Departement Statistiek en Aktuariële Wetenskap
Department of Statistics and Actuarial Science

Nuusbrief / Newsletter
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In this issue

Data Science: The future is big...

In 2015, the Department of Statistics and Actuarial Science announced the introduction of a Data Science focus to our Mathematical Statistics honours programme, in collaboration with the Department of Computer Science. This collaboration is one of the main strengths of this Data Science initiative and ensures that a wide range of skills are taught. There have been several developments since our initial announcement.

Some staff members with a keen interest in Data Science:
Dr Morne Lamont, Mr Stephan van der Westhuizen, Dr Surette Bierman, Dr David Hofmeyr, Dr Trudie Sandrock Prof Sugnet Lubbe, Me Johané Nienkemper-Swanepoel, Mr Luca Steyn and Prof Sarel Steel.

Expanding our team

Over the past two years the number of lecturers who share expertise in the theory and application of Data Science has grown. In the previous newsletter, Prof Sugnet Lubbe and Dr David Hofmeyr were introduced, and in this newsletter we learn a bit more about Dr Trudie Sandrock (P 6) and Mr Luca Steyn (P 7).

Our new colleagues assist us in improving the existing Data Science offering and rethinking our research focus areas. The additional capacity also allows us to introduce exciting new developments for our master's students: a Statistical Learning Theory module will be offered to Statistics students from 2019. With the shift in practice toward being able to analyse large datasets efficiently, the research interests of staff and students have, to a large extent, followed suit. This continuous improvement and alignment with what is expected by industry is indeed a commitment shared by all the staff in the department.

New modules

New modules that were developed in our department with the Data Science honours focus in mind are Data Mining and Statistical Learning Theory. Due to the growing interest in the Data Science focus the Data Mining module is now also being made available to students studying towards a Financial Risk Management or Actuarial Science qualification. Currently, the Computer Science modules included in the Data Science honours programme are Statistical Pattern Recognition and Machine Learning / Neural Networks.

Collaboration with industry

The department's collaborative efforts with industry continue to expand. During the third semester, Data Mining and Statistical Learning Theory students had the opportunity to meet some of the department's Data Science industry partners. The meet-up consisted of a number of talks, some question time, and informal discussions. Students learned more about the type of

learning problems tackled in the banking, credit and finance, as well as the health and computational biology industries. The types of skills that lecturers and students should focus on were highlighted and information regarding bursaries and internships offered to students was also provided.

The department thanks each of the speakers, namely August Carstens and Chané Orsmond (Capitec), Jacobus Eksteen (Compuscan), McElory Hoffman (Praelexis), and Tiaan van der Merwe (HealthQ) for taking the time to invest in our students.

In addition, the department hosted a number of lunch-time talks by August Carstens (Capitec), Jacobus Eksteen (Compuscan), McElory Hoffman (Praelexis), and Rowan Gordon (Nimble Group). Capitec also initiated a Data Mining competition for students, where students had the opportunity to test their skills in solving a real-life data analytics problem faced by Capitec. Read more on P 15.

Our students inspire us

We are privileged to teach and supervise talented, hard-working students. Some of the fruits of their labour can be seen through the awards and prizes coming their way. An exemplary example is Monika du Toit, who received the SU medal as the top master's student in the faculty, for her master's studies in Statistics. Her thesis was entitled 'L-CC classification and variable selection for multi-label data sets'.

Johané Nienkemper-Swanepoel is a PhD student in Mathematical Statistics whose PhD topic involves the visualisation of missing values in data. Read more on P 23. She received the Helga and Wolfgang Gaul Stiftung Award from the International Federation of Classification Societies in July this year.

Master's student Jandré Marais was the winner of the first Data Science Deep Learning Hackathon hosted by the Machine Intelligence Institute of Africa. The hackathon problem, based on a published paper about detecting potholes using image processing techniques, required participants to make use of about 5000 labelled road images to train a model to detect potholes in a new set of test images. Jandré's winning model obtained a test accuracy of 85.5% (https://github.com/jandremarais/PotholeDetection). He is currently in the process of finalising his master's thesis, entitled 'Deep Neural Networks for Multi-Label Image Classification'.

The future is big ...

The area of Data Science is growing quickly. This is also reflected in the growth in interest from our students. We believe that the department is well positioned to, together with industry, assist in solving the problems and further developing knowledge in the Big Data space.

This year's Data Science talk was a great success and will hopefully become an annual event.

Department welcomes new staff members

Meet Martin Coxon

Mr Martin Coxon graduated from the University of Cape Town with a Bachelor of Business Science (Actuarial Science) degree in the field of Quantitative Finance. He is a Fellow of the Actuarial Society of South Africa and Certified Enterprise Risk Actuary. He joins the department as a senior lecturer in Actuarial Science.

Name some of your career highlights

Prior to joining Stellenbosch University I worked at Insight Actuaries and Consultants, a niche health consultancy firm. I was fortunate enough to work with some of the top healthcare actuaries in South Africa across a very wide range of projects for many of the key stakeholders in the South African environment. I would say the highlight was seeing and gaining an understanding of the health-care industry from almost all possible perspectives.

What would you like to offer students?

I quite enjoy the process of learning and conveying knowledge. If anything, I hope that I can offer my students an environment where they gain the same passion for questioning the world, and learn to enjoy the process of acquiring knowledge.

What skills taught in Actuarial Science are particularly valuable in the "real world"?

Actuarial Science equips you with the skills to think widely about both the quantitative and qualitative aspects of a business problem. This is a particularly powerful combination of skills which is not readily found in other professions. This enables the actuary to successfully fulfil many roles within a business. By the same logic, these skills are also easily transferable outside the traditional actuarial domains, which means that Actuarial Science equips you with an incredibly versatile skills set.

What do you think are important characteristics that a (prospective) Actuarial Science student should possess if s/he wants to pursue a career in Actuarial Science?

A love for problem solving goes without saying. But the most important characteristic is unshakeable tenacity. The programme is tough, and even the best students fail at some point. Even within the working environment every actuary will eventually face a seemingly unsolvable problem. The successful actuary is the one that keeps coming back to the problem to try something new.

Meet Monica Matthews

Ms Monica Matthews studied at Wits and is a Fellow of the Actuarial Society of South Africa (ASSA). She joins the department as a senior lecturer in Actuarial Science.

