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### Abstract

#### **Synthesis of geological images using deep learning techniques**

We propose a framework for synthesis of geological images based on an exemplar image (a.k.a. training image). We synthesize new realizations such that the discrepancy in the patch distribution between the realizations and the exemplar image is minimized. Such discrepancy is quantified using a kernel method for two-sample test called maximum mean discrepancy. To enable fast synthesis, we train a generative neural network in an offline phase to sample realizations efficiently during deployment, while also providing a parametrization of the synthesis process. We assess the framework on a classical benchmark of a binary image representing channelized subsurface reservoirs. Results show that the method is effective in reproducing the visual patterns and spatial statistics (image histogram and two-point probability functions) of the exemplar image, providing a promising direction towards parametric synthesis of geology directly from an exemplar image.

References:

[1] Shing Chan, Ahmed H. Elsheikh, "Exemplar-based synthesis of geology using kernel discrepancies and generative neural networks", preprint arXiv:1809.07748. URL: <https://arxiv.org/abs/1809.07748>