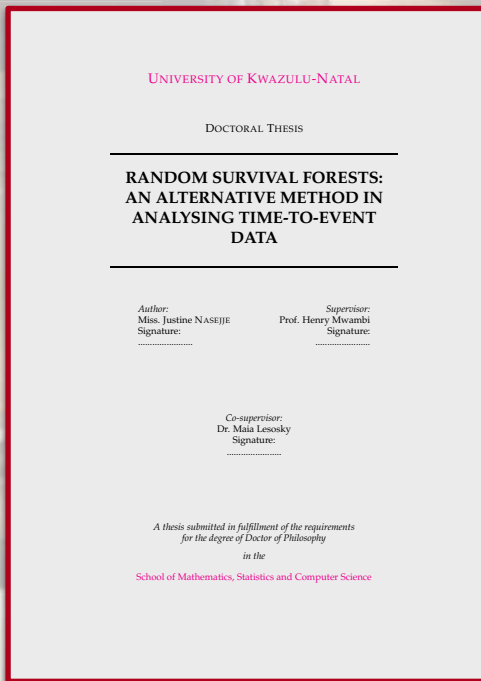


Figure 1: Targets of our three programmes designed to work together to strengthen African machine learning.

The Kambule award encourages and recognises excellence in research and writing by doctoral candidates at African universities, in any area of computational and statistical sciences. The Maathai award encourages and recognises work by African innovators that show impactful applications of machine learning and artificial intelligence.

These two awards are intended to recognise ability, struggle, effort, and African excellence. Importantly, by elevating the award winners, they can serve as an inspiration to our broader community - like the inspiration we gain from the illustrious Africans after whom these awards are named - allowing each of us to recognise the ability that we ourselves have to make meaningful contributions to our societies.

Nominated Thesis Covers



2. The Kambule Dissertation Award

The [Kambule Dissertation Award](#) celebrates African research excellence: its recipients are those that uphold Professor Thamsanqa Kambule's legacy as a defender of learning, a seeker of knowledge, and an activist for equality. Thamsanqa Kambule was among the great anti-apartheid activists and the first black lecturer of mathematics at the University of the Witwatersrand, dedicating his life to education and learning.

2.1 Champions of Research Excellence 2018

The Awards Committee has selected one winner, and based on the strength and inspirational nature of the set of nominations, has made two honourable mentions in this category. The winner will be invited to speak at the 2018 Deep Learning Indaba - the annual gathering of the African AI community - and will receive a trophy and a prize of ZAR 10 000, sponsored by the [Africa Oxford Initiative](#). In addition, the winner will also travel to the University of Oxford, to be hosted by the Africa Oxford Initiative, to participate in their [Insaka](#) meetings.

Award Winner Justine Nasejje

The 2018 Thamsanqa Kambule Doctoral Dissertation Award is conferred to Justine Nasejje. **For her doctoral thesis advancing the state of knowledge in survival analysis, and in developing research whose applications seek to uplift our continent by addressing its pressing public health challenges.**

Nasejje, J. (2018). [Random Survival Forests: An Alternative Method in Analysing Time-to-event Data](#). PhD thesis, University of KwaZulu-Natal, South Africa.



Figure 2: Dr Justine Nasejje, winner of the 2018 Kambule Dissertation Award.

Justine Nasejje's thesis developed techniques for *Random Survival Forests* that model survival outcomes in the face of risk factors. The review panel described the thesis as *clear, detailed and precise*, with the opening chapters lauded as being *succinct enough for use as teaching material*. Justine has three accepted papers and others in progress from her doctoral candidature.

What truly solidified her selection and set her apart from other candidates was her *clear role in strengthening African ML*: the applications of her research looked at under-five child mortality in Uganda, and understanding extremely drug-resistant tuberculosis—both problems of significance to the African continent. Justine was a participant in the 2017 Women in ML workshop and the first Black in AI workshop at NIPS 2017. She received funding from the German DAAD.



Figure 3: Kambule Award honourable mentions. (Left) Dr Theodor Loots, (Right) Dr Maria Schuld.

Honourable Mention Theodor Loots

Loots, M.T. (2017). [Contemplating Statistics: estimation and regression according to arc lengths](#). Doctor of Philosophy in Mathematical Statistics. University of Pretoria, South Africa.

