SECURE for Student Success

Undergraduate Research Program

Department of Physics and Astronomy

Research Duration: Summer 2024 (June – August 2024)

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Title of Project: Solving physics equations with neural networks

Goals and Objectives of the Project, Expectations and Outcomes

Describe briefly what students can expect to learn by participating in this project.

Objectives: Deep learning based on neural networks (NN) has revealed a remarkable potential in solving a wide variety of complex problems. A Physics-Informed Neural Network (PINN) is a type of neural network architecture designed to incorporate physical principles or equations into the learning process. It combines deep learning techniques with domain-specific knowledge, making it particularly suitable for problems governed by physics. In this project, **you will learn to implement the PINNs in Pytorch to solve various equations (diffusion equations, wave equations etc.) from different areas of physics.**

Expectations and Outcomes: The only requirements for students are GE-level physics background, basic knowledge of derivatives, vector and matrix, and a little bit programming experiences, preferably in Python. Through this project, students will improve their python skills by learning the state-of-the-art deep learning techniques using PyTorch. The students will also learn how to model the real world and make predictions based on computer simulations. These would be valuable experiences for the students who want to pursue an STEM career.