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Department of **Statistics and Actuarial Science**
Departement **Statistiek en Aktuariële Wetenskap**

A new year brings new energy.

I think it is the optimism that is associated with fresh beginnings and, in many ways, the chance to press the reset button.

The future seems to be filled with endless possibilities. However, another good practice is to pause and take stock, and to reflect on the accomplishments and challenges of the past year: what worked, what should we build on, what should we do more of and what should we leave behind. These are all important questions, and reflection does not need to be scary or melancholy. In the case of the Department of Statistics and Actuarial Science, the end of 2023 offered opportunities for celebration – not only the obvious "Phew – we survived!" type of celebrations (although there were some of those!), but also the type that truly made us proud to be part of one of the most outstanding academic departments globally.

Now that we stand at the dawn of 2024, we should perhaps first reflect (somewhat philosophically) on the overarching purpose of the field of Statistics, to see whether we are succeeding in achieving our objectives. At the recent retirement function of my first supervisor at Stellenbosch (more on that later), Prof Stan du Plessis (Stellenbosch University's Chief Operations Officer (COO)) alluded to the value and continued necessity of the statistical sciences in decision-making. Referencing David Spiegelhalter (a Cambridge biostatistician who has been cited more than 126 000 times), Prof Stan emphasised the power of Statistics to analyse data and then use that analysis in decision-making. This is indeed the noble ambition of the discipline: to let the facts speak for themselves in guiding our decision-making as a society. However, questions have recently been raised regarding the need for the beautiful theory we call "Statistics", saying that computation and large volumes of data have made statistical literacy and probabilistic reasoning less relevant than before. In answering this criticism, allow me to take a leaf out of our university COO's book and quote the highly influential and highly cited Spiegelhalter, hopefully imparting some wisdom:

"More data means that we need to be even more aware of what the evidence is actually worth. Far from freeing us from the need for statistical skills, bigger data and the rise in the number and complexity of scientific studies make it even more difficult to draw appropriate conclusions. Even in an era of open data, data science and data journalism, we still need basic statistical principles in order not to be misled by apparent patterns in the numbers. Signals always come with noise: It is trying to separate the two that makes the subject interesting."

Standing on the shoulders of this giant, we see that our Department has a very important role to play. The availability of computation power and large models has done nothing to eliminate the tendency to manipulate these very models into supporting a pre-determined narrative. The lessons we learned coming out of the COVID-19 era make this abundantly clear: interpretation of outcomes and objective decision-making are as important as the development of the models in the first place. The statistical method supplies the framework for evaluating data and thus sound

statistical training is perhaps more important than ever.

Being the season for reflection, we celebrate the steps we have taken in 2023 to achieve these lofty ambitions. Every year we are training increasing numbers of students to critically think about data and hopefully become more adept at separating "signals from noise". Having complex models is one matter, but being able to critically evaluate these is as important, not only for our University, but also for our country and our society at large. While our students will not be able to solve every problem that arises, they surely have the critical skills required to help us understand the problems better. Indeed, this is the starting point for improvement.

There were also some specific highlights during the year, together with future outlooks, which give us a renewed sense of optimism:

• The Department was incredibly well represented at national and international conferences in 2023. From financial risk management in the Kruger National Park, to the Actuarial Society of South Africa conference (where staff received numerous accolades) to the South African Statistical Association Conference in Durban, where our Department had a record attendance and even took first place in the student oral presentations (among other awards), there was much to be celebrated.

• On the research front, members of the Department have been making significant contributions in many different fields: from rhino conservation to novelty detection, from theoretical contributions to giving credibility to South African wine as an investment vehicle.

• In terms of teaching, 2024 will see the first graduating class of the BDatSci degree programme. This will be the first time that the fruits of many years of labour in this endeavour will be realised. Growth in enrolments continues to exceed expectations, highlighting the demand for well-rounded and proficient data scientists.

• Two new staff members joined the Department during 2023 (read more on P3). We are extremely grateful that they chose to make Stellenbosch University their academic home and we are excited to witness their future development.

• Sadly, the director of the Centre for Statistical Consultation (CSC), Prof Martin Kidd, retired at the end of 2023. Whilst the CSC does not fall directly within the Department's organogram, Martin is practically one of us. Often the first in and last out of the office, Martin has embodied the ideals of service to the university community. Although he will still be around in 2024 (and hopefully beyond) we would like to wish him a wonderful retirement spent enjoying his children and grandchildren's company. Thank you, Martin, for your service.

As a Department, we are well-placed to aid society in separating signals from noise!

Finally, at the retirement function previously mentioned, the COO reminded us that the ultimate goal of teaching and research is to serve. Our work is not conducted in isolation but in service of the larger university community, South Africa, and society. Everybody can benefit from better, data-driven decisions.

I would like to thank everyone (in the Department, Faculty and University) for their hard work, dedication, and support during 2023. We look forward to serving you all in 2024 and beyond.

