

SACAM 2025 Programme – Wits Science Stadium

Programme: Tuesday 21 January 2025 (Day 1)

08:00	Arrival, registration & coffee					
09:00	Welcome: Prof. Philip Loveday Auditorium 4					
09:10	Opening Address: Prof. Nico Wilke Session Chair: Prof. Philip Loveday					
09:30	Keynote Address 1: Prof. Schalk Kok Session Chair: Prof. Mohsen Sharifpur					
10:15	Break					
	Session 1A: Computational Fluid Dynamics and Fluid Dynamics Chairs: Prof. M. Sharifpur + Prof. J. du Toit Auditorium 4			Session 1B: Robotics and Mechatronics Chairs: Prof. H. Hamersma & Dr C. Kuchwa-Dube Auditorium 3		
10:30	22	Modelling of bubble population statistics in slag foaming using the dynamic multiple marker method	Reynolds, Oxtoby & Mamburu	9	Development and Testing of a Scaled-Down Collision Prevention System Using the Voyager robotic platform	Tigalioma & Hamersma
10:45	43	Wake Redirection Prediction for Wind Farms	Surujhlah, Biobaku, Zhang & Ho	32	Lyapunov-Based Stability and Control of a Receiver Aircraft during Aerial Refuelling	Panday & Pedro
11:00	99	Reflections on a doctoral study: Oct 1977 – Oct 1980	du Toit	33	Snake Robot Control Optimisation Using Evolutionary Algorithms	Panday & Magagula
11:15	35	CFD analysis of heat transfer in a shaft furnace using the immersed boundary method	Khama	54	Investigating the Effects of Reconfiguration on a 5R Planar Parallel Manipulator	Dharmalingum & Ranthethi
11:30	96	Large Eddy Simulation of Expansion Wave Boundary Layer Interaction	Shaikh, Paton & Ho	67	Rapid and Robust Electric Vehicle Velocity Profile Generation: Balancing Energy Efficiency, Logistical Constraints and Computational Time	Meeser & Wilke
11:45	52	An unsupervised machine learning algorithm-based approach to DMD mode selection	Biobaku	71	Improving Autonomous Vehicle Navigation: A Focus on Learning-Based Model Predictive Control for Path-Tracking	Panday & Munduku
12:00	28	Structural Fluid-Field Analysis of Windward and Leeward Characteristic of Endwall Geometry Modification for Energy Management	Aasa, Dunne & Desai	79	Neural Network-Based PID Tuning for a Ball and Plate System	Radebe & Panday
12:15				84	A Weibull Distribution-Based Approach for Rapid Ranking of Mechatronic Systems	Vhurumuku
12:30	Lunch					
13:30	Keynote Address 2: Prof. Claudia Polese Session Chair: Prof. Philip Loveday					
14:15	Sponsor Presentation 1: Qfinsoft					
