



# FESAus Monthly Technical Meeting

## *“Accelerating and Enhancing Petrophysical Analysis with Machine Learning: A Case Study of an Automated System For Well Log Outlier Detection and Reconstruction.”*

Tim Conroy, Chief Petrophysicist, Woodside Energy

### **Abstract :**

Recent advances in data science and machine learning (ML) have brought the benefits of these technologies closer to the main stream of Petrophysics. ML systems, where decisions and self-checks are made by carefully designed algorithms, in addition to executing typical tasks such as classification and regression, offer efficient and liberating solutions to the modern Petrophysicist. This presentation outlines such a system and its application in the form of a multi-level workflow to a 59-well multi-field study.

The main objective of the workflow is to identify outliers in bulk-density and compressional slowness logs, and to reconstruct them using data-driven predictive models. A secondary objective of the project is to predict shear slowness in zones where such data do not exist.

The system is fully automated, designed to optimize the use of all available data, and provide uncertainty estimates. It integrates modern concepts for novelty detection, predictive classification and regression, as well as multi-dimensional scaling based on inter-well similarity.

Benchmarking of ML results against those created by human petrophysical experts show the ML workflow can provide high quality answers that compare favorably to those produced by petrophysical experts. A second validation exercise, that compares acoustic impedance logs computed from ML answers to actual seismic data, provides further evidence for the accuracy of the ML generated results.

The ML system supports the Petrophysicist by easing the burden on repetitive and burdensome quality control tasks. The efficiency gains and time savings created can be used for enhanced effective cross-discipline integration, collaboration and further innovation.

### **About the Presenter:**

Tim Conroy is the Chief Petrophysicist for Woodside Energy. He received First class Honours in Geology from the University of Adelaide, Australia. Tim has worked in a wide range of geological settings in areas including Libya, Myanmar, West Africa, The North Sea, The North West Shelf, Atlantic margin, Browse, Otway and Cooper/Eromanga Basins. Tim has also worked for Shell in the Netherlands and Ireland and Santos in Adelaide. He specializes in Rock typing, Scanning Electron Microscopy, novel net reservoir determination techniques including visual water permeability, grain-pore size estimation using NMR and DECT- core photography- image log interpretation integration. His ambition is to help shape the future of Petrophysics by sharing the understanding of how a rock is built grain by grain and the petrophysical implications, along with harnessing the power of Machine Learning.



**DATE:** Tuesday 10<sup>th</sup> July 2018, 12:00 – 1:30 PM **VENUE:** Hotel IBIS- 334 Murray Street, Perth

**COST:** Members \$30.00; Non Members \$40.00; Students/Retirees \$10.00

Online registration at [www.fesaus.org](http://www.fesaus.org) by Friday 6<sup>th</sup> July 3PM

Note: limited seats for unregistered attendees may be available: \$50.00 cash door charge