Name some of your career highlights

I worked in retirement and investment consulting for over twenty years. It is rewarding to feel that you have hopefully played some small part in someone achieving a better retirement outcome and to provide people with some sense of comfort and perspective during uncertain investment market periods.

What are the opportunities in Actuarial Science?

In the 25 years that I have been involved in the actuarial field the opportunities have changed (and grown) significantly – health care, risk management and banking – to name but a few areas which have developed in that time. I see this as continuing. Armed with a degree in Actuarial Science (and even better – a full qualification) you will have readily transferable skills applicable to many industries.

What skills taught in Actuarial Science do you think are particularly valuable in the "real world"?

The financial mathematics skills are without a doubt the most valuable skills imparted to students. They will use it throughout the rest of their lives – both in their personal capacity and in the career they choose.

What would you like to offer students?

A degree in Actuarial Science is recognised as one of the hardest to obtain. I found completing my actuarial studies extremely challenging, particularly the first and second year. I hope to be able to support students who feel that they are in a similar position and I have a sense that, in general, students are more likely to experience a higher level of individual care and attention at Stellenbosch University than at some of the other institutions. The foundation skills and knowledge laid down in the first year are critical. Students should be taught these skills in such a manner that they have an intuitive grasp of these principles and are able to build on this platform for the rest of their studies.

What do you think are important characteristics that a (prospective) Actuarial Science student should possess if s/he wants to pursue a career in Actuarial Science?

You need to be able to think and question the material beyond what is provided in the notes or lectures for your studies. An early interest in financial markets (by reading and following developments) will help foster such thinking.

Meet Trudie Sandrock

Dr Trudie Sandrock obtained her PhD in Statistics from Stellenbosch University in 2013 and now joins the department as a lecturer in Statistics.

Name some of your career highlights

I consider myself a "hybrid academic". I spent time working in the actuarial departments of Old Mutual and Sanlam before filling analytical roles in Sanlam's marketing department as well as at Investec Private Bank. I also worked for a FTSE-listed financial services company in the UK, establishing a data-mining function for the company. Most recently, I did a two-year postdoctoral fellowship in the Department of Statistics and Actuarial Science. I started teaching during the second year of my fellowship, and I am now a full-time lecturer.

What skills taught in Statistics are particularly valuable in the "real world"?

Other than the obvious statistical, mathematical and analytical skills that are gleaned from statistical studies, I think the most important skill that students will gain from statistical studies is the ability to think critically. I would like to think that a student who has completed statistical or actuarial studies has learnt valuable reasoning skills that will be crucial in any analytical role. Having a curious mind and a willingness to delve deeper than the surface are important characteristics of students in this field.

What do you enjoy most about Statistics?

One of my favourite quotes is by John Tukey, who said: "The best thing about being a statistician is that you get to play in everyone's backyard". I have a very wide range of interests, including music, astronomy and behavioural psychology. Although I do not have formal degree qualifications in any of these fields, Statistics enables me to pursue these interests through research, as any field where data is generated has a need for statistical analysis.

What are the opportunities in Statistics?

Currently, there is a lot of talk and excitement around Big Data and Data Science. The volume of data being generated almost everywhere on a daily basis is staggering, and most companies need strong analytically-minded people to help them store, organise and analyse their data, and to guide them in making sound business decisions based on the information. Globally, Statistics is one of the most in-demand skills and there is an acute shortage of statisticians / data scientists. There are fantastic career opportunities available to students who graduate with a Statistics qualification.

Meet Luca Steyn

Mr Luca Steyn
was appointed as a junior lecturer after completing his MCom Mathematical Statistics degree at Stellenbosch University.

What do you enjoy most about Statistics?

The freedom to explore new techniques governed by the underlying data structure. I am an active Kaggle user where I explore new methods formulated in the literature. There is not a "one model fits all" approach and I enjoy exploring new, creative ways to solve a business or social problem.

What would you like to offer students?

A fun and productive working environment to learn about Statistics and explore the relevant advances in this field.

What skills taught in Statistics are particularly valuable in the "real world"?

Statistics is a tool to analyse what has happened and what might happen in the future. Understanding these techniques enables students to extract meaningful information from data. To achieve this learning outcome, the theory as well as real-world examples are discussed in our courses, in conjunction with various collaborations with business. Combined with the analytical and decision-making skills that we develop in our courses, business decisions can be made with knowledge of the key factors that drive the success or failure of the business.

Would you encourage prospective students to come to Stellenbosch University and why?

Of course! Being a student at Stellenbosch University for the past six years has been wonderful. We have a great community of keen learners who can always teach you something new. The Department of Statistics and Actuarial Science offers a variety of courses that are truly relevant in today's time, which provide a good balance between the theoretical and practical aspects of the work. Besides the academic work, Stellenbosch certainly does not have a shortage of social activities. In my opinion, my studies have not only impacted my pursued profession but also influenced my way of thinking.

What do you think are important characteristics that a (prospective) Statistics student should possess if s/he wants to pursue a career in Statistics?

The willingness to try until you succeed. Statistics is evolving faster than ever before. Therefore, prospective students should have the determination and curiosity to explore numerous techniques to make sense of data.

Carel van der Merwe visits Makerere University

A group of 15 people from various faculties and departments across Stellenbosch University travelled to Makerere University in Uganda in September as part of a postgraduate and young staff outreach organised by Stellenbosch University (SU) International with the goal of further nurturing a collaborative partnership with this institution.

Carel van der Merwe, senior lecturer in the Department of Statistics and Actuarial Science, was one of the travellers and between visits to other faculties and departments, also made a quick stop at Makerere University's Department of Statistical Methods and Actuarial Science as well.

Tell us more about your visit

We were there for six days in total. During our visit we saw various parts of the campus and faculties – including the College of Health Sciences, Food Sciences and their Agricultural Research Institute. We met the Director of Research and Graduate Training as well as a number of postgraduate students. There were also opportunities to visit some tourist attractions, such as the Namugongo Martyrs Shrine and the source of the Nile in Jinja.

What did you learn during this visit?

After this trip I realised that we, as a South African university, will struggle to remotely research problems in Africa without strengthening our ties with collaboration partners on the continent. Through collaboration we could provide them with a fresh perspective on their research problems by incorporating our skill sets, and similarly they would be able to provide us some fresh insights into how we approach our research questions.

How did you benefit from this trip?

I was able to meet my counterparts from Makerere University – which is great as it will make future communication better. Apart from that, it was great to get to meet some colleagues and postgraduate students from across SU.

