

# Prof Michael Small



THE UNIVERSITY OF  
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AUSTRALIA**

Prof Michael Small

Theme Lead

Theme 2

Professor Michael Small is the CSIRO-UWA Chair of Complex Engineering Systems at The University of Western Australia. He is an applied mathematician working in the area of complex systems, dynamical systems and chaos, with a particular emphasis on the application of mathematical techniques to real-world problems. Michael is best known for developing new paradigms for the analysis of time series data from deterministic dynamical systems – particularly in the domain of statistical hypothesis testing, data-driven model building, and using complex networks as a model of dynamical processes. Michael has spent more than 10 years working in research within the electronic and information engineering sectors. His focus is on understanding how structure, pattern and dynamics emerge from complex systems – particularly in engineering.

## Publications

- [Selecting embedding delays: An overview of embedding techniques and a new method using persistent homology \(...\)](#) —

### Journal Article

[Dr Debora Correa](#)

**Authors: Eugene Tan, Shannon Alga, Débora Corrêa, Michael Small, Thomas Stemler and David Walker<sup>1</sup>**

2023-03-01

- [A Novel Approach to Time Series Complexity via Reservoir Computing \(...\)](#) —

### Conference Publishing

[Braden Thorne](#)

**Authors: Braden Thorne, Thomas Jüngling , Michael Small , Debora Correa , and Ayham Zaitouny**

2022-12-07

- [Reservoir time series analysis: Using the response of complex dynamical systems as a universal indicator of change \(...\)](#) —

### Journal Article

[Braden Thorne](#)

**Authors: Thorne, Braden Jüngling, Thomas Small, Michael Corrêa, Débora Zaitouny, Ayham**

2022-02-10

- [Data-Driven Approach for Labelling Process Plant Event Data \(...\)](#) —

### Journal Article

[Dr Debora Correa](#)

**Authors: Débora Corrêa, Adriano Polpo, Michael Small, Shreyas Srikanth, Kylie Hollins, Melinda Hodkiewicz**

2022-01-24

- [Objective Domain Boundaries Detection in New Caledonian Nickel Laterite from Spectra Using Quadrant Scan \(...\)](#) —

### Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Zaitouny A, Ramanaidou E, Hill J, Walker DM, Small M**

2022-01-01

- [Grading your models: Assessing dynamics learning of models using persistent homology \(...\)](#) —

### Journal Article

[Dr Debora Correa](#)

**Authors: Eugene Tan, Débora Corrêa, Thomas Stemler, Michael Small**

Michael is the Theme Leader for Research Theme Two. He represents UWA and Theme Two on the Strategic Risk and Reporting Board, Operating Committee and PhD Support Panel. Michael is supervising PhD student Braden Thorne. He is also Co Supervising PhD students Gabriel Gonazalez, Ryan Leadbetter and Tim Pesch.

Research Repository I

2021-12-01

- [Detecting Asset Cascading Failures Using Complex Network Analysis \(...\)](#) —

## Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Jaymin Moffatt; Ayham Zaitouny; Melinda Hodkiewicz; Michael Small**

2021-08-27

- [Parameter extraction with reservoir computing: Nonlinear time series analysis and application to industrial maintenance \(...\)](#) —

## Journal Article

[Braden Thorne](#)

**Authors: Thorne, B., Jüngling, T., Small, M., & Hodkiewicz, M. (2021).**

2021-03-01

- [Fast automatic detection of geological boundaries from multivariate log data using recurrence \(...\)](#) —

## Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Michael Small; June Hill; Irina Emelyanova; Michael Ben Clennell**

2019-11-12

- [Quantifying the generalization capacity of Markov models for melody prediction \(...\)](#) —

## Journal Article

[Dr Debora Correa](#)

**Authors: Corrêa, D. C., Jüngling, T., & Small, M.,**

2020-02-17

- [Constrained Markov Order Surrogates \(...\)](#) —

## Journal Article

[Dr Debora Correa](#)

