Math major research presentations

See what math majors have been researching this semester!

1:00 - 1:15: A Pre-trained VAE-based Surrogate Model for Plasma Turbulence
Marshall Nicholson

1:20 - 1:35: Evaluating Integrals Using the Bracket Method
Sydney Lipton and Bridget Rozema

1:40 - 1:55: Bessel Integrals with the Bracket Method
Troy Conlay, Jordan Edwards, and Peter Verstraete

2:00 - 2:15: Bracket Method of Brackets for Bracketing Integrals with ⟨Brackets⟩ (insert brackets here): Integration via the Bracket Method
Hunter Bogar, Marshall Nicholson, and Ethan Woudwyk

Pre-trained Reconstruction
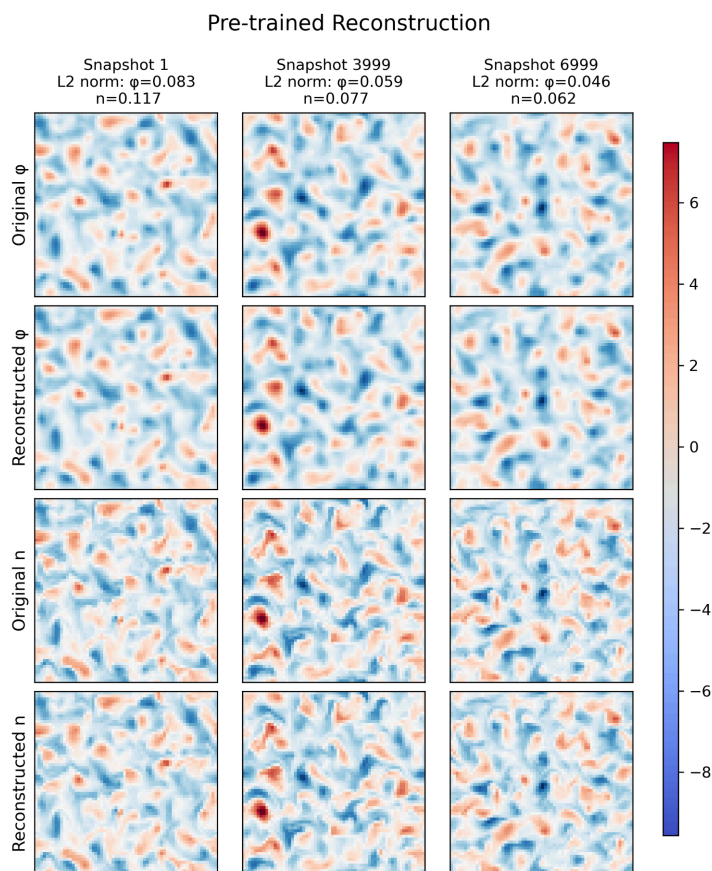
Friday 12/5, 1 - 2:20 pm

In the PCS (Mackinac A-2-610)

🍕 Pizza & refreshments provided • Join or leave at any time   *Full schedule & abstracts*

Full list of titles and abstracts

Friday December 5th – 12 - 2:30 pm – in the PCS (MAK A-2-610)

1:00: A Pre-trained VAE-based Surrogate Model for Plasma Turbulence

Marshall Nicholson

Plasma turbulence is a major challenge in controlled nuclear fusion – the unpredictable behavior of ionized gases causes energy losses and reactor component damage, hindering fusion efficiency. Traditional numerical simulations of plasma dynamics are computationally expensive, limiting real-time prediction capabilities. We developed a machine learning surrogate model based on the Hasegawa-Wakatani (HW) equations to accelerate plasma turbulence predictions.

1:20: Evaluating Integrals Using the Bracket Method

Sydney Lipton and Bridget Rozema

We will discuss the application of the integration method known as the bracket method. This method is for evaluating definite integrals over the half-line $[0, \infty)$ based on the expansion of the integrand as a power series. The advantage of establishing this method is that we can evaluate these "bracket series" with a small number of rules. We will be illustrating the application of this method via examples with Bessel functions, demonstrating its simplicity and flexibility.

1:40: Bessel Integrals with the Bracket Method

Troy Conlay, Jordan Edwards, and Peter Verstraete

The method of brackets is an integration method based on Ramanujan's Master Theorem that allows the integrals to be evaluated via solving systems of linear equations obtained from brackets. In this project, we focused on applying the method to integrals of Bessel functions.

2:00: Bracket Method of Brackets for Bracketing Integrals with ⟨Brackets⟩ (insert brackets here): Integration via the Bracket Method

Hunter Bogar, Marshall Nicholson, and Ethan Woudwyk

In this project, we use the bracket method of integration to evaluate definite integrals on the interval $[0, \infty)$. Building off of previously discovered bracket integration techniques, we validate integrals from the Table of Integrals, Series, and Products of Gradshteyn and Ryzhik.