UNIVERSITY OF PRETORIA

FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

1. BIOGRAPHICAL SKETCH

1.1 GENERAL INFORMATION													
Surname	Wilke												
First names	Daniel Nicolas												
Citizenship	South Africa						Title	Prof.		Female		Male	X
Place of birth	Bloemfontein						Date of birth			13 February 1979			
Population group	African		Coloured		Indian			White	X	Other			
Marital Status	Married						Direct Telefax			+27 12 362 5087			
Direct Telephone	+27 12 420-2861						E-mail			nico.wilke@up.ac.za			

1.2 LANGUAGE PROFICIENCY			
Language	Speak	Write	Speak
Afrikaans	Yes	Yes	Yes
English	Yes	Yes	Yes
German	Yes	Yes	Yes

1.4 ACADEMIC QUALIFICATIONS OBTAINED				
Degree	Field of study	Higher education institution	Year	Distinction
B. Eng.	Mech. Eng.	University of Pretoria	1999-2002	*Cum Laude*
M. Eng.	Mech. Eng.	University of Pretoria	2003-2005	*Cum Laude*
P. hD.	Mech. Eng.	University of Pretoria	2005-2011	NA

1.5 WORK EXPERIENCE TO DATE		
Name of employer	Capacity and/or type of work	Period
Kobus van Staaden	Technical assistant	12/2000-1/2001
Display Solutions	Traffic command center interface developer	12/2001-1/2002
University of Pretoria	Contract lecturer	1/2006-6/2006
University of Pretoria	Contract lecturer	1/2008-11/2008
University of Pretoria	Contract lecturer	1/2009-11/2009
University of Pretoria	Senior lecturer	1/2010-2018
University of Pretoria	Associate Professor	1/2019-to date

2. TEACHING AND LECTURING DUTIES

2.1 Courses/modules presented: UNDERGRADUATE					
Course	Level (yr)	Academic Institution	Degree/ Diploma	Compilation study guides	Curriculum design
Programming (MPR211)	2	UP	Degree	No	No
Programming (MPR212)	2	UP	Degree	Yes	No
Programming (MPR213)	2	UP	Degree	Yes	Yes
Solid Mechanics (MKM321)	3	UP	Degree	Yes	Yes
Computational Mechanics (MKM410)	4	UP	Degree	Yes	Yes
Optimum Design (MOO420)	4	UP	Degree	Yes	Yes

2.2 Courses/modules presented: POSTGRADUATE					
Course	Level (yr)	Academic Institution	Degree/ Diploma	Compilation study guides	Curriculum design
Finite Element Methods (MEE732)	Hons	UP	Degree	No	No
Linear Finite Element Methods (MEE780)	Hons	UP	Degree	Yes	Yes
Advanced Finite Element Methods (MEE781)	Hons	UP	Degree	No	No
Optimum Design (MOO780)	Hons	UP	Degree	Yes	Yes
Solving Optimization Problems in Engineering	PhD	IMT Lille Douai, France	Degree	Yes	Yes

2.3 Educational and self development courses attended

1. High performance computations for Engineering from the 19^{th} March – 24^{th} March 2006 at the Pollack Mihály Faculty of Engineering, University of Pècs, Hungary.
2. CHPC OpenFOAM Introductory Course that was held from 11-12 June 2009 at the University of Pretoria.
3. Advanced Parallel Computing Workshop hosted by the Meraka Institute of the Council for Scientific and Industrial Research from the 12-14 October 2009.
4. South African Laser Vibrometry Workshop held at Council for Scientific and Industrial Research Knowledge Commons on the 14th of January 2010.
5. University of Pretoria Education Induction Course, 18-22 January 2010.
6. Biomedical flow modeling presented by Prof. P. Nithiarasu at the CSIR, 25-26 August 2010.
7. Intellectual Property (IP) One Day Course held at the University of Pretoria on the 30th of September 2011.
8. Occupational Health and Safety held at the University of Pretoria on the 13th of October 2011.
9. Elastic Wave Propagation Workshop held at the Knowledge Commons CSIR on the 27th of October 2011.
10. South Africa Plasma Short Course held at the University of Pretoria from the 28-29th of October 2011.

11. Machine Learning Summer School 2019, Stellenbosch, January 2019.

12. CERN-EP/IT Data science seminar entitled *Machine learning the Universe: Opening the Pandora Box* on 6 February 2019.

2.4 STUDENT EVALUATION OF PRESENTED COURSES				
Course	Teaching (5)	Professionalism (5)	Facilitation (5)	Assessment (5)
MOO420 2019	4.6	4.6	4.6	4.6
MOO780 2019	4.6	4.6	4.6	4.6

3. RESEARCH

RESEARCH FIELD	SPECIALITY
Computational Mechanics	Granular Material Discrete Element Modelling Finite Element Modelling Interactive Simulation HPC GPU Computing (NVIDIA GPU Grant Fellow)
Engineering Optimization	Gradient-based optimization algorithms Gradient-only optimization algorithms Gradient-only optimization problem (Founder: Springer book) Response surfaces Gradient-only response surfaces (Founder: Springer book)

3..1 RESEARCH DUTIES

3.1.1 Supervision or co-supervision of students who have completed **Masters** degrees				
Name of student	Degree/Title of dissertation/thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
G.J. J. van Rensburg	**M.Eng.** Selective feature preserved elastic surface registration in complex geometric morphology	Dr. S. Kok	Dr. D.N. Wilke	2
W.J. van den Bergh	**M.Eng.** An algebraic multigrid solution strategy for efficient solution of free-surface flows	Prof. A.G. Malan	Dr. D.N. Wilke	3
G. Stephens	**M.Eng.** Characterisation of filling stage models for vacuum infusion	Dr. D.N. Wilke		3
D. Ramatola	**M.Eng.** Optimal Design of a Guided Wave Rail Web Transducer using Numerical Modeling	Dr. D.N. Wilke	Dr. P.W. Loveday	2

3.1.1 Supervision or co-supervision of students who have completed Masters degrees (cont'd)				
Name of student	Degree/Title of dissertation/thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
C. Ubbink	**M.Eng.** Multi-Objective Parallelization of Efficient Global Optimization	Prof. S. Kok	Dr. D.N. Wilke	2
A.J. Vogel	**M.Eng.** Comparing direct and indirect methods for low-budget tuning of heuristic optimization algorithms	Dr. D.N. Wilke		6
R. Schoeman	**M.Eng.** Registration based strategy for the reconstruction of mandibles from full or partial craniums to assist forensics.	Prof. S. Kok	Dr. D.N. Wilke	2
Y. Chae	**M.Eng.** Optimal sensor placement for the design of inverse experiments by simulation	Dr. D.N. Wilke		1
D. Kafka	**M.Eng.** Investigation into regression strategies to address model errors in inverse analysis of creep models	Dr. D.N. Wilke		1
S. Ravjee	**M.Eng.** Discrete element modelling investigating the effect of particle shape on backfill response behind integral bridge abutments	Prof. S.W. Jacobsz	Dr. D.N. Wilke	1
N. v.d. Walt	**M.Eng.** A Comparison Between Machine Learning Techniques to Find Leaks in Pipe Networks	Prof. P.S. Heyns	Dr. D.N. Wilke	1
I. Setshedi	**M.Eng.** Characterization of Rails Using Guided Ultrasonic Measurements and the Semi-Analytical Finite Element Method	Dr. D.N. Wilke	Dr. P.W. Loveday Dr. C.S. Long	2
W. Booyse	**M.Eng.** Traversing The Manifold, Unsupervised Deep Learning for Critical Asset Failure Prediction	Prof. P.S. Heyns	Dr. D.N. Wilke	2

