AIMS | African Institute for Mathematical Sciences SOUTH AFRICA

2022 ANNUAL REPORT

ABOUT US

The African Institute for Mathematical Sciences (AIMS) is a pan-African network of centres of excellence for postgraduate education, research and public engagement in mathematical sciences. Its mission is to enable Africa's brightest students to flourish as independent thinkers, problem solvers and innovators capable of driving Africa's future scientific, educational and economic self-sufficiency.

AIMS was founded in Cape Town, South Africa, in 2003. Since then AIMS centres have opened in Senegal (2011), Ghana (2012), Cameroon (2013) and Rwanda (2016). The pan-African network of AIMS centres is coordinated by the AIMS Next Einstein Initiative (AIMS-NEI).*

This is the annual report of AIMS South Africa for the period 1 August 2021 to 31 July 2022. It includes an overview of all activities of AIMS South Africa and its associated projects, as well as the financial statements for the 2021 calendar year.

Since AIMS South Africa opened in 2003, 955 students, of which 34% are women, from 41 different African countries have graduated from its core academic programme.

AIMS South Africa has local association with the Universities of Cape Town (UCT), Stellenbosch (SU) and the Western Cape (UWC) and international association with the Universities of Cambridge, Oxford and Paris-Sud.

AIMS SOUTH AFRICA OFFERS:

- An intensive one-year structured Master's in Mathematical Sciences with intakes in August and January.
- Specialised courses as part of regular postgraduate programmes at South African universities.
- A well-established research centre which hosts regular workshops and conferences.
- Professional development programmes for teachers.
- Public engagement activities.

* AIMS Next Einstein Initiative, Kigali, Rwanda, Email: info@nexteinstein.org
For further information, see www.nexteinstein.org

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FOREWORD

The 2021/2022 year has marked a gradual return to normal at AIMS after the lockdowns during the COVID-19 pandemic. Most courses are once more being held onsite, workshop activities at AIMS have started again and researchers and visitors are spending time at AIMS, working on research projects and interacting with our students. This has been a great relief to all of us working at AIMS, making it possible to contribute to training and scientific growth in the mathematical sciences in ways we have become known for. The positive energy at AIMS is noticeable and appreciated.

For the past two years AIMS South Africa has made an enormous effort to manage its programme and activities, affected by additional costs due to the pandemic, as well as longer waiting periods for regular funding to be approved and available for use. This has led to staff reduction, savings by introducing in-house catering for students at AIMS, and postponing necessary maintenance and improvements to the centre in the short term. Our Board and Council have been very supportive, and now the situation has improved considerably, with the renewal and approval of local funding and exciting new programmes to be launched which are internationally funded.

Since AIMS South Africa opened in 2003, 955 students from 41 African countries have graduated from its core Master's programme, of whom 34% are women and 125 South African. Among our alumni, more than 35 are now lecturing at South African universities and over 125 are working in industry in areas such as the financial, IT and engineering sectors, and as data analysts or researchers. We are very proud of this achievement as we begin our 20th year.

Highlights of the year have included a CIMPA Data Science Research School, a Science Communication Workshop as well as the Industry Immersion Programme (IIP), a special course presented together with the European School of Management Technology in Berlin, attended by AIMS alumni and other graduates. The course was presented in hybrid format and included the AIMS centres in Cameroon, Ghana and Rwanda as well as Strathmore University in Kenya. Our outreach programme included events as part of the 2022/23 International Year of Basic Sciences with emphasis on the SDG's, and we are thrilled to be one of the South African institutions involved in this activity coordinated by the Academy of Science of South Africa (ASSAf).

The third edition of the Data Science Intensive (DSI) Programme was also successfully completed in this reporting period. There were 20 participants (45% of whom were women) representing ten African countries.

We said goodbye to a number of colleagues this year, Ms Deborah Wilsnagh and Ms Jo-Anne Louw from our Finance Department, Prof. Philip Mashele, a part time Resident Researcher at AIMS and Ms Yasmin Hankel, the New Media Officer. Deborah, our Chief Operating Officer, served AIMS South Africa with energy, commitment and distinction for more than thirteen years, and it is a pleasure to acknowledge her contribution to AIMS.

My own appointment as Director at AIMS South Africa will be ending soon. Working at AIMS South Africa and with colleagues from our Pan African AIMS Network has been a wonderful experience, with the opportunity to contribute to the growth of mathematical science in Africa, supported by so many exceptional people, both from Africa and the broader international community. It is with great appreciation that I thank everyone I have worked with and especially staff at AIMS South Africa. It is a pleasure to wish my successor, Dr Ulrich Paquet, all the best as he takes over as Executive Director of AIMS South Africa in January 2023.

Barry Green
Director

ACADEMIC

PROGRAMMES

The AIMS programme is done in three phases: skills courses, which are compulsory, elective courses, and a research project phase. The 2021-22 academic year began in October 2021 when students were able to travel in to AIMS. The academic year started in online mode, with students on site and lecturers connecting remotely. By the completion of the academic programme, some onsite classes had begun.

Master's in Mathematical Sciences (January 2021 intake)

The 2021 intake included 10 students. Their academic programme was of necessity run online. Amongst courses for the group were Curves and Surfaces for Computer Graphics with Dr Laure Gouba (International Centre for Theoretical Physics) and a course on statistical genomics with Dr Emile Chimusa (UCT). Research projects covered topics such as domination numbers in graphs and finite difference methods applied to financial mathematics problems.

RESEARCH PROJECTS OF THE JANUARY 2021 INTAKE

Full name	Gender	Origin	Research Project Title	Supervisor
Madou Bayoulou	M	Burkina Faso	Application of Min Cut Algorithm in Image Segmentation	M Ali, Witwatersrand
Tebogo Doctor Malatsi	M	South Africa	A study on a new fourth-order integrable nonlinear partial differential equation	CM Khalique, North-West
Nhlangano Dale Maluleke	F	South Africa	The role of Selective HIV/AIDS Treatment of immigrant Population: the Botswana case	F Nyabadza & W Chukwu, Johannesburg
Malesela Simon Mokhanda (2020-2021 Intake)	M		Modelling Options on Futures and Forwards using Black's Model and Approximations	R Becker, AIMS South Africa
Kanting Evidence Motimele	M	South Africa	Discovering Statistical Laws of Flow Velocity Increments for Developed Turbulence Using Bayesian Model Selection	D Nickelsen, AIMS South Africa
Aaron Mubatapasango	M	Zimbabwe	Aspects of topological indices with applications to drug design	S Mukwembi, Witwatersrand
Phumudzo Nematswerani	M	South Africa	Use of Generative Adversarial Network to Forecast Stock Prices	R Becker, AIMS South Africa
Mary Njeri	F	Kenya	The domination number of d-ary increasing trees	N Ralaivaosaona, Stellenbosch
Sinethemba Nongqoto	M	South Africa	Sentiment Analysis for Covid-19 Vaccination using Twitter Data	E Dufourq, Stellenbosch & AIMS South Africa & S Er, Cape Town
Joel-Pascal Ntwali N'Konzi	M	DRC	Modelling the Role of Fear on COVID-19 Infection Dynamics	F Nyabadza & W Chukwu, Johannesburg
Londani Tshindane	M	South Africa	Solving partial integro-differential equation (PIDE) for European options using a finite difference scheme	P Mashele, North-West & AIMS South Africa

COMBINED COURSES TABLE

Period	Lecturer	Course	MSc 2021 – 2022	MSc 2021 – 2022	Hons Biomaths 2022
2021					
4-8 Oct	Jan Groenewald, AIMS South Africa	Computing and LaTeX	x		
11-29 Oct	Yves Semegni, North-West	Python Programming	x		
	Naina Ralaivaosaona, Stellenbosch	Mathematical Problem Solving	x		
2-19 Nov	Siaka Lougue, Institut de Recherche en Science de la Santé (IRSS)	Statistics	x		
	Yae Gaba, African Centre for Advanced Studies & Evans Doe Ocansey, Johannes Kepler University	Experimental Mathematics with Sage	x		
29 Nov-17 Dec	Simon Mukwembi, Witwatersrand & Bernardo Rodrigues, Pretoria	Algebraic Methods	x		
	Simon Mukwembi, Witwatersrand & Bernardo Rodrigues, Pretoria	Graphs, Designs and Applications	x		
	Tevian Dray & Corinne Manogue, Oregon State University	The Geometry of Maxwell's Equations	x		
2022					
3-7 Jan	Simon Mukwembi, Witwatersrand & Bernardo Rodrigues, Pretoria	Graphs, Designs and Applications (continued)	x		
10-28 Jan	David Aschman, Cape Town	Concepts and Problem Solving in Physics	x		
	Richard Katz, Oxford	Fluid Dynamics	x		
	Wolfram Decker, University of Kaiserslautern	Computer Algebra	x		
31 Jan-18 Feb	Stéphane Ouvry, Université Paris Sud	Introduction to Random Systems, Information Theory, and related topics	x		x
	Fernando Pestana da Costa, Aberta University	Differential Equations	x		x
2-11 Feb	Mathematics in Industry Study Group	Graduate Modelling camp and Study Group	x		
14-18 Feb	Jan Groenewald, AIMs South Africa	Introduction to Computing and LaTeX		x	
28 Feb - 18 Mar	Jeff Sanders, AIMS South Africa	Distributed Systems	x	x	
	Ronnie Becker, AIMS South Africa	Financial Mathematics	x	x	
	Lyndsay Kerr, Edinburgh	Analytical Techniques in Mathematical Biology	x	x	x
	Paul Taylor, National Institute of Health & Martha Kamkuemah, AIMS South Africa	Python Programming		x	
21 Mar - 8 Apr	Dugald MacPherson, Leeds	Model Theory and Homogeneous Structures	x	x	
	Philip Knight, Strathclyde	Networks	x	x	
	Matt Macauley, Clemson	Algebraic Biology	x	x	x
	Karl-Dieter Crisman, Gordon College	Sage		x	
11-15 Apr	Africa Scientifique	Workshop	x	x	
18 Apr - 6 May	Rafael Nepomechie, Miami	Quantum Computing	x	x	
	Tim O'Brien, Loyola	Statistical Modeling	x	x	x
	Nancy Neudauer, Pacific	Designs, Matroids and Graphs	x	x	x
9 - 27 May	Steve Bradlow, University of Illinois at Urbana-Champaign	Mathematics and Art in Africa		x	
	Joerg Zintl, Kaiserslautern University	Algebraic Geometry		x	
	Eric Andriantiana, Rhodes	Mathematical Problem Solving		x	
6-28 June	Jimmy Feng, British Columbia	Mathematics of Complex Fluids		x	x
	Juerg Weber, Western Australia	Risk Management and Economics		x	
27 June - 15 July	Montaz Ali, Witwatersrand	Optimisation		x	
25 July - 12 Aug	Henri Laurie, Cape Town	Programming with Julia		x	
	Franck Kalala Mutombo, AIMS Senegal & Rejoyce Gavhi-Molefe, AIMS South Africa	Mathematics of Data Science		x	
15 Aug - 2 Sept	Leandro Boonzaaier, Stellenbosch	Concepts and Problem Solving in Physics		x	
	Franck Kalala Mutombo, AIMS Senegal & Rejoyce Gavhi-Molefe, AIMS South Africa	Subdivision		x	

Master's in Mathematical Sciences (2021–2022 Intake and January 2022 intake)

The 2021-22 student group included 30 students, from nine countries including South Africa.

Skills courses included Mathematical Problem Solving with Dr Naina Ralaivaosaona. Throughout the year, students do a Computing and Latex course with Mr Jan Groenewald (AIMS South Africa). Electives included Graphs, Designs and Applications with Bernardo Rodrigues (University of Pretoria) and Prof. Simon Mukwembi (University of the Witwatersrand) and Data Science with Dr Emmanuel Dufourq (Stellenbosch University and AIMS South Africa), amongst many courses pure and applied. Students also took English Language and Communication Skills classes with Ms Lynne Teixeira (AIMS South Africa).

AIMS South Africa has two Structured Master's intakes. The 2022 group (15 students) joined in February 2022. They have taken, amongst others, an elective on Designs, Matroids and Graphs given by Prof. Nancy Neudauer (Pacific University), and a course on Mathematics and Art in Africa, given by Prof. Steve Bradlow (University of Illinois at Urbana-Champaign). An elective on Mathematics for Machine Learning was given by Dr Franck Kalala Mutombo (University of Lubumbashi) and Dr Rejoyce Gavhi-Molefe (AIMS South Africa). Students also attended a related CIMPA School on Mathematical and Statistical Methods for Data Science which was held at AIMS South Africa in July (see workshops).

The first on site course in two years was Networks with Dr Philip Knight from the University of Strathclyde, taken by the 2021-22 and 2022 students. This was followed by other onsite courses including Quantum Computing with Prof. Rafael Nepomechie, from the University of Miami, and Mathematics of Complex Fluids, given with Prof. Jimmy Feng (University of British Coulmbia).

Research project supervisors offered a variety of interesting topics for study. Project areas for 2021-22 included complex networks, machine learning, algebraic topology and topological data analysis, idempotent matrices and bio-acoustic modelling. Amongst the projects for 2021-22, there were 8 Distinctions, with four students getting distinctions for the full programme.

As part of the 2021-22 students' scientific environment, various talks were given throughout the academic year, including a functional analysis talk by Dr Whasuck Lee of the University of the Western Cape, and a talk on data science given by Dr Kanshukan Rajaratnam, Director of the School for Data Science and Computational Thinking at Stellenbosch University. Many workshops and talks were organised by Dr Rejoyce Gavhi-Molefe, House of Science Manager (see House of Science).

Tutors are an important part of the AIMS teaching and learning model. At different points across the reporting period, the tutors were: Alice Nanyanzi, head tutor, Shaun de Carvalho, Karima Djenabou, Pacome Nguimeya Tematio, Sam Charles, Hosana Ranaivomanana, Dinna Ranirina (also biomathematics tutor), Joel Lontsi and Tsinjo Rakotonarivo, and, earlier, Francis Egbelowo, Kendall Born, Ephifania Geza (also biomathematics tutor), Faraniaina Rasolofoson and Rockefeller.

AIMS Network offered many opportunities for students, for internships and attendance at conferences and symposia.

