

**CRUNCH Seminars at Brown, Division of Applied Mathematics**

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**FA hybrid Decoder-DeepONet operator regression framework for unaligned observation data**

**Weipeng Li, Shanghai Jiaotong University**

**Deep neural operators (DNOs) have been utilized to approximate nonlinear mappings between function spaces. However, DNOs face the challenge of increased dimensionality and computational cost associated with unaligned observation data. In this study, we propose a hybrid Decoder-DeepONet operator regression framework to handle unaligned data effectively. Additionally, we introduce a Multi-Decoder-DeepONet, which utilizes an average field of training data as input augmentation. The consistencies of the frameworks with the operator approximation theory are provided, on the basis of the universal approximation theorem. Two numerical experiments, Darcy problem and flow-field around an airfoil, are conducted to validate the efficiency and accuracy of the proposed methods. Results illustrate the advantages of Decoder-DeepONet and Multi-Decoder-DeepONet in handling unaligned observation data and showcase their potentials in improving prediction accuracy.**