3.1.1 Supervision or co-supervision of students who have completed Masters degrees (cont'd)				
Name of student	Degree/Title of dissertation/thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
K. Purchase	**M.Eng.** Centrifuge modelling and simulation of active trapdoor in sand	Prof. S.W. Jacobsz	Dr. D.N. Wilke	2
S. Baggeröhr	**M.Eng.** Unsupervised learning for fault detection for non-stationary data	Prof. P.S. Heyns	Prof. D.N. Wilke	2
C. Versteeg	**M.Eng.** Optimal control formulations for multi-body dynamic mechanisms.	Prof. D.N. Wilke		3
S. Dressler	**M.Eng.** Simulation of Fibre Pull-out Using a Graphics Processing Unit Accelerated Discrete Element Model	Prof. D.N. Wilke		3
T.J. Bam	**M.Eng.** A computer-based justification for using the simple bend test as the basis for predicting the performance of steel hooked-end fibres in reinforced concrete	Prof. S. Kok	Prof. D.N. Wilke	4
C.A. Bam	**M.Eng.** Development of a three-dimensional mesh generator with semi-analytical sensitivities for use in gradient-based shape optimization	Prof. D.N. Wilke	Prof. S. Kok	4

3.1.1 Supervision or co-supervision of students who have completed **PhD** degrees				
Name of student	Degree/Title of dissertation/thesis and date completed	Supervisor	Co-supervisor(s)	Duration of studies (years)
N. Govender	**Ph.D.** Blaze-DEM: A GPU large scale 3D discrete element transport framework	Dr. D.N. Wilke	Prof. S. Kok	3
G.J.J. van Rensburg	**Ph.D.** State Variable Based Computational Plasticity for the Hot Working of Metals	Prof. S. Kok	Dr. D.N. Wilke	4
S. Ben Turkia	**Ph.D. (IMT)** DEM characterization for industrial applications	Prof. N.-E. Abriak	Dr. P Pizette Dr. N. Govender Prof. D.N. Wilke	4
D. Kafka	**Ph.D.** Automated learning rates in machine learning for dynamic mini-batch sub-sampled losses	Prof. D.N. Wilke		3

3.1.3 Current post-graduate students				
Name of student	Degree - first registration date	Project title	Supervisor	Co-supervisor
T. Baloyi	M.Eng (WITS) 2018	Design Tool for super-sonic inlets (Enrolled at WITS)	Dr. R. Paton	Dr. D. Maclucas Prof. D.N. Wilke
Y. Chae	Ph.D. 2017	Exploitation of low dimensional strategies for high dimensional problems	Prof. D.N. Wilke	
J. Joubert	Ph.D. 2017	LBM multi-physics environment coupled for GPU based DEM (Joint PhD Supervison)	Prof. D.N. Wilke	Dr. P. Pizette IMT Lille Douai France
D. Correia (part-time)	Ph.D. 2017	Inferrence and causality in dynamical systems	Prof. D.N. Wilke	Dr. S. Schmidt
D. Ramatlo	Ph.D. 2017	Fault detection inference framework for railway guides	Prof. D.N. Wilke	Dr. P.W. Loveday Dr. C.S. Long
N. vd Walt	Ph.D. 2018	Inference of leak detection in pipe networks	Prof. P.S. Heyns	Prof. D.N. Wilke
I. Sethsedi	Ph.D. 2019	Unsupervised fault detection for railway guides	Prof. D.N. Wilke	Dr. P.W. Loveday Dr. C.S. Long
R. Balshaw	M.Eng 2020	Unsupervised deep learning for remaining useful life	Prof. P.S. Heyns	Prof. D.N. Wilke Dr. S. Schmidt

3.1.3 Obtaining research funds			
Origin of research funds	Title of research project or programme	Duration	Money allocated
UP RDP funding	Engineering Optimization	2011-2013	R50 000 p.a.
Denel Aerospace Systems	Hystou Composites Project	2011	R100 000 p.a.
Denel Aerospace Systems	Hystou Composites Project	2012	R160 000 p.a.
Denel Aerospace Systems	Hystou Composites Project	2013	R80 000 p.a.
IMT Lille Doaui Collaboration	PhD Bursary (three years)	2017	R450 000
Armines	SNCF Research	2020	R180 000

3.2 RESEARCH OUTPUTS

	Plenary addresses
1.	*Interactive process simulation to just-in-time training for treatment and waste reuse processes*, XIV International symposium on Environment, Catalysis and Process Engineering, Douai, France, 5 - 7 December, 2017.

	Invited conference papers/keynote addresses
1.	D.N. Wilke, N. Govender, P. Pizette, ”From Analysis to Design Optimization in Modelling and Simulation”, CHPC National Conference, East London, South Africa, 5-9 December 2016 (Keynote Address).
2.	N. Govender, D.N. Wilke, ” Impacts and Paradigms Enabled by GPUs in Engineering Simulations of Discrete Elements”, GPU Technology Conference, Silicon Valley, USA, 8-11 May 2017 (Joint Invited Talk - Fellows NVIDIA GPU Grant Program)
3.	D.N. Wilke, N. Govender, P. Pizette, R.K. Rajamani, ”Potential for Interactive Design Simulation in Discrete Element Modelling”, V International Conference on Particle-Based Methods (PARTICLES 2017), Hannover, Germany, 26 - 28 September 2017 (Invited Talk)
4.	Invited Lecture entitled ”All models are wrong but some are useful”, presented on 23 April 2019 at Tsinghua University, China.
5.	Keynote Lecture entitled ”GPU based DEM enabling new simulation and design paradigms”, presented at the 8th International Conference on Discrete Element Methods, Entschede, Netherlands, 21-26 July 2019.
6.	Opening Keynote Lecture entitled ”A roadmap for polyhedral shaped DEM”, presented at the GdRI Multi-Physics and Multi-scale Couplings in Geo-environmental Mechanics Workshop, Lille, France, 27-28 January 2020.

	Books published
1.	J.A. Snyman, D.N. Wilke, ”Practical Mathematical Optimization: Basic Optimization Theory and Gradient-Based Algorithms”, Second Edition, Series: Springer Optimization and Its Applications, Volume 133, Springer, 2018, ISBN: 978-3-319-77585-2.

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2. Proceedings of the 7th South African Conference on Computational and Applied Mechanics (SACAM10), Editors: S. Kok, D.N. Wilke and H.M. Inglis, South African Association for Theoretical and Applied Mechanics (SAAM), January 2011.

