UNIVERSITY OF PRETORIA

CURRICULUM VITAE: STEPHAN SCHMIDT

EVALUATION DATE: *(Office use only)*

1. BIOGRAPHICAL SKETCH

1.1 GENERAL INFORMATION

Surname	Schmidt										
First names	Stephan					**ID Number**					
Citizenship	South African					**Title**	Dr	**Female**		**Male**	X
Place of birth	Pretoria, South Africa					**Date of birth**					
Population group	**African**		**Coloured**		**Indian**		**White**	**X**	**Other *(Please specify)***		
Department	Mechanical and Aeronautical Engineering					**Position**			Senior Lecturer		
Direct Telephone	+27 (0) 12 420 2781					**Direct Telefax**					
E-mail	stephan.schmidt@up.ac.za										
Date of appointment	1 April 2019					**Permanent full-time**	X	**Temporary full-time**			

1.2 ACADEMIC QUALIFICATIONS OBTAINED

Degree/ Diploma	Field of study	Higher education institution	Year	Distinctions
PhD	Mechanical Engineering	University of Pretoria	2019	N/A
MEng	Mechanical Engineering	University of Pretoria	2017	Cum Laude
BEng (Honours)	Mechanical Engineering	University of Pretoria	2015	Cum Laude
BEng	Mechanical Engineering	University of Pretoria	2014	Cum Laude

1.3 WORK EXPERIENCE TO DATE		
Name of employer	**Capacity and/or type of work**	**Period** **From mm//yy to *mm//yy***
Invoke Analytics	Data Scientist	10/2018 – 01/2019
C-AIM consult, Business Enterprises, University of Pretoria	Contractor	02/2019 – 03/2019
University of Pretoria	Postdoctoral research fellow	02/2019 – 03/2019
University of Pretoria	Senior Lecturer	04/2019 - present

2. TEACHING ACTIVITIES

2.1 **Courses presented**		
Course	**Level *(e.g. second year, Masters)***	**Self developed** ***(Yes or No)***
MEV 781 (Vibration-based condition monitoring)	BEng (Honours) (Post-graduate) (2019) Presented a section in the course.	No
MOO 780 (Optimum Design)	BEng (Honours) (Post-graduate) (2019, 2020) Presented a section in the course.	No
MSY 781 (Empirical modelling for engineers)	BEng (Honours) (Post-graduate) (2020, 2021)	Yes
MPR 213 (Programming and information technology)	BEng (Second year) (2019-2021)	No
MOW 323 (Simulation-based design)	BEng (Third Year) (2021)	Yes
MIL 780 (Engineering Modelling)	BEng (Honours) (Post-graduate) (2022)	Yes

2.2 **Other education and pedagogic courses presented**		
Course	**Year**	**Institution**

3 TEACHING OUTPUTS

3.1 Educational publications and products

4. OTHER TEACHING CONTRIBUTIONS

4.1 Membership of national and international bodies

4.2 Visits to local and overseas universities as guest professor or lecturer in regard to teaching

4.3 Participation in national and international teaching associations, bodies, committees

5 RESEARCH ACTIVITIES

5.1 Former supervision or co-supervision *(completed)*

Name of student	Degree/Title of dissertation/ thesis and date	Supervisor	Co-supervisor(s)	Duration of studies *(years)*
Niehaus W.N.	**MEng, 2019** Informative frequency band selection for performing envelope analysis under fluctuating operating conditions in the presence of strong noise and deterministic components	Prof P.S. Heyns	Dr S. Schmidt	1
Marx, D.	**MEng, 2020** Towards a hybrid approach for diagnostics and prognostics of planetary gearboxes	Prof P.S. Heyns	Dr S. Schmidt	1

Balshaw, R.	**MEng, 2020** Latent analysis of unsupervised latent variable models in fault diagnostics of rotating machinery under stationary and time-varying operating conditions	Prof P.S. Heyns	Prof D.N. Wilke Dr S. Schmidt	1
Van Eyk, L.	**MEng, 2021** A hybrid gearbox condition monitoring Methodology using transfer learning for Calibration	Prof P.S. Heyns	Dr S. Schmidt	1

