

**SACLA  
2022**

**21–22 July**

**Cape Town  
South Africa**



**The 51st Annual Conference  
of the Southern African  
Computer Lecturers' Association**

**Conference Programme  
and  
Abstract Booklet**

### About the Logo

Since 2001, SACLA has been hosted by academic institutions based in eleven cities and towns across Southern Africa. The logo is a metro-style map of these eleven places, with each circular node closely representing their geographic positions. The Organising Committee is proud to add Stellenbosch to this map for the first time.

# Welcome to SACLA 2022

Welcome to the 51st Annual Conference of the Southern African Computer Lecturers' Association. It is my great pleasure to welcome you to the world-renowned Victoria and Alfred Waterfront and to the University of Cape Town's Graduate School of Business, housed in the historic, former, Breakwater Prison. I hope that the two-day academic programme, spanning five areas of computer-education research, two keynote addresses and an international panel engages your mind and leaves you excited for the future of computer education across our sub-continent.

This is the first SACLA conference held in-person since the COVID-19 pandemic interrupted our ability to convene and network in person. Over the next two days, I hope that you have the opportunity to reengage with colleagues that you have not been able to meet up with for some years and that our academic community becomes strengthened as a result.

It has been a privilege and pleasure to bring you SACLA 2022, and I give my thanks to the organising committee, whose hard work has made the conference possible.

*Richard Barnett*

Conference Chair

# Conference Schedule

21 JULY

22 JULY

## Pre-Conference Session

Venue: Academic Room 2

08:00 **REGISTRATION**  
(with refreshments)

## MORNING REFRESHMENTS

### Morning Session

Venue: Exhibition Hall

08:50 Conference Opening  
*Richard Barnett.*

### Keynote Session One

*Session Chair: Douglas Parry*

09:00 Learning, Unlearning and Relearning Business Analysis  
**Joe Newbert.**

### Keynote Session Two

*Session Chair: Daniel le Roux*

A Scientometric Assessment of the State of Computer Sciences in South Africa  
**Johann Mouton.**

### Paper Session One

Curriculum

*Session Chair: Jan Kroeze*

10:00 Relevant Cybersecurity: Curriculum Guidance for the South African context (16)  
*Robin Brink, Jacques Ophoff and Zainab Ruhwanya.*

### Paper Session Four

Innovative Teaching

*Session Chair: Colin Pilkington*

10:30 Experiences, motivations and plans of Humanities students pursuing a major in Information Systems in South Africa (27)  
**Temoso L.R. Masilo** and *Gwamaka Mwalemba.*

Gamification to increase undergraduate students' teamwork skills (1)  
*Tafadzwa Nyahuye and Adriana A Steyn.*

Nested-Decider: An animation program for aiding teaching and learning of decisions/nested decisions (8)

**Tiou Ramabu, Ian Sanders and Marthie Schoeman.**

11:00

### MORNING BREAK

(with refreshments)

### MORNING BREAK

(with refreshments)

### Paper Session Two

Assessment

*Session Chair: Hussein Suleman*

11:30 Towards an automated assistant for generating mathematics problems (3)  
**Zola Mahlaza.**

EskomSePush  
Bootstrapping to +2M Daily Active Users  
*Dan Wells.*

12:00 The Use of Binary Scales in Rubrics to Evaluate Computer Science Assessments (18)  
**Jacqui Muller** and *Japie Greeff.*

SACLA Annual General Meeting  
*André Calitz.*

21 JULY

22 JULY

**Lunch Session**

*Venue: Stonebreakers Restaurant*

12:30

**LUNCH**

**LUNCH**

**Afternoon Session**

*Venue: Exhibition Hall*

**Paper Session Three**

Teaching in Context

*Session Chair: Sue Petratos*

**Paper Session Five**

Pandemic Pedagogy

*Session Chair: Estelle Taylor*

Introducing Learners to Computer Programming in  
13:30 a Developing Country (11)

**Jean Greyling.**

Student experiences with blended learning at a  
South African University during the pandemic  
(6)

