



UNIVERSITY OF
KWAZULU-NATAL™
INYUVESI
YAKWAZULU-NATALI

COLLEGE OF AGRICULTURE,
ENGINEERING AND SCIENCE



POSTGRADUATE
RESEARCH &
INNOVATION
SYMPOSIUM

2018

25 October 2018 ● Westville Campus

INSPIRING GREATNESS



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PROGRAMME: RESEARCH SYMPOSIUM

Thursday 25 October 2018, T Block, Westville Campus

Theme: African Cities of the Future

Africa, home to some of the world's fastest growing economies, is experiencing massive rural to urban migration. The growing urbanisation of the African continent is exacerbating socio-economic challenges, resulting in decaying infrastructure, energy constraints, high unemployment, skills shortages and conflict.

The need for skilled professionals and appropriate engineering solutions that combine advanced technical expertise with high-level sustainability thinking has emerged as a critical challenge not only for social advancement, but also for higher education whose educational *praxes* are often not aligned with the needs of industry and society.

To create the African Cities of the Future, UKZN's School of Engineering is responding through its research and teaching in ways which are sustainable, catalytic and responsive to the needs of South Africa and beyond.

- 08:00 – 08:55 **Registration** - Guests, Judges and Exhibitors: Downstairs, T Block entrance
- Oral and Poster Presenters, General Attendees: Upstairs
- Innovation Stream: Outside T4
- 09:00 **OPENING PLENARY (T1) - Professor Kevin Kirkman, Dean of Research, CAES**
- 09:00 – 09:15 **Introduction – Professor Akshay Kumar Saha, School of Engineering**
Official Welcome – Professor Albert Modi, Deputy Vice-Chancellor, CAES
Role of InQubate – Mrs Suvina Singh, Director, UKZN InQubate
- 09:15 – 09:45 **Keynote Lecture – Mr Neil Macleod, water and sanitation specialist consultant to the World Bank:**

“The role of Research in developing African cities of the future”

09:50 – 11:10 Session 1 – ORAL PRESENTATION

Time/ venue	T5 SAEES	T6 SLS	T1 SCP	T2 SE	T7 SMSCS
09:50 – 10:10	SAEES-O-01 Buthelezi D	SLS-O-01 Aruwajoye G	SCP-O-01 Akiri S	SE-O-01 Awino S	SMSCS-O-01 Adeyemi R
10:10 – 10:30	SAEES-O-02 Duma W	SLS-O-02 Gumede N	SCP-O-02 Anyanwu V	SE-O-02 Piliso P	SMSCS-O-02 Amusa L
10:30 – 10:50	SAEES-O-03 Kondwakwenda A	SLS-O-03 Jimoh A	SCP-O-03 Awolade P	SE-O-03 Buyeye Z	SMSCS-O-03 Gatabazi P
10:50 – 11:10	SAEES-O-04 Majola N	SLS-O-04 Madonsela L	SCP-O-04 Diejomaoh O	SE-O-04 Doubra P	SMSCS-O-04 Govender P

11:10 – 11:40 **Tea**

12:40 – 13:00	SE-O-08: Vonani Mathebula MSc 971147593 <i>School of Engineering</i>	APPLICATION OF BUS TRANSFER SCHEMES TO STABILISE POWER SUPPLY IN A FOSSIL-FIRED POWER PLANT UNIT AUXILLIARY RETICULATION	58
14:00 – 15:20	Session 3 Chair: Professor Jules-Raymond Tapamo		
14:00 – 14:20	SE-O-09: Siphiwe Mdlalose MSc 212507560 <i>School of Engineering</i>	EVALUATION OF THE SEED STORAGE FACILITY WITH REGARD TO PRESERVING SEED MOISTURE, VIGOUR AND GERMINATION	59
14:20 – 14:40	SE-O-10: Mary Nabangala PhD 215000279 <i>School of Engineering</i>	RAIN FADE DURATION STATISTICS FOR RAIN FADE MITIGATION USING SITE DIVERSITY OVER DURBAN, SOUTH AFRICA	60
14:40 – 15:00	SE-O-11: Lindelani Ndlovu PhD 203505020 <i>School of Engineering</i>	GAS-PHASE CATALYTIC PARTIAL OXIDATION OF A PERFLUORINATED COMPOUND	60
15:00 – 15:20	SE-O-12: Mkhuseli Ngxande PhD 216077070 <i>School of Engineering</i>	ON INTER-SECTIONAL ACCURACY DIFFERENCES IN DRIVER DROWSINESS DETECTION ALGORITHMS	61

