



## Pós-Graduação em Modelagem Computacional em Ciência e Tecnologia

### Seminário de Pesquisa

## Generalized Lambda Distribution for Uncertain Quantification of Large Scale Spatio-temporal Models

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**Abstract:** Large-scale spatio-temporal simulations with quantified uncertainty enable scientists/decision-makers to precisely assess the degree of confidence of their simulation-based predictions. This uncertainty could be quantified or characterized in different ways, from the use of low order statistical moments (the most commonly used) to the evaluation of a complete PDF (a most complete approach). The latter provides a more comprehensive description of the uncertainty leading to aware decisions. However, fitting PDFs to the data is computationally intensive. Moreover, due to heterogeneity, the uncertainty computed in regions of the dataset is hampered by the existence of different PDF types. In this thesis, we propose a new method to quantify the uncertainty in large-scale spatio-temporal models based on the Generalized Lambda Distribution (GLD). GLD is a family of PDFs that nicely models the heterogeneity of uncertainty as discussed above. It is specified by 4 parameters that simplifies PDFs comparisons easing analytical processing, such as clustering. We show how the dataset modeled through GLDs can be used to answer queries, such as: (i) how to group the output of the UQ process based on the similarity of the uncertainty?, (ii) what is the uncertainty in some spatio-temporal locations not previously analysed?, (iii) what is the uncertainty of an specific spatio-temporal region?, (iv) how to compare two regions as a function of its uncertainty?, and (v) what is the less uncertain model from a set of models? The proposed method has been tested in realistic use cases from various scientific areas.

**Palavras-chave:** Uncertainty quantification, Generalized Lambda Distribution, Large-scale Spatiotemporal models.

**Quinta-feira - 12/07/2018 - 14:00h às 15:00h Sala: N4C**

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