3.2.1 Publications in peer-refereed accredited journals

1. D.N. Wilke, S. Kok, A.A. Groenwold, A quadratically convergent unstructured remeshing strategy for shape optimisation, International Journal for Numerical Methods in Engineering, Vol. 65, No. 1, pp. 1-17, 2006.
2. D.N. Wilke, S. Kok, A.A. Groenwold, Comparison of linear and classical velocity update rules in particle swarm optimization: notes on diversity, International Journal for Numerical Methods in Engineering, Vol. 70, pp. 962-984, 2007.
3. D.N. Wilke, S. Kok, A.A. Groenwold, Comparison of linear and classical velocity update rules in particle swarm optimization: notes on scale and frame invariance, International Journal for Numerical Methods in Engineering, Vol. 70, pp. 985–1008, 2007.
4. D.N. Wilke, S. Kok, A.A. Groenwold, The application of gradient-only optimization methods for problems discretized using non-constant methods, Structural and Multidisciplinary Optimization, Vol. 40, pp. 433-451, 2010.
5. G.J. Jansen van Rensburg, D.N. Wilke, S. Kok, Human skull shape and masticatory induced stress: Objective comparison through the use of non-rigid registration, International Journal for Numerical Methods in Biomedical Engineering, Vol. 28. pp. 170-185, 2012.
6. D.N. Wilke, S. Kok, A.A. Groenwold, “Relaxed error control in shape optimization that utilizes remeshing”, International Journal for Numerical Methods in Engineering, Vol. 94, pp. 273-289, 2013.
7. L.J. Haarhoff, S. Kok, D.N. Wilke, “Numerical strategies to reduce the effect of ill-conditioned correlation matrices and underflow errors in Kriging”, Journal of Mechanical Design, Vol. 135. pp. 96-99, 2013
8. D.N. Wilke, S. Kok, J.A. Snyman, A.A. Groenwold, “Gradient-only approaches to avoid spurious local minima in unconstrained optimization”, Optimization and Engineering, Vol. 14. pp. 275-304, 2013.
9. N. Govender, D.N. Wilke, S. Kok, R. Els, “Development of a convex polyhedral discrete element simulation framework for NVIDIA Kepler based GPUs”, Journal of Computational and Applied Mathematics, Vol 270, 386-400, 2014.
10. M.N. Ras, D.N. Wilke, A.A. Groenwold, S. Kok, “ On rotationally invariant continuous-parameter genetic algorithms”, Advances in Engineering Software, Vol. 78 pp. 52-59, 2014.
11. N. Govender, D.N. Wilke, S. Kok, “Collision detection of convex polyhedra on the NVIDIA GPU architecture for the discrete element method”, Applied Mathematics and Computation, Vol. 267 pp. 810-829, 2015.

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12. N. Govender, R.K. Rajamani, S. Kok, D.N. Wilke, “Discrete element simulation of mill charge in 3D using the BLAZE-DEM GPU framework”, Minerals Engineering, Vol 79 pp. 152-168, 2015.
13. Mowat A.G.B, van den Bergh W.J., Malan, A.G., Wilke, D.N.,“An AMG strategy for efficient solution of free-surface flow”, International Journal of Numerical Methods for Heat & Fluid Flow, Vol. 26(3/4), 1172 - 1186, 2016.
14. N. Govender, D.N. Wilke, S. Kok,“Blaze-DEMGPU: Modular high performance DEM framework for the GPU architecture”, SoftwareX, Vol. 5, 62 - 66, 2016.
15. E. Asaadi, D.N. Wilke, P.S. Heyns, S. Kok, “The use of direct inverse maps to solve material identification problems: pitfalls and solutions”, Structural and Multidisciplinary Optimization, Vol. 55(2), 613 - 632, 2017.
16. G. J. Jansen Van Rensburg, S. Kok, D. N. Wilke, ”Steel Alloy Hot Roll Simulations and Through-Thickness Variation Using Dislocation Density-Based Modeling”, Metallurgical and Materials Transactions B, 48(5), 2631–2648, 2017.
17 Y. Chae, D.N. Wilke, ”Heuristic linear algebraic rank-variance formulation and solution approach for efficient sensor placement”, Engineering Structures, 153, 717–731, 2017.
18. N. Govender, D.N. Wilke, P. Pizette, N-E. Abriak, ”A study of shape non-uniformity and poly-dispersity in hopper discharge of spherical and polyhedral particle systems using the BlazeDEM3D-GPU code”, Applied Mathematics and Computation, 319:318–336, 2018.
19. D. Ramatlo, D.N. Wilke, P.W. Loveday, ”Development of an Optimal Piezoelectric Transducer to Excite Guided Waves in a Rail Web”, NDT & E International, 95:72–81, 2018.
20. G. J. Jansen Van Rensburg, S. Kok, D. N. Wilke, ”Simultaneous estimation of boundary conditions and material model parameters”, Structural and Multidisciplinary Optimization, 58:701-717, 2018.
21. N. Govender, D.N. Wilke, C.-Y. Wu, J. Khinast, P. Pizette, W. Xu, ”Hopper flow of irregularly shaped particles (non-convex polyhedra): GPU-based DEM simulation and experimental validation”, Chemical Engineering Science, 188:34–51, 2018.
22. A.J. Vogel, D.N. Wilke, ”Spatially distributed statistical significance approach for real parameter tuning with restricted budgets”, Applied Soft Computing, 70, 648–664, 2018.
23. N. Govender, D.N. Wilke, C.-Y. Wu, R. Rajamani, J. Khinast, B.J. Glasser, ”Large-scale GPU based DEM modeling of mixing using irregularly shaped particles”, Advanced Powder Technology, 29, 2476–2490, 2018.

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24. S. Ravjee, S.W. Jacobsz, D.N. Wilke, N. Govender, ”Discrete element model study into effects of particle shape on backfill response to cyclic loading behind an integral bridge abutment”, Granular Matter, 20, Article 68, 2018.
25. N. Govender, R. Rajamani, D.N. Wilke, C.-Y. Wu, J. Khinast, ”Effect of particle shape in grinding mills using a GPU based DEM code”, Minerals Engineering, 129, 71-84, 2018.
26. G. J. Jansen Van Rensburg, S. Kok, D. N. Wilke, ”Modelling multiple cycles of static and dynamic recrystallisation using a fully implicit isotropic material model based on dislocation density”, Computational Mechanics, 62, 1343–1367, 2018.
27. N. Govender, D.N. Wilke, C.-Y. Wu, U. Tuzun, H. Kureck, ”A numerical investigation into the effect of angular particle shape on blast furnace burden topography and percolation using a GPU solved discrete element model ”, Chemical Engineering Science, 204, 9–26, 2019.
28. I. Sethsedi, C.S. Long, P.W. Loveday, D.N. Wilke, ”Estimation of rail properties using semi-analytical finite element models and guided wave ultrasound measurements”, Ultrasonics, 96, 240–252, 2019.
29. D Correia, DN Wilke, ”How We Solve for the Weights in Our Surrogate Models Matters”, Journal of Mechanical Design, 141:7, 074501, 2019.
30. JC van der Walt, P. S. Heyns, D. N. Wilke, ”Pipe network leak detection: comparison between statistical and machine learning techniques”, Journal Urban Water Journal, 15:10, 953–960, 2019.
31. MN Ras, DN Wilke, AA Groenwold, S Kok, ”On the rotational variance of the differential evolution algorithm”, Advances in Engineering Software, 136:102691, 2019.
32. S Ben-Turkia, D.N. Wilke, P. Pizette, N. Govender, N.-E. Abriak, ”Benefits of virtual calibration for discrete element parameter estimation from bulk experiments”, Granular Matter, 21:4, 110, 2019.
33. JC Joubert, DN Wilke, N. Govender, P. Pizette, U. Tuzun, N.-E. Abriak, ”3D gradient corrected SPH for fully resolved particle-fluid interactions”, Applied Mathematical Modelling, 78, 816–840, 2020.
34. GY Liu, WJ Xu, N Govender, DN Wilke, ”A cohesive fracture model for discrete element method based on polyhedral blocks”, Powder Technology 359, 190-204, 2020.
35. N Govender, PW Cleary, M Kiani-Oshtorjani, DN Wilke, CY Wu, H Kureck, ”The effect of particle shape on the packed bed effective thermal conductivity based on DEM with polyhedral particles on the GPU”, Chemical Engineering Science, 219, 115584, 2020.

