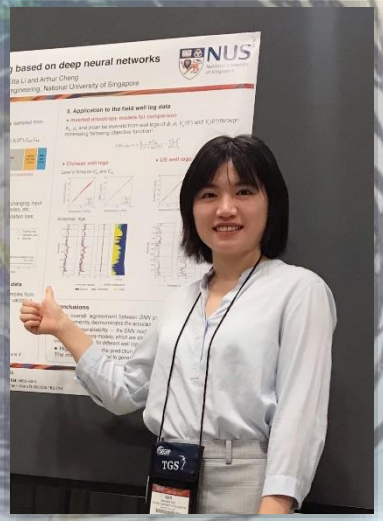
3D Carbonate Digital Rock Reconstruction using Progressive Growing GAN



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Digital Rock Physics relies on the availability of high-resolution, large-size 3D digital rock images. In practice, there is always a trade-off between the size and resolution of the acquired images. Moreover, it is time-consuming to acquire high-quality digital rock images using imaging techniques like X-ray micro-Computed Tomography (μCT) and Scanning Electron Microscope (SEM). In this paper, we propose a ML-aided 3D reconstruction method that allows to reduce the sampling rate along the axial direction during image acquisition. Considering the linearity of the latent space learned by a Progressive Growing Generative Adversarial Network (PG-GAN), we reconstruct the missing part between slices scanned at large constant intervals via linear interpolation in the latent space learned by the PG-GAN. We apply our method to reconstructing the 3D image of an Estaillades carbonate rock sample. Both the reconstructed image and the extracted pore network are visually indistinguishable from the ground truth. Overall, our method saves imaging time and cost significantly, enables efficient imaging editing in PG-GAN's linear latent space and the utilization of SEM images in 3D reconstruction for enhanced image quality, offers highly efficient compression of the image data, as well as enlarges the digital rock repository for ML research.

27 August 2021

11:00 a.m.

Zoom Link: Here
Meeting ID: 992 4969 9833
Passcode: 983837

EARTH SYSTEM SCIENCE PROGRAMME

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