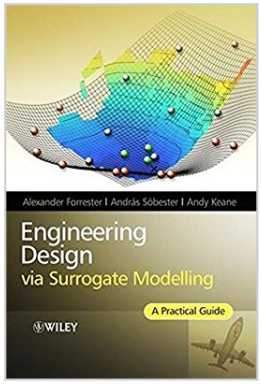


# Engineering Design via Surrogate Modelling: A Practical Guide

*By Alexander Forrester, Andras Sobester, Andy Keane*



**Engineering Design via Surrogate Modelling: A Practical Guide** By Alexander Forrester, Andras Sobester, Andy Keane

Surrogate models expedite the search for promising designs by standing in for expensive design evaluations or simulations. They provide a global model of some metric of a design (such as weight, aerodynamic drag, cost, etc.), which can then be optimized efficiently.

*Engineering Design via Surrogate Modelling* is a self-contained guide to surrogate models and their use in engineering design. The fundamentals of building, selecting, validating, searching and refining a surrogate are presented in a manner accessible to novices in the field. Figures are used liberally to explain the key concepts and clearly show the differences between the various techniques, as well as to emphasize the intuitive nature of the conceptual and mathematical reasoning behind them.

More advanced and recent concepts are each presented in stand-alone chapters, allowing the reader to concentrate on material pertinent to their current design problem, and concepts are clearly demonstrated using simple design problems. This collection of advanced concepts (visualization, constraint handling, coping with noisy data, gradient-enhanced modelling, multi-fidelity analysis and multiple objectives) represents an invaluable reference manual for engineers and researchers active in the area.

*Engineering Design via Surrogate Modelling* is complemented by a suite of Matlab codes, allowing the reader to apply all the techniques presented to their own design problems. By applying statistical modelling to engineering design, this book bridges the wide gap between the engineering and statistics communities. It will appeal to postgraduates and researchers across the academic engineering design community as well as practising design engineers.

- Provides an inclusive and practical guide to using surrogates in engineering design.
- Presents the fundamentals of building, selecting, validating, searching and refining a surrogate model.
- Guides the reader through the practical implementation of a surrogate-based design process using a set of case studies from real engineering design

challenges.

**Accompanied by a companion website featuring Matlab software at http://www.wiley.com/go/forrester**

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## Editorial Review

From the Back Cover
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Dr. **Alexander I. J. Forrester** is Lecturer in Engineering Design at the University of Southampton. His main area of research focuses on improving the efficiency with which expensive analysis (particularly computational fluid dynamics) is used in design. His techniques have been applied to wing aerodynamics, satellite structures, sports equipment design and Formula One.

Dr **Andras Sobester** is a Lecturer and EPSRC/ Royal Academy of Engineering research Fellow in the School of Engineering Sciences at the University of Southampton. His research interests include aircraft design, aerodynamic shape parameterization and optimization, as well as engineering design technology in general.

Professor **Andy J. Keane** currently holds the Chair of Computational Engineering at the University of Southampton. He leads the University's Computational Engineering at the Design Research Group and directs the rolls-Royce University Technology centre for Computational Engineering. His interests lie

primarily in the aerospace sciences, with a  focus on the design of aerospace systems using computational methods. He has published over two hundred papers and three books in this area, many of which deal with surrogate modelling concepts.

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