Warm regards,
Justin Harvey

Department's permanent and contract staff members – 2023

1st row: Prof WJ Conradie, Ms S Loggenberg, Prof T de Wet, Dr M Alfeus, Prof J Harvey, Ms L Rhode, Prof PG Slattery, Prof S Lubbe, Dr CJB Muller, Dr P Nagar, Prof D Polakow

2nd row: Ms K Stapelberg, Dr J Nienkemper-Swanepoel, Ms Z Adams, Dr H Viljoen, Prof D Nel, Prof M Kidd, Ms M Matthews, Ms N van Zyl, Mr RJ Clover, Mr D Corubolo, Prof SJ Steel

3rd row: Mr R Buys, Mr G Konan, Dr MMC Lamont, Mr S van der Westhuizen, Ms E Huysamen, Mr SJ Burgess, Mr S Louw, Mr DR Loggenberg, Dr GK Sandrock, Dr S Bierman, Prof PJ Mostert, Mr P Manefeldt

Department welcomes new staff members

Two new staff members – Dr Priyanka Nagar and Ms Zoë-Mae Adams – were appointed in the Department of Statistics and Actuarial Science in 2023.

Dr Nagar, who obtained her BSc in Actuarial and Financial Mathematics, BSc (Hons) and MSc in Mathematical Statistics, and her PhD from the University of Pretoria, joined the Department as a senior lecturer in Statistics on 1 September 2023.

Her research interests are in the field of directional statistics and distribution theory. Her PhD focused on multivariate models for directional data and included applications related to wind energy and biomechanical studies. Before joining SU, she was a lecturer at the University of Pretoria for five years where she taught courses focused on the foundational topics of Mathematical Statistics at a first- and second-year level. She also developed a new course for second-year students focused on applications in Data Science. In addition, she gained corporate experience when she worked as a full-stack data scientist in the telecommunications industry.

Dr Nagar believes that Statistics has the power to influence decision-making and the ability to affect meaningful change in the world. Her current research interest is driven by studies focusing on environmental impact and climate change in which tangible results from the statistical analysis can be found. Her passion lies in working with wind data to better understand its behaviour for harvesting wind energy at a time when sustainable energy is of utmost importance.

"By using statistical techniques to better understand the environment and climate, statisticians can contribute to ensuring a better future," she believes.

Dr Nagar's dedication to statistics and research led her to join Stellenbosch University and she hopes to inspire students to see the unique skillset that Statistics has to offer in a variety of fields.

"In an age where data is a valuable resource, widely available and harvested to streamline human tasks, there is no better field than the study of data (Statistics). Data literacy is the most fundamental requirement in all professions. Equipping students with basic data literacy, as well as advanced data analysis, is an essential skill for the future. What better career could there be than to have a hand in training the next generation of statisticians and imparting the knowledge of working with and understanding data?" she says.

Ms Adams, who obtained her MCom degree in Statistics from SU in 2022, was appointed as a lecturer in Statistics. She plans to offer representation to young students, especially young women from previously disadvantaged communities, who like Statistics and encourage them to see the possibilities in academia.

Before continuing with her postgraduate studies (master's degree) and pursuing an academic career, she worked as a Risk Management intern at Momentum Metropolitan Holdings.

"Since data science and machine learning have become the focus of statistical studies, the foundational methodologies have been, and always will be, equally important. There is still ample research to be done. However, the most valuable skills are curiosity and critical thinking.

"To foster the development of these skills among students, my approach involves promoting collaborative learning experiences. By creating an environment that encourages teamwork, students can leverage diverse perspectives to enhance their understanding. Additionally,

I aim to challenge them to think critically beyond conventional assessments. This approach not only reinforces the application of acquired skills but also nurtures a mindset of continuous exploration and problem-solving, preparing students for the complexities they may encounter in their academic and professional journeys."

Ms Adams encourages prospective students to consider enrolling at Stellenbosch University.

"The institution is actively engaged in a transformative journey, fostering an inclusive and diverse environment. Rather than serving as a deterrent, this ongoing commitment to transformation enhances the university experience by creating a vibrant community of academics. By choosing Stellenbosch University, students can be part of an educational journey that not only values diversity but actively works towards creating a supportive and enriching academic community.

"In my biased opinion, I think Statistics and Data Science deserve a lot more recognition and understanding. This field also offers many engagement opportunities, from teatime in the Department to international conferences. I have found a community that understands my way of thinking and also provides different perspectives to help with my research."

Lecturer swims from Robben Island with his sons

During the winter of 2023, Mr Hans-Peter Bakker, a lecturer in Statistics, and his three sons decided on a whim to attempt the crossing from Robben Island to Bloubergstrand – also known as the Freedom Swim – in November that year.

"Although we were reasonable swimmers at school, not one of us was primarily a swimmer anymore. The challenge was to build sufficient endurance in the three or four months we had left. Most of the training had to be done through winter; and while some hardcore swimmers do this without wetsuits, we felt the challenge of the distance was going to be enough for now," says Mr Bakker.

"We were extremely nervous as the day eventually dawned. None of us had ever done something like this before. Early on the morning of 15 November, the boats took us from Sea Point to just off the island. After donning our wetsuits and getting briefed about breaks and about not being able to touch a boat or each other, we jumped into the cold water. On that day it was just the four of us in the water. The furthest any of us had swum in training was 4 km. So, none of us had ever done such a distance, and we did not know if we could.