14:35	Break					
	Session 2A: AI/ML in Mechanics Chairs: Dr R. Paton & Dr S. Schmidt Auditorium 4			Session 2B: Heat Transfer and Thermodynamics Chairs: Prof. W. Ho & Dr I. Mahomed Auditorium 3		
15:00	51	Design for Sensing and Digitisation (DSD): A Modern Approach to Engineering Design and Design Education	Wilke	3	Effect of the placing of the coolant risers in a micro nuclear reactor on the thermal-fluid behaviour during a DLOFC	du Toit, Boyes & Slabber
15:15	48	Enhancing Surrogate Model Performance through Gradient-Driven Reference Frame Transformations and Hybrid Model Construction	Bouwer, Wilke & Kok	85	Numerical Investigation of Heat Transfer Enhancement in Hybrid Nanofluid Flow Through Variable Cross-Sectional Tubes	Atofarati
15:30	13	The challenges of applying hybrid modelling to real-world engineering systems	Hellberg, Heyns & Wannenburg	73	Numerical analysis of heat transfer and entropy generation in nanofluid motion over an expanding surface under oscillating magnetic fields: A Crank-Nicolson Finite Difference Method approach	Kunene, Dlamini & Mnisi
15:45	38	Graph Structure Learning in Engineering: A Study on Temporal Domains	Grobler & Wilke	87	Thermal and Magnetohydrodynamic Effects of Hybrid Ferrofluids in Jet Impingement Cooling Systems	Atofarati
16:00	41	Innovative Hybrid Data Generation for Evolving Rail Damage: Utilizing Variational Autoencoders in Ultrasonic Guided Wave Inspection Simulations	Ramatlo, Wilke & Loveday	50	Design and Thermal Analysis of a Retrofitted New Energy Vehicle Battery Pack Module: A Heat Dissipation Augmented Performance Study	Xavier, Mulaba & Naidoo
16:15	46	AI-Assisted Strategy Optimisation for Plant Operators in Power Generation	Wolfson	65	A modified effectiveness-NTU method for combined heat and mass transfer in air cooling and dehumidifying coils	Rousseau, Haffejee & Laubscher
16:30	91	Recent Advances in Latent Variable Models for Feature Detection in Guided Wave Ultrasound Measurements for Railway Track Monitoring	Setshedi, Wilke & Loveday	31	Strategic Roadmap for Solar Thermal Energy Technologies for South Africa's Future Energy Needs: Vision 2050	Singh & McGregor
16:45	108	Accelerating Thermochemical Equilibrium Calculations In 2- To 4-Component Systems with Physics-Informed Neural Networks	Meyer			
17:30	Conference Function					