Theodor Loots' thesis revisited linear and non-linear regression, estimation, and goodness-of-fit and proposed methods for each using arc-lengths. His thesis was described as making *strong theoretical contributions* with potential applications in ML. Mr Loots completed his degree as a *blind student*, and as his nominator writes, '*is an inspiring example of just what can be achieved*'.

Honourable Mention Maria Schuld

Schuld, M. (2017). [Quantum machine learning for supervised pattern recognition. How quantum computers learn from data](#). Doctor of Philosophy in Chemistry and Physics. University of KwaZulu-Natal, South Africa.

Maria Schuld's thesis presented technically strong contributions to the nascent and interdisciplinary field of *Quantum Machine Learning*. The

reviewer described her thesis and Ms Schuld as '*well-cited and highly visible*' and her supporting letters provide evidence of a sterling female scientist with a broader motivation to engage with the community around her.

2.2 Remembering Thamsanqa W. Kambule



Figure 4: Prof. Thamsanqa Kambule, after whom the dissertation award is named.

Dr Thamsanqa "Wilkie" Kambule, one of South Africa's greatest mathematicians and teachers, is remembered for his life's contribution to education, specifically black education under the Bantu Education Act, a segregated education system enforced by the apartheid regime. Through his teaching, 20 years of which he was the principal of Orlando High School in Soweto, he went on to shape and influence many great minds, including Nobel Peace Prize winner Desmond Tutu, former South African national police commissioner Jackie Selebi, and former chief executive officer

of the Independent Electoral Commission Pansy Tlakula.

Alongside his passion for teaching, he was also a gifted mathematician. He was awarded honorary doctorate degrees from the universities of the Witwatersrand, Pretoria and Fort Hare, and was the University of the Witwatersrand's first black professor in mathematics. In 2002, former South African president Thabo Mbeki bestowed him with the Order of the Baobab in gold

for his exceptional contribution to mathematics, education, human development and community service, and in 2008 he went on to be awarded an honorary membership of the Actuarial Society of South Africa, a membership he was denied during Apartheid.

The Thamsanqa Kambule Doctoral Dissertation Award is established in honour of his contributions to the field of mathematics and his dedication to furthering the minds of his students.

3. The Maathai Impact Award

The [Maathai Impact Award](#) reinforces the legacy of Professor Wangari Maathai in acknowledging the capacity of individuals to be a positive force for change: by recognising ideas and initiatives that demonstrate that each of us, no matter how small, can make a difference. Wangari Maathai was the first African woman to receive the Nobel prize, and one of the best examples of impact that can be made through tireless dedication to a cause.

3.1 Impactful Innovators 2018

The awards committee has selected one winner, and based on the strength of other nominations, has made two honourable mentions in this category. The winner will be invited to speak at the 2018 Deep Learning Indaba - the annual gathering of the African AI community—and will receive a trophy, and a cash prize.

Award Winner Yasini Musa Ayami (TsogoloTech)

The 2018 Wangari Maathai Impact Award has been conferred to Yasini Musa Ayami. **For his role as the founder for TsogoloTech and their work in enhancing the foundations of the African economy by working towards the ubiquitous financial inclusion of rural women in Zambia.**



Figure 5: Yasini Musa Ayami, winner of the 2018 Maathai Impact Award.

Yasini Musa Ayami is the founder of TsogoloTech, a fintech startup for village banking in Zambia whose impressive mission is to address the *financial inclusion of rural women* in Zambia. TsogoloTech aims to reach 22,000 women by 2019 with digitised financial access and links to the formal financial sector. The inspirational work of Mr Ayami and TsogoloTech demonstrates *clear support and strengthening of the continent and the development of its communities*.

Honourable Mention

Alfred Ongere (AI-Kenya)

Alfred Ongere founded AI-Kenya, an *online AI learning community* which has over 300 active members across Kenya, and has mobilised equivalent communities at his university and 5 others. He actively teaches, motivates students, coordinates meetups, and is an inspirational example of a passionate individual having impact *on a broad and African audience*.