RESEARCH PROJECTS OF THE 2021–2022 INTAKE

Full Name	Gender	Origin	Research project Title	Supervisors
Wezzie Grace Banda	F	Malawi	Dynamical Survival Analysis: From Population to Individual Based Epidemic Models	J Malinzi, Eswatini & Durban University of Technology
Godfrey Bashaga	M	Botswana	Optimal Artificial Intelligence for a Dice Duel Game from Complete Probabilistic Description	D Nickelsen & D Ranirina, AIMS South Africa
Abraham Chakawa*	M	Zimbabwe	Enhancing Bioacoustic Classifiers via Meta-Data	E Dufourq, Stellenbosch & AIMS South Africa
Mulenga Chipoka*	M	Zambia	An Analysis of Ulimisana Optimisation for Malaria Control	N Makondo, Johannesburg
Pride Duve*	M	Zimbabwe	A Mathematical Model for Malaria Disease Dynamics with Vaccination and Infected Immigrants	PJ Witbooi & JB Munyakazi, Western Cape
Joseph Kamusha	M	Zimbabwe	Various Domination Parameters in Graphs	I Allie, Cape Town
Musawenkosi Elvis Khulu	M	South Africa	Higher order stabilized finite elements for gas dynamics	S Mabuza, Clemson
Zeymisco Elias Kweya*	M	Tanzania	Some properties of idempotent matrices and their applications	B Rodrigues, Pretoria
Esther Wanangachi Lwazi*	F	Malawi	Using Epidemic Network Theory to Understand Viral Marketing	P Knight, Strathclyde
Alinafe Maenje*	M	Malawi	A Mathematical Model of Collagen Accumulation in a Healing Wound: Effects of Local and ystematic factors	J Malinzi, Eswatini & Durban University of Technology
Happiness Edit Mahlalele	F	South Africa	Deep Transfer Learning for Radio Galaxy Classification	M Atemkeng, Rhodes
Mtsetfosisekelo Mlondi Sisekelo Mhlanga*	M	Eswatini	Deep Calibration of the Variance Gamma Model	P Ouwehand, Cape Town
Francisca Justin Mulebya*	F	Tanzania	Improving network communication	P Knight, Strathmore
Lupiya Musonda	M	Zambia	Multi Agent Reinforcement Learning	J Shock, Cape Town
Nobuhle Mutombeni*	F	Zimbabwe	Predicting Avalanche Risk using Environmental Covariates	I Durbach, St Andrews
Gershom Mwale	M	Zambia	Lung Cancer Diagnosis Using Capsule Neural Network Applied to CT-scan Images	AA Akinyelu & D Ranirina, AIMS South Africa
Enock Joseph Mwenitete*	M	Malawi	Social Networks: Identifying important nodes and improving information transmission	P Knight, Strathclyde
Dumisani Lickson Namakhwa*	M	Malawi	Algebraic Topology and Topological Data Analysis	E Dufourq, Stellenbosch & AIMS South Africa
Previa Ng'andu*	F	Zambia	Distance-based Graph Indices with Application to Boiling Points of Alkanes	S Mukwembi, Witwatersrand
Luzuko Nzayo	M	South Africa	Extending Isomorphisms of Finite Substructures	DH MacPherson, Leeds
Opeyemi Dorcas Ogundeji*	F	Nigeria	Selected topological indices with applications to the identification of anti-breast cancer agents	F Nyabadza, Johannesburg
Mendrika Henitsoa Rakotomanga*	M	Madagascar	Probabilistic and statistical analyses of stellar clumps in the Collisional Ring Galaxy Arp 147	Z Randriamanakoto, SAAO
Bria Aimé Razanaparany*	M	Madagascar	Algebraic Topology and Topological Data Analysis	D Holgate, Western Cape
Bekithemba Sibanda	M	Zimbabwe	Data-driven Aspects of the Curvature-Dark Energy Degeneracy in Cosmology	PM Okouma, Rhodes & Bob Osano, Cape Town
Leon Mangaliso Sihlongonyane*	M	Eswatini	Enumeration and Uniform Random Generation of Directed Acyclic Graphs	D Ralaivaosaona, Stellenbosch
Kunengwa Tembo*	M	Zambia	Modelling the Impact of Behavioural Immunity on COVID-19 Infection	F Chirove, Johannesburg
Nkgaphe Tebatjo Tsebesebe	M	South Africa	A Finite Element Algebraic Flux Correction Method for Euler Equations with Gravity	S Mabuza. Clemson
Banele Blessing Zondo*	M	Eswatini	Relating Linear and Non-Linear Description of Gravitational Waves	C Stevens, Canterbury

* Mastercard Scholars

GRADUATE

PROFILES

Malesela Simon Mokhanda
AIMS South Africa 2021

Simon completed an honours degree in Statistics at the University of South Africa (UNISA) in 2019 before joining AIMS for the 2020-21 Structured Master's programme. During his time at AIMS, Simon was one of the student leaders and volunteers. He completed his research project titled 'Modelling S&P500 Options on Futures and Forwards using Black's Model & Approximations' under the supervision of Prof. Ronnie Becker.

Simon graduated Cum Laude in 2021. Currently he is working full time as a Quantitative Analyst at FNB South Africa in a team that is focused on the development of models and methods for Digital Fraud Detection.

"I plan to pursue a PhD in Data Science or related field whereby I can try find AI driven solutions to some of the business problems faced in my current career."

Esther Wanangachi Lwazi
AIMS South Africa 2022

Esther completed a Bachelor of Science in Mathematical Sciences Education from the University of Malawi, where she majored in Mathematics and Statistics. "Mathematics has been my favourite subject since I was young, and I enjoy learning new mathematics."

"AIMS was my dream that came true, and I will never regret being part of the AIMS community. While at AIMS, I have learned a lot of things; teamwork, time management, different analytical skills, and I developed my understanding and liking for programming. Apart from loving Mathematics as a subject, I also love teaching it, and my dream is to join higher institutions as a lecturer. I inspire to be a prosperous entrepreneur, and my interest is in applying mathematical skills and knowledge in marketing."

She is doing an internship with the IVADO Fellowship Program at the University of Montreal, Canada which started on 5 September and will end on 15 December 2022. She is working on a research topic that is a continuation of her Master's thesis, where she used the susceptible-infected-susceptible (SIS) network epidemic model to understand viral marketing. She is currently using the susceptible-infected-recovered (SIR) epidemic model to understand the impact of social media networks on viral marketing. "I am finding possible ways marketers can advertise their products using social media networks."

Pride Duve
AIMS South Africa 2022

Pride completed a Bachelor of Science Honours Degree in Applied Mathematics at the National University of Science and Technology, Zimbabwe.

"The opportunity at AIMS provided me with more appreciation of Mathematical Sciences and I was impressed by how a course in Analytical Techniques in Mathematical Biology was delivered." This helped him to develop an interest in mathematical modelling of diseases.

His AIMS thesis was titled 'A mathematical model for Malaria disease dynamics with vaccination and immigration of infectives.' During this research period, he developed quite a number of questions that he needed answers to which motivated him to do further research on tropical diseases, particularly, mosquito borne diseases. He is currently pursuing a PhD in Applied Mathematics at the Bernhard Nocht Institute for Tropical Medicine in Hamburg, Germany. "My goal is to contribute to the general health of the public, and to help save lives using mathematical modelling."

Students on the January 2022 Intake

The January 2022 Intake students began their AIMS programme in mid-February 2022. The group was made up of 15 students (6 women), 10 from South Africa, and one student from Rwanda, Zimbabwe, Cameroon, Botswana and Zambia.

STUDENTS ON THE JANUARY 2021 INTAKE

Full name	Gender	Origin
Madoda Kenny Dendeng	M	South Africa
Ganinshuti Pierre Damien Kabyare	M	Rwanda
Bralyne Vanessa Kamga Matoukam	F	Cameroon
Surprice Makgafela Koto	M	South Africa
Fortune Pitsi Lekgwara	F	South Africa
Tshepo Mahura	M	South Africa
Dimakatso Makgoba	F	South Africa
Phemelo Pabalelo Morao	M	South Africa
Denzel Spencer Ngwenya	M	Zimbabwe
Kutlwano Othomile	M	Botswana
Nombali Qodi	F	South Africa
Enala Sakala	F	Zambia
Percy Tshikororo	M	South Africa
Prince Ndivhuwo Tshivhasa	M	South Africa
Khanyiswa Tyabule	F	South Africa

Courses towards a BSc Honours in Mathematics with a Focus in Biomathematics

Each year, students doing the Honours programme in Biomathematics at SU take courses at AIMS. Two students attended in 2022. Their programme at AIMS ran from January to July. Courses taken included Analytical Techniques in Mathematical Biology, given by Dr Lyndsay Kerr (University of Edinburgh). As part of their programme, the students also completed a course of work on Mathematical Modelling in Medicine and Public Health (MedPH) coordinated by Prof. Juliet Pulliam (SACEMA,SU); Ms Zinhle Mthombothi (SACEMA), an AIMS alumna, assisted on the MedPH course. From July onwards, the biomathematics students completed their Honours year at SU.

GRADUATIONS

January 2021 Intake

A special online ceremony was held for this intake on 22 February 2022.

"It is a pleasure to congratulate you on successfully completing the Master's Degree in Mathematical Sciences at AIMS South Africa in 2021. Looking back, I am sure you will remember AIMS in Muizenberg and everyone here for many years to come. You spent many hours in the lab, attended online lectures, completed assignments, and prepared a research project, which was interesting and challenging. Meeting students from elsewhere in Africa and living together at AIMS is an experience we hope you found special - a once in a lifetime experience and upbuilding for the future. We are proud of your achievement and wish you all the best for the next step in your career," stated Prof. Barry Green.


Mr Tebogo Doctor Malatsi


Ms Nhlangano Dale Maluleke


Mr Kanting Evidence Motimele


Mr Phumudzo Nematswerani


Ms Mary Njeri


Mr Sinethemba Nongqoto


Mr Joel-Pascal Ntwali N'Konzi


Mr Londani Tshindane

GRADUATIONS

2021 – 2022 Intake

"After two years of online graduation and recognition ceremonies it is a pleasure to all be together in person today to celebrate the successful completion of the Master's Degree by our 2021-22 group of AIMS students," noted Prof. Barry Green, Director of AIMS South Africa at the Graduation and Recognition of Achievement Ceremony held on 28 June 2022.

Twenty-eight students (including 7 women) from 9 African countries completed the programme. Of these ten students were conferred their degrees by UCT. Students registered at SU and UWC will receive their official degrees at ceremonies to be held later in the year. In addition, one degree from UCT and three from UWC were also conferred in absentia to four students who completed the programme last year.

The ceremony was officiated by Prof. Maano Ramutsindela, Dean of Science, University Cape Town, Prof. Kailash Patidar, Acting Dean of Science, University of the Western Cape and Prof. Nico Koopman, Deputy Vice-Chancellor, Stellenbosch University.

"Congratulations on your momentous achievement!" noted Ms Lydie Hakizimana, Chief Executive Officer of AIMS who was the guest speaker at the event, "But completing your AIMS study does not mean you leave our family. Instead, you are joining our more than 2500 vibrant alumni who have gone on to make an impact across sectors, disciplines, and industries in Africa and beyond."

Ms Esther Wanangachi Lwazi
Student Speaker

Mr Mendrika Henitsoa Rakotomanga
Student Speaker

Mr Mendrika Henitsoa Rakotomanga, from Madagascar and Ms Esther Wanangachi Lwazi, from Malawi, spoke on behalf of the students. "The past 9 months were the best time of our lives. On behalf of our fellow students, we would like to express our sincere gratitude to AIMS. We consider ourselves lucky to have come through the doors at AIMS, our success is not only based on what we were fed in class, but also the people around us who welcomed us. AIMS was like living in one big extended family."

AIMS South Africa Graduation 2022

POST AIMS:

SUPPORT, OPPORTUNITIES AND ALUMNI

PROGRESS OF RECENT STUDENTS

Full Name	Gender	Origin	Institution	Programme/Position
Graduates from January 2021 Intake				
Madou Bayoulou	M	Burkina Faso	Still exploring opportunities	
Tebogo Doctor Malatsi	M	South Africa	Still exploring opportunities	
Nhlangano Dale Maluleke	F	South Africa	Still exploring opportunities	
Malesela Simon Mokhanda (2020-2021 Intake)	M	South Africa	First National Bank, South Africa	Quantitative Analyst
Kanting Evidence Motimele	M	South Africa	Still exploring opportunities	
Aaron Mubatapasango	M	Zimbabwe	Witwatersrand	PhD
Phumudzo Nematswerani	M	South Africa	Still exploring opportunities	
Mary Njeri	F	Kenya	Laikipia University	Part-time Lecturer
Sinethemba Nongqoto	M	South Africa	Still exploring opportunities	
Joel-Pascal Ntwali N'Konzi	M	DRC	University of Edinburgh & Heriot-Watt University	PhD
Londani Tshindane	M	South Africa	University of Venda for Science and Technology	Junior Lecturer
Graduates from 2021–2022 Intake				
Wezzie Grace Banda	F	Malawi	Malawi Revenue Authority	Research Analyst
Godfrey Bashaga	M	Botswana	Botswana International University of Science & Technology	PhD
Abraham Chakawa	M	Zimbabwe	IIP (2022)	
Mulenga Chipoka	M	Zambia	Still exploring research opportunities	
Pride Duve	M	Zimbabwe	Bernhard Nocht Institute of Tropical Medicine, Germany	PhD
Joseph Kamusha	M	Zimbabwe	Still exploring research opportunities	
Musawenkosi Elvis Khulu	M	South Africa	IIP (2022) Western Cape	PhD
Zeymisco Elias Kweya	M	Tanzania	Still exploring opportunities	
Esther Wanangachi Lwazi	F	Malawi	Data Science Internship	IVADO, Canada
Alinafe Maenje	M	Malawi	Nico Pensions Limited	Pensions Executive
Happiness Edit Mahlalele	F	South Africa	Still exploring opportunities	
Mtsetfosisekelo Mlondi Sisekelo Mhlanga	M	Eswatini	IIP (2022) Eswatini Financial Intelligence Unit	Analyst
Francisca Justin Mulebya	F	Tanzania	Mwenge Catholic University	Mathematics and Statistics Assistant Lecturer
Lupiya Musonda	M	Zambia	IIP (2022)	
Nobuhle Mutombeni	F	Zimbabwe	IIP (2022)	
Gershom Mwale	M	Zambia	IIP (2022)	

Full Name	Gender	Origin	Institution	Programme/Position
Enock Joseph Mwenitete	M	Malawi	Still exploring opportunities	
Dumisani Lickson Namakhwa	M	Malawi	Still exploring opportunities	
Previa Ng'andu	F	Zambia	DigiSkills Africa	Research II
Luzuko Nzayo	M	South Africa	Still exploring opportunities	
Opeyemi Dorcas Ogundeji	F	Nigeria	TBC	PhD
Mendrika Henitsoa Rakotomanga	M	Madagascar	Still exploring opportunities	
Bria Aimé Razanaparany	M	Madagascar	Still exploring research opportunities	
Bekithemba Sibanda	M	Zimbabwe	Still exploring opportunities	
Leon Mangaliso Sihlongonyane	M	Eswatini	IIP (2022)	
Kunengwa Tembo	M	Zambia	Still exploring opportunities	
Nkgaphe Tebatjo Tsebesebe	M	South Africa	IIP (2022)	
Banele Blessing Zondo	M	Eswatini	IIP (2022) Western Cape	PhD

Industry Immersion Programme

The AIMS-ESMT Industry Immersion Programme (AIMS ESMT IIP), now rebranded as the Industry Immersion Programme (IIP) started in 2017 as a partnership between AIMS and the European School of Management and Technology (ESMT) in Berlin, with funding support from the German Federal Ministry for Economic Cooperation (BMZ) through the German Academic Exchange Service (DAAD). The programme was seeking to provide AIMS' mathematically trained graduates with digital, soft, and business skills and internships to enhance their ability to take up careers in industry. The joint founders of the programme were Prof. Wulff Plinke and Mr Nick Barniville, and Mr Mark Heerden and Dr David Attipoe, an AIMS alumnus, both at AIMS.