"We first had to swim to the island and get far enough out of the water to satisfy the Freedom Swim support staff, who were there to provide direction and rescue should that be needed. Sharks were certainly on our minds when we set off, but the bracing water at 13° Celsius and the

Victor, Hans-Peter Snr, Frederik, and Hans-Peter Jnr

sheer 7.8 km distance quickly overshadowed these fears.

"The swim took about two hours and thirty-five minutes and included welcome short energy drink stops every half hour. We managed the distance reasonably well, but it was quite a challenge to keep going for such a long time with tiring and cramping muscles.

"As a father, the real celebration for me was not in completing the swim, but the fact that all three of my sons were willing and able to attempt something like that with me; and the tremendously supportive spirit in which they did so.

"After taking a few days to recover, which my sons described as similar to getting through a bad hangover, they asked: Dad, what's next?"

Prof Martin Kidd retires from the CSC

After 22 years, Prof Martin Kidd retired from the Centre for Statistical Consultation (CSC) at the end of 2023. His contribution to the University community has been immense and he will be sorely missed.

Prof Kidd, who matriculated from Hottentots-Holland High School in Somerset West, completed his BSc and BSc (Hons) degrees in Statistics at the University of Port Elizabeth (now Nelson Mandela University). He served his national service in the Navy in Simon's Town where he was assigned to the Institute for Maritime Technology (IMT). After completing his national service, he earned a master's degree in Statistics at Stellenbosch University (SU).

"I began my working career at the Department of Water Affairs in Pretoria. I then moved back to IMT where I spent 15 years working mainly on software development of naval decision support and simulation systems. In the latter part of my IMT career, I got involved in data mining (a term coined in the 90s), working with neural networks, CART, MARS, etc. During my tenure at IMT, I completed my PhD in Statistics at SU with the topic 'Robust estimation for scale'."

Prof Kidd was appointed as a statistician at the CSC in 2002.

"I was later appointed as director of the Centre where I worked until my retirement. In my time at the Centre, I assisted on more than 5 000 different projects, mostly master's, PhD and research related. The range of projects spanned almost all disciplines with the majority in health sciences, agrisciences, social sciences and econometrics. I co-authored more than 200 published articles."

Post-retirement, Prof Kidd will continue to be involved in the CSC in 2024. "If I don't get any further contracts from the University after that, I will probably keep on working as a statistical consultant on a freelance basis," he says.

Prof Kidd has been married to Anneke for 40 years and they have three children and four grandchildren, with a fifth on the way.

Sandra Loggenberg retires after 18 years

Sandra Loggenberg was appointed to the Department of Statistics and Actuarial Science in 2006, after she was recommended for the position of departmental assistant by her aunt, Lena.

As the Department trusted Lena's opinion of people, Sandra was invited for an interview and the rest, as they say, is history.

Sandra will always be remembered for her friendliness and her willingness to help whenever asked.

Sandra's retirement is sad day for the Department and we will miss her smiling face. We thank her for her years of dedicated service and wish her a long and healthy retirement with her family, friends, and community. She is a community person and will now have more time and opportunities to assist people in need in her community.

BDatSci student and team secure
first prize in influential Data Science hackathon

Author: Mr Daniel Bugan (with edits)

In a remarkable display of data-driven ingenuity and problem-solving skills, three students from Stellenbosch University (SU), including one from the Bachelor of Data Science (BDatSci) programme, emerged as the winners of the prestigious Standard Bank Corporate and Investment Banking Hackathon.

The hackathon, held in collaboration with Mobalyz (SA Taxi), the SU School for Data Science and Computational Thinking and the Standard Bank Group, challenged participants to construct behavioural profiles for different taxi drivers using four months of taxi data.

The SU team of Christiaan Hildebrand (BDatSci), Wicus van der Linden and Daniel van Zyl made use of a dataset containing over three million individual taxi telemetry data observations spanning four months. This data included variables such as speed, g-force ratings, and acceleration, amongst others. They were also provided with the insurance claims data of the different taxis. The team had to use this information to construct behavioural profiles for these taxi drivers without having explicit information regarding the different drivers for each taxi.

Following a Markov-inspired approach and making use of external datasets such as Uber data and integrated weather data, the team came up with a model that predicts the risk label of a driver after each trip, based on the data from that trip. The model also provides drivers and taxi owners with instant feedback and useful information that will save them a lot of money. This real-time information not only empowers drivers and provides feedback to the taxi owners, but also contributes to safer roads.

Hildebrand, a BDatSci student studying in the focal area of Statistical Learning, said the team relished the opportunity to compete in the hackathon.

"We knew that we would be working with real-world data which is something we don't often get the opportunity to do, and that excited us the most. We enjoy a challenge and we felt that this hackathon would broaden our skill set as data scientists."

The trio walked away with R22 000 in prize money, but Hildebrand said they consider this a bonus.

"The true prize in our minds was the connections and experience we gained. Before and after we presented our findings at the hackathon, we met and connected with a lot of people from Standard Bank and Mobalyz, as well as various data scientists and people of high authority in the industry. These connections are far more beneficial to us than the prize money. We also gained a wealth of crucial experience by working with real-world data to solve a real-world problem."

Prof Paul Mostert, BDatSci programme leader, said the integrated skill set that the trio obtained through the different modules in their respective degrees played a pivotal role in their victory.