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36. MH Ghasemi, S Hoseinzadeh, PS Heyns, DN Wilke, ”Numerical analysis of non-fourier heat transfer in a solid cylinder with dual-phase-lag phenomenon”, Computer Modeling in Engineering & Sciences, 122, 399–414, 2020.
37. W Booyse, DN Wilke, S Heyns, ”Deep digital twins for detection, diagnostics and prognostics”, Mechanical Systems and Signal Processing, 140, 106612, 2020.
38. DA Ramatlo, CS Long, PW Loveday, DN Wilke, ”A modelling framework for simulation of ultrasonic guided wave-based inspection of welded rail tracks”, Ultrasonics, 108, 106215, 2020.
39. R Lubbe, WJ Xu, DN Wilke, P Pizette, N Govender, ”Analysis of parallel spatial partitioning algorithms for GPU based DEM”, Computers and Geotechnics, 125, 103708, 2020.
40. D Correia, DN Wilke, ”Purposeful cross-validation: a novel cross-validation strategy for improved surrogate optimizability”, Engineering Optimization, 1-16, 2020.
41. G-Y Liu, W-J Xua, N Govender, DN Wilke, ”A cohesive fracture model for discrete element method based on polyhedral blocks”, Powder Technology, 359, 190-204, 2020.
42. G-Y Liu, W-J Xua, N Govender, DN Wilke, ”Simulation of rock fracture process based on GPU-accelerated discrete element method”, Powder Technology, 337, 640-656, 2021.
43. D Kafka, DN Wilke, ”Resolving learning rates adaptively by locating stochastic non-negative associated gradient projection points using line searches”, Journal of Global Optimization 79, 111-152, 2021.
43. D Kafka, DN Wilke, ”An empirical study into finding optima in stochastic optimization of neural networks”, Information Sciences (in press), 2021.
44. JC van der Walt, PS Heyns, DN Wilke, ”Model calibration to find leaks in water networks by desensitizing measurements to the model parameters using Artificial Neural networks”, Urban Water Journal (in press), 2021.

5.6 arXiv open-access of moderated electronic preprints

1. D Kafka, D Wilke, ”Visual interpretation of the robustness of Non-Negative Associative Gradient Projection Points over function minimizers in mini-batch sampled loss functions”, arXiv preprint arXiv:1903.08552, 2019.
2. D Kafka, D Wilke, ”Gradient-only line searches: An alternative to probabilistic line searches”, arXiv preprint arXiv:1903.09383, 2019.
3. Y Chae, DN Wilke, ”Empirical study towards understanding line search approximations for training neural networks”, arXiv preprint arXiv:1909.06893, 2019.

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4. D Kafka, DN Wilke, "Resolving learning rates adaptively by locating Stochastic Non-Negative Associated Gradient Projection Points using line searches", arXiv preprint arXiv:2001.05113, 2020.
5. D Kafka, D Wilke, "Investigating the interaction between gradient-only line searches and different activation functions", arXiv preprint arXiv:2002.09889, 2020.
6. D Kafka, DN Wilke, "Gradient-only line searches to automatically determine learning rates for a variety of stochastic training algorithms", arXiv preprint arXiv:2007.01054, 2020.

5.7 Papers presented and published in national conference proceedings

1. P.W. Loveday, C.S. Long, D.N. Wilke, and A.A. Groenwold, "Optimisation of amplification mechanisms for piezoelectric actuators", In Proc. Fourth South African Conference on Applied Mechanics, Johannesburg, South Africa, January 2004. Paper no. 1.
2. G. Stephens, D.N. Wilke, "Simulation of the vacuum infusion process", Eighth South African Conference on Computational and Applied Mechanics, 3-5 September, Johannesburg, 2012. ISBN: 978-086970-728-9.
3. S. Kok, D.N. Wilke, "Understanding linear and non-linear multi-point constraints in finite element analysis", 9th South African Conference on Computational and Applied Mechanics, Somerset-West, 14-16 January 2014.
4. D.N. Wilke, S. Kok, G. Heymann, "Numerical strategies to compute the roots of the secular function of Rayleigh waves", 9th South African Conference on Computational and Applied Mechanics, Somerset-West, 14-16 January 2014.
5. D.N. Wilke, "Gradient-only optimization in review for engineering optimization problems", Tenth South African Conference on Computational and Applied Mechanics, Potchefstroom, South Africa, 3-5 October 2016.
6. D.A. Ramatlo, D.N. Wilke, P.W. Loveday "Optimal design of a piezoelectric transducer to excite ultrasonic guided waves", Tenth South African Conference on Computational and Applied Mechanics, Potchefstroom, South Africa, 3-5 October 2016.
7. G.J. Jansen van Rensburg, S. Kok, D.N. Wilke, "Cyclic effects and recrystallisation in temperature and rate dependent state variable based plasticity", Tenth South African Conference on Computational and Applied Mechanics, Potchefstroom, South Africa, 3-5 October 2016.
8. Ramatlo, D.A., Loveday, P.W., Long, C.S., Wilke, D.N. "Estimation of Probability of Defect Detection by Combining Simulated Defect Signatures with Operational Measured Data", South African Conference on Theoretical ad Applied Mechanics, VUT, van der Bijlpark, September, 2018.

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9. Sethsedi, I., Long, C.S., Loveday, P.W., Wilke, D.N. ”Adaptive SAFE model of a rail for parameter estimation”, South African Conference on Theoretical ad Applied Mechanics, VUT, van der Bijlpark, September, 2018.
10. Wilke, D.N., Govender, N., Pizette. P., Gastbye L. ”A numerical hopper discharge study for convex and non-convex particle systems”, South African Conference on Theoretical ad Applied Mechanics, VUT, van der Bijlpark, September, 2018.

3.2.5 Papers presented and published in international conference proceedings

1. D.N. Wilke, J.F. Schutte, and A.A. Groenwold, “Constrained particle swarm searches in the optimal sizing design of truss structures”, In K. Jarmai and J. Farkas, editors, Proc. Int. Conf. on Metal Structures: Design, Manufacture, Economy, pages 301-308, Miskolc, Hungary, April 2003. Millpress, Rotterdam, the Netherlands.
2. D.N. Wilke, J.F. Schutte, A.A. Groenwold, “On constrained non-convex optimization of structural systems using particle swarms”, In Proc. Fifth World Congress on Structural and Multidisciplinary Optimization, Lido di Jesolo, Venice, Italy, May 2003. Paper no. 84.
3. D.N. Wilke, S. Kok, A.A. Groenwold, “Particle swarm searches and adaptive unstructured meshing in shape optimization”, The Fourth International Conference on Engineering Computational Technology, Eds. B.H.V. Topping, C.A. Mota Soares, Lisbon, Portugal, September, 2004.
4. S. Kok, D.N. Wilke, A.A. Groenwold, “Recent developments of the particle swarm optimization algorithm”, Proceedings of the IASTED International Conference on Computational Intelligence, Ed. M.H. Hanza, Calgary, Canada, July 4-6, 2005.
5. D.N. Wilke, S. Kok, A.A. Groenwold, Adaptive Unstructured Remeshing Using Gradient-Only Optimisation Algorithms for Shape Optimisation, The Fifth International Conference on Engineering Computational Technology. Paper number ECT222. Las Palmas de Gran Canaria, Spain. 12-15 September 2006.
6. D.N. Wilke, J.A. Snyman, S. Kok, “Shape and composite layup design of mulitlayer composite structures using the Snyman-Fatti algorithm ”, International Conference on Welded Structures. Miskolc, Hungary, 24-26 April 2008.
7. D.N. Wilke, “Modified subgradient methods for remeshing based structural shape optimization”, Thirteenth International Conference on Civil, Structural and Environmental Engineering Computing. Chania, Crete, Greece, 6-9 September 2011.
8. D.N. Wilke, “Structural shape optimization using Shor’s r-algorithm”, Third International Conference on Engineering Optimization. Paper number 353. Rio de Janeiro, Brazil, 1-5 July 2012. ISBN: 978-85-76503-43-9.