Would you encourage staff members (and students) to participate in international exchange programmes?

Most definitely – the university offers so many opportunities and I really think it would be beneficial for anyone to go on an international exchange – albeit in Africa or to some other continent.

Lecturer Carel van der Merwe (far right) visited Makerere University in Uganda during a postgraduate and young staff outreach organised by Stellenbosch University (SU) International.

Master's supervision initiative

Nicolas Dierick, a PhD candidate in the Department of Financial Economics at Ghent University, visited South Africa in August as part of a master's supervision initiative initiated by Carel van der Merwe, senior lecturer in the Department of Statistics and Actuarial Science.

Why did you visit South Africa?

Carel is a colleague of mine at Ghent University, where he is doing a joint PhD in Economics. During his first stay in Ghent he started talking about the possibility of maintaining and furthering the cooperation between our departments. He proposed a master's supervision initiative, whereby I would (hopefully) be the first (successful) trial run. The main premise would be to offer a topic and the supervision thereof for a master's student from Stellenbosch University (SU), on a research question that I would wish to address during the course of my doctoral studies.

What was your impression of the university and faculty?

I very much enjoyed my stay at Stellenbosch University. I was able to interact with numerous people at faculty and university level, many of whom stressed the increasing importance for both students and staff to gain international exposure. I must also admit to be extremely envious of the professional entry hall at the Department of Statistics and Actuarial Science. For some shady reason, my own department's signboard seems to be stolen each time we hang a new one...

What were some of the highlights of your visit?

Firstly, my stay in the Kruger National Park during the Mathematics in Finance (MIF) conference will stay with me forever. During my second week, two very memorable highlights were the morning climb up Lion's Head in Cape Town and attending the Kleinsêr finals in Stellenbosch.

How do you benefit from your collaboration with Stellenbosch University?

For her dissertation, master's student Nadia Burger researches the stock market participation puzzle. She will focus on the cross-country differences within the European Union using the new Household Finance and Consumption Survey (HFCS) dataset. Her work and data collection can offer two unique contributions.

Firstly, it will provide interesting insights into the determinants of these cross-country differences.

Secondly, the HFCS data provides a representative sample of the households' financial wealth, whereas the most frequently used dataset only samples among households aged 50 and above.

Nicolas Dierick (second from left) and Carel van der Merwe (second from right) with some of the department's master's students in the Kruger National Park during the MIF conference.

Research showcased internationally

In April 2017, Emeritus Professor Niël le Roux spent a week with Prof Gower in the UK to work on a book on 'Canonical Variate Analysis' authored by John Gower, Sugnet Lubbe and Niël le Roux. This book is scheduled to be published by John Wiley & Sons in 2018/19.

Niël also attended the Compositional Data Analysis Workshop and Conference (CoDAWork) in June, held in Abbadia San Salvatore, Italy. He gave a poster presentation with co-author Benjamin Gurr entitled 'A biplot view of violent crime in South Africa'. This presentation resulted from Benjamin's master's thesis.

In July the International Statistics Congress (ISI2017) was preceded by a satellite conference on Data Science, Statistics and Visualisation (DSSV) in Lisbon, Portugal. The DSSV was attended by Niël, Prof Sugnet Lubbe and Ms Johané Nienkemper-Swanepoel, a PhD student of the department. Sugnet presented a paper on 'Visualisations associated with bootstrapping cluster analysis' while Johané presented a paper co-authored by her supervisors Niël and Sugnet on 'The virtues and pitfalls of the visualisation of incomplete categorical data'.

Niël and Sugnet then proceeded to attend the ISI2017 conference in Marrakesh, Morocco. Here Niël presented 'Geometric perspectives on student performance at the Copperbelt University in Zambia', co-authored by his PhD student Mwanabute Ngoy, and Sugnet presented 'Functional Discriminant Analysis for Multivariate Longitudinal Data' discussing a collaborative project on the aetiology of pneumonia in infants with Mark Nicol and Heather Zar from the University of Cape Town.

The International Federation of Classification Societies (IFCS) conference took place from 8-10 August in Tokyo, Japan. The Multivariate Data Analysis Group of the South African Statistical Association is an affiliated member of the IFCS and as chair Sugnet organised a session

Prof Niël le Roux, Prof Sugnet Lubbe and Ms Johané Nienkemper-Swanepoel

at the conference where the following was presented:

- 'On the determinants of survival risk factors for HIV/AIDS patients on ART in a developing country – accounting for clustering at facility level' by Renette Blignaut and Innocent Maposa (University of the Western Cape).
- 'Challenges in visualising and imputing missing categorical data' by Johané Nienkemper-Swanepoel, Sugnet Lubbe and Niël le Roux (Stellenbosch University).
- 'A visualisation technique to identify critical variables in multivariate process monitoring' by Niël le Roux (Stellenbosch University).
- 'Using the NSGA optimisation algorithm for variable selection in spectral data classification: some lessons learnt' by Martin Kidd (Stellenbosch University) and Martin Philip Kidd (jnr).
- 'Biplots based on principal surfaces' by Raeesa Ganey (University of Cape Town and University of the Witwatersrand) and Sugnet Lubbe (Stellenbosch University).

Sugnet was invited by the Greek Society of Data Analysis to present a paper on 'A comparison of different applications of functional linear discriminant analysis'. Niël was also co-author of the paper read by Dr Pieter Schoonees from the Erasmus University, Rotterdam, entitled 'Calculating neural reliability from EEG recordings of naturalistic stimuli'.

Renette and Johané attended a pre-conference workshop: Survey Analytics from Questionnaires and Textual Social Media Analytics, presented by Prof Fionn Murtagh. During the IFCS award ceremony, Johané received the Helga and Wolfgang Gaul Stiftung Award for a young researcher, under the age of 30, with high potential working in the area of classification, clustering and related topics.

After a very busy travelling schedule, Niël was not quite done for 2017 as he travelled to Leuven, Belgium, at the end of October to teach a three-week master's module on Uni- and Multidimensional scaling. This was the second time this course was presented at the Katholieke Universiteit Leuven as Niël also taught this module in 2015.

Bayesian Biostatistics presented by an internationally renowned academic

Prof Emmanuel Lesaffre of the Leuven Biostatistics and Statistical Bioinformatics Centre (L-BioStat), Katholieke Universiteit Leuven, presented an intensive five-day course in Bayesian Biostatistics from 20 to 24 November 2017. The workshop was jointly arranged by the South African DST-NRF Centre of Excellence in Epidemiological Modelling and Analysis (SACEMA) and the Department of Statistics and Actuarial Science at Stellenbosch University.