Wicus van der Linden, Daniel van Zyl and Christiaan Hildebrand. Photo credit: Imáney Janse Van Rensburg

Hildebrand, along with Van der Linden and Van Zyl, both HonsBSc students, followed the same modules in Mathematical Statistics and Computer Science and were registered for all the Data Science modules up to their third year.

"It gives us great satisfaction to see students apply techniques they have mastered through their studies, and that the content we offer at SU is relevant and applicable for the industry."

Hildebrand concurred with Mostert.

"We would not have been able to accomplish this achievement were it not for the knowledge and problem-solving skills we gained from our Data Science modules. BDatSci is truly one of the best, most useful degrees in the modern data world. I am truly grateful for the amazing knowledge I have gained so far in my three years of study."

The BDatSci degree, introduced at SU in 2021, offers students the opportunity to gain knowledge of foundational modules in the core disciplines of Statistics, Computer Science, Mathematics, and Data Science. Students are also exposed to the latest technologies and concepts in the field of Data Science.

Prescient sponsors Financial Risk Management competition

As part of a deliberate push into blended learning, third-year Financial Risk Management students participating in the FRM 344 (Portfolio Theory and Investing) module embarked on a competition proudly sponsored by Prescient Securities. Two 10th-generation iPads were offered as prizes.

Project topics of interest related to the FRM344 module were selected by the students at the start of the second semester and submitted as part of further assessment before the end of the fourth term. A total of 20 written projects from the class of 30 students were submitted for examination (some projects were shared by pairs of students).

The top six projects then entered a winner-takes-all competition for the best presentation. Judges comprised members of the Department, members of the Faculty of Economic and Management Sciences and outside guest examiners (2/3 of the vote), as well as students (1/3 of the vote). The judges were very impressed by both the standard of the analytical work as well as the quality of the presentations. The winners were Mr Wynand van der Berg and Mr Douw Steenkamp, for their project on replicating returns on the Allan Gray SA Equity Fund, both in-sample and out-of-sample.

We congratulate these students, thank all the participants for their efforts, and trust the competition added an element of excitement and practical relevance to what is commonly perceived to be a clinical and theoretical course.

Pictured here are the prize winners, along with Mr Stephen Heath (CEO Prescient Securities) and Prof Justin Harvey, Head of the Department.

Europe Inside Out: KU Leuven Summer School

Financial Risk Management honours student Katherine van der Merwe was given the opportunity to attend the KU Summer School.

The picturesque setting of Katholieke Universiteit Leuven in Belgium served as the backdrop for a global gathering of students eager to delve into the intricacies of European business, innovation, and entrepreneurship. Over two immersive weeks, this unique summer school experience provided a holistic understanding of the European Union, combining academic rigour with unforgettable cultural excursions.

One of the most remarkable aspects of this summer school was its international appeal. Students from every corner of the world converged at KU Leuven, creating a vibrant, multicultural atmosphere. It was an opportunity to interact with peers from diverse backgrounds and learn not just from the curriculum but also from one another's unique perspectives.

The academic core of the programme revolved around key courses such as: "Doing Business with Europe" and "Innovation and Entrepreneurship". These courses delved into the economic landscape of the European Union, corporate governance practices, and the intricate financial systems that underpin Europe's economic stability. Participants found themselves engaged in stimulating discussions and thought-provoking lectures, expanding their knowledge base in these crucial fields.

Whilst the classroom provided valuable insights, the programme extended beyond the confines of academia. Students had the opportunity to explore the rich cultural heritage of Belgium and its neighbouring countries. Visits to the iconic Atomium in Brussels offered a glimpse into the city's history and art. Even more remarkable was the chance to attend a parliamentary debate at the European Parliament, providing a first-hand view of the political dynamics of the EU. A visit to IMEC in Leuven, one of the world's leading research centres in nanoelectronics and digital technology, provided a unique window into cutting-edge technology and innovation. To add a touch of adventure, a day trip to Paris allowed participants to explore the City of Light, further enhancing their understanding of European culture.

As the programme drew to a close, participants were tasked with a final challenge – group presentations on topics closely related to their two-week journey. This practical component allowed students to apply their newfound knowledge and insights. It was an opportunity to showcase the depth of understanding gained and to engage in meaningful discussions with peers and instructors.

The summer school at KU Leuven was more than just a conventional educational experience; it was a journey of discovery. From the academic exploration of EU economics, corporate governance, and politics, to the cultural immersion provided by the programme's highlights, it was a transformative experience for all participants. It's a reminder that learning extends beyond the classroom, and the world itself is an invaluable source of knowledge and inspiration.

Summer school students outside KU Leuven

Honours presentations

In October 2023, the Honours students in Statistics, Mathematical Statistics and Financial Risk Management presented their research topics to the Department. The students and their topics are listed below:

Mathematical Statistics and Statistics

Despite having only a small cohort of students with just five distinct Honours projects, this year's projects exhibited exceptional diversity and intrigue. They notably underscored the broad applicability of Statistics and Data Science, encompassing areas such as movie recommendations, Airbnb pricing strategies, analysis of flight delays, predicting soccer match outcomes, and exploring the financial implications of uncertainty estimation in deep learning.