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9. G.J. Jansen van Rensburg, S. Kok, D.N. Wilke, “Simultaneous estimation of experimental and material parameters”, Third International Conference on Engineering Optimization. Paper number 341. Rio de Janeiro, Brazil, 1-5 July 2012. ISBN: 978-85-76503-43-9.
10. D.N. Wilke, S. Kok, “Numerical sensitivity computation for discontinuous gradient-only optimization problems using the complex-step method”, Tenth World Congress on Computational Mechanics. Paper number 19508. Sao Paulo, Brazil, 8-13 July 2012. ISBN: 978-85-86686-70-2.
11. G.J. Jansen van Rensburg, S. Kok, D.N. Wilke, “Material parameter identification on metal matrix composites”, Tenth World Congress on Computational Mechanics. Paper number 18234. Sao Paulo, Brazil, 8-13 July 2012. ISBN: 978-85-86686-70-2.
12. D.N. Wilke, “Line search and algorithmic considerations for gradient-only optimization”, An International Conference on Engineering and Applied Sciences Optimization, Kos, Greece, 4-6 June 2014.
13. D.N. Wilke, S. Kok, G. Heymann “Comparison of two inverse strategies to characterize soil profiles”, 4th International Conference on Engineering Optimization, Lisbon, Portugal, September 8-11, 2014.
14. S. Kok, D.N. Wilke “Estimating the stress-strain curve of steel wire”, 4th International Conference on Engineering Optimization, Lisbon, Portugal, September 8-11, 2014.
15. G.J. Jansen van Rensburg, S. Kok, D.N. Wilke “Simultaneous boundary value and material parameter estimation using imperfect compression data”, 4th International Conference on Engineering Optimization, Lisbon, Portugal, September 8-11, 2014.
16. S. Kok, D.N. Wilke ”Optimizing snap-through structures by using gradient-only algorithms”, 11th World Congress on Structural and Multidisciplinary Optimisation, Sydney, Australia, 7-12 June, 2015.
17. D.N. Wilke, S. Kok ”Design optimization of multi-point constraints in structural analysis”, 11th World Congress on Structural and Multidisciplinary Optimisation, Sydney, Australia, 7-12 June, 2015.
18. D.A. Ramatlo, P.W. Loveday, C.S. Long and Daniel N. Wilke “SAFE-3D analysis of a piezoelectric transducer to excite guided waves in a rail web”, 42nd Annual Review of Progress in Quantitative Nondestructive Evaluation Conference, Minneapolis, Minnesota, July 26-31, 2015.

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19. N. Govender, P. Pizette, D.N. Wilke and N-E. Abriak “Validation of the GPU based BLAZE-DEM framework for hopper discharge”, IV International Conference on Particle-Based Methods, Barcelona, Spain, September 28-30, 2015.
20. D.N. Wilke “How to get rid of discontinuities when constructing surrogates from piece-wise discontinuous functions”, 5th International Conference on Engineering Optimization, Iguassu Falls, Brazil, 19-23 June 2016.
21. D.A. Ramatlo, D. N. Wilke, P.W. Loveday “Optimal Design of a Piezoelectric Transducer for Exciting Guided Wave Ultra sound in Rails”, 43rd Annual Review of Progress in Quantitative Nondestructive Evaluation Conference, Atlanta, GA, July 17-22, 2016.
22. N. Govender, D.N. Wilke, P. Pizette, R.K. Rajamani, “Industrial Scale Particle Simulations on the GPU Using the Blaze-DEM Dalian, China, 1-4 August, 2016.
23. P. Pizette, N. Govender, N.-E. Abriak, D.N. Wilke, “GPU DEM Simulations and Experimental Studies of Ball Milling Process for Dalian, China, 1-4 August, 2016.
24. D.N. Wilke, N. Govender, P. Pizette, N.-E. Abriak, “Computing with Non-convex Polyhedra on the GPU”, 7th International Dalian, China, 1-4 August, 2016.
25. G. Heymann, D.N. Wilke and S. Kok, “Inversion of effective phase velocity seismic surface wave data by partial least squares regression”, 5th International Conference on Geotechnical and Geophysical Site Characterization, Jupiters Gold Coast, Queensland Australia, 5-9 September 2016.
26. D.N. Wilke, P. Pizette, N. Govender and N-E. Abriak ”Towards reproducible experimental studies for non-convex polyhedral shaped particles”, Powders and Grains, Montpellier, France, 3-7 July 2017.
27. P. Pizette, N. Govender, D.N. Wilke and N-E. Abriak ”DEM GPU studies of industrial scale particle simulations for granular flow civil engineering applications”, Powders and Grains, Montpellier, France, 3-7 July 2017.
28. N. Govender, D.N. Wilke, P. Pizette, and J. Khinast, ”BlazeDEM-GPU A Large Scale DEM simulation code for GPUs”, Powders and Grains, Montpellier, France, 3-7 July 2017.
29. D.N. Wilke, N. Govender, P. Pizette, R. Rajamani, ”Geometric design of SAG mill lifter bars utilizing the discrete element method”, 12th World Congress of Structural and Multidisciplinary Optimization, Braunschweig, Germany, 5 - 9 June 2017.
30. Carla Grobler, Schalk Kok, Daniel N. Wilke, ”Simple Intuitive Multi-objective Parallelization of Efficient Global Optimization: SIMPLE- EGO”, 12th World Congress of Structural and Multidisciplinary Optimization, Braunschweig, Germany, 5 - 9 June 2017.

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31. P. Pizette, N. Govender, D.N. Wilke, B. Gobé, N.-E. Abriak, R.K. Rajamani, ”3D Laser scanning technique coupled with 3D DEM GPU simulations for railway ballasts” Particles 2017, Hanover, Germany, 26-28 September 2017.
32. D.N. Wilke, N. Govender, P. Pizette, R. Rajamani, ”Potential for interactive design simulation in discrete element modelling”, Particles 2017, Hanover, Germany, 26-28 September 2017.
33. N. Govender, D.N. Wilke, R. Rajamani, P. Pizette, J. Khinast, B. Glasser ”Numerical study on the effect of particle shape on mixers on GPUS” Particles 2017, Hanover, Germany, 26-28 September 2017.
34. Böhling, P., Govender, N., Khinast, J. G., Fathollahi, S., Wilke, D.N., Rajamani, R. ”The Effect of Particle Shape in Drum Mixers”, 2017 AIChE Annual Meeting, Minneapolis, USA, October 29 - November 3, 2017.
35. Wilke, D.N. Govender, N. Rajamani, R.K. Pizette, P. ”Which uncertainties do we need to consider in simulation based comminution to perform statistical learning”, Comminution 2018, Cape Town, South Africa,16 - 19 April 2018.
36. Govender, Wilke, D.N., Pizette, P. ”Hopper flow of irregularly shaped particles (non-convex polyhedra): GPU-based DEM simulation and experimental validation”, Comminution 2018, Cape Town, South Africa,16 - 19 April 2018.
37. N. Govender, D.N. Wilke, ”BLAZEDEM-GPU FOR SIMULATIONS WHERE PARTICLE SHAPE MATTERS”, DEM 8 Conference, Enschede, The Netherlands, 21-26 July, 2019.
38. D.N. Wilke, N. Govender, BLAZEDEM-GPU ENABLING AN INTERACTIVE SIMULATION PARADIGM”, DEM 8 Conference, Enschede, The Netherlands, 21-26 July, 2019.

3.2.7 Papers presented and published in international conference proceedings

1. D.N. Wilke, S. Kok, Gradient-only optimization for discontinuous functions, 18th Triennial Conference of the International Federation of Operational Research Societies, Sandton, 13-18 July, 2008.
2. D.N. Wilke, S. Kok, A.A. Groenwold, Error estimate based remeshing strategy for shape optimization using radial basis functions, XXII International Congress of Theoretical and Applied Mechanics (ICTAM), Adelaide, August 25-29, 2008.
3. D.N. Wilke, S. Kok, A.A. Groenwold, Towards a simple generic anisotropic remeshing strategy for shape optimization, Africomp 2009, Sun City, 7-11 January, 2009.
4. D.N. Wilke, S. Kok and A.A. Groenwold, Multiple Load Cases In Adaptive Shape Optimization, Eighth World Congress on Structural and Multidisciplinary Optimization, Lisboa, Portugal, June 2009.