Programme: Wednesday 22 January 2025 (Day 2)

08:30	Arrival & coffee					
09:00	Keynote Address 3: Prof. Quinn Reynolds and Dr Alfred Bogaers Session Chair: Prof. Philip Loveday					
09:45	Sponsor Presentation 2: Aerotherm					
10:05	Break					
	Session 3A: Aerodynamics Chairs: Prof C. Polese & Prof J. du Toit Auditorium 4			Session 3B: AI/ML in Mechanics II Chair: Prof. J. Buhmann & Dr S. Schmidt Auditorium 3		
10:30	21	Fluid Structure Interaction in Flapping Wings: How Important is Flexibility in Performance Predictions?	Krige, Ho & Boon	53	Latent Space Perspicacity and Interpretation Enhancement	Stevens, Wilke & Setshedi
10:45	83	Flow Topology Around a Supersonic Aircraft Body	Clark, Skews & MacLucas	55	Deep Graph Learning: Accommodating Rational Functions in Discrete Differential Operator Learning	Rajh, Joubert & Wilke
11:00	66	Numerical Simulations of Induced Flow Asymmetry of Truncated Aerospike Nozzles	Hohls, Law & MacLucas	64	Neural Network Principals Applied to Non-Linear Phenomena in Mechanical Systems	van Vuuren
11:15	90	Transient Effects of Acceleration and Deceleration on the Formation and Location of the Bow Shock on an RAE 2822 Aerofoil	Morrow, Roohani, Skews & Gledhill	10	A systematic literature review of techniques used for remaining useful life prediction	Maré & Bührmann
11:30	78	Thermal effects on accelerating bodies	Makomva, Roohani & Gledhill	94	Challenges with Identifying Sparse Parametric Data-Driven Models from Normalised Datasets	Raut, Wilke & Schmidt
11:45	82	Aerodynamic Loading for Transonic Flight with Acceleration	Mahomed, Roohani, Skews & Gledhill	11	Predictive maintenance: A transfer learning approach for predicting the RUL of industrial equipment	Maré & Bührmann
12:00	23	Exploring Aeroacoustic Models for Propeller Noise Prediction in Electric Aircraft: Challenges and Certification Implications	Schutte & Bosman			
12:30	Lunch					
13:30	Keynote Address 4: Dr Mehdi Safari Session Chair: Prof. Mohsen Sharifpur					
	Session 4A: Vibration & Condition Monitoring Chair: Prof P. Loveday & Dr C-J. Kat Auditorium 4			Session 4B: Computational Methods in Mechanics Chairs: Prof. M. Sharifpur & Dr A. Bogaers Auditorium 3		
14:15	47	Insights into Epistemic and Aleatoric Uncertainties in Experimental Rolling Element Bearing Condition Monitoring Data	Osetoba, Schmidt & Wilke	56	A Future of Computational Mechanics: Opportunities with Quantum Computing	Wilke
14:30	60	Latent Space-Sensor Source Analysis in PCA and VAE for Enhanced Vibration Monitoring	Mundondo	100	The Material Point Method for Geotechnical Applications	Coetzee & Purvance
14:45	75	A Phenomenological Rolling Element Bearing Damage Model For Simulating Multi-Sensor Vibration Data	Ramabulana & Schmidt	102	Review of Continuum Modelling Approaches for Particulate Systems	Bosman
15:00	77	Virtual strain measurement of a vibrating beam	Durandt & Bekker	104	Modelling the Melting Behaviour of Granular Heaps	Bogaers
15:15	81	Identifiability of rolling element bearing damage in vibration-based condition monitoring using virtual calibration	Schmidt & Wilke	105	Comparison between CFD and SPH methods for solving the flow through a hydrocyclone	Schmitt
15:30	95	Development of a Two-Dimensional Wagon Track Numerical Model	Perumal, Nickerson & Bekker			
15:30	Break					
	Session 5A: CFD II Chair: Prof. Q. Reynolds & Dr L. Nel Auditorium 4			Session 5B: Biomechanics I Chair: Prof. K. Hassani & Prof. T. Pandelani Auditorium 3		
15:45	93	Seismic Response Analysis of Flexible Steel Water Storage Tanks Using Arbitrary Eulerian-Lagrangian and Coupled Eulerian-Lagrangian Methods	Pourbeni, Strasheim & Mattar	5	Analysis of blood flow for designing of a prosthetic mitral valve using computational fluid dynamics method	Taheri, Shojaei, Khorrammehr & Hassani
16:00	80	CFD Modelling and Experimental Validation of Pre-heating of Manganese Ore with Air to 600 °C in a Packed Bed	Sambo & Khama	16	Valvular hemodynamic: flow and clot modeling in venous valves with variable aperture	George
16:15	107	Computational Fluid Dynamics Modelling of the Improved Airflow on a Ballistic Grille Using a Porous Medium Approach	Mothomogolo	26	Mechanobiology of the corneal endothelium	Nyamudeza
16:30	98	Dust extinction moisture of iron ore in relation to testing at reduced atmospheric pressure conditions	Frangakis & Rantoa	39	Computational Fluid Dynamics of Aqueous Humor and Gas Bubble Interactions in Endothelial Keratoplasty: Implications for Graft Adherence	Cheng
16:45				37	Fluid structural interaction simulation of a carotid artery with flexible arterial walls	Strubing

Programme: Thursday 23 January 2025 (Day 3)

