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SURROGATE MODELS IN MICROWAVE AND ANTENNA ENGINEERING

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ABSTRACT

Surrogate models have become the de facto method of approaching engineering problems for which simulation or experimental data is very expensive to obtain. Such models are typically designed to require the smallest possible number of data points to obtain a useable model, and can then be used to investigate a multitude of scenarios. Two types of problem are particularly difficult to approach using classical techniques – optimization with high numbers of variables, and yield estimation and optimization.

While both these areas have seen widespread research over the past decade, the fields of microwave and antenna engineering have long been focused mostly on rigorous mathematical surrogate models, where the aim is to fit a model as accurately as possible to a set of data. Recently however, approximate models, and models incorporating random behaviour, have started to appear in the field. Two examples are the design of a very large antenna array [1], and yield estimation of microwave filters with up to 70 randomly varying dimensions [2]. Both these examples made extensive use of surrogate models, to achieve solutions not otherwise possible. Currently, the level of activity in this field of microwave and antenna engineering has risen dramatically, with a number of groups across the world currently active in this field.

Microwave and antenna problems offer very specific problem types, (even in electronic engineering, this is a unique field) due to the underlying fundamental network and electromagnetic theory, and therefore the field calls for very specific models, and very specific implementation of models, as the aim in all cases is to exploit the physics as much as possible to reduce the required data sets. It therefore differs substantially from other engineering fields, and have become a sub-type of its own.

The aim of this mini-symposium is to create a forum to discuss the newest developments. The work is of very high interest to industry, as real-world design problems typically fall in these categories. The mini-symposium will consist of one session, with a keynote talk, and 5 other

presentations. It will cover various aspects regarding state-of-the-art techniques in the use of surrogate models of varying types, in optimization and yield estimation of microwave and antenna structures.

REFERENCES

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