Idaho State University

Mathematics and Statistics

Undergraduate Colloquium

From Functions to Operators: Learning Nonlocal Structure with Neural Integral Models

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While most machine learning models focus on learning functions, many real-world systems—from physical processes to brain activity—are governed by relationships between entire signals or fields. These relationships are naturally described as operators, which capture how one function transforms into another.

This talk introduces the emerging paradigm of neural operator learning, with an emphasis on integral formulations that explicitly model nonlocal interactions. Starting from intuitive examples, we build up the mathematical and computational framework needed to understand these models and their advantages over traditional architectures.

We then present recent work applying neural integral operators to challenging problems, including spectroscopic inverse problems and brain encoding/decoding tasks. These applications demonstrate how operator-based models can effectively capture complex structure in high-dimensional data.

Friday, May 1

2:00 pm

PS 308

Zoom Meeting ID: 81849854948