08:30							Arrival & coffee						
Session 6A: Dynamics & Vehicle Dynamics Chairs: Prof. C. Coetzee and Prof. P. Loveday Auditorium 4				Session 6B: Structural Mechanics, Materials & Manufacturing Chairs: Prof. M. Venter & Prof. C. Polese Auditorium 3									
09:00	6	Vehicle Dynamics Parameter Estimation through Automated Covariance Scheduling	Eldring, Hamersma, Peenze & Els	4	Hoyt Xceed archery riser mechanical analysis	Lopes & Pietra							
09:15	7	Improving brake performance with changeable suspension settings on rough terrain	Achamer, Hamersma & Els	12	Evaluating digital image correlation speckle pattern quality using finite element-based displacement fields	Phukubye, Venter & Neaves							
09:30	57	Evaluation of Lumbar Spine Loading in Hybrid III Manikin Using MADYMO Simulations for Vertical Impact Scenarios	Pandelani	29	Development of a methodology to design sportive equipment	Pietra							
09:45	86	Articulating Drop Foot Orthosis Device Testing Rig	Zapke & Venter	18	Mechanical properties of epoxy resins under various loading conditions – Comparison between bio- and petroleum- based resins commercially available in South Africa	Sindane							
10:00	92	Propulsion Unit Sizing of a Battery-Powered New Energy Vehicle: A Retrofitting Approach using Vehicular Dynamics	Xavier, Mulaba & Naidoo	30	Analysing the effects of cyclic loading on corrugated paperboard boxes	Cronjé & Coetzee							
10:15	24	Dynamics of a Nutating Mill with Charge-Structure Interaction	Janse van Vuuren, Bredell & Coetzee	97	Geometrical Deviations of a Scaled-Down Ti6Al4V(ELI) Aircraft Nose Wheel Fork Produced by Selective Laser Melting	Monaheng							
10:30	20	Method for characterisation of wall surface roughness in bulk solids handling	Frangakis	101	Bushing characterization under combined loading	Kat, Chiari, Els & Mantovani							
10:45				106	Virtual TIG Welding Simulator	Jonker							
11:00							Break						
Session 7A: Acoustics & Ultrasonics Chair: Dr W. Roos & Dr D. Ramatlo Auditorium 4				Session 7B: Biomechanics II Chair: Prof. K. Hassani & Dr A. Panday Auditorium 3									
11:15	19	Development of an Electromagnetic Acoustic Transducer for Measurement of Lamb Waves in Plates	Mathoho, Kgwete, Fromme & Loveday	44	Comparative Analysis of Shear-Driven and Coupled Biochemical-Haemodynamic Models for Thrombus Formation	Bougardt, Ho, Ngoepe, Paton, Pillai, Pule & Moisane							
11:30	34	Measurement of Acoustic Properties of Slurries using Low-Cost Laboratory Equipment	Mabandla & Loveday	58	Viscoelastic modelling of right ventricular of porcine heart	Pandelani							
11:45	40	Decoding Reflection Patterns: A Damage Evolution – Reverberation Interaction Study in Welded Rail Tracks for Ultrasonic Guided Wave Inspections	Ramatlo, Loveday & Wilke	63	Biomechanical characterisation of Aortic valve leaflets	Matjeka, Kuchumov, Ngwangwa, Nemavhola & Pandelani							
12:00	103	Signal Analysis of Ultrasonic Testing in 3D Printed MSLA UV Cured Resin Samples	Luthuli	89	An external fixator study: Mechanical behaviour of Ilizarov wires	van der Westhuizen							
12:15				62	Biomechanical Impact of Lower Limb Posture on Injury Severity During Underbody Blast Events	Sekhuthe, Miyambo, Modungwa & Pandelani							
12:30							Light Lunch						
13:15							Closing: Prof. P. Loveday Session Chair: Prof. N. Wilke & Prof. T. Pandelani						
13:25							SAAM AGM Chair: Prof. T. Pandelani Auditorium 4						
14:00	Platinum Sponsor Workshop: Qfinsoft will run a two-hour workshop on PyAnsys (South West Engineering Building)			Wits Laboratory Tours (North West Engineering building)									

Keynote Speakers

Prof. Schalk Kok, University of Pretoria, “Recent advances in surrogate modelling”

Abstract

Prof. Schalk Kok will present a personal perspective on surrogate modelling. He has worked on and off on surrogate modelling for almost three decades. His first exposure to surrogate modelling occurred during his masters studies in 1996, when he used polynomial surrogates to replace a transient thermoelastic finite element model. He next encountered surrogates in 2009, where he was involved with a mesh movement project. Radial basis functions were used to move the fluid mesh in a fluid-structure interaction (FSI) solver. More recently (2022-2024), Prof. Kok and Prof. Nico Wilke supervised doctoral student Johann Bouwer to develop near-optimal gradient enhanced surrogates. Specifically noteworthy is the development of a data pre-processing step that transforms the dataset using scaling and rotation. The intent is to transform the dataset to be more isotropic, making it more likely that a radial basis function surrogate (consisting of the summation of isotropic basis functions) will approximate the data accurately.