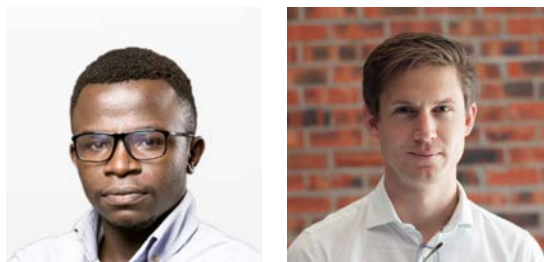


Figure 6: Maathai Award honourable mentions. (Left) Alfred Ongere, AI-Kenya. (Right) Frans Cronje, DataProphet.

Honourable Mention

Frans Cronje (DataProphet)

Frans Cronje and DataProphet have the broad goal of achieving *zero-defect manufacturing using AI*, and have

already seen many success cases in the automotive, steel and engine shipping sectors. They are also doing impactful work in the health-care sector, where they are building a programme for new and expectant mothers to monitor their checkups and medication regime. Frans Cronje represents a young company *successfully applying ML/AI to real-world problems* and is worthy of celebration.

3.2 Remembering Wangari Muta Maathai



Figure 7: Prof. Wangari Muta Maathai, after whom the impact award is named

Professor Wangari Muta Maathai, Africa's first female Nobel Laureate, is internationally recognised for her contributions to democracy, peace and sustainable development in Kenya and across the greater African collective. Born in rural Kenya, she went on to become the first woman in East and Central Africa to earn, both at the University of Nairobi, a doctorate degree and to be appointed to associate professor. Alongside her academic career, Professor Maathai was a vociferous environmental and political activist, and

was central to Kenya's first multi-party elections in 1992, during which she strove for free and fair elections. She went on to serve in the Kenyan government, representing the Tetu constituency from 2002 to 2007 and working as the Assistant Minister for the Department of Environment and Natural Resources from 2003 to 2007.

Her deep connection with the environment led her to found a pan-African environmental organisation, the Green Belt Movement (GBM), whose goal was to reduce poverty and promote environmental conservation through community-based tree planting. She was a fierce advocate for women, serving on the National Council of Women of Kenya

for 11 years and uplifting the lives of women through her work with the GBM. Her contributions were recognised in 2004 when she was awarded the Nobel Peace Prize. She continued her inspirational work, founding the Wangari Institute for Peace and Environmental Studies in partnership with the University of Nairobi, chairing global initiatives to protect African forest regions, and was appointed a United Nations Messenger of Peace on environmental and climate change.

Wangari Maathai left a lasting impact on our continent and the world, and through this award we form a continuity of her spirit, and recognise the next generation of impactful Africans.

4. Recommendations

1. Increase number of nominations

The full impact of the awards is at present limited by the *extent of awareness of the awards, increasing which will have the principal outcome of an increased number of nominations*. For the 2018 programme, the Kambule and Maathai awards each received 6 and 7 nominations respectively. Our goal is also to broaden the range of African countries from which the nominations are received; for the 2018 programme, all nominations for the Kambule award came from South African universities. This will be achieved through an earlier call, wider and more frequent spread of the call, and in conjunction with the other recommendations of this report.

2. Improve Diversity of Nominees

Diversity of genders, nationalities, races, and subject areas are a core principle of

the awards programme. The Kambule award this year had 50% women in its six nominations, which should be maintained. There were no women in the set of nominations for the Maathai award—much more outreach will be needed to reflect this need. The set of nominating countries, as mentioned above, should also be broadened.

3. Broaden Eligibility

The eligibility criteria should be expanded to ensure that the widest set of nominees can be captured. One element, the eligible period was increased half-way during the 2018 call, and should be done from the outset for the awards cycles for the next 3 years. More clarification and examples of the different types of nominators should be given. Clarity on the prizes and benefits for nominees should also be given in the

opening call, to make nomination worthwhile.

4. Enhance the Reviewing Process

The review period can be strengthened based on the experience of the 2018 awards period. A diverse review panel with relevant backgrounds should be selected in advance, and more detailed guidance on the process of selection should be described. The external reviewers should be introduced to the nominees, to in that way enhance the

personal networks of the nominees and to create mentorship opportunities.

5. Dedicated Campaign for Sponsors

Awards sponsors should be identified in advance and the prizes should be established early on. The nature of the prizes should continue to aim to give as much exposure to the winners as possible, thereby allowing them to both serve as an inspiration to the community and to grow personally.

5. Programme Details

The nomination process involved the submission of required information using a set of online forms. The eligibility criteria for both awards were meant to be as simple as possible to reduce barriers to nominating candidates. Nominations period ran from January to April 2018.