*Maryam Seboa and Walter Ferreira Uys.*

First-Year Students' Awareness of IT Careers (12)  
14:00 *Malibongwe Twani, André Paul Calitz and Margaret  
Cullen.*

"I feel like I am teaching myself": An Exploratory  
Study of the Factors and Implications of Online  
Learning (25)

*Malcolm Garbutt, Pitso Tsibolane and Tristan  
Pillay.*

14:30

**AFTERNOON BREAK**

(with refreshments)

Conference Closing

*Richard Barnett.*

14:40

**CLOSING REFRESHMENTS**

**Panel Session**

*Session Chair: Adriana Steyn*

Lessons learnt from online teaching and beyond,  
what now?: Three countries speak (23)

15:00 **Adriana A Steyn, Craig van Slyke, Geoffrey Dick,  
Guillermo Rodríguez-Abitia and Hossana  
Twinomurinzi.**

16:30

**Conference Dinner**

*Venue: Boardroom 2*

18:30 Arrival and Welcome Drink

19:00 Speeches, Best Paper and Top Reviewer Award  
*Richard Barnett, Daniel le Roux, and Douglas Parry.*

19:30 Dinner Served

22:00

# Keynote Speakers

## A Scientometric Assessment of the State of Computer Sciences in South Africa

*Johann Mouton.*

### About the Speaker

Professor Johann Mouton is the director of the DSI-NRF Centre of Excellence for Scientometrics and STI Policy and professor at CREST. He is on the editorial board of five international journals including *Science and Public Policy*, *Science, Technology and Society* and *Minerva*. He has authored or co-authored 10 monographs including *The practice of social research* (2002, with E Babbie), *How to succeed in your Masters and doctoral studies* (2001) and *Doctoral education in South Africa* (with Nico Cloete, 2015). He has also edited or co-edited 9 books, published 90 articles in peer reviewed journals and chapters in books, written more than 100 contract and technical reports and given more than 200 papers at national and international conferences and seminars. He has presented more than 60 workshops on research methodology, post-graduate supervision and bibliometrics and supervised more than 100 doctoral and master's students. He has received two prizes from the Academy for Science and Arts in South Africa including one for his contribution to the promotion of research methodology in South Africa. He established the African Doctoral Academy (ADA) in 2009. In 2012 he was elected to the Council of the Academy of Science of South Africa. In 2020 he was listed in the second edition of ASSAf's publication on *The legends of South African science*. He was lead or co-author on the following recent books and major reports – *Building a new cadre of researchers in South Africa* (2017), *The next generation of scientists in Africa* (2018) *scientists; The quality of South Africa's research publications* (2019), *The state of the South African research enterprise* (2019) and *A review of the NRDS and TYIP* (2020).

He is currently working on predatory publishing, funding of science in Africa, the mobility of South African doctoral graduates and the state of knowledge production at SA universities.

### Talk Abstract

The presentation will focus on the results of a recent scientometric study on the state of Computer Science that was commissioned by the Department of Science and Innovation. The key themes included in the presentation are: trends in the academic pipeline of Computer Science students (from Honours to Doctoral studies) disaggregated by gender, race and university; an analysis of the academic staff capacity of the discipline again focusing on issues of diversity and finally a bibliometric analysis of the publication outputs (articles and conference proceedings) of Computer Science as funded by the DHET publication scheme. The talk will end with a brief comparison of the field in terms of internationally benchmarking indicators.

## Learning, Unlearning and Relearning Business Analysis

*Joe Newbert.*

### About the Speaker

Joe Newbert is the Chief Training Officer at Business Change Academy—one of the world's favourite business analysis training companies with a mission to help business analysts catapult their careers.

Joe has been all over the business analysis profession since 1998.

Back in the day, he co-authored the IIBA® Business Analysis Competency Model and more recently he served as Non-Executive Director on the IIBA-SA Strategy Board.