Over the last two decades, the Bayesian approach has become increasingly popular in virtually all application areas, partly because of its well-known capability to tackle complex statistical modelling tasks. The aim of this course was to introduce the participants to Bayesian statistical methods, from basic concepts to hierarchical models, model building (using packages like WinBUGS, OpenBUGS and JAGS) and model testing. Numerous biostatistical examples (e.g. meta-analyses and longitudinal studies including growth curve modelling) illustrated the theoretical concepts.

An added bonus of hosting the workshop in the department was that Prof Paul Mostert secured extensive funding for young permanent academic staff from South African universities to attend this workshop. The funding sponsored transport, accommodation and registration costs. The funding was awarded as a Teaching Development Grant (TDG) for academics in Statistics, recognising and supporting the discipline as a scarce skill in South Africa. Sixteen young academics from various South African universities attended this five-day workshop.

Prof Emmanuel Lesaffre

Actuarial Teachers' and Researchers' Conference

The UK Actuarial Teachers' and Researchers' Conference (ATRC) 2017 was held at the University of Kent, Canterbury, in July. The conference annually attracts academics involved in actuarial education as well as representatives from the Institute and Faculty of Actuaries (IFoA) and the Actuarial Education Company (ActEd). Some actuarial practitioners were also present, indicating the interest from practice in what is happening at universities.

Prof Garrett Slattery from the Department of Statistics and Actuarial Science attended this year's conference and reported that several presentations focused on the new IFoA curriculum, which comes into effect from the start of 2019. This is of particular interest to us in South Africa, as the Actuarial Society of South Africa (ASSA) will largely be following this curriculum.

Universities worldwide will be undergoing curriculum changes over the next few years to align themselves with such changes, which have been initiated by changes in the core syllabus of the International Actuarial Association (IAA).

The research theme of the conference focused on mortality issues. Topics discussed included mortality projections and the impact of aging on macroeconomic conditions, asset valuations and property prices.

Prof Slattery represents South Africa at the 2017 Vision Cup

The teams at the 2017 Vision Cup

The most prestigious event on the visually impaired golf calendar in 2017 was the Vision Cup, which runs along the same lines as the famous Ryder Cup and features 12 players per team (four each from the three categories) from each of North America (NA) and the Rest of the World (RoW). The event was staged over three days in British Colombia, Canada. With home advantage the NA side went in as favourites to win the trophy won by the RoW team in Italy in 2015.

Prof Garrett Slattery (fresh from runner-up finishes in the B2 category in the British and Irish Opens earlier in July) had the privilege of being chosen to be the playing captain of the RoW side.

After the first two days of pairs play there was nothing to separate the teams. The 12 singles matches proved equally tight, with everything coming down to the final match on the last day. The gallery on the 18th hole was treated to a tense finish which Hollywood could not have scripted better. Ultimately the event was drawn at 12 points apiece, and the trophy was retained by the RoW team until the next staging of the event in 2019.

March 2017 Graduation: Errata

Louis de Jager and Mr Carel van der Merwe

Unfortunately two gremlins slipped into our previous newsletter. We neglected to mention that Dr Ariane Neethling was the co-supervisor to Dr Retha Luus' PhD. Also, Mr Louis de Jager received his master's degree in March but was unfortunately not included in our previous newsletter. We apologise for these two oversights.

Degree: MCom (Financial Risk Management)
Supervisor: Mr CJ van der Merwe
Title of thesis: Credit and Debit Value Adjustment Estimations in the Data Sparse South African Market
Abstract:
Due to input data and resource challenges, corporate treasurers need to consider creative alternative methods to include CCR in their fair-value adjustments. Therefore, semi-analytic methods and input approximation methods were considered in this research. It was found that simpler semi-analytic methods do not possess the complexity needed to deal with the complexity of netting and collateral agreements. They serve as good approximations to quickly estimate a ball-park CVA, but lack the accuracy of the MC and Swaption based approach.
Hyperlink: http://scholar.sun.ac.za/handle/10019.1/100846

Schroder's essay competition offers students opportunity to broaden horizons

Winners of the Schroder's essay competition with staff members of the Departments of Statistics and Actuarial Science and Economics.

Also present are Prof Niel Krige, chairperson of SU's Development Office (4th from left) and Prof Ronel du Preez, Vice-dean: Teaching and Learning (3rd from right).

After failing to produce a paper for last year's Schroders essay competition, master's student in Economics Ruan Erasmus made amends by delivering the best paper of the 2017 competition.

The essay competition forms part of a joint investment research initiative that stems from an agreement signed between the Department of Statistics and Actuarial Science and global asset management firm Schroders' Multi-asset Investments and Portfolio Solutions (MAPS) division in November 2015.

The competition was open to postgraduate students from the Departments of Statistics and Actuarial Science, Business Management and Economics on topics proposed by MAPS and Schroders' strategic partner Lombard Insurance. Each topic was assigned to a mentor by Schroders, who were available via Skype to give advice and practical insight.

The winners – Ruan, Theunis Bothma, Kiran Singh, Jan Esterhuysen, Gideon du Rand, Marcel Bovijn, George Spies, Christina Yaffes, Lara Marais and Ian Louw – walked away with R20 000 each.

The top-three achievers all wrote their essay on the same topic: Finance & Investment – Gauging investor sentiment. Ruan's topic was 'Stock Index Performance: The Role of Media Sentiment'.

"The topic was very similar to that of my honours dissertation, which focuses on the effect of media sentiment in financial markets. By participating in the competition, I was not only forced to delve deeper into the topic of media sentiment but it also enabled me to acquire more knowledge of the intricate relationships that exist within the financial sphere," he said.

"The key point that I've learnt from this competition is that one should always seize the opportunity to broaden one's horizon and conduct research in one's preferred field of study. I am, therefore, grateful that Schroders has brought such an invaluable experience to Stellenbosch University for a second consecutive year."

Ashley Lester, Global Head of Multi Asset and Portfolio Solutions Research at Schroders, reviewed all the essays. "The essay competition this year produced a pleasing number of entries, including some excellent and thoughtful pieces of innovative research. Some of the essays undertook original empirical research, with fascinating results. Congratulations to all the winners of our competition."