Bio

Prof. Schalk Kok is an experienced academic in the field of mechanical engineering, currently serving as Professor and Head of the Department of Mechanical and Aeronautical Engineering at the University of Pretoria. He is also currently appointed as the Chair of the School of Engineering, in the EBIT Faculty. Prof. Kok completed his B.Eng. and M.Eng. degrees at the University of Pretoria, followed by a Ph.D. at the University of Illinois at Urbana-Champaign, supported by notable scholarships including a Fulbright award.

Prof. Kok’s professional journey has spanned academia and applied research. He worked at the University of Pretoria from 2003 to 2009, at the Council for Scientific and Industrial Research (CSIR) from 2009 to 2013, and he returned to the University of Pretoria in 2013. Since returning to UP, his research has concentrated on computational solid mechanics and material modeling, contributing to areas such as finite element analysis and material parameter identification.

His contributions have also extended to professional service, including leadership roles in the South African Association of Theoretical and Applied Mechanics (SAAM). He is a past president of SAAM, serving in the role for three consecutive 2-year terms (2010-2016).

Prof. Claudia Polese, University of the Witwatersrand, “Shaping South Africa's Future: Innovations in Advanced Manufacturing”

Bio

Claudia Polese is an Associate Professor in Aerospace Manufacturing and Design at the School of Mechanical, Industrial and Aeronautical Engineering at the University of the Witwatersrand, Johannesburg, South Africa, and she also serves as the Advisory Aerospace Research Director of the National Aerospace Centre. A National Research Foundation-rated researcher since 2011 and a Fellow of the Royal Aeronautical Society, Prof. Polese leads as Head of the Aeronautical Engineering Stream and Deputy Director of the ARUA Centre of Excellence in Materials, Energy and Nanotechnology. Prof. Polese has played a pivotal role in advancing South African research in cutting-edge aerospace technologies through collaborations with the Council for Scientific and Industrial Research, Airbus and various international institutions. In recognition of her contributions to fostering industrial and scientific partnerships between Italy and South Africa, she was honoured with the Knight of the Order of the Star of Italy and the NSTF-South32 Science Oscar for her work in advancing research, infrastructure and human capital in advanced manufacturing technologies.

Dr Alfred Bogaers, Ex-Mente & Prof. Quinn Reynolds, Mintek, “Life at 1500°C - a multiphysics modelling journey through pyrometallurgy”

Bio

Quinn Reynolds is 48 years old and holds degrees in Engineering and Applied Mathematics. He has worked in the Pyrometallurgy Division at Mintek for over 25 years. Mintek is a state-owned research institute serving the extensive mineral and metallurgical processing sector in South Africa. Quinn is also an extraordinary professor in the department of Chemical Engineering at Stellenbosch University.

His expertise includes mathematical and computational modelling of complex coupled phenomena in high temperature processes, and in particular the application of high-performance computing and open source software platforms to pyrometallurgy. His current areas of research include magnetohydrodynamic modelling of electric arcs, multiphysics fluid flow problems in furnace tapping and phase separation, combustion modelling for metallurgical processing, and reduced order modelling for digital twin applications.

Dr Mehdi Safari, Mintek, “Applications of Computational Fluid Dynamics for Mineral Processing”