A popular speaker on the BA conference circuit, nowadays Joe actively serves the community as Editor-in-Chief for Inter-View Report, Podcast Host on OneSixEight FM, and Newsletter Curator at 5W-iH. And, he also writes in fits and starts at Newberts Blog.

For his detailed biography, please go to [joenewbert.com](http://joenewbert.com).

### Talk Abstract

You work hard to educate your students: spending countless hours preparing material for your classes, patiently explaining the mechanics of each system model, carefully designing realistic case studies, and tirelessly marking assignments and exams.

Yet, when the graduate arrives at the workplace they discover things aren't quite as expected.

First, they discover that they need to learn something new that the syllabus didn't cover. Then, they discover that they need to forget something they were taught and do things differently. Next, they discover that they need to know something they were taught but far better than they do.

That is the disconnect between universities and organisations; the difference between theory and practice.

So, what does a business analyst do? Where does their work make an impact? And how does a graduate transition to the business analyst profession?

This session will open your eyes by taking you on a journey of discovery into the real world of business analysis.

We will cover:

- Modern expectations of the business analyst
- South African business change survey statistics
- Trending business analysis learnings for lecturers

Whether you set the syllabus or deliver the lectures, this session will give you the expert guidance you need to improve your work and steer your students towards a successful business analyst career.



## Invited Talk

**EskomSePush | Bootstrapping to +2M Daily Active Users**

*Dan Wells.*

### About the Speaker

Dan Wells used to be the CTO of Superbalist; from August 2022 he will be working full time on EskomSePush, AskMyStreet and some other projects. He has a Masters in Computer Science from Rhodes University. He's a big user of Open Source technologies: daily he works with things like Kubernetes, Flutter, and Python. Dan is motivated by learning something new everyday, and wants to teach others on the way. The question is always, how does it scale?

### Talk Abstract

Dan will tell us how EskomSePush was bootstrapped: with just two peeps in their spare time, zero budget, late nights, and a bunch of iterations to become the "most used loadshedding app in ZA". EskomSePush has over 2M Daily Active Users. The app is built with Flutter and behind the scenes powered by Firebase, Kubernetes, and Python and loads of love.

# Conference Paper Abstracts

## Paper Session One Curriculum *Session Chair: Jan Kroeze*

### **Relevant Cybersecurity: Curriculum Guidance for the South African context (16)**

*Robin Brink, Jacques Ophoff and Zainab Ruhwanya.*

Cybersecurity is vital to most organisations, and it is important that Higher Education institutions ensure the relevance of degrees to meet industry needs. It is desirable to minimise any gap in the skills graduates obtain compared to what organisations expect when hiring a cybersecurity professional. This research examines the cybersecurity tasks, knowledge, and skills that are sought by South African organisations. Content analysis was used to compare job advertisements from five well-known online job portals with the knowledge areas, units, and topics from the Cybersecurity Curricula 2017. The results indicate that knowledge in organisational security is most needed, specifically relating to identifying and protecting organisations against risk. Some areas are shown to be less relevant in the sample of advertisements, such as component security. The results of the analysis can be used by Higher Education institutions, as well as other training providers, to ensure an industry-relevant cybersecurity curricula in the South African context. The research also demonstrates a replicable approach that can be used to ensure cybersecurity education-industry alignment in the future.

### **Experiences, motivations and plans of Humanities students pursuing a major in Information Systems in South Africa (27)**

*Temoso L.R. Masilo and Gwamaka Mwalemba.*

In recent years, there has been emphasis on the need for graduates and professionals with skillsets that span beyond one domain or discipline. This study explores the motivations, experiences and plans of students pursuing a multidisciplinary degree combining majors from the Humanities with Information Systems. This was accomplished through a qualitative, exploratory case study at a South African University. The findings indicate that students are motivated by a broad range of factors including their personal attributes, individuals close to them, and the employability/financial prospects of a degree. One of the significant findings in terms of the experiences of students is that students sometimes feel like because their degrees are from the Faculty of Humanities, peers and potential employers in the technology industry doubt their Information Systems related skills. After completing their studies, students have a wide variety of plans such as pursuing Information Systems related careers or starting a business. Some students expressed a desire to make an impactful difference. The outcomes of this study can inform other universities that wish to implement similar degree programmes as well as students looking to pursue such programmes.