5.2 Current post-graduate students

Name of student	Degree	Short project title	Supervisor	Co-supervisor(s)	Year of registration
Correia, D.	PhD (Part-time)	Inference and causality in dynamical systems	Prof D.N. Wilke	Dr S. Schmidt (Involved since 2020)	2017
Khosa, M.	MIT (Big Data Science) (Part-time)	Anomaly detection for time-series signals in telecommunication applications	Dr A.S. Bosman	Prof D.N. Wilke Dr S. Schmidt	2020
Padayachee, P.	MSc (Computer Science) (Part-time)	Anomaly detection in time-series signals	Dr A.S. Bosman	Prof D.N. Wilke Dr S. Schmidt	2020
Ellis, B.	PhD	Hybrid diagnostics and prognostics for rotating machines	Prof P.S. Heyns	Dr S. Schmidt	2020
Balshaw, R.	PhD	Machine learning for condition monitoring of rotating machines	Prof P.S. Heyns	Prof D.N. Wilke Dr S. Schmidt	2021
Raut, J.	MEng	Dynamic discovery in physical systems	Prof D.N. Wilke	Dr S. Schmidt	2021
Mashaba, K.P.	MEng (Part-time)	Calibration of physics-based models of rotating machines	Dr S. Schmidt	Prof D.N.Wilke	2021
Sibanda, T.	MEng	Rotating machine condition monitoring methods	Dr S. Schmidt		2021
Van Eyk, L.	PhD	Machine learning methods for hybrid diagnostics	Prof P.S. Heyns	Dr S. Schmidt	2022

5.3 Obtaining research funds *(Optional)*

Origin of research funds (e.g. contract research, THRIP, international funding organisations, other(s)	Title of research project or programme	Duration	Money allocated (R) *(Optional - exact amounts not required)*
University of Pretoria	Research Development Fund (Hybrid condition-based maintenance methodologies	2021 - 2023	-

	for gearboxes)		
VLIR-UOS programme Global Minds (KU Leuven)	**Short research visit funding** Signal processing for hybrid diagnosis and prognosis methods	3 months	-

6 RESEARCH OUTPUTS

6.1 Publications in peer-reviewed or refereed journals

1. Schmidt, S., Heyns, P.S. and De Villiers, J.P., 2018. A novelty detection diagnostic methodology for gearboxes operating under fluctuating operating conditions using probabilistic techniques. Mechanical Systems and Signal Processing, 100, pp.152-166. (Impact factor: 4.370)
2. Schmidt, S., Heyns, P.S. and De Villiers, J.P., 2018. A tacholess order tracking methodology based on a probabilistic approach to incorporate angular acceleration information into the maxima tracking process. Mechanical Systems and Signal Processing, 100, pp.630-646 (Impact factor: 4.370).
3. Schmidt, S., Heyns, P.S. and Gryllias, K.C., 2019. A discrepancy analysis methodology for rolling element bearing diagnostics under variable speed conditions. Mechanical Systems and Signal Processing, 116, pp.40-61. (Impact factor: 4.370)
4. Schmidt, S., Heyns, P.S., 2019, An open set recognition methodology utilising discrepancy analysis for gear diagnostics under varying operating conditions. Mechanical Systems and Signal Processing, 119, pp.1-22. (Impact factor: 4.370)
5. Schmidt, S., Heyns, P.S., 2019, Localised gear anomaly detection without historical data for reference density estimation. Mechanical Systems and Signal Processing, 121, pp.615-635. (Impact factor: 4.370)
6. Schmidt, S., Heyns, P.S. and Gryllias, K.C., 2019, A pre-processing methodology to enhance novel information for rotating machine diagnostics. Mechanical Systems and Signal Processing, 124, pp.541-561. (Impact factor: 4.370)
7. Schmidt, S. and Heyns, P.S., 2020. Normalisation of the amplitude modulation caused by time-varying operating conditions for condition monitoring. Measurement, p.106964. (Impact factor: 3.364)
8. Schmidt, S., Heyns, P.S. and Gryllias, K.C., 2020, A methodology using the spectral coherence and healthy historical data to perform gearbox fault diagnosis under varying operating conditions. Applied Acoustics, 158, p.107038. (Impact factor: 2.440)
9. Schmidt, S., Mauricio, A., Heyns, P.S. and Gryllias, K.C., 2020. A methodology for identifying information rich frequency bands for diagnostics of mechanical components-of-interest under time-varying operating conditions. Mechanical Systems and Signal Processing, 142, p.106739. (Impact factor: 6.471)
10. Schmidt, S., Zimroz, R., Chaari, F., Heyns, P.S. and Haddar, M., 2020. A simple condition monitoring method for gearboxes operating in impulsive environments. Sensors, 20(7), p.2115. (Impact factor: 3.031)
11. Niehaus, W.N., Schmidt, S. and Heyns, P.S., 2020. NIC Methodology: A probabilistic methodology for improved informative frequency band identification by utilizing the available healthy historical data under time-varying operating conditions. Journal of Sound and Vibration, 488, p.115642. (Impact factor: 3.429**)**
12. Schmidt, S. and Gryllias, K.C., 2021. Combining an optimisation-based frequency band identification method with historical data for novelty detection under time-varying operating conditions. Measurement, 169, p.108517. (Impact factor: 3.364)
13. Chen, Y., Schmidt, S., Heyns, P.S. and Zuo, M.J., 2021. A time series model-based method for gear tooth