Carel van der Merwe, senior lecturer, who managed and organised the competition with Schroders, was pleased with the growing interest in the essay competition as well as the positive feedback from Schroders.

Students win trip to London after success on stock exchange

Two Stellenbosch University students won an all-expenses-paid trip to visit the London Stock Exchange and R12500 each after coming out tops in the 2017 JSE Investment Challenge.

SU students Tonia Schoeman and Luke Nel receive their prize from Nicky Newton-King (CEO: JSE), Leon Coopasamy (Rhodes University) and Simon Brown (CEO: Just One Lap).

Now in its 44th year the Challenge aims to educate the youth about financial markets and investing. The initiative allows learners and students to buy shares in a virtual portfolio and practise trading in a risk-free environment. Each team is given a virtual sum of R1 million which they can use to trade JSE-listed shares.

The winners – Tonia Schoeman and Luke Nel, BCom Actuarial Science students in their third and second year respectively – are no strangers to this competition.

As learners of DF Malan High School they were part of the team that won the Schools Challenge in 2013 and 2014. In 2015, Luke's team won the Schools Challenge for a third time, while Tonia and her team came third in the University Challenge.

They joined forces again in 2016 and this time they won the University Challenge. Their prize included R25000 (R12500 each) and an all-expenses paid trip to the Australian Securities Exchange (ASX) in Sydney, where they were given the opportunity to ring the bell to open the market.

Their winning streak continued in 2017 and they ascribe their success to hard work and a goal-orientated approach.

"We placed between four and five orders on the stock exchange every day. During the six months of the challenge, we placed a total of 574 orders and our portfolio grew by 46%. We spent at least one hour per day on the game and because of the short time span, we followed a very high-risk approach.

"We enjoy the competition tremendously and learn something new each year. It's a great diversion from our studies," they say.

Tonia and Luke both plan to qualify as actuaries. Luke would like to specialise in investments and banking while Tonia wants to specialise in investment strategies and asset management for financial services providers.

"During the course of the challenge we gain significant practical experience and we are sure that this experience will be very valuable in the future."

Competition creates opportunities for students to develop practical skills

Stellenbosch students participating in a Data Science competition hosted by Capitec and the Department of Statistics and Actuarial Science not only had to create models to solve a problem, but also had to present and "sell" those models to the industry partner.

Capitec competition winners with organisers and staff.
***Front**: Carel van der Merwe (SU); Elan van Biljon (1st); Jeanne Daniel (5th); Ivona Contardo-Berning (SU); Prof Sugnet Lubbe (SU); Chane Orsmond (Capitec); Monika du Toit (Capitec) and August Carstens (Capitec).*
***Back**: Jandré Marais (2nd); Jacob Kenyon (4th); Luca Steyn (3rd); Dr David Hofmeyr (SU) and PW Janse van Rensburg (Capitec).*

Students received a sanitised data set and were told to solve a real-world problem identified by Capitec. After creating their models, the participants with the top five scores had to present their findings to a panel consisting of four Capitec representatives and four SU lecturers.

Brother and sister Elan and Chloe van Biljon joined forces to take first prize. Chloe has an undergraduate background in Actuarial Science and is currently busy with a master's degree in Economics while Elan is a fourth-year Electrical and Electronic Engineering student (Informatics stream).

In second place was Jandré Marais, a master's student in Mathematical Statistics. He valued the opportunity to apply theory on a real-world problem.

"It is very rewarding to find a solution to a problem and more so if someone can gain from it. It's an excellent opportunity to apply what you've learned and to see how your capabilities compare with others'. Hit-and-miss is a big part of the process. It's fun when one of your stranger ideas improves the model, because then you can investigate why it happened and learn something new in the process," he added.

According to Capitec's August Carstens, this competition is an extension of their collaborative efforts with universities, providing more students with the opportunity to gain practical exposure.

"It was also an opportunity to share and spread our excitement and enthusiasm for data science," he said. "It was evident that all the participants put a great deal of time and effort into solving the problem at hand. Students showed interest in understanding the intricacies of the problem and came up with creative ideas on how to solve it."

According to him they ran one of the earlier versions of their model on the competition data. Two of the solutions actually outperformed Capitec's earlier model. "We have developed the first version of the solution and we are looking continuously to improve it in future. We definitely got some helpful insights from the students' work," he added.

Carel van der Merwe, senior lecturer, regarded this competition as an excellent opportunity to apply theory in practice. "Students also had to develop the additional skill of presenting their model to an industry partner as they would in a real-life situation."

JASON EVEZARD: At the top of his game (and his studies)

Jason Evezard with his award as top goal scorer and South Africa's runners-up trophy at the EU Nations tournament in May.

At the recent annual Maties Sport Awards evening, Maties water polo player Jason Evezard was called to the stage twice – once to receive full colours for his water polo achievements and once more to receive an award as top academic achiever.

Despite travelling abroad a couple of times to represent South Africa internationally, this second-year BCom Actuarial Science student still managed to maintain an academic average of 86%. His first-year average was 91%.

"It is all about balance and being organised and focused. Playing water polo is a passion and a very important part of my life. I believe that a healthy mind, body and spirit is key to a healthy lifestyle," says Jason.

His first international duty of 2017 involved travelling to Poland to represent South Africa at the EU Cup of Nations in May. There he made a big impression by scoring the most goals of the tournament. South Africa won silver.

"I was surprised and extremely happy. It was great to be acknowledged after all the hard work and training and being able to make a positive contribution to the team."

After captaining the SA U/20 team at the FINA Junior World Championships in Serbia in August, Jason travelled straight to Taiwan to compete in the World Student Games (Summer Universiade) in Taipei, alongside fellow Maties Lood Rabie, Lwazi Madi, Nicholas Downes, Jordan Rumbelow and Cameron Sugden.

There he scored 19 of South Africa's 53 goals, making him the second highest goal scorer at the World Student Games.

> I believe that a healthy mind, body and spirit is key to a healthy lifestyle

"It's an honour to represent SA internationally in a sport that I am passionate about. It has given me the opportunity to meet and play against many top water polo players, and form friendships with people throughout South Africa as well as all over the world."

His ultimate goal is to represent South Africa at the Olympic Games.

Apart from spending the necessary time in front of the books, Jason trains approximately 16 hours per week which includes gym, swimming and skills sessions.

He doesn't mind though. For him, there is no downside to playing water polo.