The IIP team partnered with Academics Without Borders (AWB) in Canada to scale the programme outside of AIMS. Following a challenging 2020 with the onset of the COVID-19 pandemic, we managed, with the support of all the partners, to deliver yet another successful "Online Blended Programme". The Business Skills modules were drawn from the ESMT Online MBA, comprising notes, streamed lectures, and Zoom Q&A sessions with the relevant professors. In 2021, we successfully scaled the programme to Strathmore University in Kenya and have since trained more than 20 students from Strathmore.

Focusing on data analytics and business intelligence in the workplace (workspace for those in hybrid internships) this year, complementing the general business skills, with modules such as Data & Decisions, Data Analytics for Business and Agile Leadership. Once again "Engageli" the online engagement learning platform was used. This platform offers an inclusive, secure virtual classroom for higher education and is designed to recreate high-quality, small-group collaborative experiences, even in a large-scale environment. Engageli is advancing the higher education industry globally by improving virtual teaching and learning experiences. Its premier cloud-based, multimodal digital learning technology creates flexible, inclusive, secure environments optimized for learner connections and active learning. The company has been recognized for these innovations and named to the 2021 HolonIQ EdTech 200 list, highlighting the most promising education technology companies in North America. The company was founded in 2020 by Dan Avida, Dr Serge Plotkin, and Dr Daphne Koller, Co-Founder of Coursera and Insitro.

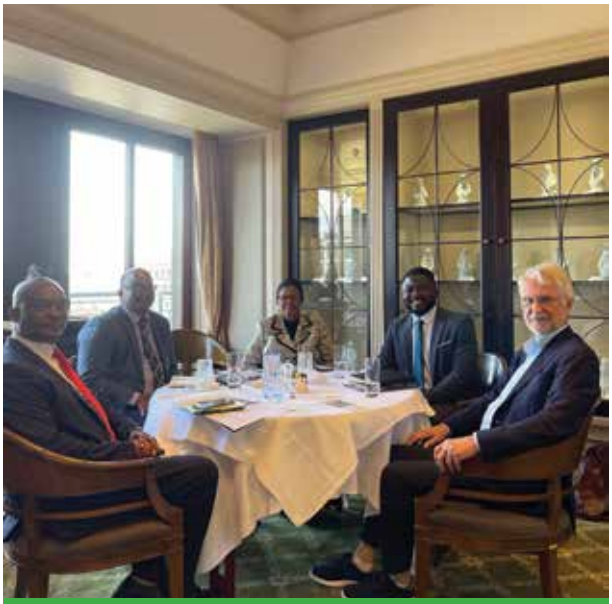
Furthermore, we brought back the Design Thinking class offered by Prof. David Dunne, University of Victoria in Canada. We also had two new lecturers join the programme from the Gustavson Business School of the University of Victoria in Canada.

The number of candidates in the 2022 IIP cohort doubled to 100 participants from 15 African Countries. This comprised of 86 students from AIMS and 14 students from Strathmore University in Kenya. The students were hosted at AIMS South Africa, AIMS Ghana, AIMS Rwanda and in Kenya, with a new cohort at AIMS Cameroon. The IIP was run for five weeks from 4 July to 5 August 2022. Dr Attipoe led the Online Blended Programme remotely assisted by part-time MBA tutors present in the other programme centres. This year, Harvard Business Publishing granted access to all relevant teaching materials for free. Students participated in the world-renowned Everest Simulation. The simulation was delivered by Prof. Stacey Fitzsimmons from the University of Victoria in Canada. She recently visited AIMS South Africa to further strengthen the relationship between the programme and the faculty at the Gustavson Business School.

As always, the internships remain integral to the success of the programme. Results of the previous three years attests to this success with over 80% of students successfully being placed into internships or employment. This year's cohort are currently being placed into internships.

To manage the effective scaling of the IIP throughout the AIMS fraternity, the founding team have registered a new organisation called Industry Immersion Africa (iiAfrica). The mandate of the non-profit organisation is to enhance STEM graduate employability across Africa. iiAfrica's office is within AIMS South Africa premises in Muizenberg, Cape Town. Founder of iiAfrica, Prof. Plinke, founding Dean of ESMT Berlin, expressed his joy in this step to see the creating a sustainable organisation from the IIP programme. Dr Attipoe was appointed Managing Director of iiAfrica.

In conclusion, the IIP has now scaled the offering to 4 AIMS centres, AIMS Ghana, AIMS Rwanda, AIMS Cameroon and AIMS South Africa. We will continue to offer the programme at Strathmore University in 2023.



Meeting with the Ambassador of Botswana to Germany in Berlin

iiAfrica Team

IIP graduates at AIMS Rwanda

Visit by IIP Professor from the University of Victoria in Canada

Alumni Updates

Ms Tatenda Emma Matika, originally from Zimbabwe and Ms Tshenolo Thato Daumas, from South Africa, both AIMS South Africa 2019 graduates were selected for the AIMS and Eberhard Karls University Tübingen prestigious Data Science & AI Fellowship Programme.

Mr Trust Chibawara, who graudated from AIMS South Africa in 2008, successfully completed his PhD studies with SU. His thesis was titled: 'Model-Based Inference of the Impact of Early Access to Anti- retroviral Therapy for All on HIV Incidence among Young Woman in Swaziland'. Trust has had the opportunity to experience AIMS life in many different roles: as an AIMS alumnus, AIMS Research Master's scholarship beneficiary, an AIMS Tutor as well as working for the AIMS Network. "I will forever be grateful for all the support and encouragement that I have been privileged to receive from AIMS. I have grown so much as a person by having been through AIMS, have been inspired in many ways and for that I will forever be grateful."

Ms Valimbavaka Hosana Ranaivomanana, who graduated from AIMS South Africa in 2018 and was a awarded a DAAD Scholarship in 2019, successfully completed her PhD in Pure Mathematics at SU. She was also a tutor at AIMS South Africa.

ALUMNI

PROFILES

Dr Issa Karambal
AIMS South Africa 2007

Issa joined AIMS South Africa in the 2006 intake for the Postgraduate Diploma in Mathematical Sciences. Upon graduating, he completed a Master's in Applied Mathematics at UKZN before joining Heriot-Watt University for a PhD in Applied Mathematics. Thereafter, he moved to Canada, where he occupied different positions in both academia and industry, the most senior being a senior manager of advanced analytics at the Canadian Imperial Bank of Commerce. In November 2021, Dr Issa returned to AIMS as the AIMS-Carnegie Junior Research Chair in Data Science at Quantum Leap Africa (QLA) where amongst other responsibilities he will nurture Africa's next-generation of data scientists. His main research interest includes theoretical and applied data science. In particular, he is interested in solving problems related to health, education, and agriculture using machine learning. He is also interested in the approximation theory of deep neural networks, and spectral analysis of non-selfadjoint operators resulting from the linearization of nonlinear PDEs.

Dr Oluwakemi Imole Adewumi
AIMS South Africa 2016

Kemi joined AIMS in 2015 from Ekiti State University, Nigeria. Upon graduating from AIMS South Africa, she secured the prestigious commonwealth scholarship for a Master's in Quantitative Finance and Mathematics at Heriot-Watt University, from which she graduated with distinction. This achievement won her the Vice Chancellor's Scholarship to pursue a PhD in Economics at the University of Kent. She recently graduated from this PhD programme and is currently working as a Statistical Analyst at the Government Statistical Services in the UK. She also recently consulted for the World Bank.

Motivated by the challenges she faced during her undergraduate studies, Dr Kemi founded a non-profit, CHRISTAD Foundation (www.christadfoundation.org), which helps create awareness of the various possible career paths for a degree in Mathematics within her community.

Dr Samuel Edet
AIMS South Africa 2017

Samuel is currently an Associate Economist at the World Bank Group. He joined AIMS after completing a Bachelor's degree in Mathematics from the University of Ibadan. After his time at AIMS, he joined a joint doctoral programme between KU Leuven and IMT School for Advanced Studies. His thesis was on 'Essays on Innovation Networks and Global cities', part of which was featured in the Economist. During his PhD he was selected for a graduate training programme with the World Bank which matured into his current position. His personal blog can be found on https://samueledet.com/ where he writes on social and political issues, mostly in Africa.

Tatenda Emma Matika
AIMS South Africa 2020

Tatenda joined AIMS in 2019 from the National University of Sciences and Technology, Zimbabwe. Whilst at AIMS, she developed an interest in Data Science which influenced her trajectory to her current research fellowship at the University of Tübingen. She was among the five AIMS alumni selected for the inaugural intake of this prestigious fellowship, and her current project is to understand and improve teachers' attention in classroom settings based on data recorded from smart glasses worn by the teachers. Before this fellowship, she was a research intern at ICRISAT in Bamako, Mali, where she worked on a project to develop a market analytics module for smallholder farmers. Due to her passion for data science and AI, she has contributed related content in various media, including a blog (https://tatematika.wordpress.com/posts/) and a YouTube channel (Tatenda Emma) where she covers tutorials, interviews and mentorships.

RESEARCH

The Research Centre is supported by the Department of Science and Technology and the National Research Foundation, South Africa; the German Government (through the BMBF); and the Alexander von Humboldt Foundation. The Research Centre is now 14 years old and hosts researchers working in several focus areas under the theme Mathematical Modelling in a Multidisciplinary Context.

Prof. Philip Mashele's appointment as Part-time Senior Resident Researcher and Dr Marc Sedjro's appointment as a German Research Chair ended on 31 December 2021.

RESIDENT RESEARCHERS

Name	Current Position	Gender	Area of research
Dr Bubacarr Bah	German Research Chair	M	Applied mathematics and computer science
Prof. Bruce Bassett	Senior Resident Researcher	M	Cosmology and astrophysics
Dr Emmanuel Dufourq	AIMS Canadian Junior Research Chair in Climate Science	M	Machine learning
Dr Rejoyce Gavhi-Molefe	Resident Researcher	F	Computational mathematics: subdivision
Prof. Barry Green	Senior Resident Researcher	M	Pure mathematics
Prof. Cang Hui	South African Research Chair Mathematical and Theoretical Biosciences (SU-AIMS)	M	Mathematical and theoretical physical biosciences
Prof. Phillip Mashele	Part-time Senior Resident Researcher (appointment ended 31 December 2021)	M	Mathematical finance
Prof. Jeff Sanders	Senior Resident Researcher	M	Theoretical computer science
Dr Mario Santos	South African Research Chair in Cosmology with Multi-Wavelength Data (UWC-SAAO-AIMS)	M	Cosmology and astrophysics
Dr Marc Sedjro	German Research Chair (appointment ended 31 December 2021)	M	Applied mathematics with specialization in Partial Differential Equations and Calculus of Variations
Dr Simukai Utete	Senior Resident Researcher	F	Robotics

POSTDOCTORAL FELLOWS

There were 10 postdoctoral fellowships during the period under review.

Name	Citizenship	Gender	Start date to end date	Research Field	Supervisor/Host
Shankar Agarwal	India	M	1 April 2018 – 31 December 2022	Data Science	Dr B Bah
Andronicus Akinyelu	Nigeria	M	1 February 2022 – 1 July 2022	Improved COVID-19 diagnosis using Capsule neural network (CapsNet)	Dr B Bah
Sthembiso Reuben Gumede	South Africa	M	1 September 2019 – 31 August 2021	Dynamic modelling of species distributions in response to climate change	Prof. C Hui
Elbahja Hamid	Morocco	M	1 April 2022 – 31 March 2024	Physics Aware Learning	Dr B Bah
Lorene Jeantet	France	F	1 April 2022 – 31 March 2024	Investigating machine learning model for ecology	Dr D Dufourq

Martha Kamkuemah	Namibia	F	1 July 2022 – 30 June 2024	Specification and Validation of Artificial Intelligence-based Internet of Things Systems	Prof. J Sanders
Ines Mbando	Cameroon	F	1 August 2022 – 31 July 2024	Classification of High Frequency Trade direction using Machine Learning: Application to the South Africa Financial Data	Prof. B Green
Daniel Nickelson	Germany	M	1 October 2019 – 31 July 2022	Estimation of Marginal Likelihood for Complex Models	Dr B Bah
Dinna Ranirina	Madagascar	F	1 January 2019 – 31 July 2021	Data Science	Dr B Bah
Chebbi Sabrine	Tunisia	F	1 April 2022 – 31 March 2024	Multi-armed Bandit, Theory and Application in Communication Networks	Dr B Bah

POSTGRADUATE STUDENTS IN THE RESEARCH CENTRE

The number of students hosted by the AIMS Research Centre and supervised by AIMS resident researchers totalled 36 during the period under review. Fourteen of these are doctoral students. The 11 students who have graduated are asterisked in the table below.