crack detection and severity assessment under random speed variation. Mechanical Systems and Signal Processing, 156, p.107605. (Impact factor: 6.823)

14. Schmidt, S., Zimroz, R. and Heyns, P.S., 2021. Enhancing gearbox vibration signals under time-varying operating conditions by combining a whitening procedure and a synchronous processing method. Mechanical Systems and Signal Processing, 156, p.107668. (Impact factor: 6.823)
15. Schmidt, S. and Gryllias, K.C., 2021. The anomalous and smoothed anomalous envelope spectra for rotating machine fault diagnosis. Mechanical Systems and Signal Processing, 158, p.107770. (Impact factor: 6.823)
16. Schmidt, S., Heyns, P.S. and Gryllias, K.C., 2021. An informative frequency band identification framework for gearbox fault diagnosis under time-varying operating conditions. Mechanical Systems and Signal Processing, 158, p.107771. (Impact factor: 6.823)
17. Balshaw, R., Heyns, P.S., Wilke, D.N. and Schmidt, S., 2022. Importance of temporal preserving latent analysis for latent variable models in fault diagnostics of rotating machinery. Mechanical Systems and Signal Processing, 168, p.108663. (Impact factor: 6.823)
18. Ellis, B., Heyns, P.S. and Schmidt, S., 2022. A hybrid framework for remaining useful life estimation of turbomachine rotor blades. Mechanical Systems and Signal Processing, 170, p.108805. (Impact factor: 6.823)

Publications submitted to peer-reviewed or refereed journals

1. Mauricio, A., Schmidt S., Qi, J., Gryllias, K., IESFOgram for bearing diagnostics under steady and varying speed conditions: Blind and Frequency-Targeted feature evaluation
2. Correia, D., Wilke, D.N. and Schmidt, S., 2022. Sparse Identification of Conditional relationships in Structural Causal Models (SICrSCM) for counterfactual inference. Probabilistic Engineering Mechanics, p.103295.

6.2 Books and/or chapters in books

Provide full details, including full titles, names of all the authors, publishers, dates, page numbers etc. Specify your exact contribution to the book e.g. editorial role, co-author

Co-author of two chapters in the book:

1. Schmidt, S. and Heyns, P.S., 2022. Rotating Machinery Condition Monitoring Methods for Applications with Different Kinds of Available Prior Knowledge. In *Smart Monitoring of Rotating Machinery for Industry 4.0* (pp. 103-115). Springer, Cham.
2. Chaari, F., Schmidt, S., Hammami, A., Heyns, P.S. and Haddar, M., 2022. On the Use of Jerk for Condition Monitoring of Gearboxes in Non-stationary Operations. In *Smart Monitoring of Rotating Machinery for Industry 4.0* (pp. 157-167). Springer, Cham.

