



Computer Science meets *The Arts*

In popular culture, computer scientists are often portrayed as techno-geeks who are glued to their screens, bashing away on their keyboards and glugging back energy drinks to keep them coding through the night. Yet computer science is in essence simply the use of computers to study information and solve problems. Here, *Quest* profiles two recent MSc graduates who applied their computer science skills to their personal interests.

Ballet pose recognition

Margaux Fourie, a lecturer at the University of Johannesburg's Academy of Computer Science and Software Engineering, recently graduated with a master's degree in computer science. Her postgraduate studies gave her an opportunity to pursue her twin passions.

"As a computer scientist, I have a passion for solving problems, but simultaneously I've always loved and intensely pursued the athletic art form of ballet. At the start of my postgraduate studies, these two passions were introduced

to one another as I began research in pose recognition using computer vision," said Margaux.

Her journey to a master's degree was filled with unique challenges, adventures and wonderful opportunities. Some of the challenges were the limited datasets available for ballet, and a lack of experienced dancers available for capturing the required data. But the highlights included being accepted into an American professional ballet company's programme.

"Being accepted was a dream come true. With the blessing of the Faculty of Science, I was afforded the opportunity to train with this touring company that I've long admired. For nine months I was based in Jackson, Mississippi, in the USA, where I got to dance alongside a group of extremely talented people. It was an incredibly enriching experience that involved tours to Mexico and Cuba, along with opportunities to reach out to communities through dance. On top of that, I was surrounded by gifted dancers every day, which enabled me to capture a complete dataset for my research."

Upon returning to South Africa, Margaux had the daunting task of completing her dissertation, with only a few months remaining to the official deadline.

"It was a challenging yet extremely rewarding process to write up the research that took me on an adventure of a lifetime," she said. "The unwavering support I received from family and the Academy of Computer Science and Software Engineering made it possible to complete the study in time. I am grateful to UJ, the Faculty of Science and the Academy for generously granting me the opportunities that came along with the pursuit of this qualification."



Adam Liwinski, CC BY-NC 2.0

**Margaux Fourie**

Margaux jokingly pointed out that her master's graduation was scheduled for 1 April 2020 – April Fool's Day.

"True to that day's reputation, my graduation could not take place due to the national lockdown. But I am pleased to say that I still graduated virtually and got to celebrate the event with colleagues and loved ones digitally."

In July, Margaux presented her research in the virtual First International Conference on Artificial Intelligence in HCI (Human-Computer Interaction), which had been due to take place in Copenhagen. The resulting refereed paper, co-authored with her supervisor, Dustin van der Haar, proposes a feature importance study for determining which body parts play the most significant role in ballet pose recognition. The study is based on the use of OpenPose for feature extraction, together with Support Vector Machine, Random Forest and Gradient Boosted Tree classifiers.

IsiZulu language processing

Research into isiZulu language processing earned Sibonelo Dlamini his MSc degree in computer science from the University of KwaZulu-Natal (UKZN), where he was supervised by Edgar Jembere and Anban Pillay.

Sibonelo completed his schooling at George Campbell School of Technology in Durban, after which he registered at UKZN for a degree in electronic engineering. He soon realised, however, that he was more keen on computer programming, and switched to a BSc in computer science. "As I progressed through my undergraduate degree, I fell more in love with the field of computer programming and have been ever since," he said.

After completing his BSc honours degree in computer science, Sibonelo progressed to master's level, focusing his research on natural language processing. This field of study combines programming, machine learning and language – three areas Sibonelo is passionate about. "It is exciting to do research in an area that is a key driver of the Fourth Industrial Revolution," he said.

In his research project, Sibonelo dealt with isiZulu, which is an agglutinative language. This means it has a complex internal structure, constituted by numerous morphemes – the smallest units in a language that have meaning. It is

**Sibonelo Dlamini**

therefore more difficult to develop language technologies for isiZulu than for English, which has a simpler internal structure. Sibonelo tested the hypothesis that incorporating information about the internal structure of words of an agglutinative language would improve performance on the Word Sense Disambiguation (WSD) task. This is a machine-learning task that determines the correct sense of an ambiguous word in text.

Sibonelo's research goes a long way towards helping maintain the relevance of isiZulu in the current information age. He explained that people would stop using languages if they could not use technologies for tasks like voice recognition, information retrieval and grammar-checking.

"The motivation for my study was to stop the migration of language preference from isiZulu to English," he said. "It will preserve the invaluable cultural heritage that the language represents for a large section of South African society, and retain access to indigenous knowledge, which is encoded in the language."

Sibonelo explained that developing language technologies for a language was important because it maintained the relevance of the language in the information age. "If we don't create space for indigenous African languages within this revolution, we may witness their rapid extinction and the erosion of African identity that will necessarily follow," he said. "Through my research, I hope to mitigate this potential hazard through the development of state-of-the-art technologies for agglutinative languages."

Sibonelo is currently continuing his research at PhD level, working towards creating an automatic speech recognition solution for isiZulu, since speech is becoming a ubiquitous means of interfacing with computers. His future plans are to work full-time as an academic because of his passion in both research and teaching.

'Ballet pose recognition' issued by the University of Johannesburg
<https://www.uj.ac.za/newandevents/>

'isiZulu language processing' written by Samantha Ngongo for the University of KwaZulu-Natal's newsletter Ndaba Online, Vol. 8 Issue 19.
<http://ndabaonline.ukzn.ac.za/UkzndabaNewsletter/Vol8-Issue19-caes-grad>

Academy of Science of South Africa (ASSAf)

ASSAf Research Repository

<http://research.assaf.org.za/>

A. Academy of Science of South Africa (ASSAf) Publications

D. Quest: Science for South Africa

2020

Quest Volume 16 Number 3 2020

Academy of Science of South Africa (ASSAf)

Academy of Science of South Africa (ASSAf)

<http://hdl.handle.net/20.500.11911/154>

Downloaded from ASSAf Research Repository, Academy of Science of South Africa (ASSAf)