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5. L.J. Haarhoff, S. Kok and D.N. Wilke, The effect of more appropriate correlation function choices when creating Kriging surfaces for mathematical optimisation, 2nd International Conference on Engineering Optimization, Lisboa, Portugal, September 2010.
6. W.J. van den Bergh, A.G. Malan, D.N. Wilke “An algebriac multigrid solution strategy for efficient solution of free-surface flows. ” Second African Conference on Computational Mechanics, AFRICOMP 2011, Cape Town, South Africa. 5 - 8 January 2011.
7. D.N. Wilke “Investigation of gradient-only optimization to handle discontinuous constraints with applications in shape optimization. ” Second International Conference on Computational Engineering (ICCE 2011), Darmstadt, Germany. 4 - 6 October 2011.
8. S. Kok, D.N. Wilke, Challenges to present a postgraduate finite element course in structural mechanics at the University of Pretoria, 23rd International Congress of Theoretical and Applied Mechanics (ICTAM 2012), Beijing, China, 19–24 August, 2012.
9. N. Govender, D.N. Wilke, S. Kok, BLAZE-DEM: A GPU Based Polyhedral DEM Particle Transport Code, 4th International Congress on Computational Engineering and Sciences (FEMTEC 2013), Las Vegas, USA, 19–24 May, 2013.
10. N. Govender, I. Gledhill, S. Kok, D.N. Wilke, GPU-Based Discrete Element Rigid Body Transport, 6th International Conference on Discrete Element Methods (DEM6), Golden, Colorado, USA, 5–6 August, 2013.
11. N. Govender, S. Kok, D.N. Wilke, Particle Simulations on NVIDIA GPUs, 4th European Seminar on Computing, Pilsen, Czech Republic, June 15 – 20, 2014.
12. N. Govender, S. Kok, D.N. Wilke, Blaze-DEM a convex polyhedral particle discrete element framework for NVIDIA GPUs, 4th African Conference on Computational Mechanics (AfriCOMP’15), Marrakech, Morocco, 7–9 January, 2015.
13. N. Govender, D.N. Wilke, S. Kok, “BLAZE-DEM: A GPU Based Polyhedral DEM Particle Transport Code”, 4th International Congress on Computational En- gineering and Sciences (FEMTEC 2013), Las Vegas, USA, 19–24 May, 2013.
14. N. Govender, I. Gledhill, S. Kok, D.N. Wilke, “GPU-Based Discrete Element Rigid Body Transport”, 6th International Conference on Discrete Element Methods (DEM6), Golden, Colorado, USA, 5–6 August, 2013.

3.2.7 Conference papers presented (but not published)

1. D.N. Wilke, S. Kok, Gradient-only optimization for discontinuous functions, 18th Triennial Conference of the International Federation of Operational Research Societies, Sandton, 13-18 July, 2008.

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2. D.N. Wilke, S. Kok, A.A. Groenwold, Error estimate based remeshing strategy for shape optimization using radial basis functions, XXII International Congress of Theoretical and Applied Mechanics (ICTAM), Adelaide, August 25-29, 2008.
3. D.N. Wilke, S. Kok, A.A. Groenwold, Towards a simple generic anisotropic remeshing strategy for shape optimization, Africomp 2009, Sun City, 7-11 January, 2009.
4. D.N. Wilke, S. Kok and A.A. Groenwold, Multiple Load Cases In Adaptive Shape Optimization, Eighth World Congress on Structural and Multidisciplinary Optimization, Lisboa, Portugal, June 2009.
5. L.J. Haarhoff, S. Kok and D.N. Wilke, The effect of more appropriate correlation function choices when creating Kriging surfaces for mathematical optimisation, 2nd International Conference on Engineering Optimization, Lisboa, Portugal, September 2010.
6. W.J. van den Bergh, A.G. Malan, D.N. Wilke “An algebriac multigrid solution strategy for efficient solution of free-surface flows. ” Second African Conference on Computational Mechanics, AFRICOMP 2011, Cape Town, South Africa. 5 - 8 January 2011.
7. D.N. Wilke “Investigation of gradient-only optimization to handle discontinuous constraints with applications in shape optimization. ” Second International Conference on Computational Engineering (ICCE 2011), Darmstadt, Germany. 4 - 6 October 2011.
8. S. Kok, D.N. Wilke, Challenges to present a postgraduate finite element course in structural mechanics at the University of Pretoria, 23rd International Congress of Theoretical and Applied Mechanics (ICTAM 2012), Beijing, China, 19–24 August, 2012.
9. N. Govender, D.N. Wilke, S. Kok, BLAZE-DEM: A GPU Based Polyhedral DEM Particle Transport Code, 4th International Congress on Computational Engineering and Sciences (FEMTEC 2013), Las Vegas, USA, 19–24 May, 2013.
10. N. Govender, I. Gledhill, S. Kok, D.N. Wilke, GPU-Based Discrete Element Rigid Body Transport, 6th International Conference on Discrete Element Methods (DEM6), Golden, Colorado, USA, 5–6 August, 2013.
11. N. Govender, S. Kok, D.N. Wilke, Particle Simulations on NVIDIA GPUs, 4th European Seminar on Computing, Pilsen, Czech Republic, June 15 – 20, 2014.
12. N. Govender, S. Kok, D.N. Wilke, Blaze-DEM a convex polyhedral particle discrete element framework for NVIDIA GPUs, 4th African Conference on Computational Mechanics (AfriCOMP’15), Marrakech, Morocco, 7–9 January, 2015.

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13. N. Govender, D.N. Wilke, S. Kok, “BLAZE-DEM: A GPU Based Polyhedral DEM Particle Transport Code”, 4th International Congress on Computational En- gineering and Sciences (FEMTEC 2013), Las Vegas, USA, 19–24 May, 2013.
14. N. Govender, I. Gledhill, S. Kok, D.N. Wilke, “GPU-Based Discrete Element Rigid Body Transport”, 6th International Conference on Discrete Element Methods (DEM6), Golden, Colorado, USA, 5–6 August, 2013.
15. N. Govender, D.N. Wilke, ” Impacts and Paradigms Enabled by GPUs in Engineering Simulations of Discrete Elements”, GPU Technology Conference, Silicon Valley, USA, 8-11 May 2017
16. N. Govender, D.N. Wilke, ”Advances in Discrete Element Particle Modelling Using the GPU Based Code Blaze-DEM”, GPU Technology Conference, Silicon Valley, USA, 26-29 March 2018

3.2.8 Conference posters presented (but not published)

1. N. Govender, D.N. Wilke, S. Kok, A GPU based polyhedral particle DEM transport code, GPU Technology Conference, San Jose, CA, USA, 24–27 March, 2014.
2. N. Govender, S. Kok, D.N. Wilke, BLAZE-DEM A GPU Based Polyhedral Particle Transport code, 4th European Seminar on Computing, Pilsen, Czech Republic, June 15 – 20, 2014.

3.2.10 Books published

1. J.A. Snyman, D.N. Wilke, ”Practical Mathematical Optimization: Basic Optimization Theory and Gradient-Based Algorithms”, Second Edition, Series: Springer Optimization and Its Applications, Volume 133, Springer, 2018, ISBN: 978-3-319-77585-2.
2. Proceedings of the 7th South African Conference on Computational and Applied Mechanics (SACAM10), Editors: S. Kok, D.N. Wilke and H.M. Inglis, South African Association for Theoretical and Applied Mechanics (SAAM), January 2011.