Co-editor of the book and co-author of the following chapters:

3. Wilke, D.N., Schmidt, S. and Heyns, P.S., 2021, February. A Review of Singular Spectral Analysis to Extract Components from Gearbox Data. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 160-172). Springer, Cham.
4. Wilke, D.N., Heyns, P.S. and Schmidt, S., 2021, February. The Role of Untangled Latent Spaces in Unsupervised Learning Applied to Condition-Based Maintenance. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 38-49). Springer, Cham.
5. Ellis, B., Stephan Heyns, P. and Schmidt, S., 2021, February. Diagnosis and Prognosis of Mechanical Components Using Hybrid Methods. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 106-115). Springer, Cham.

6. Schmidt, S., Heyns, P.S. and Wilke, D.N., 2021, February. Identifiability Considerations for Rotating Machine Fault Diagnosis and Prognosis. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 8-20). Springer, Cham.
7. Balshaw, R., Heyns, P.S., Wilke, D.N. and Schmidt, S., 2021, February. Learning-Based Methods for Vibration-Based Condition Monitoring. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 75-86). Springer, Cham.
8. Schmidt, S., Wilke, D.N. and Heyns, P.S., 2021, February. A Comparison Between Independent Component Analysis and Established Signal Processing Methods for Gearbox Fault Diagnosis Under Time-Varying Operating Conditions. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 207-223). Springer, Cham.
9. Marx, D.G., Heyns, P.S. and Schmidt, S., 2021, February. Hybrid Diagnostics and Prognostics of Planetary Gearboxes. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 182-197). Springer, Cham.
10. Eyk, L.V., Heyns, P.S. and Schmidt, S., 2021, February. A Short Review of Gear Fault Modelling in a Hybrid Modelling Context. In *International Workshop on Modelling and Simulation of Complex Systems for Sustainable Energy Efficiency* (pp. 242-258). Springer, Cham.

6.3 Published full-length conference papers/keynote addresses

Provide full details of each publication, including full titles, names of all the authors, journals, dates, page numbers etc.

1. Schmidt, S., Heyns, P.S. and De Villiers, J.P., Discrepancy signal processing techniques for gearbox condition monitoring applications, First World Congress on Condition Monitoring, London, United Kingdom, 13-16 June, 2017.
2. Schmidt, S., Heyns, P.S. and Gryllias, K.C., A probabilistic novelty detection methodology based on the order-frequency spectral coherence, The sixth International Conference on Condition Monitoring of Machinery in Non-Stationary Operations, Santander, Spain, 20-22 June, 2018.
   This paper was nominated for the best paper in the category: Young researcher.
3. Schmidt, S., Heyns, P.S. and Gryllias, K.C., Discrepancy analysis for gearbox condition monitoring: A comparison of different healthy data models, The 31st International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management, Sun City, South Africa, 2-5 July, 2018.
4. Schmidt, S., Heyns, P.S. and Gryllias, K.C., A comparison of different features for discrepancy analysis-based bearing diagnostics, The 28th Biennial ISMA conference on Noise and Vibration Engineering, Leuven, Belgium, 17-19 September, 2018.
5. Schmidt, S., Mauricio, A, Heyns, P.S. and Gryllias, K.C., A new method for identifying diagnostic rich frequency bands under varying operating conditions, SURVISHNO, Lyon, France, 8-10 July, 2019.
6. Schmidt, S., Heyns, P.S. and Gryllias, K.C., Towards prognostics under time-varying operating conditions: A frequency band identification approach, The 29th Biennial ISMA conference on Noise and Vibration Engineering, Leuven, Belgium, 7-9 September, 2020.
7. Schmidt, S., Chaari, F., Zimroz, R., Heyns, P.S. and Haddar, M., 2021, March. Gearbox Fault Identification Under Non-Gaussian Noise and Time-Varying Operating Conditions. In *International Conference on Acoustics*

and Vibration (pp. 1-9). Springer, Cham.

8. Schmidt, S., Heyns, P.S. and Gryllias, K.C., 2021, October. Combining the Spectral Coherence with Informative Frequency Band Features for Condition Monitoring Under Time-Varying Operating Conditions. In *International Congress and Workshop on Industrial AI* (pp. 189-201). Springer, Cham.