PHD STUDENTS

No.	Name of student	Citizenship	Gender	Study duration	Supervisor	Based at
1	Buri Gershom	Uganda	M	6 September 2016 (ongoing)	Dr W Ndifon	AIMS/SU
2	Eberechi Georgina Chris-Kalu	Nigeria	F	2019 (ongoing)	Dr D Ikpe	UNISA
3	Benjamin David Du Toit	South Africa	M	1 January 2017 (ongoing)	Prof. C Hui	SU
4	Ephifania Geza	Zimbabwe	F	24 August 2015 (ongoing)	Prof. N Mulder	AIMS/SU
5	Martha Ndeyapeuomagano Kamkuemah*	South Africa	F	1 July 2016 – 30 April 2022	Prof. J Sanders	AIMS/SU
6	Mmatlou Kubyana*	South Africa	M	1 March 2020 (ongoing)	Prof. C Hui	SU
7	Vitalis Kimutai Lagat*	Kenya	M	1 May 2017 – 30 April 2022	Prof. C Hui	SU
8	Funmilayo Makinde	Nigeria	F	1 January 2019 (ongoing)		UCT
9	Samuel Ofosu Mensah	Ghana	M	1 February 2019 (ongoing)	Dr B Bah	AIMS/SU
10	Thina Ncube	South Africa	F	1 February 2019 (ongoing)	Prof. C Hui	SU
11	Rockefeller	Nigeria	M	1 January 2020 (ongoing)	Dr B Bah	AIMS/SU
12	Ethan Roberts*	South Africa	M	1 March 2018 – 31 December 2021	Dr N Oozeer and Prof. B Bassett	AIMS/UCT
13	Lorenzo Ruaro	Itally	M	1 January 2020 (ongoing)	Prof. C Hui	SU
14	Abdulrahaman Lawal Suleiman	Nigeria	M	1 January 2018 (ongoing)	Prof. C Hui	SU

MASTER'S STUDENTS

No.	Name of student	Citizenship	Gender	Study duration	Supervisor	Based at
1	Dorcas Asare	Ghana	F	1 July 2022 (ongoing)	Dr B Bah	AIMS/SU
2	Vedanth Baiju	South Africa	M	1 January 2022 (ongoing)	Dr E Dufourq	UCT
3	Donavan Broughton	South Africa	M	1 January 2022 (ongoing)	Dr E Dufourq	SU
4	Everlyn Chimoto	Kenya	F	1 February 2022 (ongoing)	Prof. B Bassett	AIMS/UCT
5	Roanne Coetzer	South Africa	F	1 January 2022 (ongoing)	Dr E Dufourq	SU
6	Tshenolo Thato Daumas*	South Africa	F	1 February 2020 – 30 April 2022	Dr B Bah	AIMS
7	Thembelihle Rose Dlamini	Eswatini	F	29 April 2022 (ongoing)	Prof. H Touchette & Dr D Nickelsen	SU/AIMS
8	Evander El-Tabonah Nyoni*	Zimbabwe	M	25 August 2019 – 31 December 2021	Prof. B Bassett	AIMS
9	Richard Gibbs	South Africa	M	1 January 2020 - 30 April 2022	Prof. C Hui	SU
10	Thomas Gueifão	Portugal	M	1 January 2022 (ongoing)	Dr E Dufourq	University of Lisbon
11	Charles Herbst	South Africa	M	1 January 2022 (ongoing)	Dr E Dufourq	SU
12	Precious Blessing Khumalo	South Africa	F	1 February 2020 (ongoing)	Dr Y Gaba and Prof. HP Kunzi	UCT
13	Kiprono Elijah Koech*	Kenya	M	1 February 2020 – 30 April 2022	Dr B Bah	AIMS
14	Thabang Malapane	South Africa	M	1 July 2021 (ongoing)	Dr E Dufourq & Prof. F Nichols	SU
15	Tebogo Malatsi	South Africa	M	1 March 2022 (ongoing)	Prof. Abdul Kara	WITS
16	Santeshan Naidoo	South Africa	M	1 January 2022 (ongoing)	Dr E Dufourq	SU
17	Kibidi Neocosmos*	South Africa	M	1 February 2020 – 30 April 2022	Dr B Bah	AIMS
18	Thabani Ngcobo	South Africa	M	1 July 2019 (ongoing)	Dr N Hale & Dr M Sedjro	SU
19	Max Nieuwoudt*	South Africa	M	1 February 2020 - 31 December 2021	Prof. B Bassett	AIMS/UCT
20	Nonhlanhla Luphade	Zimbabwe	F	1 January 2021 (ongoing)	Dr E Dufourq	UCT
21	Emmanuel Sekyi*	Ghana	M	1 February 2020 – 30 June 2022	Prof. B Bassett	AIMS/UCT
22	Joseph Wacira	Kenya	M	22 March 2022 (ongoing)	Dr B Bah & Prof. W Brink	AIMS/SU

RESEARCH ACHIEVEMENTS

- Mr Ofosu Mensah, was awarded an internship at the Excellence Cluster "Machine Learning - New Perspectives for Science" at the Institute for Ophthalmic Research, University of Tübingen from 1 November 2021 for 4 months. He continued his work on deep learning for retinopathy in collaboration with a start-up, Eye2you, which is developing cameras for imaging the retina.
- Dr Vernon Visser (SANBI), **Prof. Cang Hui (SU/AIMS)**, Dr Sandra MacFadyen (SU), Prof. John Measey (SU) and **Dr Emmanuel Dufourq (SU/AIMS)**, have won the NITHeCS grant of R1 million to create a research programme titled: "Advancing Biodiversity Informatics and Ecological Modelling".
- Dr Dufourq has also been appointed as part of the editorial board for the Ecological Informatics Journal.

RESEARCH

INITIATIVES

AFRICA Data Science Intensive (DSI) Programme 2022

The DSI Programme is an extended workshop based on the JEDI (Joint Exchange Development Initiative) model that uses real-world problems to give participants hands-on knowledge of the latest algorithms and techniques in data science and artificial intelligence, insights into industry trends and standards, network building and practical team skills used in business to facilitate transitioning to a data science role in industry, academia or through entrepreneurship.

The first edition of the DSI took place in 2018 and the second edition in 2020. The third edition of the DSI Programme started on 24 January 2022 with 20 participants (45% of whom were women representing ten African countries) chosen from 2268 applicants.

The founder and lead organiser of the DSI is Prof. Bruce Bassett. The Academic Lead & Manager for the 2022 programme was Dr Nadeem Oozeer (SARAO), supported by the following tutors: Mr Martin Page, Dr Tanya Garrigoux, Mr Felix Silwimba and Mr Emmanuel Sekyi, all DSI Alumni, together with Mr Edoardo Altamura, a PhD student in Computational Astrophysics and Cosmology at the University of Manchester. The Programme Manager was Ms Linda Camara, with administrative support provided by Ms Rene January.

The 2022 Africa DSI programme was once again run online, and an in-person workshop was held in Paarl, from 9 to 13 May, giving participants an opportunity to do team building activities, submit and present their final research projects. Participants completed the following modules: Module 1: Introduction to machine learning and key data science skills: Regression (including Computer Vision); Module 2: Optimisation and Forecasting and Module 3: Natural Language Processing. For the 4th module participants selected their own topics and had to apply the appropriate tools, concepts and skills to tackle the challenge successfully, thereby demonstrating mastery of the full data science project cycle. Final project topics included amongst others: an automated school attendance system; retail data analysis and customer segmentation and growth analysis; bioacoustics; object detection of solar radio bursts; data analytics for improving blood service management; plant disease classification and detection; cattle activity recognition and tracking; galaxy image classifier; computer vision applied to reptile classification; forecast and optimisation for renewable energy scheduling; modelling influenza incidence; and fraud detection.

On 13 May 2022, the top four participant presenters were selected to give presentations to a panel of judges which consisted of Dr Rob Adam (Managing Director, SARAO), Prof. Barry Green (Director, AIMS South Africa); Mr William Galloway (Chief of Intelligence, Voxcroft); and Mr Dries Cronje (CEO and Founder of Deep Learning Cafe).

Mr Christopher Mbeva from Kenya, was selected as the winner. Mr Mbeva, also a keen farmer, presented work he had done in creating an online plant disease classifier and detection tool. Users can upload photographs and videos and receive advice and information on how to manage any problems detected.

Mr Sitwala Mundia, from Zambia, was the overall top participant for the Africa DSI 2022 Programme, with Ms Rhodasi Mwale, also from Zambia, in second place and Ms Amy Rouillard, from South Africa in third place.

Mr Christopher Mbeva
Africa DSI winner 2022

Ms Rhodasi Mwale
Africa DSI 2nd place 2022

Ms Amy Rouillard
Africa DSI 3rd place 2022

Mr Sitwala Mundia, top DSI participant with Mr Khaya Sishuba, Director Bilateral Relations, Department of Science & Innovation

Guest speakers at the event included Mr Khaya Sishuba, Director Bilateral Relations, Department of Science & Innovation. He noted, "It is very interesting to see how the projects selected by the participants have an impact on real life. This programme really talks to the heart of the human capital development efforts being conducted by the department. I am grateful for the work that is being done and for our strategic partners, in particular the United Kingdom, who support these types of programmes." For the participants he added, "Your impact will be great, the network you have created and the learnings you have achieved will go a long way to generate joint projects and interactions in the future across the African continent."

Ms Nancy Armah and Mr Arnold Kgabi spoke on behalf of the participants. Ms Armah said, "This experience was stupendous. It forced us all to grow in every area of our lives. For the last four months my whole life was DSI. Thank you to all the organisers and tutors." Mr Kgabi also added his thanks and said, "The relationships and partnerships found here will help us make a real difference. This programme changes lives and it would be great to see it continue and reach out to more people."

Lecturers and judges for the course came from all over the world including organisations such as Airbnb, Cambridge University, IBM, Nvidia, Netflix as well as African startups and companies such as Nosible, Optimum and VoxCroft Analytics. Among the lecturers were: Prof. Neil Lawrence (Cambridge University); Dr Navin Sivanandam (Airbnb); Dr Sudeep Das (Netflix); Ms Annika Brundyn (Solutions Architect @ NVIDIA and DSI alumnus); Mr Stuart Reid (Nosible); Dr Talisin Beynon; Dr Celia Cintas (IBM); and Dr Jennifer Veitch (SAEON).

The programme sponsor was the UK – South Africa Newton Fund through the Development in Africa with Radio Astronomy (DARA) Big Data project. Other sponsors included AWS and Nvidia. The DSI is undertaken in collaboration with AIMS South Africa and Grailabs.

Africa DSI 2022 Participants and tutors with Prof. Bruce Basset

PRESENTATIONS

AT WORKSHOPS AND CONFERENCES

Throughout the year, AIMS Researchers and students attended various conferences and workshops to present their work. These included the following:

- Dr Bah gave a presentation at a **CoE–MaSS Seminar** held on 6 August, titled: 'An Integer Programming Approach to Deep Neural Networks with Binary Activation Functions'.
- On 29 August 2021 Dr Bah gave a talk titled: 'On Error Correction Neural Networks for Economic Forecasting' at the **IndabaX Senegal Workshop**.
- On 6 September Dr Dufourq, gave a talk titled: 'Machine Learning for Ecology' at a **NITheCS Colloquium**.
- Mr Rockefeller gave three presentations with the title: 'Modelling of Chaotic Dynamical Systems using Historical Consistent Neural Network (HCNN)'. On 10 September in the **Seagate Minnesota Campus Distinguished Speaker Series**. As an AIMS Doctoral Training Programme in Climate-Related Sciences PhD Fellow he gave the talk at the bi-annual research update meeting held on 17 September. On 1 October he gave the talk at the **AIMS–Germany Mini–symposium on Applied Mathematics** hosted by the University of Passau. His talk was ranked as one of the 3 best (out of 24) and won the DAAD prize of 500 Euros.
- Mr Ofosu Mensah, gave a presentation at the **8th Heidelberg Laureate Forum** which was held from 20 to 23 September 2021.
- Dr Nickelsen presented at the **64th Annual Congress of the South African Mathematical Society** held from 29 November to 1 December 2021, online.
- Dr Sedjro was one of the guest speakers at the **AIMS Cameroon Mathematics and its Applications Meeting**. This was held from 12 to 14 January 2022
- Dr Dufourq gave a talk at **Wildlife Acoustics** on 20 January 2021 which was part of the webinar series "Primates You May Have Missed" where he discussed how machine learning is being used to monitor the critically endangered black-and-white ruffed lemurs in Madagascar and the critically endangered Hainan gibbon in China.
- On 26 March 2022, Prof. Bassett gave a talk titled: 'A Brief History of the Future: The Fate of our Universe,' at a **SAAO Cape Town Open Night**.
- On 8 April 2022, Dr Nickelsen gave a talk titled: 'How to learn from what we don't know,' at the **CoE–Mass Weekly Seminar**.

Dr Dufourq at Bata University

Prof. Bassett SAAO talk

SEMINARS

The Journal Club

This is a seminar series of the AIMS Research Centre, where research students, AIMS researchers, visiting researchers and invited speakers present their research. The focus of the talks is to share the journey of obtaining research results including challenges faced and insights gained. The following talks were held in the period under review.

- On 7 September Dr Nickelsen (AIMS) gave a talk titled: 'Bayesian inference for laws of nature - a fantasy?'
- On 21 September, Prof. Sanders (AIMS) gave a talk titled 'Modelling Consciousness.'
- On 28 September, Dr Whasuck Lee (UWC) gave a talk titled 'Operator theoretical approaches to Partial Differential Equations.'
- On 19 October 2021, Mr Rockefeller (AIMS) gave at talk titled: 'Modeling of Chaotic Dynamical Systems using Historical Consistent Neural Networks (HCNNs)'.
- On 26 October 2021, Dr Hans-Georg Zimmermann (Fraunhofer Insitute for Intelligent Systems, Germany) gave a talk titled: 'From Modelling Intelligence to Modelling Consciousness'.
- On 2 November 2021, Mr Koech (AIMS), gave a talk titled: 'On Action Recognition and Video Classification - An Overview'.
- On 16 November, Ms Juliana Marcos (AIMS alumna) gave a talk titled: 'Object Detection and Tracking for Space Situational Awareness using Event-based Cameras: A Reproducibility Study'.
- On 2 February 2022, Dr Jan Hązła (Swiss Federal Institute of Technology Lausannea (EPFL) / AIMS Rwanda) gave a talk titled: 'Channel coding of binary linear codes and Reed-Muller codes.'

Dr Jan Hazla

- On 15 March 2022, Mr Kubyana (SU/AIMS) gave a talk titled: 'Nonlinear dynamics of the rock-paper-scissors game.'
- On 29 March 2022, Dr Christian Budde (University of the Free State) gave a talk titled: 'One-Parameter Semigroups - An Operator Theoretical Approach to Evolution Equations'.
- On 3 May 2022, Prof. Rafael Nepomechie (University of Miami) gave a talk titled: 'Bethe ansatz and quantum computing.'

Prof. Rafael Nepomechie

- On 10 May 2022, Mr Gershom Buri (AIMS / SACEMA) gave a talk titled: 'Vaccinating to mini-mise COVID-10 morbidity.'
- On 17 May 2022, Dr Madhurananda Pahar (SU) gave a talk titled: 'Using machine learning to detect COVID-19 in vocal audio'.
- On 31 May 2022, Dr Peter Olukanmi (University of Johannesburg), gave a talk titled: 'Algorithms in the 4IR: Improved machine learning techniques via probability theory.'

Financial Mathematics Webinars

The Financial Mathematics Research Group at AIMS South Africa hosted the following webinars:

- On 30 September 2021, Dr Rock Stephane Koffi (Elenjical Solutions) gave a talk titled: 'A Fitted Multi-Point Flux Approximation (MPFA) Method for pricing two asset options'.
- On 28 October 2021, Dr Hermann Azemtsa Donfack (University of Johannesburg) gave a talk titled: 'Interpolating Volatility Smile with Radial Basis Functions'.
- On 2 December 2021, Prof Phillip Mashele (NWU/AIMS) gave a talk titled: 'Research gaps in Financial Mathematics'.

Research Visitors

Dr Franck Kalala Mutobo, Academic Director, AIMS Senegal visited AIMS South Africa from 1 to 8 September. He held research discussions with Dr Bah and he gave a presentation at the Data Science Group Reading meeting on 7 September 2021. He also had a meeting with Prof. Green.

Dr Yae Gaba, affiliated with Quantum Leap Africa at AIMS Rwanda, and a postdoc supervised by Dr Bah, visited the AIMS Research Centre from 17 November to 15 December 2021.

LIST OF PUBLICATIONS

2021

Adabor, E. S. (2021) 'Computational investigations of the immune response to repeated influenza infections and vaccinations', *Royal Society Open Science*, 8(3). doi: 10.1098/rsos.201433.

Bah, B. et al. (2021) 'Learning deep linear neural networks: Riemannian gradient flows and convergence to global minimizers', *Information and Inference: A Journal of the IMA*, 11(1), pp. 307–353. doi: 10.1093/imaiai/iaaa039.

