

# **Title: Randomization Based Deep and Shallow Learning Methods for Classification and Forecasting**

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[http://scholar.google.com.sg/citations?hl=en&user=yZNzBU0AAAAJ&view\\_op=list\\_works&page\\_size=100](http://scholar.google.com.sg/citations?hl=en&user=yZNzBU0AAAAJ&view_op=list_works&page_size=100)

**Abstract:** This tutorial will first introduce the main randomization-based feedforward learning paradigms with closed-form solutions. The popular instantiation of the feedforward neural networks is called random vector functional link neural network (RVFL) originated in early 1990s. Other feedforward methods included in the tutorials are random weight neural networks (RWNN), extreme learning machines (ELM), Stochastic Configuration Networks (SCN), Broad Learning Systems (BLS), etc. We will also present deep random vector functional link implementations. Another randomization-based paradigm is the random forest which exhibits competitive performances in batch mode classification. Oblique random forests will also be presented. The tutorial will also consider computational complexity with increasing scale of the classification/forecasting problems. The tutorial will also present extensive benchmarking studies using classification and forecasting datasets.

**Bio-sketch:** **Ponnuthurai Nagaratnam Suganthan** received the B.A degree, Postgraduate Certificate and M.A degree in Electrical and Information Engineering from the University of Cambridge, UK in 1990, 1992 and 1994, respectively. He received an honorary doctorate (i.e. Doctor Honoris Causa) in 2020 from University of Maribor, Slovenia. After completing his PhD research in 1995, he served as a pre-doctoral Research Assistant in the Dept of Electrical Engineering, the University of Sydney in 1995–96 and a lecturer in the Dept of Computer Science and Electrical Engineering, the University of Queensland in 1996–99. He was an Editorial Board Member of the *Evolutionary Computation* Journal, MIT Press (2013-2018) and an AE of *IEEE Trans on Cybernetics* (2012 - 2018), *IEEE Trans on Evolutionary Computation* (2005 - 2021). He is an associate editor of the *Applied Soft Computing* (Elsevier, 2018-), *Neurocomputing* (Elsevier, 2018-), *IEEE Trans on SMC: Systems* (2020 - ), *Engineering Applications of AI* (Elsevier, 2022 - ), *Information Sciences* (Elsevier, 2009 - ), *Pattern Recognition* (Elsevier, 2001 - ) and *Int. J. of Swarm Intelligence Research* (2009 - ) Journals. He is a founding co-editor-in-chief of *Swarm and Evolutionary Computation* (2010 - ), an SCI Indexed Elsevier Journal. His co-authored SaDE paper (published in April 2009) won the "IEEE Trans. on Evolutionary Computation outstanding paper award" in 2012. His former PhD student, Dr Jane Jing Liang, won the IEEE CIS Outstanding PhD dissertation award, in 2014. His research interests include randomization-based learning algorithms, swarm and evolutionary algorithms, pattern recognition, deep learning and applications of swarm, evolutionary & machine learning algorithms. He was selected as one of the highly cited researchers by Thomson Reuters yearly from 2015 to 2021 in computer science. He served as the General Chair of the IEEE SSCI 2013. He has been a member of the IEEE (S'90, M'92, SM'00, F'15) since 1991, Fellow since 2015, and an elected AdCom member of the IEEE Computational Intelligence Society (CIS) in 2014-2016. He is an IEEE CIS distinguished lecturer (DLP) in 2018-2021.