

Introduction

Applications of artificial neural networks are omnipresent nowadays, ranging from machine translation to chatbots with reasoning capabilities, and from computer vision to physical system simulation.

The theoretical basis for these advances lies in more fundamental mathematics: linear algebra, calculus, and statistics. With some Python code, this workshop will demonstrate in particular how to build an artificial neural network from the fundamentals to recognize digits, a milestone problem in the development of artificial intelligence.

(Category: Mathematics, Computing, Machine Learning, Python coding)

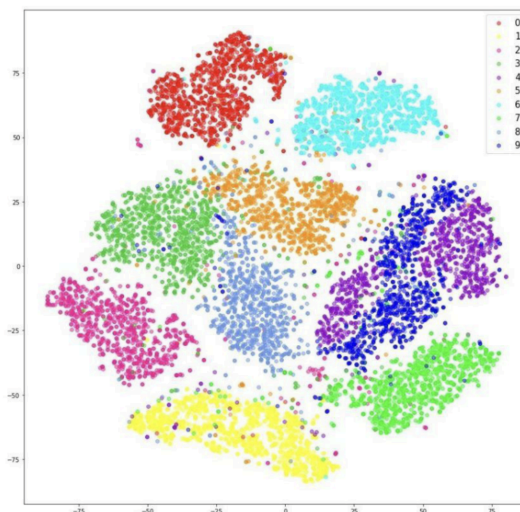


Figure 1: Visualizing clusters of digits from the MNIST dataset using an embedding named t-SNE.

Resources: <https://github.com/EssenceBL/ATasteOfDeepLearning> forked from HanlunAI
Resources Status: Open-sourced by Hanlun AI in 2022-2023.

Course History: Derived from a workshop trial run at a local school, SPC in 2022. The workshop was summarized in an article appearing in EDB's School Mathematics Newsletter (2023, Issue 26, pp. 78-91). Joint work of four authors.

Support needed for a delivery

Venue: Computer Room/ PC laboratory
Target Groups: Highly motivated secondary school students
No. of sessions: 3 sessions, 1.5 hours per session

Keywords: linear algebra, random walk, false positive (type I), false negative (type II), MCMC, CNN, constraints satisfaction, Sudoku