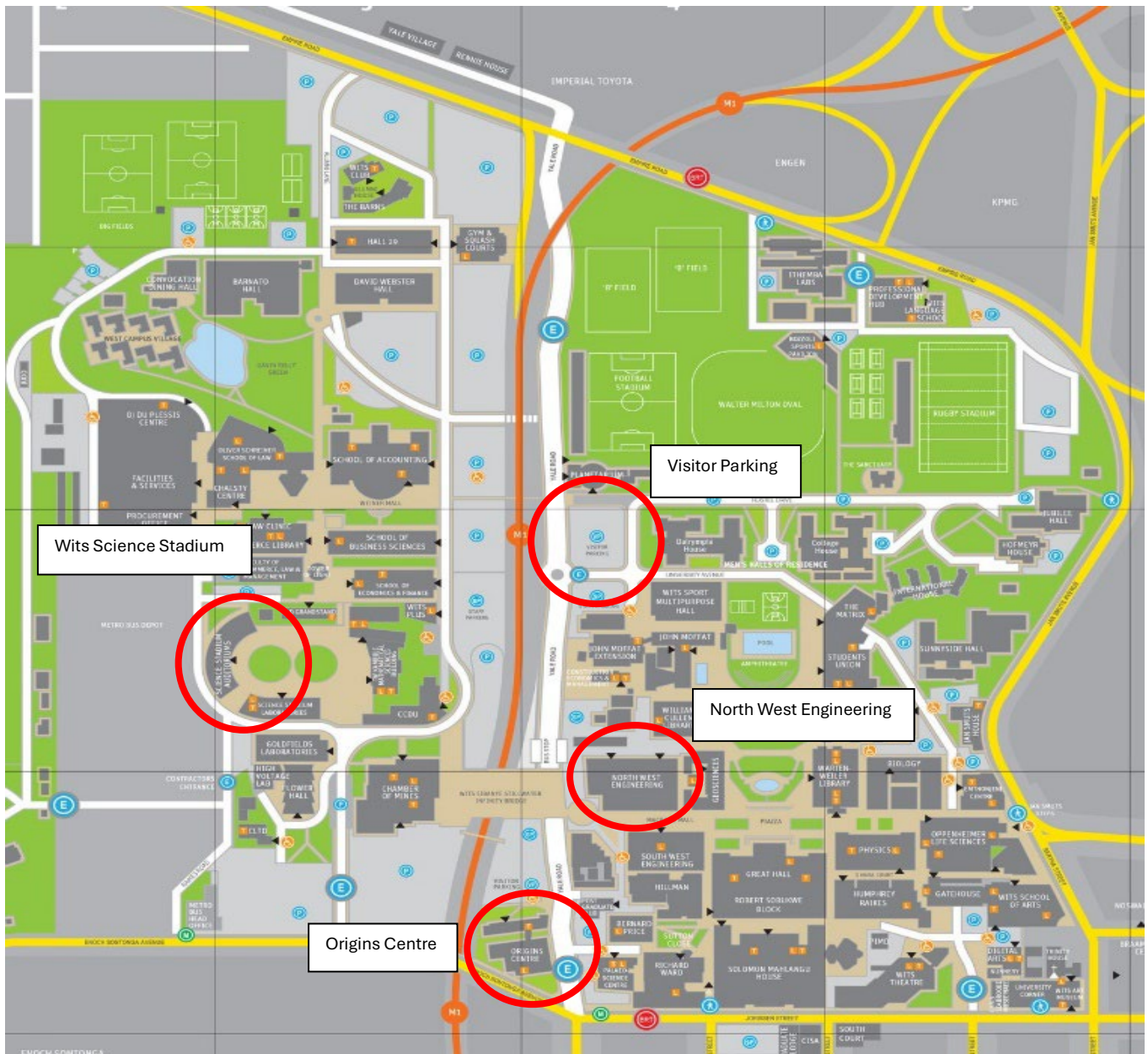
Abstract

Computational Fluid Dynamics (CFD) is a vital tool in mineral processing, providing detailed insights into fluid dynamics and multiphase interactions essential for various operations. By solving the Navier-Stokes equations, CFD enables precise simulation and analysis of fluid behavior, enhancing equipment design, process optimization, and efficiency. A key application of CFD is in optimizing hydrocyclones, crucial for particle classification and separation. Simulations allow visualization of flow patterns and particle trajectories, facilitating design improvements that boost separation efficiency while reducing energy consumption. Similarly, CFD plays a pivotal role in flotation processes by modeling interactions between air bubbles and mineral particles, leading to better cell designs and operational parameters that improve mineral recovery. Furthermore, CFD is instrumental in optimizing mixing tanks and reactors, where uniform mixing is essential. It analyzes fluid flow and mixing patterns, guiding impeller design and improving efficiency. In slurry transport systems and thickeners, CFD models particle settling and slurry flow through pipelines, minimizing energy use and preventing blockages for more efficient transport. Beyond process optimization, CFD contributes to environmental management in mining. It models pollutant dispersion in air and water, aiding in the design of effective ventilation systems and effluent treatment processes, thus reducing environmental impacts and ensuring regulatory compliance. Applications in mine ventilation also enhance workplace safety. In summary, CFD fosters a deeper understanding of fluid flow phenomena, enabling the development of more efficient, sustainable, and environmentally friendly mineral processing technologies. Its role in improving productivity and minimizing environmental impact continues to grow, positioning CFD as a cornerstone of innovation in the mineral processing industry.

Bio

As an industrial research leader, Dr. Safari has over 17 years of experience applying cutting-edge research to practical industry solutions, specializing in novel mineral processing technologies. He is an NRF C1-rated researcher by the National Research Foundation. His expertise lies in scaling up laboratory to pilot-scale technologies and processes to achieve profitability. Mehdi has extensive knowledge in the classification, physical separation, and flotation of various minerals and has collaborated with leading mining houses such as Rio Tinto, Anglo