- If the examiners' reports were available, these should also have been submitted.

5.1 The Kambule Award

Submissions

Nomination included a summary of the thesis, its key contributions and the submission of the thesis itself.

Also required was a supporting letter that described the thesis's main theoretical, methodological, or applied contributions.

- This supporting letter should have been written by an academic who was in a position to comment on the merits of the work and the candidate, e.g., PhD supervisor, thesis examiner, academic mentor, collaborators, etc.
- The letter should have been written by someone other than the person who was nominating the candidate.

Selection Process

Dissertations were reviewed for technical depth and significance of the research contribution, potential impact on theory and practice, quality of presentation, and its role in strengthening African machine learning.

All nominations were reviewed by an external panel, who themselves were experts in the subject area of the thesis, with at least one external reviewer for each nomination. Thereafter the Awards Committee reviewed all the evidence, which included supporting letters, reviewers' statements and nomination statements, ranked the nominations, and proposed a winner. The proposed winner and the overall selection process were audited by an external panel consisting of members of the Indaba advisory board, and an internal panel that consisted of members of the Indaba organisers who were not involved in the selection process.

Eligibility

The Kamabule award had a wide eligibility that included:

- PhD theses in the broad area of computational and statistical sciences would be eligible. This included, but was not restricted to: machine learning, deep learning, artificial intelligence, statistics, probability, data science, information theory, econometrics, optimisation, statistical physics, biostatistics and bioinformatics, natural language processing, computer vision, and computational neuroscience.
- The Awards Committee interpreted the phrase “PhD thesis” to mean a dissertation in final form, i.e. approved by the student’s examinations board, e.g., viva examinations completed, public defence completed, corrected version submitted, or degree awarded.
- The nominee must have been registered as a student and received their degree from an African university.
- A dissertation could be nominated by the author themselves, an academic who was in a position to comment on the merits of the work and the candidate (e.g., PhD supervisor, thesis examiner, academic mentor, collaborators), a department chair or head of department.
- Theses completed during the period of 2015-2018 were eligible for nomination.
- Nominations were welcomed from any African country.
- The thesis could have been in any language, although the Awards Committee would require English translations for full consideration of theses written in other languages.

- All supporting letters and reports should have been in English (or a translation supplied)

5.2 Maathai Award

Submissions

Nominations could be made by applicants themselves or by any other nominator. Nominations were to include details of the impactful work and the necessary contact details.

We requested two supporting letters that described the nature of the impactful work, why it is considered to be impactful, and in what way the nominated candidate(s) or organisation strengthen African machine learning. Letter writers could be anyone familiar with the impactful work.

Selection Process

Nominations were reviewed to assess the breadth of potential impact they have had, their role in strengthening African machine learning and artificial intelligence, and the strength of the supporting letters.

All nominations were reviewed by an external panel, who themselves were experts, with at least one external reviewer per nomination. Thereafter the Awards Committee reviewed all the evidence, which included supporting letters, reviewers’ statements and nomination statements, ranked the nominations, and proposed a winner. The proposed winner and the overall selection process were audited by an external panel consisting of members of the Indaba advisory board, and an internal panel that consisted of members

of the Indaba organisers who were not involved in the awards process.

Eligibility

The Maathai award had a wide eligibility, which included that:

- The award was open to individuals, teams, or organisations.
 - The Awards Committee considered impactful work to be broadly defined as any work - technological, social, or economic - that has had, or has the potential to positively transform our African societies. There are many ways to have impact, and we hoped that those who would submit nominations/self-nominations would be generous and creative in their judgement of the term 'innovation'.
 - Examples of such impact included amongst others:
 - A research paper that shows important results using machine learning to solve important problems that address food security.
 - The work of an African startup using machine learning, whose work is set to have positive impact or demonstrate technical excellence in their focus area.
- An individual who has shown a track record of empowering individuals and groups affected or involved with machine learning.
 - Government agencies or individuals contributing positively to the policy and society conversations around machine learning and artificial intelligence.
 - A non-profit organisation that empowers innovators through skills development or mentoring.
 - An established business that has deployed machine learning in an innovative way to positively impact their business and customer experience.
- Nominations could have been made by anyone, including individuals and organisations themselves.
 - Nominations were welcomed from any African country.
 - All supporting letters were requested in English (or a translation supplied).