"I am keen on most water sports which include surfing, skiing and wakeboarding. I also enjoy music and play the violin and piano."

Mathematics in Finance conference 2017

One of the perks of being a Financial Risk Management master's student at exactly the right time is attending the international Mathematics in Finance Conference (MIF) in the Kruger National Park for one whole week.

Monique-Marie Hugo, Nadia Burger, Justin Perrang, Ryan Singh and Jan Retief attended the 2017 MIF conference in the Kruger National Park.

During MIF we were privileged to encounter ground-breaking theories within finance.

Two of our favourite talks were about the innovative Hawks Graphs presented by Paul Embrechts, a professor from ETH Zurich, and a method of modelling financial bubbles presented by a lively professor from Columbia University, Phillip Protter.

Not only were we able to engage with the current developments in the financial mathematics world but Nadia Burger, Justin Perrang and Ryan Singh also had the honour of presenting their research. Lecturer Carel van der Merwe gave an informative talk on approximating risk-free curves in a sparse data environment.

We were extremely privileged to meet and to listen to well-known professors from all over the world and we even had the opportunity to interact with them on a game drive, a braai and dance with them to the beat of African music.

Our time at the MIF was enriched with the excitement of trying to spot a cheetah or a lion, counting the endless bucks, dodging a couple of elephants and watching Prof Willie Conradie showing off his skills as a braai-master.

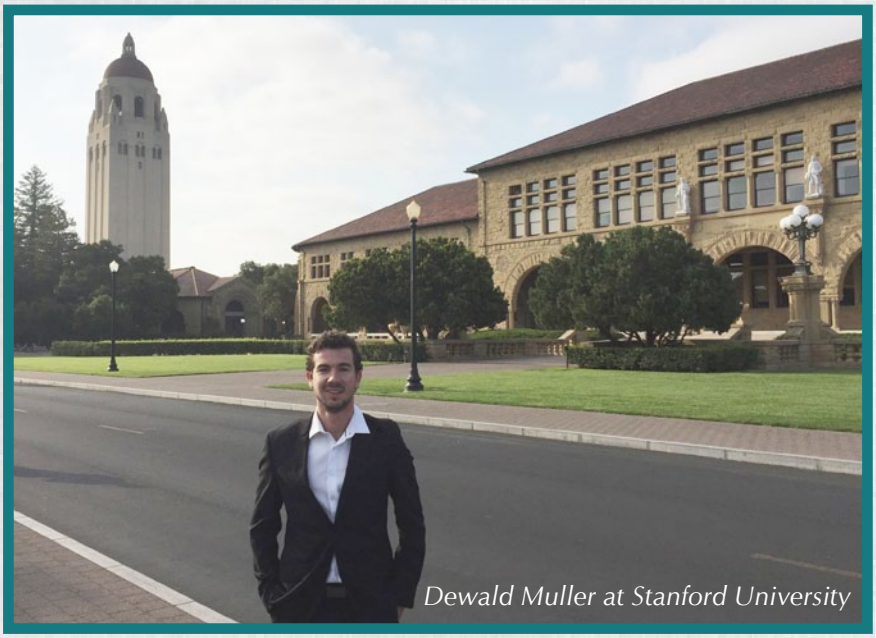
We knew that MIF would be a once-in-a-life-time opportunity, but we never expected it to be life-changing.

We knew that MIF would be a once-in-a-life-time opportunity, but we never expected it to be life-changing. Our trip was filled with memories that we as a group will cherish forever. Attending an international conference and being able to understand most of what the speakers were saying definitely encouraged and inspired our master's group. It also showed us that the skills we have learnt so far at Stellenbosch University are world class.

We are now, more than ever, excited for what lies ahead in the field of finance, risk and statistics.

DEWALD MULLER: Reflecting on my time at the Stanford Summer school

On Saturday 24 June 2017 I walked down University Avenue in Palo Alto after a 28-hour flight. I was on my way to Stanford University for an experience that would change my life: the Stanford Summer Session – an eight-week study programme for students from across the world.



Dewald Muller at Stanford University

Stanford creates an incredible environment where academics and entrepreneurship co-exist. You could be having coffee with friends while one of the Nobel Prize winners for Economics has coffee right next to you. There are more than 50 subjects that students can choose to complete during the eight weeks. I completed courses in Sociology, Technology Entrepreneurship and Leading Trends in Technology.

In the Sociology class we had a professor from Germany who also acts as a consultant for Facebook. This class gave incredible insights into the world of social media and digital connection. Snapchat was founded in this department. In the Technology Entrepreneurship class we were divided into groups of five people (from five different countries) and we had to build and pitch a start-up within the eight weeks. In the Leading Trends class we learnt about all the new developments in the technology space, including blockchain, crypto currencies, artificial intelligence and the internet of things. Some of the leaders in these industries came to speak to our class, such as JB Straubel, co-founder of Tesla. We also had the privilege to visit various companies in Silicon Valley, including Google and Facebook.

During the eight weeks I experienced how South Africans are at the forefront of international business and innovation. I had the privilege of meeting Roelof Botha, an actuary from South Africa who was the co-founder Paypal. I also met up with Dr Nico Marais, president of Wells Fargo Asset Management in the United States and the person who helped initiate the Schroder's and Lombard bursaries for our department. My experience was concluded with a get together with a former master's student from our department, Stephen Reid. Graduating top of his class in Stellenbosch (Chancellors medal, 2008) he went on and did the same at Stanford University with his PhD in Mathematical Statistics.

As a graduate you leave Stellenbosch with everything you need to pursue your dreams out there

This experience just confirmed to me once again the world-class education we receive at Stellenbosch University and the Department of Statistics and Actuarial Science. As a graduate you leave Stellenbosch with everything you need to pursue your dreams out there – it all comes down to what you make of your time at university.

Meet the class of 2017

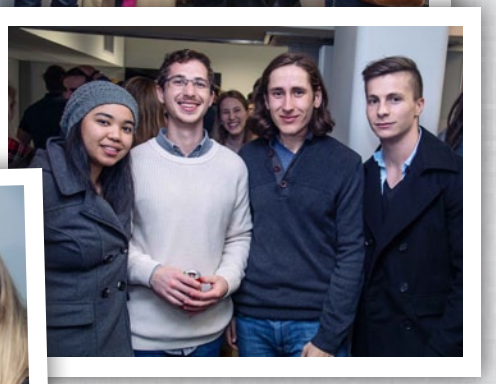
The Department of Statistics and Actuarial Science is proud of its third-year and honours students. These students have come a long way and we wish them well for the future.

