## 11th International Conference "Distributed Computing and Grid Technologies in Science and Education" (GRID'2025)



Contribution ID: 543

Type: Sectional talk

## On Neural Network Approach for Numerical Integration of Single and Double Integrals

Thursday 10 July 2025 15:00 (15 minutes)

This paper is dedicated to the description of the application of a neural network approach to the numerical integration of single and double integrals and its implementation as a Python programming language library "Skuld". The essence of the approach is to train a neural network model to approximate the integrand and then to use the parameters of the model to numerically calculate the value of the integral.

The usage of this approach can decrease time and computational complexity required to get a numerical integration result, especially when the number of integrand variables is large. Where the common numerical methods become too complex, this numerical approach allows calculations to be less demanding of the computational time and resources.

Single and double integrals are well integrated with common numerical methods, however, this work is a foundation for further development of the neural network integration library "Skuld" capable of numerical integration of multiple integrals, where the approach will unfold its advantages.

The paper describes the mathematical foundation of the approach and its software implementation: the "Skuld"library. The library was tested using Genz's test functions and was applied for calculations within the framework of a physics problem of modeling of meson properties in a QCD-motivated model with separable interaction kernel for the NICA experiment.

Author: ШИПУНОВ, Григорий (Государственный университет "Дубна")
Co-authors: СТРЕЛЬЦОВА, Оксана (ЛИТ ОИЯИ); Dr КАЛИНОВСКИЙ, Юрий (ЛИТ ОИЯИ)
Presenter: ШИПУНОВ, Григорий (Государственный университет "Дубна")
Session Classification: Methods and Technologies for Experimental Data Processing