

# Compact Implicit Neural Representations for Efficient Visual Analysis of Large Multivariate Data

Shanu Saklani

## Abstract

The widespread use of Deep Neural Networks (DNNs) has fueled their application in complex scientific visualization challenges. Recent progress in developing compressed data models through implicit neural representations has yielded encouraging results in areas like spatiotemporal volume visualization and super-resolution. Building on these advancements, we have developed a compressed neural representation tailored for multivariate datasets with hundreds of variables. Our method leverages a single network to simultaneously learn representations across all data variables using parameter sharing, enabling state-of-the-art compression with a model size substantially smaller than the volume of multivariate data points. Through extensive evaluations, our model demonstrates superior performance over various data reduction and compression techniques, excelling in reconstructed data quality, gradient fidelity, visualization accuracy, preservation of inter-variable dependencies, storage efficiency, and effectiveness across multiple multivariate applications.