1. **Wynand Neethling and Mia Meyer**
   Topic: Recommender systems

2. **Sunal Kumar**
   Topic: A classification study on flight delays

3. **Alastair Dunn and Michael Focke**
   Topic: Statistical models for predicting association football match outcomes and scorelines

4. **James Grové and Leon von Moltke**
   Topic: Illustration of uncertainty estimation in deep learning on sequential financial data

5. **Jordan Baker and Gerhard Geldenhuys**
   Topic: Modelling seasonal price variations in Cape Town's Airbnb market

Financial Risk Management

This year, the Financial Risk Management program featured 11 presentations. The event showcased students engaging in cutting-edge research spanning various topics such as optimal investment strategies, currency hedging, rough volatility analysis, statistical mapping of financial information, biplots, and models pertinent to South African fine wine, amongst others. Witnessing students dedicated to conducting practical research addressing challenges within the South African financial markets was truly inspiring. The presentations were delivered by the following speakers:

1. **Goncalves, PA and De Necker, A.**
   Topic: A South African perspective on the optimal timing and instruments to switch from a cash position to equity during a US recession

2. **Willemse, CAL and Helberg, RM.**
   Topic: Exploring term premium: Measurement and trading techniques in the South African fixed income market

3. **Smuts, C and Howard, J.**
   Topic: Making cents of it all: Currency hedging and South African balanced funds

4. **Klinkernberg, M and Hanekom, K.**
   Topic: Strategic portfolio building: Constructing a top-quartile South African multi-asset unit trust fund through asset allocation

5. **Nel, DR.**
   Topic: Is the volatility of the FTSE/JSE All Share Index rough?

6. **Vito, KT.**
   Topic: Statistical mapping of information embedded in the news, and resultant price-action: A South African study

7. **Van der Merwe, KAA and Cohen, M.**
   Topic: A study of the evolution of hedge accounting under IFRS: An FRM perspective

8. **Felix, D.**
   Topic: The correlation between text mining and prediction of stock price movement

9. **Marias, F and Herholdt, F.**
   Topic: The influence of rollover risk in the banking sector

10. **Bence, JC and Mackenzie, CS.**
    Topic: Representing SMOTE through biplots

11. **Blignaut, A and Viljoen, JM.**
    Topic: South African fine wine as an alternative investment

Final-year cocktail function

The final-year cocktail function was hosted on 18 October in the foyer of the Van der Sterr building and was attended by third-year students and staff. Below is a small selection of photographs of the event.

Photos supplied:
Credit for all: Ignus Dreyer SCPS Photos

Department's postgraduate students – 2023

1st row: JP Viljoen, S Steenkamp, C Dean, L von Moltke, P Maneveldt, K Stapelberg, Z Adams, T van Tonder, G Konan, R Buys, J Baker

2nd row: F Marais, S Kumar, L Minnaar, P Kasonda, N Africander, L Stadler, S Trumpie, H Wilkinson, A Lamont, C Smuts, M Cohen, J Thompson

3rd row: A de Necker, W Neethling, M Meyer, E Campher, A Blignaut, N Mumba, A Randelhoff, L Bartholomae, E Greyling, J Howard, K van der Merwe, C Mackenzie, G Geldenhuys

4th row: P Goncalves, K Schaberg, M Focke, J Mc Carthy, J Grové, P Slabbert, H de Kock, S du Preez, C Dudley

5th row: P Muller, H Basson, C Willemse, JC Bence, D Nel, J Benadie, H Straal, J Kruger, W Reinach, L van Rooyen, C Hollenbach, A Heyneke, M Durie, A Dunn

7th International Conference "Mathematics in Finance" concludes in Kruger National Park

The serene landscape of Berg-en-Dal rest camp in the Kruger National Park served as the backdrop for the 7th international conference on "Mathematics in Finance" from 24-28 July 2023.

Hosted by the African Institute for Financial Markets and Risk Management (AIFMRM) at the University of Cape Town, this prestigious event aimed to foster collaboration among academics, postgraduate scholars, and industry practitioners specialising in quantitative finance, risk, and financial data analytics.

Attendees included master's students in Financial Risk Management who seized the opportunity to participate in this enriching gathering. Students, including Guy Konan, Ruan Buys, Pieter Jansen van Rensburg, Phuthehang Maphatsoe, and Nelson Kyakutwika, were immersed in an atmosphere conducive to learning and networking with esteemed researchers in their field.

One of the noteworthy highlights of the conference was the engaging oral presentation by Dr Mesias Alfeus, a lecturer in the Department of Statistics and Actuarial Science, entitled "Implied roughness in the term structure of oil market volatility". Dr Alfeus introduced an insightful paper elucidating the derivation of roughness from the option market within oil markets. His presentation captivated the audience, sparking meaningful discussions and garnering commendation.

Additionally, Dr Alfeus played a pivotal role by chairing one of the sessions, contributing his expertise to facilitate discussions and exchange of ideas among conference participants.

The NITheCS Quantitative Finance Research Programme (QFRP) took centre stage during a dedicated slot at the conference. Dr Alfeus introduced this groundbreaking research initiative, emphasising its focus on industry-directed research projects. The QFRP aims to address quant finance and risk research challenges solicited from industry practitioners. Programme research associates are tasked with responding to these challenges, and successful outcomes are expected to result in publications in renowned academic journals.