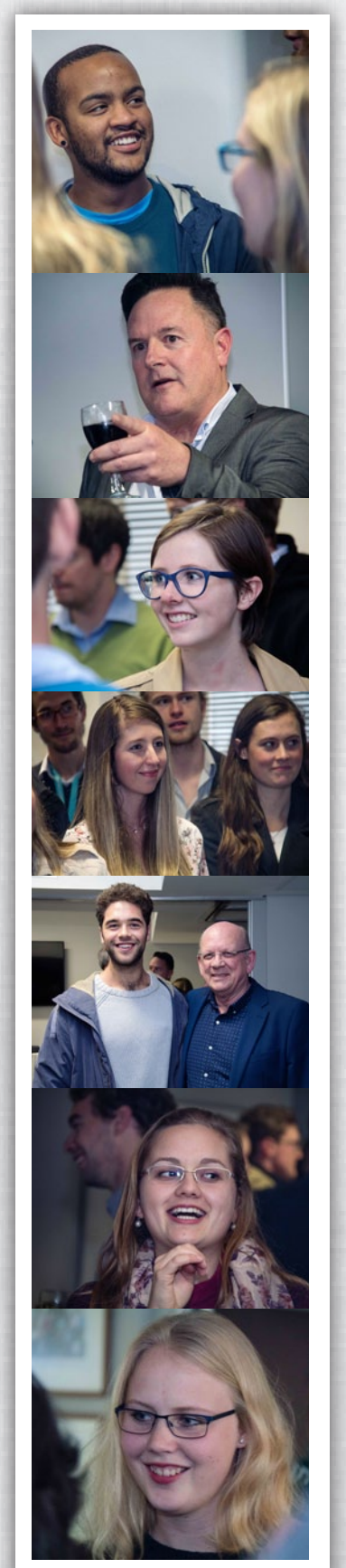
Third-year students and lecturers

Honours students and lecturers

Year-end cocktails with 2017's third-years

Just before the final-year exams commence, lecturers and final-year students get the opportunity to reminisce over our shared experience of students' undergraduate studies. But in addition to the fond memories, we also share in the excitement of young adults about to continue with their post-graduate studies or enter the work environment.





MARI RABIE: Academic and sporting excellence are not mutually exclusive

Maties alumna Mari Rabie was studying towards a degree in Actuarial Science while preparing for the 2008 Olympic Games in Beijing. She tells us about her journey.

"Idle happiness eludes me. I'm activity driven, happiest when I am working towards some goal, fuelled by a curiosity to see how far I can go. I'm of the opinion that academic and sporting excellence are not mutually exclusive."

This is Mari Rabie's response when probed about finding the balance between being a successful double-Olympian who pursued an undergraduate BCom Actuarial Science degree at Stellenbosch University and later a master's degree in Applied Statistics and an MBA as a South-African-at-large Rhodes scholar at Oxford. She managed all of this while competing in a number of competitions centred around the ITU World Triathlon Series.

Mari has now retired from professional sport and works at Remgro Limited as an executive assistant to the CEO, Jannie Durand.

Born and bred in Stellenbosch and a third-generation SU alumna, Mari comes from an athletic family. Her father was a top marathon runner in the 1970s, and her brother is currently finishing his master's degree in Engineering (US) while competing for the national water polo team. Her two cousins, Niel and Dewald Botha, are both star cricketers who also chose to pursue an Actuarial Science degree at Stellenbosch.

She describes her 11th place at the 2016 Rio Olympic Games as "momentous" after battling myocarditis (chronic heart disease) for ten months during 2014 and 2015. In the process she missed out on half of the valuable points on offer during the Olympic Games qualifying period.

"Rio put my Beijing demons to rest. It was a good day, a very good day – especially after all the obstacles I had to overcome to get there. To prove to myself that I could come back after numerous years away from the sport and compete at the highest level was a great personal achievement."

Mari had some unfinished business with the Olympics after the 2008 Olympic Games in Beijing. The disappointment of a 43rd place in the competition after her bicycle broke down was so big that she decided to rather concentrate on something else – her studies. Her good performance in Rio eight years later helped her close the book on that.

Mari's fondest memory of the Department of Statistics and Actuarial Science is a no-nonsense welcoming speech by Prof Garrett Slattery, who said: "Look to your left, look to your right, look behind you and look in front of you. Probably only one of you will become an actuary – it's mostly up to you if that one person will be you".

MEET AN ALUMNA

This comment is in line with her favourite quote from Albert Einstein: "I know quite certainly that I myself have no special talent; curiosity, obsession and dogged endurance, combined with self-criticism, have brought me to my ideas".

She also remembers the encouragement and understanding from various professors when she shared her ambition to combine qualifying for the 2008 Olympics with studying Actuarial Science. One such encouragement came in the form of a challenge: "Good luck, Miss Rabie. Only one person has managed to combine Actuarial Science with high-level sport. That is Faffa Knoetze, and he was quite bright."

Years later, Mari would end up working alongside Faffa, a senior at Remgro Limited.

As she started her master's degree in Applied Statistics at Oxford, straight out of undergrad without an honours degree, Mari retrospectively appreciated the academic standard at Stellenbosch which had equipped her with a solid foundation for further academic success.

The most important skill that she developed through her undergraduate and postgraduate studies was the ability to grasp difficult concepts quickly.

"The reality is that the world is changing quite rapidly and the most important skill to acquire, in my opinion, is to process and understand information quickly. An arduous degree like Actuarial Science gives you ample practice."

Her advice to prospective students is to be process-orientated as opposed to goal-orientated. Mari mentions that she has always managed in life by focusing on the next task at hand and simply doing it to the best of her ability. She discusses the importance of reflection, noting that it is crucial to take time to reflect on what you have learnt and at the same time to take responsibility for your own development and learning.

"Find people who inspire you and who you can look up to. In a town like Stellenbosch you do not have to look too far to find inspirational people."

Her position at Remgro gives her the opportunity to learn a vast amount about a variety of different sectors

across the South African economy, including financial services, health-care and consumer products, even though most of it is not traditional actuarial work. Mari considers it important to work in an environment where she is constantly surrounded by talented individuals, where continual learning is encouraged and an honest commitment to the community is upheld.