6. Financing the Awards

The Indaba organisation did not have an explicit budget for this awards programme, and thus sought sponsors to enable this important programme in strengthening African machine learning.

The Kambule prize was **generously sponsored by the Africa Oxford Initiative** who will also be hosting the winner at one of their Insaka meetings at the University of Oxford.

The ideal prize gives recognition to the winners, but also enables them in ways

that supports their growth, by giving them exposure and opportunities that might not otherwise be possible. It is for this reason that the financing of future awards programmes should be strengthened to allow larger prize amounts and funds for travel and speaking opportunities as a platform for the candidate to gain exposure and demonstrate their excellence in research and applications.

7. The Future

The importance of creating spaces of recognition, those that celebrate ability, struggle, effort, and African excellence, should not be underestimated. We are proud to play a role in showing that such excellence is prevalent, and part of an ongoing and ever-strengthening machine learning community across our continent. We believe that the ingredients of community, leadership and recognition, which are embodied by the three principal programmes of the Indaba Organisation, are the foundations of a self-supporting environment that will, through sustained activity, strengthen African machine learning. These awards are essential and their scope will only increase over time. This year's award winners are inspirational. They have energised us in ways we could not have imagined, and their excellence deserves to be celebrated.

And so we continue to tell the story of African excellence.

Appendix A: List of Nominees

Nominees for the Kambule Dissertation Award 2018

- Justine Nasejje, University of KwaZulu-Natal
- Maria Schuld, University of KwaZulu-Natal
- Oluwaseun Francis Egbelowo, University of the Witwatersrand
- Raphael Angulu, University of KwaZulu-Natal
- Theodor Loots, University of Pretoria

Nominees for the Maathai Impact Award 2018

- Alfred Ongere, Multimedia University of Kenya
- Frans Cronje, DataProphet
- Jacques Ludik, Machine Intelligence Institute of Africa
- Surafel Tilahun, University of Zululand
- Yasini Musa Ayami, TsogoloTech

Appendix B: External Review Panel Members

Kambule Award

Alessandra Tosi (Univ. Oxford)
Konstantina Palla (Microsoft)
Jacob Biamonte (DeepQuantum)
Fulufhelo Nelwamondo (CSIR)
Dalton Lunga (Oak Ridge Labs)
Rajesh Ranganath (NYU)
Balaji Lakshminarayanan (DeepMind)

Maathai Award

Mmaki Jantjies (Univ Western Cape)
Megan Yates (Ixio Analytics)
Martha Kamkuemah (UCT)
Geoff Nitschke, (Univ. Cape Town)
Danielle Belgrave (Microsoft)
Graham Muhanga (Africa's Talking)

Appendix C: List of Indaba Organisers and Advisory Board

Indaba Abantu

- Shakir Mohamed, Staff Research Scientist, DeepMind
- Ulrich Paquet, Staff Research Scientist, DeepMind
- Vukosi Marivate, Senior Researcher, Council for Scientific and Industrial Research
- Willie Brink, Senior Lecturer, Stellenbosch University
- Nyalleng Moorosi, Senior Researcher, Council for Scientific and Industrial Research
- Stephan Gouws, Research Scientist, Google
- Benjamin Rosman, Principal Researcher, Council for Scientific and Industrial research (CSIR), and Senior Lecturer, University of the Witwatersrand
- Richard Klein, Associate Lecturer, University of the Witwatersrand
- Avishkar Bhoopchand, DeepMind
- Kathleen Siminyu, Africa's Talking
- Muthoni Wanyoike, InstaDeep, Kenya.
- Daniela Massiceti, University of Oxford
- Herman Kamper, Stellenbosch University

Advisory Board

- Bitange Ndemo, Univ of Nairobi, Safaricom, Former Permanent Secretary
- Bubacarr Bah, Research Chair, African Institute for Mathematical Sciences
- Bonolo Mathibela
- Danielle Belgrave, Microsoft Research Cambridge, Imperial College
- George Konidaris, Assistant Professor, Brown University
- Joy Buolamwini, MIT and Algorithmic Justice League
- Nando de Freitas, Senior Staff Research Scientist, DeepMind
- Rachel Thomas, Fast.ai co-founder, Univ San Francisco