## Paper Session Two Assessment *Session Chair: Hussein Suleman*

### **Towards an automated assistant for generating mathematics problems (3)**

*Zola Mahlaza.*

High school students in low-income countries are negatively impacted by the SARS Covid-19 pandemic. Consequently, university lecturers of mathematics will have to offer remedial classes to bridge the gap. Since they cannot create practice problems at scale for each student's needs, there is a need for computational tools to do so. There are no existing and published formalisations of mathematical problems that abide by the South African curriculum to allow the automatic generation of problems. We aim to address this gap by formalising exam problems written by grade 12 South African students in the period 2008-2020. We evaluate the problem types by demonstrating 65% coverage of the 74 matric rewrite problems from the years 2011-2018. The presented problem formalisations allow the generation of maths problems to be used for student-led remedial practice.



### **The Use of Binary Scales in Rubrics to Evaluate Computer Science Assessments (18)**

*Jacqui Muller and Japie Greeff.*

Creating a rubric for project based assessment in ICT modules is a complex process and can be quite subjective if the wrong scales are used for rubric elements. The aim of this paper is to present a framework for developing rubrics that use binary scales for the rubric elements which will both lessen the risk of subjectivity entering into the marking process and also creates an opportunity for automation to be used for the marking of parts of the assessment. The framework and process used to develop a rubric are explained and an example is presented of what the final result would look like if created in this way. The framework was developed using a Design Science Research approach which is also the suggested approach to be used in the creation of a rubric. It is believed that this approach, once automated, could lead to a more dynamic approach to assessment where students can submit their work partially and get feedback immediately and lecturers can track in real time the progress of the class.



## Paper Session Three Teaching in Context *Session Chair: Sue Petratos*

### Introducing Learners to Computer Programming in a Developing Country (11)

*Jean Greyling.*

The South African government has committed to the implementation of coding and robotics teaching in primary schools. This vision faces the challenge that 16,000 schools in the country do not have computer laboratories, and that most teachers are not trained to teach coding. In an attempt to address this reality, the TANKS mobile app was developed at Nelson Mandela University in South Africa. It introduces introductory coding concepts without the need for a computer. The scope of the project has broadened, turning into an unplugged coding movement. Generic guidelines for the introduction of computer programming in schools continue to be provided that could be relevant to and applied in any developing context. These guidelines identify the tools to be used here, how to make the project financially sustainable, alternative methods to traditional teaching, as well as the role of training for this kind of coding instruction.



### First-Year Students' Awareness of IT Careers (12)

*Malibongwe Twani, Andre Paul Calitz and Margaret Cullen.*

The demand for Information Technology (IT) professionals has increased globally and has impacted the South African IT labour market. The increase in the demand for computing skills has been impacted by the Fourth Industrial Revolution (4IR). The IT skills in high demand include positions such as Software Developers, Data Scientists and Business Analysts. The choice of a career is usually made in Grade 9 and various factors influence a scholar's career choice. Creating IT career awareness is important for scholars to understand the various IT career paths or available career options. First-year students have generally made a career choice and should be aware of different job descriptions and job titles. This study examined first-year IT students' IT career awareness as a factor that influences students choosing IT careers. A questionnaire was administered to 405 first-year students at a national university in South Africa to determine their IT career awareness. The results indicated that there is a statistical difference in career awareness between first-year IT students and students taking non-IT courses. The results further indicated differences in the understanding of the job titles and job descriptions amongst respondents speaking different home languages, specifically amongst respondents speaking African home languages. Finally, the paper presents recommendations for intervention strategies in order to create IT career awareness amongst scholars.