The conference concluded with participants lauding the event for its insightful discussions, networking opportunities, and the invaluable platform it provided for interdisciplinary collaborations in the realm of quantitative finance and risk management.

Attending the conference were Pieter Jansen van Rensburg, Phuthehang Maphatsoe, Guy Konan, Dr Mesias Alfeus, Nelson Kyakutwika and Ruan Buys.

A strong showing at the
annual SASA conference

In November 2023, staff and students from the Department of Statistics and Actuarial Science attended the 64th South African Statistical Association (SASA) Conference held in Durban.

Dr Chris Muller presenting at SASA

Luca Steyn presents a workshop on Extreme Value Theory

This annual conference serves as a platform for statisticians to engage with the latest developments in the field and share their research across various statistical themes. The conference, hosted by the University of Kwazulu-Natal at the prestigious Elangeni and Maharani Southern Sun hotel, provided a vibrant environment for intellectual exchange, fostering discussions on a multitude of statistical topics. The conference was attended by representatives from most South African universities as well as by renowned international statisticians such as Prof Dennis Lin (Purdue University), Mark Glickman (Harvard University) and Oliver Chinganya (UN Economic Commission for Africa).

Our Department was well-represented, with both staff and students actively contributing to the diverse array of themes such as time series analysis, multivariate data visualisation, education in Statistics and Data Science, and machine learning.

Several of our staff members played a pivotal role by presenting pre-conference workshops, showcasing their expertise in key areas of statistical research. Prof Tertius de Wet and Mr Luca Steyn presented a workshop on Extreme Value Theory. Members of the Centre for Multi-Dimensional Data Visualisation (MuViSU), Prof Eric Beh and Prof Rosaria Lombardo, presented a workshop on the visualisation of categorical data with correspondence analysis.

In addition to the workshops, the following staff members delivered presentations:

- Prof Danie Uys on "The James-Stein estimator"
- Dr Johané Nienkemper-Swanepoel, Prof Niël le Roux and Prof Sugnet Lubbe on "GPAbin MCA biplots to recover categorical response patterns after multiple imputation"

- Dr Priyanka Nagar on "A multivariate circular-linear model for biomechanical data"

We are delighted that two of our postgraduate students made us proud by winning prizes in two categories. Ms Cassandra Posthumus, supervised by Dr David Hofmeyr, won the 2nd prize in the national Honours Projects competition for her project "High-dimensional co-occurrence modelling with an application in disease co-morbidity". Mr Mokgeseng Ramaisa, supervised by Dr Johané Nienkemper-Swanepoel, won the first prize for the best oral presentation made by a young statistician for his presentation "Extending GPAbin biplots for continuous data: A methodology for biplot visualisations for continuous completed datasets". These achievements reflect the high calibre of research and academic excellence fostered within our Department, setting a standard for future generations of statisticians.

Staff and students attending the conference were front, left to right: Mokgeseng Ramaisa (SU master's student), Raeesa Ganey (Wits), Johané Nienkemper-Swanepoel (SU) and Carel van der Merwe (SU). Back (left to right): Danie Uys (SU), Stephan van der Westhuizen (SU), Peter Manefeldt (SU master's student), Sugnet Lubbe (SU), Rosaria Lombardo (University of Campania "Luigi Vanvitelli", Italy), Zoë-Mae Adams (SU & PhD student), Roelof Coetzer (NWU) and Ruan Buys (SU master's student).

We are also pleased to announce that Dr Chris Muller, a senior lecturer in our Department, was appointed as the Treasurer of SASA. We extend our congratulations to Dr Muller on this prestigious appointment and wish him all the best in this new role.

The Department is grateful to everyone involved in making our attendance at this year's SASA conference a resounding success. The dedication of our staff and students enhanced the reputation of our Department, whilst showcasing Stellenbosch University as a leading institution in the fields of Statistics and Data Science.

Zoë-Mae Adams and Mokgeseng Ramaisa enjoying a coffee break.

Actuaries shine at conventions

The Department of Statistics and Actuarial Science is extremely proud to have had three of our actuarial colleagues give presentations at prestigious actuarial conventions in 2023.

Simon Louw, senior lecturer in Actuarial Science, presented with alumnus Lusani Mulaudzi at the International Congress of Actuaries in May and again at the Actuarial Society of South Africa (ASSA) Annual Convention in October. Furthermore, the pair bagged awards on both occasions.

At the International Congress of Actuaries, Simon and Lusani won the Best Paper prize in the category 'Professionalism, Ethics and Actuarial Education'. The paper [HERE] entitled "Serving the public interest through the Public Interest Actuary" discusses how actuarial associations serve the public interest by contributing to public policy, using ASSA's Public Interest Actuary as a case study.

Spurred on by this prize, Simon challenged Lusani to a debate at the Actuarial Society Convention on the topic "Should ASSA actively participate in broad public policy analysis and debate?" They won the prize for the best debate at the convention. You can watch it HERE.