ORAL PRESENTATIONS (T7)

Time	Room T7	Title	Page No.
09:50 – 11:10	Session 1 Chair: Dr Sudan Hansraj		
09:50 – 10:10	SMSCS-O-01: Rasheed Adeyemi PhD 215076528 <i>School of Mathematics, Statistics and Computer Science</i>	SPATIO-TEMPORAL MODELLING OF SUB-NATIONAL UNDER-FIVE MORTALITY IN A DEVELOPING COUNTRY CONTEXT	62
10:10 – 10:30	SMSCS-O-02: Lateef Amusa PhD 217080935 <i>School of Mathematics, Statistics and Computer Science</i>	ESTIMATING CAUSAL EFFECTS IN HEALTH OUTCOMES OBSERVATIONAL STUDIES: A RANK-BASED MAHALANOBIS DISTANCE WEIGHTING APPROACH	63
10:30 – 10:50	SMSCS-O-03: Paul Gatabazi PhD 216076827 <i>School of Mathematics, Statistics and Computer Science</i>	MULTIPLE EVENTS MODEL FOR THE INFANT MORTALITY AT KIGALI UNIVERSITY TEACHING HOSPITAL	64
10:50 – 11:10	SMSCS-O-04: Prinolan Govender MSc 213535970 <i>School of Mathematics, Statistics and Computer Science</i>	A COMPARATIVE STUDY OF METAHEURISTICS FOR THE BLOOD ASSIGNMENT PROBLEM	64
11:40 – 13:00	Session 2 Chair: Dr Sudan Hansraj		
11:40 – 12:00	SMSCS-O-05: Ahmed Hassan PhD 216074514 <i>School of Mathematics, Statistics and Computer Science</i>	AUTOMATED DESIGN OF SEARCH METHODS	65

ORAL ABSTRACTS

ROOM T7 – SMSCS ORAL PRESENTATIONS Chair: Dr Sudan Hansraj

SMSCS-O-01

SPATIO-TEMPORAL MODELLING OF SUB-NATIONAL UNDER-FIVE MORTALITY IN A DEVELOPING COUNTRY CONTEXT

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The mortality indicator used, the Standardized Mortality Rate (SMR) depends to a large degree on the size of the population; its variance is inversely proportional to the expected values and therefore areas with a small population result in estimates that vary greatly. Furthermore, the variability in the observed cases is usually higher than expected, which produces over dispersion. The availability of spatial data is important to distinguish between two sources of extra variability, which are due to 'spatial dependence' and the correlation between the spatial unit and contiguous spatial units, generally the adjacent geographical area. The variations in mortality rates becomes more compounded in health outcomes when it varies over time (years). Bayesian spatio-temporal modelling strategies can be applied to a large number of rare causes of mortality outcomes to enable examination of spatio-temporal variations on smaller geographic scales such as counties (districts) as suggested in [2]. This method allows examination of spatiotemporal variation across states (districts) in a developing country. The hierarchical Bayesian spatiotemporal models were implemented with spatially structured and unstructured random effects, correlated time effects, time varying confounders and space-time interaction terms in the software R-INLA to produce smoothed state level SMRs. The approach was applied to childhood mortality data from DHS between 2003 - 2013 to explore spatiotemporal variation in SMRs. Model-based estimates of SMRs were mapped to explore geographic variation. The model performance and predictions were evaluated using predictive measures such as Deviance information criterion (DIC) and Conditional Predictive ordinates (CPO) and Probability Integral Transforms (PIT) [3,4].

Keywords: Bayesian methods, Geographic disparities in childhood health, Small area analysis

- [1] Blangiardo, M.; Cameletti, M.; Baio, G. and Rue, H. (2013). Spatial and spatio-temporal models with R-INLA, *Spatial and Spatio-temporal Epidemiology*, 7, 39-55.
- [2] Gelman, A.; Carlin, J.; Stern, H. and Rubin, D. (2004) *Bayesian Data Analysis*. Second Edition, London. Chapman and Hall.
- [3] Spiegelhalter, D.; Best, N.; Bradley, P. and van der Linde, A. (2002) Bayesian measure of model complexity and fit (with discussion), *Journal of the Royal Statistical Society, Series B*, 64, 4, 583-639.