Attipoe, D. S. and Tambue, A. (2021) 'Convergence of the mimetic finite difference and fitted mimetic finite difference method for options pricing', *Applied Mathematics and Computation*. Elsevier Inc., 401, p. 126060. doi: 10.1016/j.amc.2021.126060.

Barbieri, D. M. **(Hui, C.)** et al. (2021) 'Impact of COVID-19 pandemic on mobility in ten countries and associated perceived risk for all transport modes', *PLoS ONE*, 16(2 February), pp. 1–18. doi: 10.1371/journal.pone.0245886.

Basel, A. M. **(Hui, C.)** et al. (2021) 'Assemblage reorganization of South African dragonflies due to climate change', *Diversity and Distributions*, 27(12), pp. 2542–2558. doi: 10.1111/ddi.13422.

Blot, L. **(Agarwal, S.)** et al. (2021) 'Cosmological model parameter dependence of the matter power spectrum covariance from the DEUS-PUR Cosmo simulations', *Monthly Notices of the Royal Astronomical Society*, 500(2), pp. 2532–2542. doi: 10.1093/mnras/staa3444.

Boyero, L. **(Hui, C.)** et al. (2021) 'Impacts of detritivore diversity loss on instream decomposition are greatest in the tropics', *Nature Communications*, 12(1), pp. 1–11. doi: 10.1038/s41467-021-23930-2.

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WORKSHOPS

AND CONFERENCES

AIMS South Africa hosted three workshops in this reporting period.

Graph Theory Workshop

This workshop was organised by AIMS Alumnus Dr Eric Adriantiana Head of Department/Senior Lecturer, Math Department, Science Faculty, Rhodes University. It was held at AIMS South Africa from 8 to 10 December 2021. There were eight participants and this workshop was funded by CoE-MaSS.

Participants at the Graph Theory Workshop

ICI3D Strategy, Sustainability, and Succession Planning workshop

This workshop was hosted at AIMS South Africa from 27 June to 8 July 2022. The International Clinics on Infectious Disease Dynamics and Data (ICI3D) cultivates locally led application of modelling skills to inform decision-making for public health planning and policy in Africa through coordination and support of training, career development, and networking activities that unite people across disciplinary and institutional boundaries. Ten participants took part in this workshop.

CIMPA Research School

The CIMPA Research School: Mathematical and Statistical Methods for Data Science, was held at AIMS South Africa from 18 to 29 July 2022. The school aimed to introduce students to the mathematical and statistical underpinnings of some of the latest Data Science methods that seek to address the challenge of Big Data analysis.

The attendance/participation was a hybrid with onsite and online participation (30 participants attended onsite and 45 online). Similarly, lectures were delivered in a hybrid format. The following courses were delivered onsite:

- Statistical Methods for Spatial Data Science by Prof. Sophie Dabo-Niang, Université de Lille
- Deep Generative Models by Dr Steve Kroon, SU
- Science Communication by Dr Gavhi-Molefe, AIMS South Africa

The following courses were delivered online:

- Randomized Numerical Linear Algebra by Dr Bah, AIMS South Africa
- Topics in the Analysis of Large Databases by Dr Patrick Tardivel, Institut de Mathématiques de Bourgogne, Burgundy University
- Modern Graphical Models by Prof. Piotr Graczyk, LAREMA, Université d'Angers and Dr Salha Mamame, University of the Witwatersrand
- Complex Networks, Embedding Methods and Applications by Prof. Franck Kalala Mutombo, University of Lubumbashi

Participants at the CIMPA Research School

AIMSSEC

AIMS SCHOOLS ENRICHMENT CENTRE

Introduction

The African Institute for Mathematical Sciences School Enrichment Centre (AIMSSEC), is a non-profit organisation in South Africa whose mandate (amongst others) is to enhance capacity building and upskilling of mathematics teachers through a series of in-service teacher development training courses for primary and secondary mathematics teachers in South Africa. The CAPS document remains the underpinning curriculum that informs AIMSSEC's teaching content, as this is the curriculum South African learners follow during their educational journey. At our core, AIMSSEC believes in strengthening capacity while empowering mathematics teachers to equip their students with the desired 21st century skills.

AIMSSEC's intervention is informed by the following issues which have been identified within South African schools:

I. Underqualified teachers in rural and disadvantaged communities.
II. South Africa ranked low in international comparisons of maths and science education;
III. Inequalities in educational opportunities;
IV. The need for in-service training;
V. The lack of teaching materials to engage learners in developing the understanding and skills needed in this fast-changing world.

The educational terrain in South Africa is endowed with plenty of lesson resources and textbooks but few of these meet the country's desired national needs for teaching/learning in this 21st century.

AIMSSEC, prides itself on providing top notch lesson resources, carefully designed to meet national demands as far as the South African child's education is concerned. These resources are freely available on AIMSSEC's aiming high website: https://aiminghigh.aimssec.ac.za

In the reporting period, from August 2021 to July 2022, AIMSSEC delivered three professional development training courses:

I. MT2 online under the auspices of the South African Mathematical Foundation (SAMF) and AECI
II. MT3 online under the auspices of SAMF and Standard Bank
III. DIMC SAMO 3 online under the auspices of SAMF and Old Mutual.

> ***AIMSSEC endorses the continued upskilling and training of mathematics teachers to enable South African learners to embrace 21st century skills.***

An overview of the three online intervention courses offered during the reporting period

Both the **Mathematical Thinking** online courses MT2 and MT3 were offered to mathematics teachers at Senior Phase- SP (Grades 7 – 9) and Further Education and Training - FET Phase (Grades 10 – 12). The MT2 course attracted 75 teachers of which 11 subsequently withdrew, and the MT3 course attracted 74 teachers of which 16 did not complete the course. This was a seriously stressful and difficult period for teachers with increased teaching commitments due to COVID, so those teachers who managed to complete the courses are to be commended.

The **DIMC SAMO 3** (Differentiation and Inclusion in the Mathematics Classroom) online course particularly focused on empowering teachers to develop an understanding of diversity in the classroom and how to respond to diversity by differentiating the teaching and learning of mathematics. Most of the classrooms in South African schools have large numbers of learners of mixed abilities, some with special needs and as such a thorough preparation of lessons geared at reaching all is non-negotiable. The course focused on professional development in formative assessment and understanding how to meet the learning needs of highflyers as well as learners with learning difficulties and special needs attracted eighty teachers, with a drop out figure of nineteen.

All the three courses covered topics such as Number, Algebra, Geometry, Measures, Statistics (Data Handling) and Probability, as well as Educational Technology. They all targeted teachers who aspire to change from the traditional "chalk and talk" approach of teaching to a more learner-centred one; teachers who desire to be enthused with a fresh approach to teaching and learning mathematics; teachers who are newly qualified or under-qualified and want to be part of a mathematics community which boosts of sharing good practices and continual trial of new ideas, and indeed those who intend to further their teaching careers. The overall emphasis lies in sharpening teachers': Technology, Pedagogic and Content Knowledge (TPACK) skills.

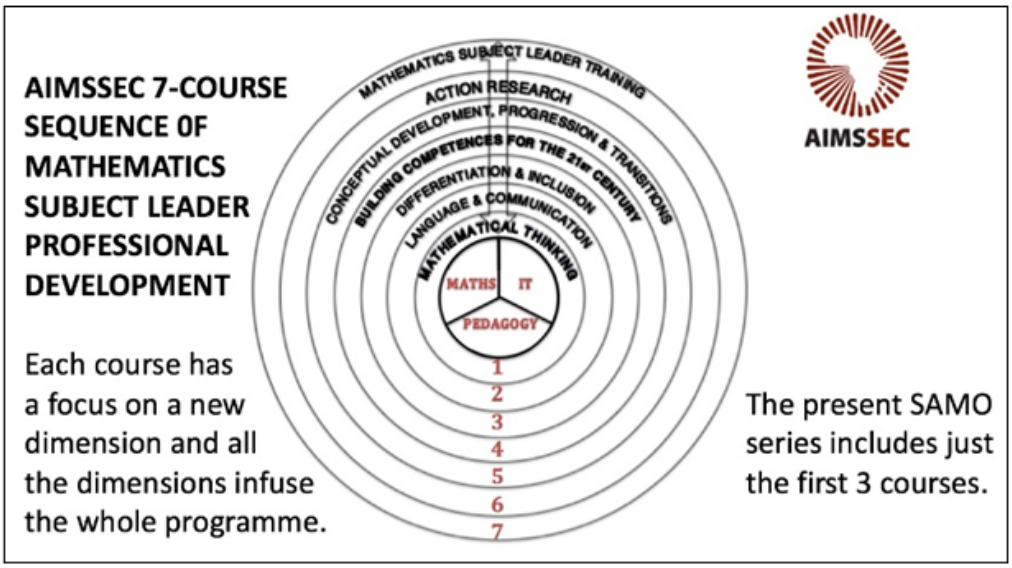
AIMSSEC has a designed seven-course sequence structure for the Mathematics Subject Teacher Professional Development Programme. The South African Council for Educators (SACE) endorses the courses offered. See the relationship of these courses on the graph below.

In all the three AIMSSEC online courses offered during this reporting period, local and international lecturers designed and executed delivery of lectures. Online platforms such as Zoom, Google Classroom, WhatsApp, etc were utilised. Carefully crafted home-study guides formed a very handy learning tool for teachers.

AIMSSEC's human resources personnel had to carry out research geared at assessing the impact of its interventions within the South African Education fraternity

Pre– and Post– tests were administered to all the students who attended the courses. A survey questionnaire was further administered to all involved in the course activities: students (teachers), presenter lecturers, and tutors. Guskey's (2000) model for analysis of Professional Development Programmes, was employed. The model makes use of five levels of Professional Development Evaluation, namely: **Level 1:** Participants' Reaction; **Level 2:** Participants' Learning; **Level 3:** Organisational (School) support and change; **Level 4:** Participants' use of new knowledge and skills; **Level 5:** Learning outcomes (Teachers' impressions about learners' learning outcomes).

The research findings were an astounding success, with all pointing out that AIMSSEC is delivering on its mandate, that of sharpening teachers' TPACK skills, equipping them with the most desired 21st century skills.



RESULTS OF THE THREE COURSES OFFERED BY AIMSSEC:

Course	Course Duration	# Attended	% Passed	Average mark
MT2	28/08/2021- 11/12/2021	64	85.9 %	67.8 %
MT3	19/02/2022- 12/06/2022	57	94.7 %	67.4 %
DIMC SAMO3	05/02/2022- 12/06/2022	61	93.4 %	74.5 %

Outreach Activities

AIMSSEC outreach extends around the world through the AIMING HIGH Teacher Network and App https://aiminghigh.aimssec.ac.za and https://aimssec.app. Along with WhatsApp groups for AIMSSEC alumni, this provides a community and free lesson resources and support for teachers.

The annual AIMSSEC **Global Maths & Science Lesson (GMSL)**, involving over 10,000 participants, has included topics such as DNA; Maths and Science in Sport; Fractals; Health Statistics; Women in Science and The Golden Ratio.

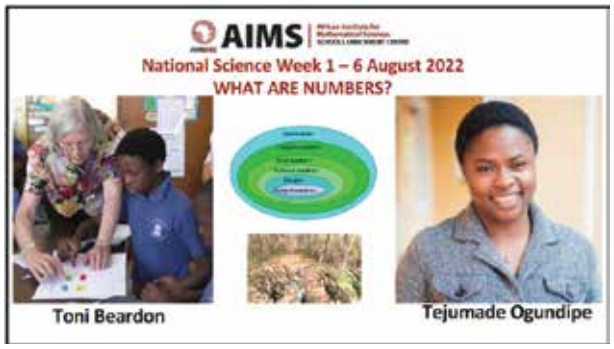
AIMSSEC's **Daily Maths Starter (DMS)** on Facebook, together with the weekly broadcast of the **Happy Maths Hour (HMH)**, has a large following of teachers, parents, and home educators. Once a month AIMSSEC broadcasts the **Global Teacher Empowerment Network (GTEN)** workshops for primary and secondary teachers. The AIMSSEC You Tube Channel has recordings of HMH and GTEN broadcasts and also short videos for use in lessons, specialising in activity/inquiry-based learning and making manipulatives from junk, see https://www.youtube.com/c/MathsToys.

In its partnerships with other organisations, AIMSSEC provides teacher training for the South African Mathematics Foundation (https://www.samf.ac.za/en/), consultancy for Open Development Education (https://opendeved.net/) and monthly workshops in Spanish for teachers for Edu Caixa (https://educaixa.org).

The UK Charity **Mathematics Education to Empower Africa (METEA)** raises funds for AIMSSEC and other projects. Although METEA is not officially linked to AIMSSEC, all the trustees have close connections with AIMSSEC.

Public Engagement

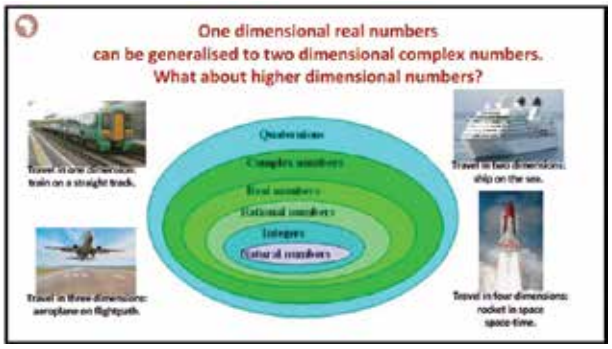
National Science Week, South Africa



This year's National Science week activities took place in KwaZulu-Natal (KZN) province. AIMSSEC embraced the opportunity to showcase its activities by registering to be one of the presenters. The two presenters, Ms Toni Beardon and Dr Tejumade Ogundipe, managed to put AIMS and AIMSSEC on the map by successfully presenting an article titled 'Numbers in the last 5000 years and numbers in your lives'.

The presentation was given two slots, one on 1 August 2022 and the other one on 4 August 2022. They presented one activity to two different audiences who actually formed two group of learners from a collective of schools around the KZN province.

The article handled numbers right from the early civilisation (development) of number theory to the present-day knowledge of numbers. They smartly gave a preview of the Number Theory, focusing on the real number system, stretching from natural numbers, whole numbers, …, up until Irrational numbers, extending learners scope to complex numbers, and ultimately to quaternions (4-D numbers used in applied mathematics and physics). See the visual relationship of these numbers on the graph below:



Conclusion

A big thank you goes to SAMF, Old Mutual, AECI, and Standard Bank for their generous helping hand which brought realisation of these courses to fruition. Their commitment to the overall development of the South African child through education is commendable.

As a training institution, we have come to realise that many of South African mathematics teachers lack pedagogical skills to function effectively as mathematics educators in the education system in our country. AIMSEC endorses the continued upskilling and training of mathematics teachers to enable South African learners to embrace 21st century skills.