Mr Davy Corubolo, senior lecturer in Actuarial Science, co-presented with Mark Randall at the ASSA Convention. Their paper [HERE] on "Designing a market capitalisation-weighted benchmark for domestic equity investors" considers the issues and factors affecting broad equity market benchmark design in South Africa, and proposes three alternative benchmarks that enable investors in the South African equity market to select a broad market benchmark that is most appropriate to their circumstances and

requirements, and which may be more robust and consistent over time. You can watch Davy and Mark's presentation HERE.

ASSA's Social Security and Retirement Reform Working Group hosted their first Social Security Indaba at the end of September, which brought together government representatives, business, civil society, and labour to discuss how income protection for vulnerable South African households could be improved through social security. **Ms Natalie van Zyl**, senior lecturer in Actuarial Science, assisted in organising and facilitating this event.

Zambia is presently dealing with similar social security issues as SA, and the President of their Actuarial Society gave a synopsis of their experience and what we can learn from it. The Indaba concluded with a broad agreement to work towards creating solutions across interest groups.

Natalie co-authored a paper [HERE] on "Evolving social security in South Africa: an actuarial perspective" that was presented at the ASSA Convention (after previously being presented at the International Congress of Actuaries in May 2023).

The paper received a meritorious mention from the Research Committee. You can watch the presentation HERE. She also attended the 4th International Conference on Social Justice, hosted by Stellenbosch University's Social Justice Centre, where she presented on the same topic to interdisciplinary social security researchers.

An update on the Centre for Multi-Dimensional Data Visualisation

The Centre for Multi-Dimensional Data Visualisation (MuViSU) has published its first R package on CRAN, biplotEZ, for EZ-to-use biplots.

The package aims to enable and empower practitioners and researchers of varying skills to apply biplots more widely in many disciplines. Biplots are valuable visualisation tools in exploratory data analysis. In their simplest form, biplots are regarded as generalised scatterplots for more than two variables. The availability of software presently limits biplot application to expert users. The desire to provide an EZier-to-use package for practitioners wanting to visualise their data encouraged the development of a user-friendly R package.

In September 2023, the Department of Statistics and Actuarial Science's Dr Johané Nienkemper-Swanepoel and Dr Raeesa Ganey (Wits University and MuViSU member) presented the first hands-on workshop for biplotEZ at StatCon 2023. This conference series, which was held at the Protea Breakwater Lodge in Cape Town, is aimed at graduates/early career academics. The workshop participants were introduced to the main aspects of biplot methodology and various examples were shown to demonstrate the current functionalities of biplotEZ.

This was followed by two presentations by Prof Sugnet Lubbe, creating awareness of biplotEZ. First, Prof Lubbe took the opportunity of a plenary presentation at the Southern Africa Mathematical Sciences Conference, hosted in Pretoria, to discuss multi-dimensional visualisations with biplotEZ. The following week she presented biplotEZ R package for EZier biplots at the annual South African Statistical Association Conference.

Prior to the launch of biplotEZ, an information session for the National Graduate Academy for Mathematical and Statistical Sciences was organised in July 2023 to discuss research opportunities for prospective Statistics and Data Science students. The presenters were Drs Nienkemper-Swanepoel and Ganey. The presentation highlighted their research interests in the field of multivariate data visualisation – specifically biplots. Furthermore, selected current projects of MuViSU were discussed.

MuViSU organised an invited paper session on "Multi-dimensional visualisation in action: advances and applications" at the 25th International Conference on Computational Statistics (COMPSTAT2023) held in London, England, in August 2023. Speakers from South Africa (Dr Raeesa Ganey), Australia (Dr Patricia Menendez), Italy (Prof Rosaria Lombardo) and Germany (Mr Marcus Mayrhofer) presented papers in this session. At the same conference, Dr Nienkemper-Swanepoel (co-authors: le Roux, N.J. and Lubbe, S) presented a paper in an invited paper session on "The impact of (un)congenial multiple imputation approaches on Gpabin biplots".

MuViSU hosted Prof Rosaria Lombardo from the Università della Campania Luigi Vanvitelli (Naples) for two weeks during November and December 2023. She is a leading expert in the field of multivariate categorical data analysis and has published more than 120 papers in international peer-reviewed journals, as well as three books (Wiley and Springer). During her visit, she and Prof Eric Beh (extraordinary professor of the Department) presented a full-day pre-conference workshop at the South African Statistical Association (SASA) 2023 conference in Durban. Prof Beh joined online from Australia and together they presented "Categorical data visualisation through the variants of correspondence analysis". Thereafter Prof Lombardo joined MuViSU members in Stellenbosch for research discussions and also presented a special seminar at the Department on "An application on Italian sustainable development goals data by using linear and functional partial least-squares".

MuViSU resources:

CRAN – **HERE**

Visit the MuViSU GitHub page **HERE** for the development version of the package and other projects.

Prof Rosaria Lombardo presenting at departmental seminar.

Raeesa Ganey (l) and Johané Nienkemper-Swanepoel (r) presenting on biplotEZ at StatCon 2023.

Team introduces groundbreaking SA Wine Index to investment market

The Department of Statistics and Actuarial Science's Dr Mesias Alfeus, together with his Financial Risk Management honours students Anton Blignaut and Jean-Pierre Viljoen, has unveiled an innovative research paper focusing on South African fine wine.