3.2.11 Chapters in books

1. J. Crous, D.N. Wilke, S. Kok, D.-G. Chen, S. Heyns, ”On system identification for accelerated destructive degradation testing of nonlinear dynamic systems”, ICSA Springer Book Series in Statistics: Statistical Modeling for Degradation Data, Springer, Singapore,pp:335–364, 2017, ISBN:978-981-10-5193-7.
2. Pizette P., Govender N., Abriak N.E., Wilke D.N., GPU DEM Simulations and Experimental Studies of Ball Milling Process for Various Particle Shapes. In: Li X., Feng Y., Mustoe G. (eds) Proceedings of the 7th International Conference on Discrete Element Methods. DEM 2016. Springer Proceedings in Physics, vol 188:1345–1352, Springer, Singapore, 2017. DOI 10.1007/978-981-10-1926-5_141.
3. Wilke D.N., Govender N., Pizette P., Abriak N.E., Computing with Non-convex Polyhedra on the GPU. In: Li X., Feng Y., Mustoe G. (eds) Proceedings of the 7th International Conference on Discrete Element Methods. DEM 2016. Springer Proceedings in Physics, vol 188:1371–1377, Springer, Singapore, 2017. DOI 10.1007/978-981-10-1926-5_141.
4. Govender N., Wilke D.N., Pizette P., Rajamani R.K., Industrial Scale Particle Simulations on the GPU Using the Blaze-DEM Code. In: Li X., Feng Y., Mustoe G. (eds) Proceedings of the 7th International Conference on Discrete Element Methods. DEM 2016. Springer Proceedings in Physics, vol 188:1379–1388, Springer, Singapore , 2017. DOI 10.1007/978-981-10-1926-5_141.
5. Y. Chae, D.N. Wilke, ”Sub-dimensional Surrogates to Solve High Dimensional Optimization Problems in Machine Learning”, Advances in Artificial Intellegence: Reviews, IFSA Publishing, 2019. ISBN: 978-84-09-09016-7.

4. OTHER SCHOLARLY RESEARCH-BASED CONTRIBUTIONS

4.1.1 National

1. Conference Attendance: Third CHPC National Meeting that was held from the 9-10 December 2008 at the University of Kwa-Zulu Natal.
2. Conference: CHPC National Meeting 2009 and 5th BELIEF Symposium that was held from the 7-9 December 2009 at the Sandton Convention centre in Johannesburg.
3. Conference Attendance: Fluxion mini conference held at the Council for Scientific and Industrial Research on the 26th of November 2009.
4. Conference presentation: D.N. Wilke, S. Kok, J.A. Snyman and A.A. Groenwold, Overcoming discontinuities in computational engineering optimization using gradient-only optimization, South African Conference on Applied Mechanics, University of Pretoria, 11-13 January 2010.

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5. Conference Attendance: NAFEMS 2010 Virtual Conference: 2020 Vision on Engineering Analysis and Simulation, November 15-16 2010.
6. Conference Presentation: Fluxion and Ballast Mini Conference held at STIAS in Stellenbosch on the 22nd of November 2010.
7. Conference Attendance: 2011 Ansys Conference and User Group Meeting on the 1st of November 2011.
8. Forum Presentation: OpenSim held at CSIR, Knowledge Commons, Ulwazi Auditorium on Thursday the 8th of March 2012.
9. Conference Presentation: Hystou feedback session held at Denel Dynamics Kendaba on the 29th of April 2012.

4.1.2 International

1. Co-proposer and co-chair of mini-symposium *Inverse Problems in Engineering*, 4th International Conference on Engineering Optimization, Lisbon, Portugal, 8-11 September, 2014.
2. Member of the International Scientific Committee of the 5th International Conference on Engineering Optimization 2016.
3. Member of the International Scientific Committee of the 5th International Conference on Engineering Optimization 2016.
4. Co-proposer of the mini-symposium *Particle Simulations on GPUs* with Dr Govender (University of Surrey, Guildford, United Kingdom) and Prof Charley Wu (University of Surrey, Guildford, United Kingdom) at the 6th European Seminar on Computing, Pilsen, Czech Republic, 3-8 June 2018.
5. Co-proposer of the mini-symposium *GPU and High Performance Computing in DEM* with Dr Govender (University of Surrey, Guildford, United Kingdom) and Dr Patrick Pizette (IMT Lille Doaui, France) at the 8th International Conference on Discrete Element Methods, Twente, Netherlands, 21st - 26th July 2019.
6. Co-proposer of the mini-symposium *Non-spherical particle shape and packing in DEM* with Dr Govender (University of Surrey, Guildford, UK) and Prof. John-Paul Latham, (Imperial College London, UK) at the 8th International Conference on Discrete Element Methods, Twente, Netherlands, 21 - 26 July 2019.

4.2 Teamwork and collaboration with others

Other researchers **national**

1. Prof. S.W. Jacobz in Civil Engineering at the University of Pretoria: Collaboration on discrete element modelling in geotechnical applications. Students S Ravjee and K Purchase.
2. Prof. G. Heymann in Civil Engineering at the University of Pretoria: Collaboration inverse problems in geotechnical applications.
3. Prof. W. Focke in Chemical Engineering at the University of Pretoria: Collaboration on discrete element modelling of mixing applications. Student A vd Walt.
4. Prof. A.A. Groenwold at the University of Stellenbosch: Collaboration on algorithmic research in engineering optimization.
5. Dr. J. Heyns at the DPSS CHPC, Pretoria, South Africa: Efficient model approximations using varying fidelity models. Student Ms N Musehane.
6. Dr. P.W. Loveday at the Sensor Science and Technology,. CSIR Material Science and Manufacturing on wave guide modelling and applications in conjunction with graduate students Ms. D. Ramatlo and Mr. I. Setshedi.
7. Dr. C.S. Long at the Sensor Science and Technology,. CSIR Material Science and Manufacturing on wave guide modelling and applications in conjunction with graduate students Ms. D. Ramatlo and Mr. I. Setshedi.
8. Dr. D. MacLucas at Defence, Peace, Safety and Security Unit, CSIR on developing an optimization framework in conjunction with postgraduate student Ms. T. Baloyi.
9. Dr. M. Hindley at USNC on graphite material characterization and modelling.

Other researchers **International**

1. Prof. Din Chen, the Wallace H. Kuralt Distinguished Professor at the School of Social Work, University of North Carolina at Chapel Hill, North Carolina, USA. Collaboration of statistical modeling for degradation data.
2. Dr. P. Pizette at Mines-Douai, LGCgE GCE, F-59508 Douai, France: Collaboration on discrete element modelling and applications for high speed rail ballast applications.
3. Prof. R. Rajamani at the Metallurgical Engineering Department, University of Utah, USA. Collaboration on discrete element modelling and applications for comminution.

4.2 Teamwork and collaboration with others

Other researchers **International**

4. Prof. N.-E. Abbriak at Mines-Douai, LGCgE GCE, F-59508 Douai, France: Collaboration on discrete element modelling and applications for high speed rail ballast applications.

5. Dr. J. Khinast at the Research Center Pharmaceutical Engineering, GmbH, Graz, Austria: Collaboration on discrete element modelling and applications. Collaboration on polyhedral particle shape discrete element modelling for pharmaceutical applications.

6. Prof. Benjamin Glasser, Chemical and Biochemical Engineering, Rutgers - The State University of New Jersey, USA. Collaboration on polyhedral particle shape discrete element modelling for pharmaceutical applications.