**Authors: Corrêa, D. C., Moore, J. M., Jüngling, T., & Small, M.**

2020-02-28

- [Reconstruction of Complex Dynamical Systems from Time Series using Reservoir Computing \(...\)](#) —

## Journal Article

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**Authors: Jüngling, T., Lymburn, T., Stemler, T., Corrêa, D., Walker, D. & Small, M.,**

2019-05-01

- [Quadrant scan for multi-scale transition detection \(...\)](#) —

## Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Zaitouny, A., Walker, D.M. and Small, M., 2019.**

- 2019-10-08
- [Fast automatic detection of geological boundaries from multivariate log data using recurrence.](#) (..) —

## Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Zaitouny, A., Small, M., Hill, J., Emelyanova, I. and Clennell, M.B., 2020. Fast automatic detection of geological boundaries from multivariate log data using recurrence. Computers & Geosciences, 135, p.104362.**

- 2019-11-12
- [Sensitization to immune checkpoint blockade through activation of a STAT1/NK axis in the tumor microenvironment](#) (...) —

## Journal Article

[Dr Ayham Zaitouny](#)

**Authors: Rachael M. Zemek, Emma De Jong, Wee Loong Chin, Iona S. Schuster, Vanessa S. Fear, Thomas H. Casey, Cath Forbes, Sarah J. Dart, Connall Leslie, Ayham Zaitouny, Michael Small, Louis Boon, Alistair R. R. Forrest, Daithi O. Muiri, Mariapia A. Degli-Esposti**

2019-07-17

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## Presentations

- [Detecting transitions in dynamical and industrial systems](#) (...) —



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**Theme 2**

2023-09-02

- [Critical Transitions in Complex Systems](#) (...) —



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## Theme 2

2023-05-29

- [What does the Data Say or Why I don't like analogies? \(...\) —](#)



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## Theme 2

2022-12-08

- [Learning the dynamics: from radial basis functions to reservoir computers. \(...\) —](#)



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### **Theme 2**

2021-11-04

- [Master Class - Deterministic Dynamics, Machine Learning & Tipping Points \(...\)](#) —



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### **Theme 2**

2021-03-04

- [Raising the Bar \(...\)](#) —



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### Theme 2

2019-11-22

- [ICIAM,2019, \(...\) —](#)



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### Theme 2

2019-07-15

- [SIAM 2019 \(...\) —](#)



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### Theme 2

2019-05-20

- [International Workshop on Complex Systems and Networks \(...\)](#) —



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### Theme 2

2019-09-24

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## Awards and Prizes

- [ARC Discovery Grant in the 2020 round. \(...\)](#)
- [National Geographic Society - AI for Earth Innovation Grant \(...\)](#)

# Tools

Quality Score

Consistency

Completeness

Accuracy

Timeliness

Relevance

Describe

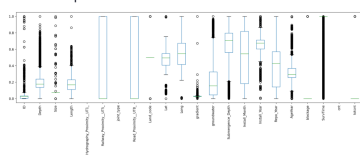
Score: 0.8

Score: 0.8

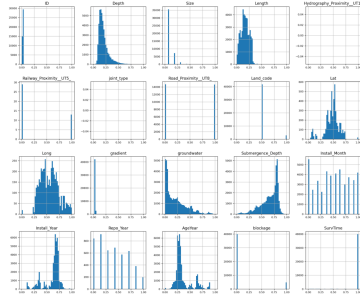
Warnings

- There are 6 numerical columns with high (>60%) missing values
- There are 2 numerical columns that contain only a single unique value
- 7 columns and 34.4% of rows were removed prior to performing numerical analysis
- There are 2 categorical columns that contain only a single unique value
- There are 13 out of 16 categorical columns with imbalanced data

Features Boxplots



Features Distribution



IDEA Tool (...) — 2022-07-06

Evaluate the appropriateness of data for the purposes of maintenance predictive analytics

Theme 2 Theme 5