Enhancing Creativity in Deep Learning Models with SAVE-Inspired Activation Functions

Stelian Brad

Technical University of Cluj-Napoca, Memorandumului 28, 400114 Cluj-Napoca, Romania
stelian.brad@staff.utcluj.ro

Abstract. Deep Learning models, a type of artificial intelligence (AI), generate new outputs based on their training data. Examples include Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and Large Language Models (LLMs) like ChatGPT. However, these models lack human-like creativity, imagination, and original thought. Activation functions play a significant role in these models, determining a neuron's output by mapping inputs to non-linear outputs. This paper aims to explore new activation functions inspired by inventive principles to increase these models' creative potential. The research methodology involves studying each inventive principle of the Structured Activation Vertex Entropy (SAVE) method and identifying associated mathematical models inspired by physics or other natural science areas. These models can be turned into activation functions, which, based on the SAVE algorithm, can be proposed for the type and order of activation functions in a neuronal network. A novel model architecture investigates input-output transformations, leading to recommendations for deep learning model architecture and input formulation. The study's main findings are that human-behavior inspired activation functions might increase the inventive capacity of deep learning models, and there are practical ways to formulate inputs in deep learning models for handling complex and abstract concepts. However, this paper is limited to a narrow aspect of designing deep learning models for inventive design, and further research is needed to investigate various hyperparameters, network architecture, training data quality, and optimization algorithms in combination with the proposed activation functions.

Keywords: Deep Learning, Activation Functions, SAVE Method, Inventive Principles, Neural Networks, Creative Design.