



Traditional versus stochastic optimization methodology in practical engineering problems

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Microsoft Teams link
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When solving a practical engineering problem, one often has to resort to some **traditional optimization technique**, e.g. direct search, gradient-based or nature-based methods, to mention a few. Selecting the right technique shall imply the use of specialized computational tools, then leading to a specific solution, not always to an optimum. For instance, gradient-based methods are fast and reliable, but may bring to local optima; on the other hand, evolutionary methods may require several iterations and, in case of complex problems, may not always reach the global optimum. Unlike traditional techniques, **stochastic optimization methods** based on Gaussian processes allow to build a surrogate model, as well as to display an approximation accuracy map. These peculiar features of stochastic methods enable for quick and precise identification of the optimum solution for virtually any problem. The advantage of using these methods becomes especially evident when the goal is to solve complex engineering problems involving many parameters, as often found e.g. in the realm of **mechanics of solids and structures, environmental and biosystem engineering, architecture and sustainable construction**.

The seminar focuses on the stochastic optimization methodology, which can be deployed to tackle various practical optimization problems, not necessarily limited to engineering applications. Comparing stochastic optimization with traditional optimization methods on a few characteristic examples will allow participants to appreciate its advantages and rather wide scope of applicability.

Tomasz Garbowski is Associate Professor at the Faculty of Environmental and Mechanical Engineering, Poznań University of Life Sciences, Poland. He has also got experiences as Assistant Professor, Visiting Professor and Researcher at various Polish and foreign universities, e.g.: Poznań University of Technology, Poland; Koszalin University of Technology, Poland; Politecnico di Milano, Italy; Lunds Univeristet, Sweden; Univerza v Ljubljani, Slovenia. His main field of research is devoted to the identification and calibration of various material models as well as for the mechanics of composite and corrugated materials.

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