NITheCS
National Institute for
Theoretical and Computational Sciences

NITheCS Internship Programme 2024/2025

RESEARCH TOPICS

TOPIC	HOST	HOST INSTITUTION
1. Data mining, management and modelling for decision making 2. Data-driven machine learning models and algorithms 3. Foundational capabilities of discrete-event models for societal impact 4. Integrated multiscale modelling and simulation 5. Multiscale model verification, validation (V&V) and uncertainty quantification (UQ) using statistical algorithms 6. Theoretical foundations of machine learning models V&V and UQ	Dr David Tshwane	CSIR
1. Compact Stars as Laboratories for Matter at Extremes and Fundamental Physics 2. Physics and Evolution of the Early Universe 3. Physics of Core-Collapse Supernovae 4. Quantum Information Science 5. Relativistic Fluid Dynamics in Heavy-Ion Collisions and Particle & Nuclear Astrophysics 6. Relativistic Kinetic Theory in Heavy-Ion Collisions and Particle & Nuclear Astrophysics 7. Statistical and Thermal Physics in Heavy-Ion Collisions and Particle & Nuclear Astrophysics 8. Theoretical & Computational Physics & Finance 9. Theoretical & Computational Physics & the Environment 10. Theoretical and Computational Biophysics and Medical Physics 11. Theory and Phenomenology of Relativistic Heavy-Ion Collisions 12. Topics from Complexity Science Summer Study and Research Programme 13. Trends in Computational, Mathematical and Physical Sciences Education in South Africa	Prof Azwinndinni Muronga	Nelson Mandela University
1. Using Isolation Forest to predict customers that are most likely to churn	Mr Lindani Dube	North-West University
1. Novel Computational Materials design and prediction using ab initio method	Dr Kingsley Obodo	

NITheCS
National Institute for Theoretical and Computational Sciences

TOPIC	HOST	HOST INSTITUTION
1. Can we measure Fermi constant with astronomical data? 2. Large-scale structure correlations in the Universe 3. Neutral hydrogen evolution in galaxies	Prof Yin-Zhe Ma	Stellenbosch University
1. Categorical Algebra 2. Lattice Theory 3. Logic and Computation 4. Theory of Forms	Prof Zurab Janelidze	
1. Introduction to open quantum systems 2. Introduction to quantum computing	Prof Francesco Petruccione	
1. The mathematical study of angular momentum in quantum mechanics	Prof Bruce Bartlett	
1. Rings and related structures	Prof Amartya Goswami	University of Johannesburg
1. Application of Machine Learning to Predict Quantum Correlations 2. Quantum Simulation of Open Quantum Systems using Near-Term Intermediate-Scale Quantum (NISQ) Devices	Prof Ilya Sinaskiy	University of KwaZulu-Natal
1. Computational Ghost Imaging for Smart City Applications. 2. Emergent Quantum Phenomena in Non-Equilibrium Many-Body Systems	Dr Aniekan Magnus Ukpong	
1. On non-spatiality of some generalizations of Lindelöf locales	Dr Simo Mthethwa	
1. Evolution equations: An operator theoretical approach 2. Existence and uniqueness of solutions of ordinary differential equations 3. Generation results for operator semigroups: From Hille-Yosida to Lumer-Phillips 4. Sobolev spaces 5. The Peron–Frobenius theorem about positive matrices	Dr Christian Budde	University of the Free State
1. Investigating Theories with Sign Problems Using Complex Langevin Method 2. Monte Carlo Simulations of Matrix Models	Prof Anosh Joseph	University of the Witwatersrand
1. Jet-substructure modification in a small droplet of quark-gluon plasma: Analysis of simulated data 2. Partonic energy-loss in a small droplet of quark-gluon plasma: Analytical calculation 3. Predictions for experiments high-energy nuclear physics that produce high-density nuclear matter	Dr Isobel Kolbe	
1. Utilizing Machine Learning Algorithms for Automated Classification of Tuberculosis-Affected Lungs from X-ray Images	Dr William Vambe	Walter Sisulu University

FIND OUT MORE: https://bit.ly/3YBsgfm

APPLY (by 17 May 2024): https://bit.ly/3JP3MZt