6.4 Non-refereed publications or popular articles

6.5 Patents

6.6 Technical reports

7 OTHER SCHOLARLY RESEARCH-BASED CONTRIBUTIONS

7.1 Participation in conferences, workshops and short courses - specify type of contribution

7.2.1 National

1. 2017 Eskom Power Plant Engineering Institute Student Workshop (EPPEI); Attended, authored and presented one paper.
2. 2018 Eskom Power Plant Engineering Institute Student Workshop (EPPEI); Attended, authored and presented one paper.

7.2.2 International

1. First World Congress on Condition Monitoring (WCCM2017), London, England, June 13-16, 2017. Attended, authored and presented one paper.
2. The Sixth International Conference on Condition Monitoring of Machinery in Non-Stationary Operations (CMMNO2017), Santander, Spain, June 20-22, 2018. Attended, authored and presented one paper.
3. The 31st International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management (COMADEM2018), Sun City, South Africa, 2-5 July, 2018. Attended, authored and presented one paper. Reviewer for three papers.
4. 28th Biennial ISMA conference on Noise and Vibration Engineering (ISMA2018), Leuven, Belgium, 17-19 September, 2018. Attended, authored and presented one paper.
5. SURVISHNO: First joint organization of the conferences Surveillance, VISHNO (Vibration Shocks and Noise) and EVA (Experimental Vibration Analysis), Lyon, France, 8-10 July, 2019. Attended, authored and presented one paper.
6. 29th Biennial ISMA conference on Noise and Vibration Engineering (ISMA2020), Leuven, Belgium, 7-9 September, 2020. Virtually attended, authored and presented one paper.
7. The first International Workshop on MOdelling and Simulation of COmplex Systems for Sustainable Energy Efficiency (MOSCOSSEE 2021), 25-26 February, 2021. Co-chair of the organising committee and part of the scientific committee. Virtually attended and presented one paper.
8. International Congress and Workshop on Industrial AI 2021 (IAI 2021), Lulea, Sweden, 6-7 October 2021. Virtually attended, authored and presented one paper.

7.2 Teamwork and collaboration with others:

Other researchers (national and international)

- Prof. P. Stephan Heyns – University of Pretoria, South Africa
- Prof. D. Nico Wilke – University of Pretoria, South Africa
- Prof. Konstantinos C. Gryllias – KU Leuven, Belgium
- Prof. Radoslaw Zimroz - Wroclaw University of Technology, Poland
- Prof. Fakher Chaari - École nationale d'ingénieurs de Sfax, Tunisia

Other research institutions (national and international)

7.3 Membership in national and international bodies

None

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

2018: Visiting post-graduate student at KU Leuven, hosted by Professor Konstantinos C Gryllias (2 weeks)
2019: Visiting scholar at École nationale d'ingénieurs de Sfax, hosted by Professor Fakher Chaari (1 week)
2019: Visiting scholar at KU Leuven, hosted by Professor Konstantinos C Gryllias (5 weeks)
2019: Visiting scholar at INSA Lyon, hosted by Professor Jerome Antoni and Professor Quentin Leclere (4 weeks)
2022: Visiting scholar at KU Leuven, hosted by Professor Konstantinos C Gryllias (12 weeks)

8 MANAGEMENT AND ADMINISTRATIVE DUTIES

- Member of the Marketing Committee of the Department of Mechanical and Aeronautical Engineering (University of Pretoria), 2019

9 COMMUNITY SERVICE OR PROFESSIONAL SKILLS

10.1 Outreach projects

10.2 Professional service performed

10.3 Clinical service

10.4 Involvement with other universities/scientific institutions

External examiner

- MEC4047F - Mechanical Vibrations: University of Cape Town, South Africa (2020-2022)

10.5 Referee duties

Conferences:

- Refereed 3 papers for the 31st International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering 2018
- Refereed 4 papers for the Turbo Expo Turbomachinery Technical Conference & Exposition 2020

Journals:

- Mechanical Systems and Signal Processing (Regular reviewer since 2018.)
- Shock and Vibration
- MDPI Sensors
- IEEE Sensors
- Measurement
- Engineering Failure Analysis
- Journal of Dynamics, Monitoring and Diagnostics

10 AWARDS AND SCIENTIFIC/SCHOLARLY RECOGNITION

11.1 Evaluation status as scientist/scholar

11.2 Research awards and prizes

11.3 Teaching awards and prizes

11.4 Artistic awards and prizes