PUBLIC ENGAGEMENT

HOUSE OF SCIENCE

The last two years have undoubtedly served as a stark reminder to scientific institutions, academics and researchers across the global landscape of the need to communicate, promote and engage effectively with non-scientific audiences (e.g. industry, decision-makers, journalists, indigenous knowledge holders and the general public) across different formats, tools and platforms (e.g. science festivals, churches, public lectures, botanical gardens, community halls, radio, newspapers and social media). In South Africa, the science communication and public engagement agenda, in particular, is equally essential if we want to build a transformative and effective National System of Innovation (NSI) for the country's sustainable development, progressive democracy and the growth of a literate, informed society. Launched in 2018 at AIMS South Africa and led by Dr Rejoyce Gavhi-Molefe and supported by the Department of Science and Innovation (DSI), the House of Science remains an overarching innovation space for advancing science communication and public engagement at AIMS for the transformation agenda and societal development. Its strategic objectives include the following critical dimensions:

- To build capacity and train AIMS students, researchers, academics and alumni so that they are better enabled, skilled and confident in undertaking public engagement activities, initiatives and community outreach.
- To promote mathematical sciences with the broader community in Africa, showcasing the work of AIMS.
- To improve the participation, progression and retention rates of women and girls in STEM-related fields.
- To conduct research studies on various topical issues on science/mathematics communication and gender diversity in STEM in Africa.
- To stimulate young people's interest to pursue careers in STEM and become the next generation of scientists, academics, leaders and problem solvers.

To achieve these strategic objectives, the House of Science has established three flagship programmes. These are the *Africa Scientifique - Leadership, Knowledge and Skills for Science Communication; Women Advancement Forum International Exchanges, Research & Academia (WAFIRA); and The Ishango Workshops on Mathematics Communication in Africa*. The three programmes are jointly delivered by AIMS and African Gong: The Pan-African Network for the Popularization of Science & Technology and Science Communication based on the MOU that both organisations undertook in 2019 as a means of confirming their commitment to work in a strategic partnership. The House of Science has also pioneered added value enrichment programmes helping students and emerging researchers overcome the personal challenges of advancing in mathematical sciences careers. The programmes include AIMS Gender in STEM: AIMS Women in STEM and Mentoring for Transformative Masculinity in-house mentoring events, Après-Lunch with the Mathematical Scientist webinars featuring diverse speakers in industry and academic sectors. The House of Science also delivers the Public Lecture Series and social media campaigns and amongst others participates in science festivals/forums.

Achievements and Activities

In its fourth year of existence, the House of Science has made significant progress in several critical areas of its strategic plan - from the development of a strategic framework to delivering flagship and added value enrichment activities to research output. The progress is evident in the 2019-21 AIMS South Africa annual reports and feedback from relevant stakeholders. The improvement was also evident despite the disruption by the global pandemic (COVID-19). Then, the House of Science had to (and still) adapt innovative ways of delivering its programmatic activities. During the reporting period, the House of Science has also demonstrated its critical role as an overarching innovation space for the added value enrichments to the AIMS academic programmes by delivering two courses to the current January intake students' cohorts. The WAFIRA and Ishango Workshops were not delivered due to limited financial resources.

In 2023, the House of Science will continue to consolidate and deepen its programmes. This will include further monitoring, evaluating, and disseminating the achievements and learning of the House of Science programmes outcomes, strengthening partnerships, and securing the requisite sustainable funding. House of Science will also enhance its Human Resource capacity to support progress in its areas of strategic importance. The next subsections provide the breakdown of achievements during the reporting period.

Strategic Alignment & Mainstreaming of the House of Science Framework within the Institutional Strategy of AIMS

At the Centre level:

The House of Science framework has been aligned within the core pillars of the AIMS South Africa research and capacity-building frameworks to demonstrate viable and strategic alignment between its (AIMS South Africa) operations and those of the South African national government mission, vision, and objectives, including the transformation agenda of the NSI. Institutional frameworks such as that of the House of Science have a pivotal role to play not only in the promotion of the mathematical sciences within the broader community but also in the implementation of the South African DSI Science Engagement Strategy. With its innovative flagship programmes, the House of Science has the potential to contribute to the science communication agenda in the South African landscape as one of the role players. AIMS South Africa is in the process of mainstreaming science communication/public engagement into its academic research frameworks to instil a culture and mindset of effectively engaging the public on mathematical science issues.

At the Network level:

The House of Science framework has been proven to be a user-friendly and flexible model. Thus, it will be replicated and rolled out across the AIMS centres. Most importantly, it will provide an oversight and coordination function for AIMS public engagement efforts in the new AIMS 10-Year Strategic Framework. This strategic AIMS Network framework will encompass African capacity-building and engender pan-African partnerships across the continent. The intention is to grow the footprint, profile and visibility of the AIMS science communication and public engagement programmes, agenda, outputs, and track record.

Flagship Activities

Africa Scientifique Programme for AIMS South Africa Master's Students

The House of Science, in partnership with African Gong, has delivered the Africa Scientifique Programme to the third cohort of AIMS Master's students in the 2022 academic year. Thirty students participated in the 2022 Africa Scientifique programme. The first two programmes were delivered successfully at AIMS in 2020 and 2021. This programme is a unique, innovative Afrocentric capacity-building initiative designed to support and provide young and emerging African academics and researchers with leadership, knowledge and skills for impactful science communication. The programme provides students with added value enrichment skills intended to produce well-rounded graduates equipped with essential soft skills, which are highly valued in the workplace. It is delivered in three phases, namely the Africa Scientifique Introductory Workshop, the three-day Africa Scientifique Workshop and then the six-months post-workshop mentoring and project activities. The 2022 Africa Scientifique programme was delivered online on 25 February 2022 (Phase 1) and face-to-face at AIMS from 11 to 13 April 2022 (Phase 2). Phase 3 commenced in May 2022 and was completed in November 2022. Each phase of the 2022 Africa Scientifique programme is described below.

Phase 1 – Introductory Workshop:

This workshop introduced the participants to the background and rationale concerning the programme, its transformational pan-African contexts, and the envisaged outcomes for participants. During the introductory session, the participants indicated that they had never attended any science communication capacity-building training nor undertaken public engagement activity to communicate mathematics. This is not surprising, given the limited opportunities for science communication training in the South African science ecosystem and on the continent. It should also be noted that there is a perception among the mathematics community that it is challenging to communicate mathematics. This programme was thus the beginning of a new journey of knowledge, discovery and first-hand experience in science communication.

Phase 2 – The three–day Workshop:

The workshop allowed participants to delve deeper into the world of science communication and the potential leverages that it can engender in their career advancement. Over the three intensive days, the participants were provided with thought-provoking, hands-on, informative, inclusive, transformative, and interactive sessions and networking opportunities. The sessions were ably facilitated by dynamic and diverse African Science Communication professionals, researchers, and academics. Established mathematical scientists and Africa Scientifique programme alumni pursuing careers in academia and industry also contributed to the workshop. The scientists shared their experiences, insights, practical techniques, and strategies for advancing and leveraging science communication skills, opportunities in one's career progressions, and striving for societal impact (i.e., the impact beyond the academic community) through mathematical sciences research. The alumni shared insights and knowledge from their 'hands-on' experiences based on the 2021 Post-Workshop science communication project planning, delivery and evaluation. The three-day workshop covered themes/topics such as research dissemination, public engagement and good practice in mathematics outreach activities; gender & socio-cultural Inclusion in science communication; leadership skills for research, academia and future career progression; presentation and communication skills, both written and oral, utilising diverse tools, platforms and engagements; research time management, work-life balance and successful research outcomes; mentoring, science communication and industry/entrepreneurship; science communication formats, platforms and tools: engendering public trust and engagement.

Africa Scientifique Science Communication Projects:

After the three-day workshop, the participants were expected to draw from knowledge, skills and values attained to identify, conceptualise, and outline a specific science communication/public engagement activity that they will undertake as individuals or collaboratively. After all, it was crucial that they put into practice the tools they had gained from the programme. The project activity framework had to feature the following critical elements:

- Clear objectives.
- Message.
- Target audience, particularly the seven identified groups of neglected/hard-to-reach publics (i.e., the science interpreters, industry, decision-makers, journalists, tourists, indigenous knowledge holders and the general public) from the DSI Science Engagement Strategy.
- African language, tools/formats.
- Mathematical science themes or contents.
- Timeframes.
- Resources.
- Monitoring/evaluation plan.

Africa Scientifique Workshop Awards:

After the workshop, all the participants were awarded certificates. Two participants (Mr Tolotranirina Andrianarisoa and Ms Everlyn Chimoto) who demonstrated outstanding improvements in their engagement, enrolment, communication, and presentation skills over the three days of the workshop received the Africa Scientifique Excellence Awards. These included a cash prize conferred by African Gong. The House of Science YouTube Channel (https://www.youtube.com/channel/UCk54pq7mCovkGz-GkptdKpQ) contains the video of participants sharing their workshop experience.

Phase 3 – Six–month Post Workshop Support and delivery of Science Communication Project Activities:

The critical aspect of the Africa Scientifique programme is that students are supported during the six-month Africa Scientifique Post-Workshop when they design, deliver and evaluate their science communication projects. The projects addressed societal challenges using mathematical science knowledge and research in their communities. During that period, they are also supported with their post-AIMS career progression by the House of Science, African Gong and volunteer mathematical scientists. Participants were able to identify a range of hard-to-reach and/or neglected audiences defined in the DSI Science Engagement Strategy. Examples of such audiences included small-scale farmers, taxi managers, township youth, adult patients and government officials. The following are a few samples of science communication projects undertaken then: Enhancing COVID-19 vaccination strategies; dangers of social media; corruption in governments; starting a small business; curbing drug abuse in the youth; minimising traffic jams and accidents; the problem of gambling; and the best routes to minimise township taxi journeys using mathematics and mathematical models.

2022 Africa Scientifique Workshop Contributors

Workshop Programme	Contributors' Name/Professional Category/Affiliation/Year
Introductory remarks	• Ms Lydie Hakizimana, CEO, AIMS Global Network • Prof. Barry Green, Director, AIMS South Africa • Dr Elizabeth Rasekoala, President, African Gong • Dr Rejoyce Gavhi-Molefe, Senior Manager, House of Science
Main sessions	• Drs Elizabeth Rasekoala and Rejoyce Gavhi-Molefe • Prof. Nokwanda Makunga, Medical Plant Biotechnology Expert, Stellenbosch University • Ms Azeza Fredericks, Independent Science Communicator • Mr Mawethu Nyakatya, Research Partnerships Manager, Stellenbosch University
Panel discussion & Africa Scientifique Programme Alumni contributions	• Dr Blaise Dongmo, 2004 AIMS Alumnus and Probabilistic Safety Assessment Analyst, Eskom's Koeberg Nuclear Power Station, South Africa • Mr Cebolenkosi Ngema, Graduate Data Scientist, Derivco PTY LTD, South Africa - Africa Scientifique Programme 2020 Alumni • Mr Ms Thandiwe Dlamini, Mathematics Educator, Mbuluzi High School, Swaziland - Africa Scientifique Programme 2021 Alumni • Mr Saviour Chibeti, Lecturer, University of Lusaka, Zambia - Africa Scientifique Programme 2021 Alumni • Ms Everlyn Chimoto & Ms Thembelihle Dlamini, MSc Students, AIMS South Africa - Africa Scientifique Programme 2021 Alumni • Ms Florence Owino, Data Analyst Intern, Better World Systems, Kenya - Africa Scientifique Programme 2021 Alumni

Added Value Enrichment Activities

During the reporting period, the House of Science organised several Gender in STEM and Après-Lunch webinar activities. It also offered science communication and mathematics-related short courses. House of Science further participated in the official Launch of the 2022 South Africa National Science Week.

AIMS Gender in STEM

Seven AIMS Gender in STEM (AIMSGIS): AIMS Women in STEM (AIMSWIS) and Mentoring for Transformative Masculinity (MTM) in-house mentoring events were held for the students (both male and female). The objectives of the AIMSGIS mentoring programme are to:

- Create a safe space where students can obtain support from caring senior students who are willing to listen to them, serve as good role models, help them develop their life skills and build self-confidence.
- Provide a diverse environment for networking with successful professionals in STEM, including AIMS alumni.
- To improve the participation, progression and retention rates of women and girls in STEM-related fields.

The mentoring events featured nine AIMS alumni pursuing different career paths in academia and industry. The events provided an enabling environment for discussions concerning the challenging realities related to the topics experienced by AIMS students and researchers.

AIMS Gender in STEM Speakers/Mentors

Date	Mentor/Affiliation/Professional Category
10 November	• Ms Nolubabalo Makhadi*, *Senior Data Analyst Consultant*, ALTRON, South Africa • Ms Florence Owino*, *Data Analyst Intern*, Better World Systems, Kenya - Africa Scientifique Programme 2021 Alumni • Dr Rock Koffi*, Analyst, Elenjical Solutions, South Africa • Ms Mary Familusi*, *PhD Candidate*, University of Cape Town, South Africa
23 February	• Dr Palesa Mothapo, *Research Manager & Head of the Postdoctoral Research Support*, Stellenbosch University • Ms Iness Kyapwanyama* & Mr Joe Chinoya*, *Lecturers*, University of Lusaka, Zambia - Africa Scientifique Programme 2021 Alumni
11 & 12 May	• Dr Tejumade Ogundipe, *IT Coordinator and Mathematics Lecturer*, AIMSSEC • Dr Lorène Jeantet, Postdoctoral Fellow, AIMS South Africa • Ms Emily Muller*, *PhD Student*, Imperial College London, UK • Dr Morenikeji Akinlotan*, *Postdoctoral Fellow*, Queensland University of Technology, Australia
25 May	• Dr Andronicus Akinyelu & Dr Daniel Nickelsen, *Postdoctoral Fellows*, AIMS South Africa
7 & 22 July	• Ms Zinhle Mthombothi*, *AIMS Alumna & Junior Researcher*, South African Centre for Epidemiological Modelling and Analysis • Prof. Sophie Dabo-Niang, *Functional Data Analysis and Spatial Statistics Expert*, University of Lille and INRIA-MODAL, France

*AIMS Alumni

Celebrating 2022 International Women in Mathematics Day (12 May):

The mentoring events on 11 and 12 May were hosted in celebration of International Women in Mathematics Day and the achievements of African women in mathematics. The day is in honour of the late acclaimed Iranian mathematician and Stanford University Prof. Maryam Mirzakhani (1977-2017). Prof. Mirzakhani was the first and only woman to win the prestigious Fields Medal, which is considered the highest honour in mathematics. House of Science celebrated the day with two in-house Mentoring events. The events featured four female role models from STEM-related career fields who shared their insights concerning challenges that are unique to African females in Mathematical Sciences in their respective contexts and the opportunities. Students also celebrated the day by sharing their perspectives on the importance of addressing gender diversity and inclusion in Mathematical Sciences in Africa on AIMS social media.