American, BHP, Glencore, Vale, Fortescue, Sibanye-Stillwater, Impala Platinum, Assore, and Vedanta. Additionally, he has worked with renowned equipment suppliers including FLSmidth, Eriez, and Metso:Outotec on global projects involving REE, PGM, gold, copper, cobalt, nickel, lead, zinc, iron, barite, apatite, and phosphates. Throughout his career, Mehdi has consistently delivered technical, financial, and reputational success. Currently, he is responsible for providing development, engineering, and support services, focusing on enhancing productivity, managing risks, and delivering sustainable, safe, and efficient solutions to clients in the mining industry.

Map of Wits Campus: <https://www.wits.ac.za/maps/braamfontein-campus/>



Access to Campus:

Visitors should have their Drivers licence and an email saying they are attending the conference (e.g. your registration email). Drivers should use the Yale Road North and Yale Road South entrances.

Parking is available next to the Digital Dome/Planetarium.

The E- hailing users (Uber, Bolt) must have their ID documents and the same email stating that they are attending the conference, they must use the entrance on Jorissen and Eendrach Street (Sutton Close).

WiFi Access

- 1) Eduroam (majority of people from SA academia should have access to this network)
- 2) Wits-Guest (The temporary login details are: Username: 282ao Password: 049Fohbn)

Presentations: 12 minutes for presentation and 3 minutes for questions. Presentations to be loaded on computer before the session begins. Certificates will be awarded for exceptional student presentations – more details to follow.

Conference Function: A cocktail function will be held at the [Wits Origins Centre](#). This will include a guided tour of the Centre.

Qfinsoft Workshop: Using the PyAnsys environment for setting up and running Ansys simulations

Introduction to Ansys	10 minutes
Introduction to PyAnsys	10 minutes
Demonstration on using PyAnsys	30 minutes
Hands-on session using PyAnsys	60 minutes
Questions and Answers	10 minutes

School of Mechanical, Industrial and Aeronautical Lab Tour

A walking tour of selected labs/displays in North West Engineering:

- Mirage (Claude Hohls, Michael Atkins)
- 3D Printing & Laser Cutting (Claude Hohls)
- Cold Gas Spray (Michael Lucas, Takunda Maunganidze)
- Supersonic Wind Tunnel (Zahra Shaikh, Irshaad Mahomed)
- Material Lab, FSW, DIC & IHD (Tristan Strydom, Tiaan Smit)
- Fuel Testing (Andre Storm)
- Bulk Materials Handling (Terrance Frangakis)
- CNC, MQL, Workshop, etc. (Nthape Mphasha, Claudia Polese)