Tian**Theunissen**

Location
Vermont,
South Africa

Contact
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Affiliations

MUST deep learning,
Faculty of Engineering,
North-West University

CAIR, CSIR

Languages
English [Fluent]
Afrikaans [Fluent]

Profile
South African
Male
32 y.o

Links
Google Scholar
LinkedIn
ORCiD

Career status

I am a Senior Lecturer at the North-West University in South Africa and a senior member of the MUST Deep Learning research group at the Faculty of Engineering. We are engaged in both fundamental and applied research, emphasizing research quality and integrity. With 7 years of experience in machine learning theory, building deep learning models, software development, and academic research, as well as 4 years of experience leading projects/teams, I am well-prepared for **roles in machine learning, whether as a researcher, teacher, or developer**.

Experience

2025–   **MUST Deep Learning**   Hermanus, South Africa
Senior lecturer
Independent and collaborative research. Research publication. Supervisor for M.Eng (four in progress, one completed) and PhD (one completed) students. Mentor/advisor for postgraduate students. Deep learning short course co-presenter. Software development. Developer team lead. Group meeting chair. Research co-ordination and leadership. Project management.

2021–2025   **MUST Deep Learning**   Hermanus, South Africa
Postdoctoral research fellow
Independent and collaborative research. Research publication. Supervisor for M.Eng and PhD students. Mentor/advisor for postgraduate students. Deep learning short course co-presenter. Software development. Developer team lead. Group meeting chair. Research coordination and leadership. Project management.

2018–2021   **MUST Deep Learning**   Potchefstroom, South Africa
PhD candidate researcher
Independent and collaborative research. Research publication. Supervisor for M.Eng students. Mentor/advisor for postgraduate students. Deep learning short course co-presenter. Software development. Group meeting chair. Server administration.

2018   **North-West University**   Potchefstroom, South Africa
Xcel-programme teaching assistant
Give weekly mathematics classes during a bridging program preparing learners for engineering studies. Test grading.

2016–2017   **North-West University**   Potchefstroom, South Africa
Lecturer's assistant
Give weekly tutorial classes on 3rd and 4th year level signal theory. Test grading. Handling and grading of practical demonstration projects. Test supervision.

2014   **Council for Scientific and Industrial Research (CSIR)**   Pretoria, South Africa
Contractor
Required practical work experience. FPGA programming. General debugging.

Education

2021   **PhD** in Computer and Electronic Engineering   North-West University, South Africa
(Thesis: Generalization in deep learning: Bilateral synergies in MLP learning)

2017   **M.Eng.** in Computer and Electronic Engineering   North-West University, South Africa
(Thesis: Raw coal ore classification using image segmentation methods)

2015   **B.Eng.** in Computer and Electronic Engineering   North-West University, South Africa
(Thesis: Virtual advertisement area identification)

Selected Projects

2025– **Knowledge Discovery in Complex Sequential Data** *MUST Deep Learning*
Principal investigator, Technical lead, Project manager
Project constitutes a work package in the focus area Elevating Data Analytics and Machine Learning in South Africa at the National Institute for Theoretical and Computational Sciences (NITheCS). Set to start in 2025 with an expected 5-year lifestyle. Goal is to develop and improve knowledge discovery techniques when applying deep time series modeling techniques to related scientific and engineering problems.

2022–2025 **Knowledge Discovery in Time Series Data** *MUST Deep Learning*
Technical lead
Project forms part of the Machine learning in support of computational and theoretical sciences research program under NITheCS. Involves developing and applying interpretable deep time series methods for knowledge discovery in multidisciplinary scientific domains.

2023–2024 **Automatic comparison of images for diagnostics and integrity verification** *MUST Deep Learning*
Technical lead & Project manager
Project was a Technology Innovation Agency (TIA) seed funded project to develop image change detection technology using deep learning methods. Focus area was informal settlement building change detection to track economic growth markers.

Selected Publications

C. Mouton, R. Rabe, D.G. Haasbroek, M. W. Theunissen, H.L. Potgieter, and M. H. Davel, "Is network fragmentation a useful complexity measure?", NeurIPS Workshop on Scientific Methods for Understanding Deep Learning, 2024.

C. Mouton, M. W. Theunissen, and M. H. Davel, "Input margins can predict generalization too", 38th Annual AAAI conference on Artificial Intelligence, 2024.

