Autoencoder演算法於極端降雨天氣類型之群集分析應用

An autoencoder-based neural network approach for cluster analysis of extreme rainfall events

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摘　　要

本研究利用人工智慧(Artificial Intelligence，簡稱AI)中的Autoencoder演算法，以1979至2020的NCEP再分析資料進行訓練，將原始資料投射至高維度的空間向量中，建立多變量特徵擷取模組。並利用TCCIP1979年至2019北部地區1公里降雨分析資料，挑選出北部極端降雨日作為目標事件，將模組應用於極端降雨事件日的天氣類型群集分析，分析造成極端降雨事件的天氣類型種類。研究結果發現不同變數組合以及訓練方式，會產生不同的天氣類型分群結果，本研究量化分析不同分群結果的優劣，並比較以AI模組投射至高維度空間向量後分群與原始資料分群之差異。

關鍵字：AI技術、Autoencoder、極端天氣

Abstract

This study conducts a clustering analysis on the synoptic weather types of extreme rainfall events over northern Taiwan by using the autoencoder algorithm. The CFSR reanalysis data from 1979 – 2020 is used for training the model. The autoencoder algorithm encodes the input data into a lower-dimensional latent space, thus establish a multi-variable features extraction module. The 1-km resolution TCCIP rainfall reanalysis from 1979 – 2019 is used to define the extreme rainfall events in northern Taiwan. The autoencoder-based module and K-means algorithm are combined to clustering the synoptic weather types of extreme rainfall events over northern Taiwan. This study also uses an object method to compare the clustering results between using the raw data and using the latent representation.

Key words: AI, Autoencoder, extreme rainfall