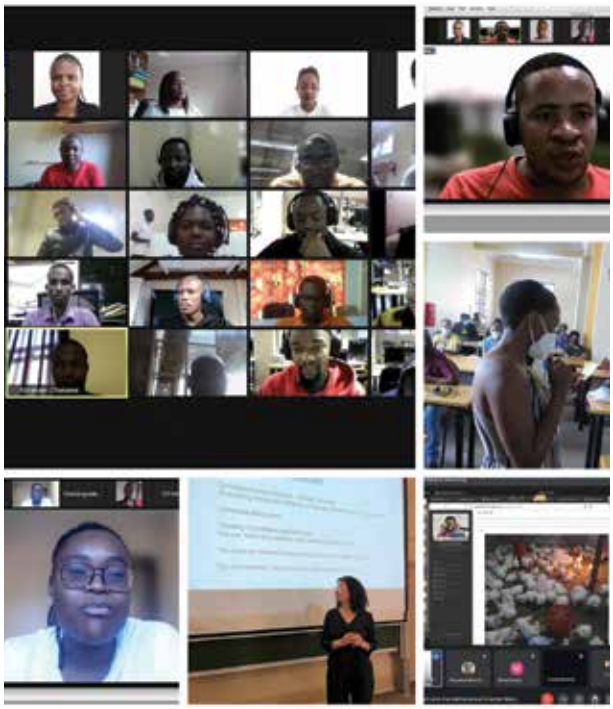
Après–Lunch with the Mathematical Scientist Webinar Series

During the reporting period, eight Après-Lunch webinars were held. Launched in 2020, this fortnightly webinar series provides a conducive platform for students, researchers and mathematics devotees to interact with esteemed mathematical scientists/role models working in academia/industry and other sectors. The webinars thus enable graduate students to meet potential mentors in their academic careers and foster collaboration and communication among researchers and professionals. The 2022 Après-Lunch webinar's theme was 'Career Advancement in Mathematical Sciences: Challenges, Opportunities & Transformation in South Africa'. Moderated by Dr Gavhi-Molefe, the associated webinars discussed the challenges experienced by mathematical graduates, and career opportunities in some of the most attractive, rapidly evolving and fascinating mathematical sciences disciplines. Since 2020, these talks have attracted graduate students, lecturers and researchers from other local and African universities, and school educators and professionals working in industry. On average, 45 people attended each webinar. These webinars have contributed to the promotion of AIMS programmes and the recruitment of South African students over the last two years. Some of the 2022 sessions were held in a hybrid format.

- The 22 February 2022 hybrid event featured Mr Lusani Mulaudzi, a Healthcare Actuary, Independent Non-Executive Director, Consultant and Lecturer at UCT. He is also a former President of Public Interest Actuary for the Actuarial Society of South Africa (ASSA).
- The 11 May 2022 webinar featured Ms Emily Muller, a 2017 AIMS Alumna and a PhD Student in Data Science at Imperial College London, UK.
- On 25 May 2022 the speaker was Mr Musa Kurhula Baloyi, a 2012 AIMS Alumnus, Machine Learning Engineer, founder of Madyondza Consulting and currently working as an Independent Consultant. He is also a Software Developer with vast industry experience in various roles within the IT spectrum.
- The 15 June 2022 webinar featured Dr Tendai Mugwagwa, a dynamic scientist and inspirational role model to many young African people, and an AIMS alumnus from the class of 2003 (the first graduating class). Dr Mugwagwa is also a Senior HTA Manager at Pfizer - one of the world's premier biopharmaceutical companies in the UK.
- The 29 June 2022 speaker was Prof. Philibert Nang, a renowned Gabonese Mathematician currently working at the University of Pretoria, South Africa. He is a specialist in Algebraic Analysis.

Special Après–Lunch Webinars for Local Universities

Two special Après-Lunch webinars were organised in partnership with the Universities of Venda (UNIVEN) and Limpopo (UL) in South Africa. The special webinars aimed to boost the transformation and pipeline by encouraging students from Historically Disadvantaged Institutions (HDI) to take up studies and research in mathematical sciences at AIMS South Africa. The webinars were attended by undergraduate and postgraduate students and staff in mathematics, applied mathematics, statistics and computer science in their respective universities. The UL webinar took place on the 23 March 2022. Dr Lesiba Galane, a Lecturer and AIMS Alumnus at the institution, assisted in organising the webinar. The UNIVEN webinar occurred on the 26 November 2021. Dr Eric Maluta, the Head of the Department of Physics at the institution, and PhD students - Mr Ndivhuwo Ndou and Mr Lutendo Phuthu - provided support and logistics arrangements for the webinar. The background and rationale behind AIMS, its programmes (training, research, and public engagement), its admission process, and its footprint/impact in South Africa and on the continent were also presented to the webinar participants.



Special Après–Lunch Webinars for Local Universities Speakers

Date	Panellists/Affiliation/Professional Category
26 November 2021	• Dr Thifhelimbilu Bucher*, Nuclear Physist & Lecturer, Cape Peninsula University of Technology, South Africa • Mr Rockefeller*, PhD Candidate, AIMS South Africa • Ms Ephifania Geza*, Bioinformatician, University of Cape Town, South Africa • Mr Ndivhuwo Mphephu*, Quantitative Risk Analyst, South African Standard Bank
23 February	• Dr Bubacarr Bah, Data Scientist, AIMS South Africa • Mr Vhahangwele Ramuada*, Business Intelligence Developer, Nedbank, South Africa • Ms Zinhle Mthombothi*, Junior Researcher, South African Centre for Epidemiological Modelling and Analysis • Mr Mmatlou Kubyana*, PhD Candidate & Data Analyst, Stellenbosch University

*AIMS Alumni

House of Science delivers short courses

One of the critical roles of the House of Science, as an overarching innovation space for the added value enrichments to the AIMS academic programme, is to identify gaps in the provisions to AIMS students and work to support and address them with a view to strengthening their academic and mathematical knowledge, skills and aptitudes. Thus, during the August and September 2022 period, the AIMS House of Science offered two courses - Introduction to Subdivision Theory and Applications (Subdivision; Review Course) and Mathematics for Machine Learning (Math4ML; Skills Course) to the current January intake students' cohort. The courses provided the basis for enhancing the mathematical knowledge and understanding, relevant skills and values of the students. These courses also served to broaden the horizons, scope and dynamic understanding of the post-AIMS career progression of the students in utilising this cutting-edge mathematical knowledge and skills.

The courses were facilitated and co-facilitated by Dr Gavhi-Molefe and Prof. Franck Kalala Mutombo affiliated with the University of Lubumbashi, DRC, and vice versa. Dr Dinna Ranirina, a postdoctoral researcher at AIMS South Africa was a tutor.

Public Engagement and Communication of Data Science for Societal Impact short course

This course was delivered during the 2022 CIMPA Mathematical and Statistical Methods for Data Science School which took place from 18 to 29 July 2022 at AIMS South Africa. It was offered as an added value enrichment for the participants and was facilitated by Dr Gavhi-Molefe. The course provided an enabling platform for discussions and engagements concerning critical challenges that continue to hinder young and emerging African mathematical and statistical scientists in disseminating and communicating data science research with non-scientific audiences, industries and science policymakers across different formats, and tools and platforms. The students described the course as very informative, engaging, impactful, empowering and transformative, and appreciated it for enhancing their science communication, presentation skills, confidence and knowledge.

House of Science at the 2022 National Science Week

On 30 July 2022, AIMS South Africa joined over 70 science, technology and innovation (STI) exhibitors from universities, science councils, national research facilities, industry, science centres, government departments and relevant non-governmental organisations across the country at the official Launch of the 2022 South Africa National Science Week (NSW). NSW is an annual week-long celebration of STI and one of the many DSI-led activities to build a South African society that is knowledgeable about science, critically engaged and scientifically literate. The theme was 'Celebrating the role of basic sciences in the modern world'. The Launch, which took place at the Umlazi Campus of the Mangosuthu University of Technology in Durban, was officially inaugurated by the Minister of Higher Education, Science and Technology, Dr Blade Nzimande. During his speech, Dr Nzimande commended South African scientists and researchers for their hard work and determination in finding out what COVID was, how it was transmitted and how we could slow down its spread in our communities.

"It is science, technology and innovation that enabled us to monitor where the virus was spreading, and how it was changing. Mathematical modelling also enabled us to make predictions we could use in planning," said Dr Nzimande.

The AIMS exhibition stand featured hands-on activities and 2020 and 2021 Africa Scientifique Programme Alumni's science communication posters. The exhibitors' presentations further showcased research conducted at AIMS and the importance of mathematical sciences and their application in everyday life. They also engaged learners, teachers, and members of the general public with Origami (the traditional art of paper folding).

The exhibitors from AIMS were Dr Gavhi-Molefe and Ms Everlyn Chimoto. Ms Chimoto is currently a Master's student and Natural Language Processing researcher at AIMS South Africa.

House of Science host 2022 RISE Global Winners

On 4 August 2022, AIMS South Africa hosted eight of the 100 RISE global winners. RISE, an initiative of Schmidt Futures and the Rhodes Trust, identifies young people aged 15 to 17 who need opportunity and support for life as they work to serve others. The programme offers a lifetime of benefits including scholarships, mentorship, career development and funding opportunities to help them work toward solving humanity's most pressing challenges. The Residential Summit is a fully-funded, three-week summit with other members of the Rise Global Winner cohort. It is held on a rotational basis globally for each new cohort. The 2022 summit took place in Cape Town, South Africa. As part of the summit, RISE winners were expected to interact with partner organisations. Thus, AIMS as one of the RISE partners in Africa had the pleasure of hosting a very high-functioning self-directed group of RISE Global winners with an interest in STEM. They were accompanied by their two facilitators.

The day's programme was designed to expose the guests to the cutting-edge research conducted at AIMS. The guests had an opportunity to engage in dialogue with the AIMS staff, students, alumni and researchers and work in small groups through a hands-on activity.

Prof. Green, Dr Gavhi-Molefe; and AIMS Outreach Senior Manager, Mr Sampson Kofi Adotey, gave guests an overview of AIMS' vision and missions. They also shared the AIMS academic, research and public engagement and science communication programme, and its impact/footprint locally and internationally. The guests were shown the AIMS short film titled, 'Wajenzi', a science in Africa movie that seeks to engage the public and galvanise support for African scientific excellence. For the hands-on activity, the guests had to design a public engagement strategy as a scientific group of advisors to encourage the AIMS community and public to give back and encourage public trust in science. They were also exposed to the personal experiences and areas of expertise of AIMS current students and alumni through speed mentoring and networking lunch sessions. The mentors included Dr David Attipoe , Dr Lorène Jeantet, Dr Simukai Utete, tutors, Mr Joel Lontsi and Ms Hosana Ranaivomanana and Research Centre students, Mr Rockefeller, Ms Dorcas Asare and Ms Thembelihle Dlamini.

STAKEHOLDER ENGAGEMENT

Meetings attended

On 30 November 2021, Prof. Green, Dr Gavhi-Molefe and Dr Utete participated in the Virtual Delegation visit of African Partners to Baden-Württemberg. They were members of a panel discussion titled 'Research-based teaching and local research projects' which was led by Prof. Michael Winckler the Administrative Director of IWR (see https://typo.iwr.uni-heidelberg.de/contact). The interaction between IWR and AIMS was discussed, with training and research workshops in mind.

On 1 December 2021, Prof. Green participated in a virtual round table hosted by the Centre national de la recherche scientifique (CNRS) at the Science Forum South Africa 2021. He was part of a panel titled 'Building stronger and more equitable research relations between Africa, France and Europe'. The round table provided the opportunity to examine different ways of establishing and developing contacts and partnerships in research.

THE AIMS NETWORK

Graduates from other AIMS Centres

AIMS Centre	2021/2022 Graduates		
	Women	Men	Total
Cameroon	26	29	**55**
Ghana	37	63	**100**
Rwanda	23	37	**60**
Senegal	22	22	**44**
			259

AIMS Rwanda Graduation 2022

AIMS Senegal Graduation 2022

AIMS Cameroon Graduation 2022

AIMS–Tübingen Data Science & AI Fellowship Program

AIMS and the Eberhard Karls University Tübingen (Cluster of Excellence "Machine Learning – New Perspectives for Science) partnered to launch a Prestigious Data Science & AI Fellowship Program. This four-year (2022-2025) fellowship program aligns well with the objectives of the AIMS Work-Integrated Learning (WIL) programs, which integrate academic instruction with on-the-job practice and has been shown to increase graduate employability and professional career growth.

Candidates were nominated by AIMS evaluating academic performance, technical qualification and personal suitability. Selected through a competitive application process, the selected AIMS alumni were offered a fully funded 6-month research fellowship with a group affiliated with the Cluster of Excellence at the Eberhard Karls University Tübingen, Germany.

Ms Tatenda Emma Matika, originally from Zimbabwe and Ms Tshenolo Thato Daumas, from South Africa, both AIMS South Africa 2019 graduates were selected for this programme. They joined other recipients Ms Wafaa Mohammed, Ms Bolaji Bamiro, and Mr Faisal Mohamed for this fellowship initiative.

AIMS NEI and iSQI Partner to Boost the Skills of Youth in Africa

In June 2022, AIMS-NEI and the International Software Quality Institute (iSQI GmbH) entered a long-term partnership to boost the skills of youth in Africa. The partnership seeks to certify the skills of young Africans including students and teachers at AIMS-NEI centres in Rwanda, Ghana, Cameroon, Senegal and South Africa through internationally recognized certification schemes such as ISTQB®, TMAP®, iSAQB®, IREB® and schemes from A4Q.

AIMS NEI and iSQI also plan to launch a joint initiative called "4Africa Digital Skills," which will establish a digital certification module geared towards closing the digital skills gap throughout the continent. According to the World Economic Forum, approximately 230 million jobs in Africa will require digital skills by 2030. The ability to scale up the delivery of such digital training will ensure that youth in Africa are well-equipped to thrive in the growing digital sectors.

AIMS and IVADO Renew Partnership to Advance STEM in Africa

AIMS and the Institute for Data Valorization (IVADO), with the financial support of the Canada First Research Excellence Fund, renewed a two-year, CAD $200,000 partnership to host supervised research internships for AIMS Master's students at its world-class Montreal-based research universities.

This innovative partnership awarded 16 scholarships to AIMS Master's students to carry out supervised research activities at Université de Montréal, Polytechnique Montréal and HEC Montréal.

The new cohort of 16 AIMS students, which included: Ms Esther Wanangachi Lwazi, Mr Dumisani Lickson Namakhwa and Ms Happiness Edit Mahlalele, who graduated from AIMS South Africa in June 2022, started their four months in Montreal in July 2022. This collaborative initiative builds upon the successes of the first AIMS-IVADO fellowship programme launched in 2019.

GOVERNANCE

AND ADMINISTRATION

Trust

The AIMS Trust meeting was held on 27 January 2022. In attendance were Dr Rob Adam, Prof. Loyiso Nongxa, Prof. Neil Turok (Chair), Ms Nasima Badsha, Prof. Fritz Hahne, and Prof. Daya Reddy. They were joined by Prof. Barry Green, Ms Deborah Wilsnagh and Ms Lynne Teixeira.