M. W. Theunissen, C. Mouton, and M. H. Davel, "The Missing Margin: How Sample Corruption Affects Distance to the Boundary in ANNs", in Artificial Intelligence Research. Springer, vol 1734, in the Communications in Computer and Information Science series, 2022.

A. E. W. Venter, M. W. Theunissen, and M. H. Davel, "Pre-interpolation loss behavior in neural networks", in Artificial Intelligence Research. Springer, 2020, pp. 296–309.

M. H. Davel, M. W. Theunissen, A. M. Pretorius, and E. Barnard, "DNNs as layers of cooperating classifiers", in Proc. 34th AAAI Conference on Artificial Intelligence, 2020.

M. W. Theunissen, M. H. Davel, and E. Barnard, "Benign interpolation of noise in deep learning", South African Computer Journal, vol. 32, no. 2, pp. 80–101, 2020.

M. W. Theunissen, M. H. Davel, and E. Barnard, "Insights regarding overfitting on noise in deep learning", in South African Forum for Artificial Intelligence Research, 2019, pp. 49–63.

Student Supervision

2024–	**Detecting problematic samples in deep learning** *Leon Freese (M.Eng)* Supervising with Dr. Randle Rabe	MUST Deep Learning
2024–	**Inducing diversity among subpredictors in an implicit deep ensemble** *Ruan van der Spoel (M.Eng)* Co-supervising with Dr. Randle Rabe	MUST Deep Learning
2024–	**An empirical investigation of the capacity gap in feature-based knowledge distillation from deep ensembles** *Brynne Lewis (M.Sc)* Supervising with Prof. Marelie Davel	MUST Deep Learning
2023–	**Visualising feature effects for deep time series models** *Leah Mokgadi (M.Sc)* Co-supervising with Prof. Marelie Davel	MUST Deep Learning
2022–2024	**On margin-based generalization prediction in deep neural networks** *Coenraad Mouton (PhD)* Co-supervised with Prof. Marelie Davel	MUST Deep Learning
2020–2022	**Interpreting deep neural networks with sample sets** *Willem Venter (M.Eng)* Co-supervised with Prof. Marelie Davel	MUST Deep Learning

Workshops

2020–Now	**Deep Learning bootcamp** Coordinator and presenter at MUST Deep Learning's annual deep learning course, held at the North-West University. A crash course to introduce attendees to the fundamentals of machine learning and current approaches to deep learning application and theory.	MUST Deep Learning
2023	**Introducing the 'know-it' toolkit** Co-runner and presenter at the NITheCS workshop: Machine Learning in Support of Computational and Theoretical Sciences Knowledge Discovery in Time Series Data, held at SACAIR 2023.	MUST Deep Learning
2022	**Know-it toolkit** Co-runner and presenter at the NITheCS workshop, held at SACAIR 2022.	MUST Deep Learning
2018	**The propagation of class information in neural networks** Co-presenter at the first Forum for Artificial Intelligence Research (FAIR), held by the Centre for Artificial Intelligence Research (CAIR). This forum was to become SACAIR.	MUST Deep Learning

Tools

Programming: Python, C#, C++, SQL, etc.

Data analysis: Numpy. Matplotlib. Pandas. OpenCV.

Machine Learning: PyTorch. scikit-learn. Captum.

IDEs: PyCharm. Visual Studio. Google Colab.

Code management: GitHub. Git. Bitbucket.

Technical communication: Overleaf.

Administration: Google Docs Editors suite. ClickUp.

Ability and Skill

Academic: Investigative research ability. Technical writing. Communicating abstract concepts. Firm grasp on machine learning theory. Teaching.

Professional: Proven leadership and management skills. Expertise in data analysis. Comfortable in Debian or Windows environments. Can apply learned theory about various software development methods. Applying machine learning concepts in practice.

Personal: Excellent English linguistic and grammatical proficiency. Good balance of critical and creative thinking. A self-sustained drive to exceed expectations. Unshakable commitment to performing tasks with integrity.

References

Previous postdoc research supervisor: Prof. Marelie Davel
marelie.davel@gmail.com

Previous PhD research supervisor: Prof. Etienne Barnard
etienne.barnard@gmail.com

Previous PhD student and colleague: Dr. Coenraad Mouton
moutoncoenraad@gmail.com