Paper Session Four  
Innovative Teaching  
*Session Chair: Colin Pilkington*

**Gamification to increase undergraduate students' teamwork skills (1)**

*Tafadzwa Nyahuye and Adriana A Steyn.*

Historically, education is a highly competitive environment, where an individual is deemed successful based on high marks attained individually. The ability to work effectively in teams is an important learning objective for final-year undergraduate students. Teamwork skills are among the highly desired soft skills recruiters struggle to find among many university graduates. The purpose of this study is to evaluate whether gamification can aid in developing teamwork skills in undergraduate students. Following the design science research methodology, two games were developed. The first game is a computer-based cycling game for a single player and the second game is a computer-based King of the Mountain-type game, played as a team. In order to move from one level of the Mountain to the next, players would need to answer general trivia questions, in addition to applying teamwork skills to specific questions. There was no limit to the number of attempts players made in each game. Data was collected during play and via a questionnaire administered upon completion of the games. The results show that students found the games to be engaging and enjoyable. After a few attempts, a number of students noted that they felt part of the team and perceived that the games would enhance their teamwork skills. Participants felt that the games enhanced their team dynamics and that their desire to see their team succeed increased the more they played together. The results show potential for utilising gamification as a means to enhance students' teamwork skills.



## Nested-Decider: An animation program for aiding teaching and learning of decisions/nested decisions (8)

*Tiou Ramabu, Ian Sanders and Marthie Schoeman.*

Introductory programming can be challenging for teachers to teach and students to learn. Some of the learning challenges are linked to students' inadequate prior programming background. As a result, introductory programming students commit syntactical or logical errors. Animation programs have been suggested and used as aiding tools for teaching and learning introductory programming concepts. However existing animation programs for teaching introductory programming concepts are limited, tend to focus on K12 computing education and are too generic. In this study, we developed a special animation program called Nested-Decider. Nested-Decider is a teaching and learning aid program for decisions/nested decisions, especially for struggling students studying text-based programming. In order to test Nested-Decider, we adopted an action research methodology where the actual struggling introductory programming students from the university participated. We grouped struggling students into experimental and control groups, where the experimental group was taught decision-statements with Nested-Decider and the control group was taught without Nested-Decider. Through pre-teaching and post-teaching algorithm exercises, we compared the results between the two groups and found significant improvement in the experimental group.



Paper Session Five  
Pandemic Pedagogy  
*Session Chair: Estelle Taylor*

**Student experiences with blended learning  
at a South African University during the pandemic (6)**

*Maryam Seboa and Walter Ferreira Uys.*

Online learning was introduced as a mode of delivery at most universities in South Africa during 2020. This was done to complete the academic year that was impacted by the need to comply with government isolation regulations due to the pandemic. In 2021 blended learning was implemented at some Universities to cater for students who needed to attend practical tutorials and lab work as part of their degree. This trend appears to continue in 2022 with more Universities considering blended learning as a transition to the new normal. In this paper, the blended learning experiences of eleven students at a South African University was evaluated by means of online interviews. The OECD framework was used as a lens to present this student readiness for the BLE and was structured around the primary tasks and activities and their related factors. Future research should also examine lecturer and institutional readiness in the transitioning from online to blended learning.



**“I feel like I am teaching myself”:**

**An Exploratory Study of the Factors and Implications of Online Learning (25)**

*Malcolm Garbutt, Pitso Tsibolane and Tristan Pillay.*

Higher education institutions had to quickly adapt to a new normal brought about by the Covid-19 pandemic. This research set out to explore the factors impacting the adoption of online learning by students in South Africa and the implications of these factors on future learning. An online survey was conducted and analysed using quantitative and qualitative methods, guided by an extended technology acceptance model. The research was necessary as online learning is anticipated to continue to be used for education by higher education institutions. The findings showed the benefits of learning flexibility of online learning. However, social isolation resulted in low motivation and perception of lowering the quality of education. The research concludes that students need reassurance that they are getting an adequate education through structured learning materials and processes with timely lecturer support. Students need access to peers and must be encouraged to engage. Furthermore, students need to find their optimal learning spaces because, as life-long learners, they need to teach themselves effectively.