This pioneering study introduces a novel South African wine index, employing a repeat-sales regression methodology and rooted in principles of growth-optimal portfolio theory and modern portfolio principles.

The central objective of the research was to explore the impact of integrating this newly developed wine index into investment portfolios. The team's analytical findings uncovered a significantly positive influence on portfolio growth rates and diversification. By integrating South African wine assets, the study enhances portfolio diversification and growth, offering investors a new avenue to optimise their comprehensive portfolios.

The study's key findings are encapsulated in three distinct takeaways:

1. **Construction of the SA Top 10 Wine Index**: The team constructed the index based on liquidity parameters measured by both volume and value, combined with a 5-year average of Tim Atkin MW scores.

2. **Composition of the SA Top 10 Fine Wine Index**: Analysing 2 756 transactions, predominantly in red wine, the resultant SA Top 10 Fine Wine Index includes notable names such as Sadie Family Columella, Kanonkop Paul Sauer, Porseleinberg, Klein Constantia Vin de Constance, Sadie Family Palladius, Meerlust Rubicon, Boekenhoutskloof Syrah, Vilafonté Series C, Sadie Family Skurfberg, and Alheit Family Makstok. Remarkably, wines within this index have yielded returns of over 80% across four years, factoring in storage and brokerage fees.

3. **Portfolio optimisation through modern portfolio theory**: The research employed a Growth-Optimal Portfolio (GOP) and Minimum Variance Portfolio using Modern Portfolio Theory principles. This methodology aims to select the best combination of assets to achieve specific investment goals whilst managing risk efficiently. By optimising portfolios, investors seek to maximise returns, minimise risk, or strike a balance between the two.

The researchers also delved into the broader realm of collectibles in investment markets, highlighting the relevance of prior research in areas such as art, antiques, and stamps. The study underscores the unique challenge and opportunity posed by the "consumption versus investment" dynamic present in fine wine as an investment asset. This duality introduces "consumption risk" whilst simultaneously presenting as an "illiquid investment" against the backdrop of "liquid consumption".

The research also addressed critical issues such as storage costs, spoilage, and insurance concerns associated with investing in fine wine. The team's groundbreaking work marks a significant milestone in the South African investment horizon, offering investors a new perspective on diversification and growth through fine wine assets.

Working paper available on SSRN **HERE**.

Here are from left to right Jean-Pierre Viljoen, Dr Mesias Alfeus and Anton Blignaut.

Oxford professor engages in collaborative research at Stellenbosch University

In July 2023, the Department of Statistics and Actuarial Science welcomed Prof Sam Cohen, a full professor from the Mathematical Institute at Oxford University. Prof Cohen and the Department's Dr Mesias Alfeus engaged in collaborative research focusing on mathematical and statistical approaches to yield curve management within developing markets.

Their joint research delves into the application of Arbitrage-free models and deep learning techniques to enhance the accuracy of estimating zero-coupon yield curves in developing markets. Prof Cohen's expertise and collaborative efforts with Dr Alfeus provide a comprehensive exploration of these mathematical and statistical approaches, aiming to revolutionise yield curve estimation methodologies.

During his visit, Prof Cohen shared insights and expertise at the National Institute for Theoretical and Computational Sciences (NITheCS) as part of the Quantitative Finance Research Programme (QFRP) colloquium. His presentation entitled "Approximating PDEs with wide neural networks" delved into the application of neural networks as function approximators for solving Partial Differential Equations (PDEs). Prof Cohen elaborated on the 'deep Galerkin' and 'Q-PDE' algorithms, showcasing conditions under which neural networks, when infinitely wide, converge to the true Sobolev solution of the PDE. He supported his findings with compelling numerical examples.

Expressing his thoughts on his inaugural visit to Stellenbosch University, Prof Cohen remarked that he had a splendid experience during his stay, emphasising the warmth and hospitality he encountered.

Prof Cohen's visit not only enriched the ongoing collaborative research efforts at the Department but also contributed significantly to the exploration of advanced mathematical and statistical methodologies, leaving an indelible mark on the academic landscape of the University.

Seminar programme: First semester 2024

Date	Speaker / Title
16 February	Jan Beirlant (Katholieke Universiteit Leuven, Belgium)
	Tail Classification using Non-Linear Regression on Tail Model Plots
1 March	Priyanka Nagar (SU)
	Statistics on Manifolds: An introduction to Directional Models
15 March	Nelson Kyakutwika (SU)
	Joint Modelling of SPX Options, VIX Options, and VIX Futures
12 April	Zoe-Mae Adams (SU)
	Embedded Word MCA Biplots for Sentiment Visualisation
26 April	Daniel Polakow (SU)
	Honey, do I look leptokurtic in this denominator? *Conditional Correlations in Investment Portfolios, and the Gerber Statistic*
10 May	Alexis Levendis (Metropolitan)
	Static Hedging of Vanilla and Exotic Options in a South African Context

All seminars start at 13:10 in room 2048 of the Van der Sterr Building, c/o Victoria and Bosman Streets, Stellenbosch, but can also be attended via Microsoft Teams by using the following link: **CLICK HERE** to join the meeting. Enquiries: Elizna Huysamen (krugere@sun.ac.za).