7. Prof. Charley Wu, Department of Chemical Engineering, University of Surrey, United Kingdom. Collaboration on discrete element modelling and applications to be extended towards multi-physics applications.

8. Prof. Ugur Tuzun, Senior International Consultant in Chemical and Process Engineering, Alumnus Professor University of Cambridge, UK.

9. Prof. Wen-Jie Xu, Institute of Geotechnical Engineering, Department of Hydraulic Engineering Tsinghua University, Beijing, China. Collaboration on discrete element modelling and applications for geotechnical applications.

4.3 Positions and membership in national and international bodies

1. Member of the South African Association for Theoretical And Applied Mechanics (SAAM) (elected 2016, actively serving as Treasurer on the EXCO of SAAM).
2. Member of South African National Committee for the International Union of Theoretical and Applied Mechanics (elected 2017).
3. Member of the South African Institution of Mechanical Engineering.
4. Member of the National Agency for Finite Element Methods and Standards (NAFEMS).
5. Member of the Society for Industrial and Applied Mathematics (SIAM).

4.5 Visits to local and overseas universities or research institutes as guest professor or researcher

1. Graduate School of Computational Engineering at Darmstadt TU, Germany, October 2011.
2. LGCgE at Mines Douai, France, June-July 2016.
3. LGCgE at IMT Lille Doaui, France, November-December 2017.
4. University of Surrey, December 2017.
5. University of Utah, Mach 2018.
6. LGCgE at IMT Lille Doaui, France, May-June 2018.
7. Monash, Australia, December 2018.
8. CSIRO, Australia, December 2018.
9. Tsinghua University, China, April 2019.

5. MANAGEMENT OR ADMINISTRATIVE DUTIES

5.1 Departmental activities

1. Postgraduate coordinator (2016-)
2. Departmental coordinator for final year design project allocation (2015-).
3. Departmental coordinator for licenses of commercial computational engineering software (2011-).
4. License server administrator (2011-2014).
5. Departmental website administrator (2011-2014).
6. Departmental coordinator for final year research project allocation (2010-).

5.2 Faculty activities

1. Member of the University of Pretoria High Performance Computing Steering Committee.

5.3 National body activities

1. Member of the Fluxion Specialist Working Group (2009-2013).
2. Actively serving as Treasurer on the EXCO of the South African Association for Theoretical And Applied Mechanics (SAAM).

6. COMMUNITY SERVICE OR PROFESSIONAL SKILLS

6.1 Outreach projects

1. SAIMechE technology olympiad workshops from 2004-2005 at numerous secondary schools (Mamelodi, Soshanguve, Irene, Waterkloof, Garsfontein, Wonderboom) in Tshwane.

6.2 Professional service performed

1. Co-chair, Seventh South African Conference on Computational and Applied Mechanics, University of Pretoria, 11-13 January 2010.
2. Member of the scientific committee, Seventh South African Conference on Computational and Applied Mechanics, University of Pretoria, 11-13 January 2010.
3. Member of the Fluxion Specialist Working Group (2009-2013).
4. Local organiser for the CHPC OpenFOAM Workshop that was held from 11-12 June 2009 at the University of Pretoria.
5. Member of the scientific committee, Eighth South African Conference on Computational and Applied Mechanics, 3-5 September, Johannesburg, 2012.
6. Optimization skill transfer workshop (one week) presented for researchers at Landward Sciences, CSIR (2016).
7. Optimization course (4 days) for PhD students presented at IMT Lille Douai, France (2017).
8. Development of a material characterization environment for nuclear graphite material models in CalculiX for USNC (2017).
9. Development of a planar dynamic model of truck for Mr Gerhard van Deventer (2018).

6.3 Professional societies

1. Elected Member of the South African Association for Theoretical And Applied Mechanics (SAAM) (elected 2016 and re-elected 2018), actively serving as Treasurer on the EXCO of SAAM).
2. Elected Member of South African National Committee for the International Union of Theoretical and Applied Mechanics (elected 2017 and re-elected 2018).

6.4 Involvement with other universities / scientific institutions

1. ARMSCOR: Served on the Fluxion Specialist Working Group (2009-2013).
2. IMT Lille Douai, France: co-supervision of two PhD students
3. CSIR: Co-supervision of one Masters and two PhD students.
4. CSIR: Presented optimization skill transfer workshop for Landward Sciences.

6.5 Referee duties

I have refereed papers for the following *international journals*:

1. Advanced Powder Technology
2. Powder Technology
3. Swarm Intelligence
4. Robotics
5. Computers and Mathematics with Applications
6. Computers and Structures
7. International Journal of Numerical Methods for Heat and Fluid Flow
8. Hydrology

I have refereed papers for the following *local journals*:

1. South African Journal of Industrial Engineering
2. Journal of the Chinese Institute of Engineers

I have refereed papers for the following *international conferences*:

1. Second African Conference on Computational Mechanics, University of Cape Town, Cape Town, 5-8 January 2011.
2. 4th International Conference on Engineering Optimization, Lisbon, Portugal, 8-11 September, 2014.

I have refereed papers for the following *local conferences*:

1. Seventh South African Conference on Computational and Applied Mechanics, University of Pretoria, 11-13 January 2010.
2. Eighth South African Conference on Computational and Applied Mechanics, 3-5 September, Johannesburg, 2012.
3. Third Southern African Solar Energy Conference (SASEC2015),11-13 May, Skukuza, 2015.
4. Eleventh South African Conference on Computational and Applied Mechanics, 17-19 September, Vanderbijlpark, 2018.

Appointed as external/internal examiner for the following Masters theses:

1. M.C. Beckley, *Comparison of Sampling Methods for Kriging Models*, Department of Mechanical and Aeronautical Engineering, University of Pretoria, 2014.
2. D.J. McDougall, *The suitability of a simultaneous analysis and design (SAND) formulation for ground structure based sizing optimisation of geometrically non-linear structures*, Department of Mechanical and Mechatronic Engineering, Stellenbosch University, 2015.

6.6 Evaluation status as scientist/scholar
1. NRF **Y2** rated researcher effective 1 January, 2016.

6.6.1 Research awards and prizes
2005 Sasol Medal and Prize, for best master's student in Mech. Eng. at UP.

6.6.2 Honors, awards and scholarships
2001 Flender industry design award for best industry selected third year design at UP 2002 MMD award for best 4th year student in Maintenance Engineering at UP 2002 Sasol Medal and Prize for best 4th year student in Mech. Eng. at UP 2003 NRF Prestigious scholarship 2006 NRF Scarce skills scholarship 2015 Inaugural Tuks Young Research Leader Programme Fellow 2019 Exceptional Young Researcher Award (University of Pretoria) 2019 Vice-Chancellors Book Award (University of Pretoria)

6.6.3 Supervised students honors, awards and scholarships
2014 Best presentation by Ph.D. student: N. Govender, D.N. Wilke, S. Kok, Fast Collision Detection on the GPU for particle simulations, CHPC National Meeting and Conference (CHPC 2014), Kruger National Park, 1–5 December, 2014. 2015 Best student presentation: N. Govender, D.N. Wilke, S. Kok, Blaze-DEM a convex polyhedral particle discrete element framework for NVIDIA GPUs, 4th African Conference on Computational Mechanics (AfriCOMP'15), Marrakech, Morocco, 7–9 January, 2015. 2015 at the 42nd annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE), Dineo Ramatlo was awarded third place for the 13th Annual Student Poster Competition. 2019 Joint-PhD student with IMT LIlle Douai, Johannes Joubert, was awarded the French EIFFEL Excellence bursary.

6.7 PROFESSIONAL REGISTRATION			
PrEng	Professional registration as professional engineer	ECSA (Engineering Council of South Africa)	2016