Council

The AIMS South Africa Council meeting took place on 4 May 2022. Members who attended the meeting were: Prof. David Holgate (University of the Western Cape) Chair: Prof. Barry Green (Director, AIMS, ex-officio member); Prof. Thandi Mgwebi (Nelson Mandela Metropolitan University); Prof. Stéphane Ouvry (Université Paris Saclay); Prof. Balazs Szendroi (Oxford University); Prof. Daya Reddy (University of Cape Town); Prof. Neil Turok (Edinburgh University); Prof. Louise Warnich (Stellenbosch University); Prof. Grae Worster (Cambridge University). Others in attendance: Ms Lydie Hakizimana (AIMS-NEI CEO); Ms Deborah Wilsnagh (AIMS South Africa COO); Ms Lynne Teixeira (Secretariat).Prof. Balazs Szendroi resigned from the Council as he has moved to a new position in Austria. He has been replaced by Prof. Mike Giles from Oxford University.

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Staff


Barry Green


Deborah Wilsnagh


Simukai Utete


Barrie Barnard


Igsaan Kamalie


Jan Groenwald


Rejoyce Gavhi-Molefe


Linda Camara


Joan Africa-Brown


Jonathan Carter


Lynn Evon


Noami Fekema


Nazeer Kamalie


Emmanuel Kongolo


Jo-Anne Louw


Bjorn Pieterse


Lynne Teixeira


Najwa Chellan


Virgenia Davidson


Tejumade Ogundipe


Kwethemba Moyo

FINANCIAL
OVERVIEW

By formal agreement, Stellenbosch University provides financial management services to AIMS South Africa. An independent trust was established in 2002, called The AIMS Trust, whose financial information has also been consolidated into these financial statements.

Total Income Analysis

Figure 1.1
Total income per main component (%)

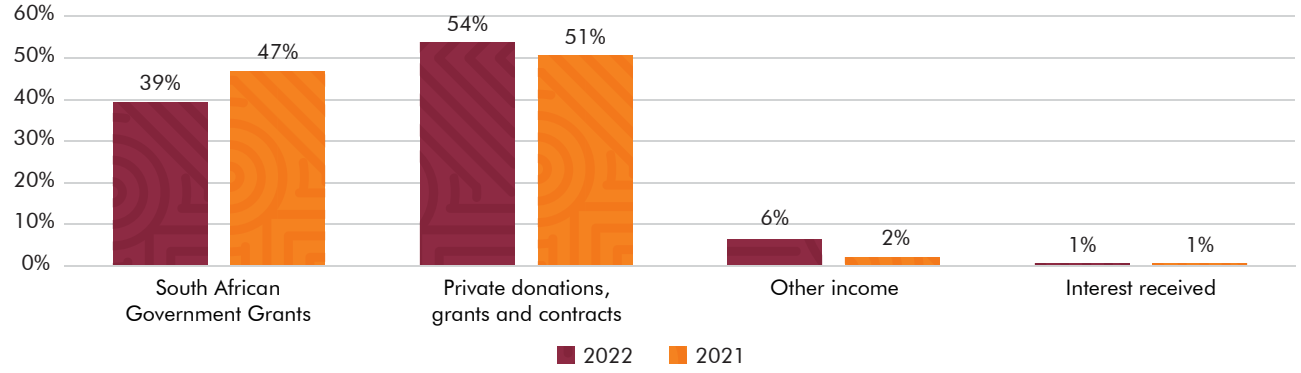

Figure 1.2
Total income per main component (Rand)

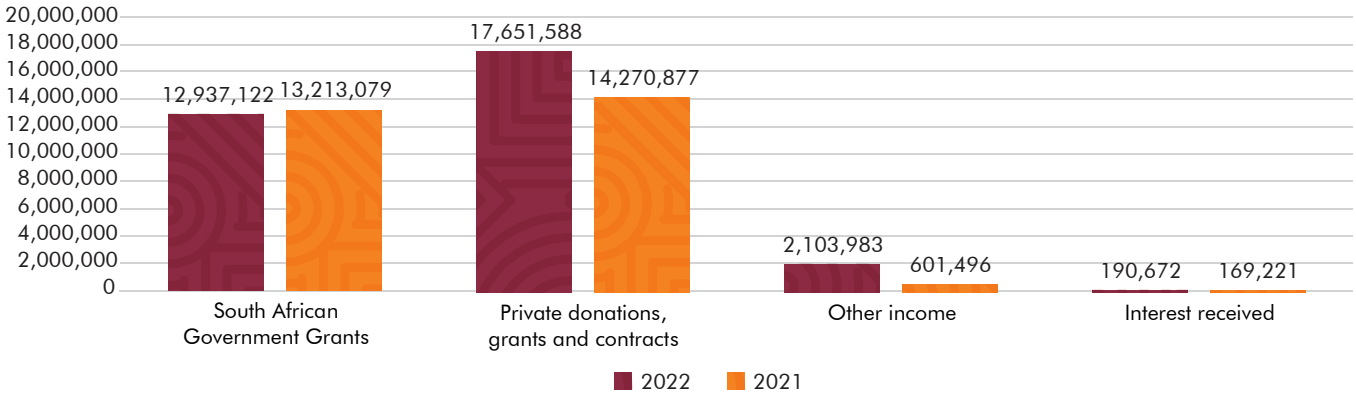

Figure 1.1 & Figure 1.2

These figures shows the comparison of AIMS South Africa's income per main component; expressed as a percentage and in Rand values.

Comparatively, total income increased by 16.38%. This increased can be explained by:
i) increase in private donations, grants and contracts (24%); and
ii) an increase in other income (250%)

South African Government grants is showing a decrease of R275,956; this is mainly due to a slight drop in the grant received from Department of Higher Education and Training (DHET) and The National Research Foundation (NRF).

The increase in private donations, grant and contracts is mainly due to a new grant received from AIMS Canada for the Junior Research Chair in Data Science (R1 million) and an increase in the funding received from AIMS-NEI (R2 million).

The increase in other income is mainly the result of the AIMS South Africa vehicle replacement that was done during the 2022 financial year. The profit on the vehicles sales amounted to R669,000. The amount transferred from SU Transport Services to replace the vehicles amount to R900,000. In the vehicle replacement fund, adminstered by SU Transport Services, there was a reserve of R279,000 which was also transferred to AIMS South Africa. R120,000 was received from the University of the Witwatersrand for workshops conducted at AIMS South Africa.

To note:

For the 2022-2023 financial year, the grant from The National Skills Funds was finally approved. The contract, and subsequent receipt of the funds, is in the final stages of finalisation. Over the three-year funding period, the total income received will be R21,925,414.

Also, funding is expected from DeepMind to launch the new Artifical Intelligence for Science pan-African Masters Programme.

Breakdown of South African Grants for the 2022 and 2021 financial years are as follows:

Department	Programme	2022	2021
Department of Higher Education and Training	Academic Programme	R6,868,000	R6,510,000
Department of Science and Innovation	Academic Programme, Research Programme and Post AIMS bursaries	R1,035,000	R1,212,500
National Research Foundation	Research Programme	R5,034,122	R5,490,578
Total South African Government Grants		**R12,937,122**	**R13,213,078**

Breakdown of private donations, grants and contracts for the 2022 and 2021 financial years are as follows:

Department	Programme	2022	2021
Mastercard Foundation	Taught Master's Programme and Teacher Training Bursaries	R7,475,726	R4,238,220
The Alexander von Humboldt Foundation	German Research Chairs	R2,093,638	R3,997,434
DAAD	Bursaries / Scholarships	R172,623	R320,105
Other Private Donations	Taught Master's Programme, ESMT, DSI and Teacher Training Programme	R7,909,601	R5,715,118
Total Private Donations, Grants and Contracts		**R17,651,588**	**R14,270,877**

Total Expense Analysis

Figure 2.1

Total expenses per main component (%)

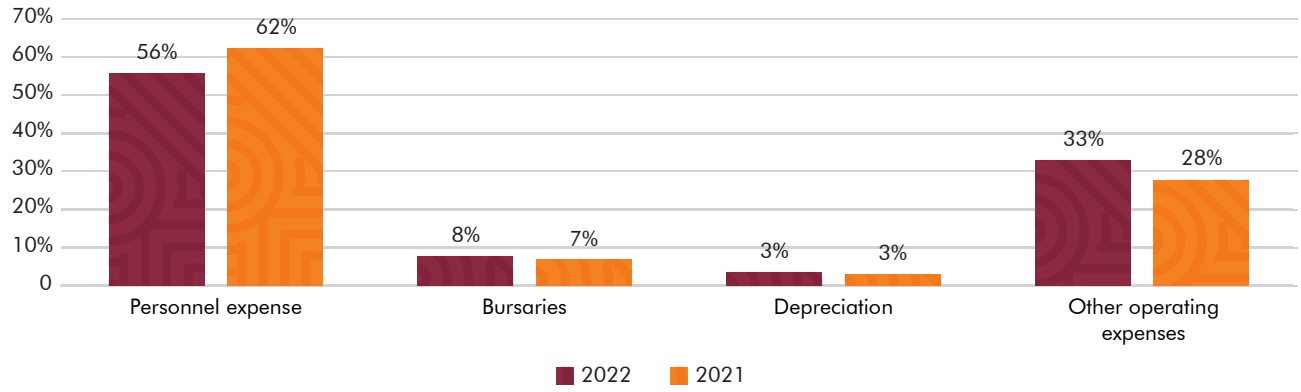

Figure 2.2

Total expenses per main component (Rand)

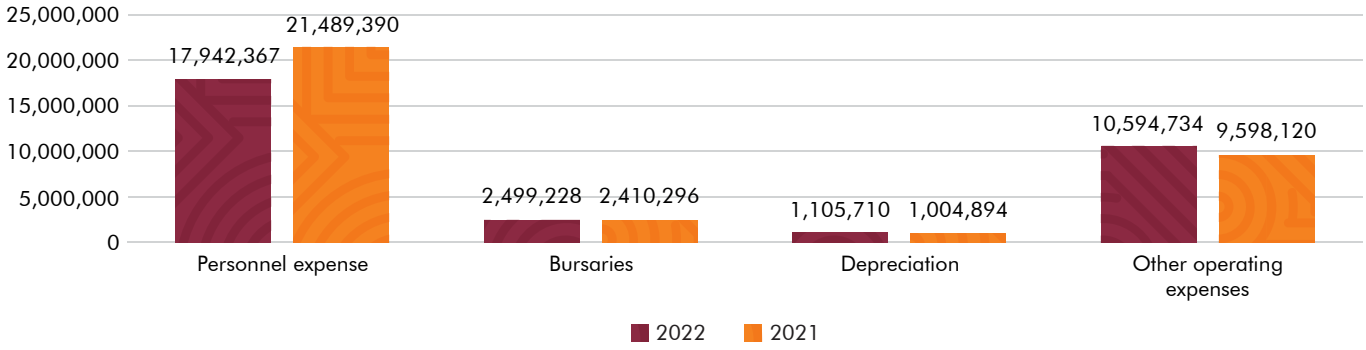

Figure 2.1 & Figure 2.2

These figures shows the comparison of AIMS South Africa's expenses per main component; expressed as a percentage and in Rand values.

Comparatively, total expenses decreased by 7.3%. This decrease is mainly due to a drop of 20% in the personnel expenses.

Bursaries comprises bursaries to AIMS Research Centre students, DAAD and post AIMS bursary recipients.

Other operating expenditure includes all costs related to the Taught Master's Programme.

Expenditure is monitored carefully, within the prescribed limits as determined by funder requirements and regulations.

Breakdown of total expenses per main component

Expense		2022	2021
Personnel expense		R17,942,367	R21,489,390
Bursaries		R2,499,228	R2,410,296
Depreciation		R1,105,710	R1,004,894
Other operating expenses		R10,594,734	R 9,598,120
Total expenses		**R32,142,039**	**R34,502,700**

African Institute For Mathematical Sciences South Africa
Statement of Financial Position at 30 June 2022

		2022	2021
		R	R
ASSETS			
NON–CURRENT ASSETS		**28,386,070**	**28,180,448**
Property, plant and equipment	3	24,104,580	23,934,217
Intangible Assets	4	1	1
Financial Assets	5	4,281,489	4,246,230
CURRENT ASSETS		**2,430,744**	**1,371,363**
Cash and cash equivalents	6	1,167,918	172,941
Trade and other receivables	7	1,216,023	1,174,494
Inventory	8	46,803	23,928
TOTAL ASSETS		**30,816,814**	**29,551,811**
FUNDS AND LIABILITIES			
FUNDS AND RESERVES		**20,582,487**	**19,839,747**
Accumulated funds		16,174,240	15,399,110
Resticted reserve: endowment fund		2,153,447	2,119,601
Restricted reserve: other		104,000	171,649
Fair value reserve		2,150,800	2,149,387
CURRENT LIABILITIES		**10,234,327**	**9,712,064**
Stellenbosch University payable	9	6,299,976	6,229,014
Trade and other payables	10	3,934,351	3,483,050
TOTAL FUNDS AND LIABILITIES		**30,816,814**	**29,551,811**

African Institute For Mathematical Sciences South Africa
Statement of Comprehensive Income for the Year Ended 30 June 2022

		2022	2021
		R	R
Government grants		12,937,122	13,213,078
Donations Income		17,651,588	14,270,877
Other Income		1,434,584	601,496
Profit on sale of fixed assets		669,399	-
Gross Income		**32,692,693**	**28,085,451**
Operating Expenses	11	(32,142,039)	(34,502,700)
Operating surplus / (deficit)		**550,654**	**(6,417,249)**
Finance income		190,672	169,221
Surplus / (deficit) for the year		**741,327**	**(6,248,028)**
Other comprehensive income:			
Item that may be subsequently reclassified to profit or loss			
Change in value of available-for-sale financial assets		1,413	298,545
Total comprehensive surplus / (deficit) for the year		**742,740**	**(5,949,483)**

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- Avery Tsui Foundation
- Neil Turok
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European School of Management and Technology (ESMT Berlin)

German Academic Exchange Service (DAAD)

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Government of South Africa:

- Department of Higher Education and Training (DHET)
- Department of Science and Innovation (DST)
- National Research Foundation (NRF)

ETDP SETA

The Mastercard Foundation Scholars Program

Science & Technology Facilities Council, UK (SA-DISC-Net Collaboration)

Stellenbosch University

Université Paris-Sud XI

University of Cambridge

University of Cape Town

University of Oxford

University of Pretoria

University of the Western Cape

AIMS South Africa would like to thank the following lecturers for donating their honoraria to AIMS in this period:

Dugald MacPherson
Paul Taylor
Richard Katz
For a list of all AIMS South Africa supporters, please visit: https://www.aims.ac.za/en/support/supporters

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The ForExcellence Program finds fitting ways for academic partners to support Africa's most promising mathematical science students. These include: faculty guest-lecturers at AIMS Centres; scholarships to support AIMS students; post-graduate students providing teaching support at AIMS centres; funding to support research and operation of centres; collaborations on research projects, internships and other employment opportunities for graduates.

For more information please visit www.nexteinstein.org/connect/for-excellence-program/

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