A recent interest for Mari is the area of disruptive financial technology. The rapid pace of innovation through technology has created opportunity for a wider number of participants in the financial services sector, alongside an improved, more customised experience for existing users.

Whilst the functions may remain similar, Mari points to three trends driving innovation: "The reality is that laws and regulations change, and we are facing a momentous time trying to decide how best to regulate the world's most important resource: data. Secondly, we as consumers change – we become more comfortable with technology, we travel more, are "time poor" and we have changing expectations of immediacy. Finally, technology continues to improve in leaps and bounds – we're beginning to see the rise of Artificial Intelligence (AI), robo-advisors and high-frequency trading in more developed capital markets."

Mari still enjoys exercising in her free time alongside studying for her last few Institute & Faculty of Actuaries exams. She has chosen to specialise in Investment.

She also keeps herself busy by advising the athleisure brand, MOVEPRETTY, she cofounded with Annelize Kotze.

Exploratory visual analysis for multivariate incomplete categorical data

Johané Nienkemper-Swanepoel, currently a PhD student of the Department of Statistics and Actuarial Science and Biometry lecturer in the Genetics Department at Stellenbosch University, recently received the Helga and Wolfgang Gaul Stiftung award.

Johané Nienkemper-Swanepoel (centre) receives the award from Mrs Helga Gaul (right) with Prof Wolfgang Gaul (left) looking on, during the recent IFCS conference in Tokyo, Japan.

This prize is awarded biennially by the International Federation of Classification Societies (IFCS) to a young researcher, under the age of 30, with high potential working in the area of Classification, Clustering and related topics. Johané also presented a paper entitled "Challenges in visualising and imputing missing categorical data" at the recent IFCS conference in Tokyo where she received the award from Mrs Helga and Prof Wolfgang Gaul.

Here Johané provides a brief explanation of her work.

Exploratory visual analysis for multivariate incomplete categorical data

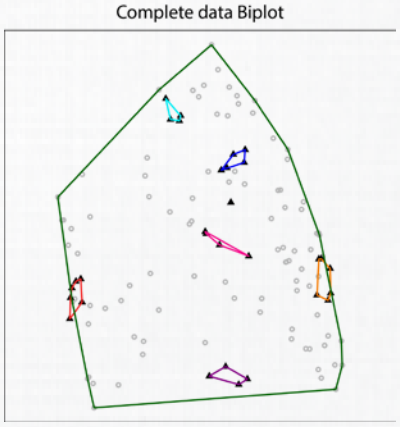
J Nienkemper-Swanepoel, NJ le Roux, S Gardner-Lubbe

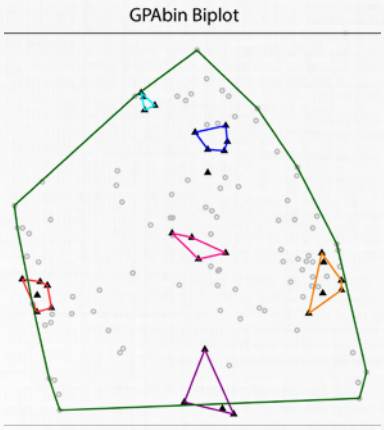
Consider a set of individuals where measurements are made for each individual (or sample) on a set of categorical questions (or variables). A measurement on a categorical variable can only be one of a finite number of qualities like "agree", "disagree" or "don't know". Typically, the categorical variables are represented as the columns of a matrix having the samples as its rows. Multiple correspondence analysis (MCA) is a multivariate categorical technique which enables the simultaneous exploration of the associations among the individuals and their different qualitative responses measured for all the categorical variables. MCA biplots are constructed for a visual inspection of the categorical data. Biplots are regarded as generalised scatterplots, in which multiple variables and samples are represented in a single display.

Incomplete data are a common problem and suitable techniques to handle missing values are crucial to continue with a standard analysis. Various imputation techniques are available to substitute missing observations with plausible response values. Multiple imputation (MI) is the favoured approach since multiple plausible values for each missing value are generated, resulting in multiple complete data sets for further analysis. These multiple data sets then have to be combined in an optimal way. This in turn is one of the aims of the exploratory data analysis project. Orthogonal Procrustes Analysis (GPA) is used to optimally align multiple configurations which eases a one-to-one comparison between MI visualisations.

A technique encapsulating MI, MCA biplots and GPA was developed by the researchers and is referred to

as GPAbin. GPAbin enables the exploration of a single visualisation as opposed to multiple visualisations after MIs have been generated for a particular data set. A simulation study confirmed that the GPAbin method is unbiased and preserves the relationships between the original samples and variables with varying percentages of missing values and causes for missingness.





The investigation of the optimal visualisation of incomplete data continues by comparing a non-imputation technique with the proposed GPAbin technique. Subset MCA (sMCA) allows the separation of missing and observed responses by adding an additional response field for each variable to indicate whether responses are missing. In order to compare the GPAbin to the sMCA approach, the same simulation study was performed. The sMCA approach is a strong contender and in data sets with a low percentage of missing values, the initial relationships observed in the simulated data are preserved. However, GPAbin incorporates the uncertainty of imputing missing values with multiple plausible values for each missing response and is therefore the preferred choice.

The success of the sMCA method lies in the visualisation of the non-responses, since a focused analysis can be performed on the missing responses only. The allocation of additional response levels for missing observations are referred to as an active method for the handling of incomplete categorical data. This can be further categorised into a single and multiple approach. The single missing active method allocates one additional missing response level for each variable, whereas the multiple active method creates unique response levels linking a missing response to a specific individual. The single active method assumes that all individuals with missing values are similar, since the missing responses per question are pooled together. This could be misleading and not representative of the individuals in the data set. The multiple active approach results in a higher dimensional problem, but provides a more realistic representation of the individuals in the survey.

Visualising the missing subset of a data set uncovers relationships between samples and variables which provide insight into the possible reason for the non-responses. Choosing a suitable technique to handle missing values relies on understanding the cause of the non-responses. The occurrence of missing values can be explained as the result of a random process referred to as the missing data mechanism. Three mechanisms are defined: missing at random (MAR), missing completely at random (MCAR) and missing not at random (MNAR).

The sMCA method shows promise for identifying the cause of missing data which could lead to the selection of the most appropriate handling technique for particular incomplete data sets.

We wish all alumni, supporters, industry partners, students and staff of the Department of Statistics and Actuarial Science a peaceful and blessed festive season.