# COMP6001 Neuromorphic Algorithms and Computation

Assignment 2 – Source Detection and Classification (35%)

Due Sunday 30th October 11:59pm

Overview. Peak detection or source finding is a generalised detection problem similar to anomaly detection, where spatial or temporal areas of interest need to be identified. Sources could resemble bright peaks amongst background noise or periods of high activity in time series data. In this assessment, a dataset of arbitrary origin is provided, which you will need to interpret. The dataset contains many sources with varying characteristics. Two datasets are provided, a frame-based dataset of 30 images and an event-based dataset of 10 event-streams. In the frame-based dataset, the number of sources varies, while the event-based dataset contains only one source per case. The aim of this assessment is to detect the sources using your own method, broadly classify/characterise the sources and evaluate your algorithm. The student is expected to develop reasonable solutions within the assessment time frame as an exploration of the trade-off between 'perfect' solutions which require copious resources and are beyond scope, compared to finished solutions delivered on time.
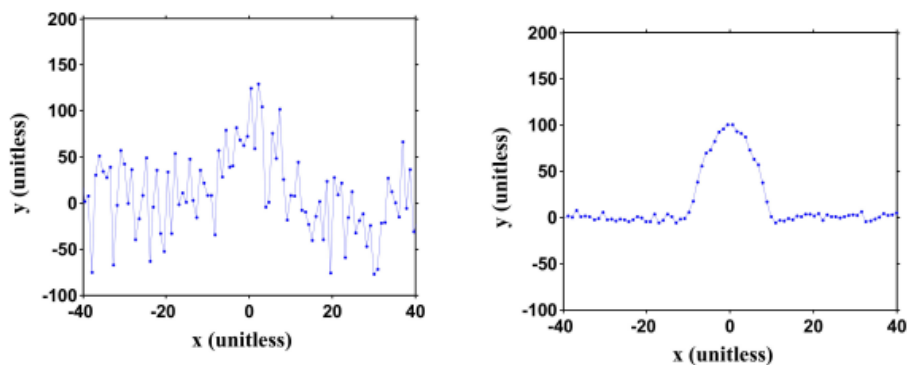
Example peak detection, where a noisy signal (left) contains an underlying peak (right) (Sung, J.Y., Chen, J.K., Liaw, S.K. and Kishikawa, H., 2021. Accurate Peak Detection for Optical Sensing with Reduced Sampling Rate and Calculation Complexity. *Sensors*, *21*(7), p.2306.)

Q1. (40%) Develop an algorithm to detect the number of sources within the frame-based datasets, while attempting to maintain a low F1 score.

    a. Overall algorithm design (25/40)
    b. Overall performance/correctness (15/40)
    c.

Q2. (40%) Build a simple classifier to characterise sources in the frame-based and event-based datasets. Characterisation should be used to place sources into several of your down source types based on the characteristics you deem potentially relevant.

    a. Overall algorithm design. (10/30)
    b. Estimation (with justification, there is room for interpretation) of the number of different source types and appropriate classification of sources into each type using the frame-based dataset. (10/30)
    c. Extraction of characteristics from sources in the event-based datasets and rough characterisation based on these characteristics. (10/30)

Q3. (20%) Evaluate and briefly justify your algorithms

    a. Justification of algorithm choice (5/30)
    b. Complexity and scalability (5/30)
    c. Compare your frame-based and event-based approach dataset (10/30)
    d. Similarity to solutions within literature (5/30)
    e. Profiling to identify bottlenecks (5/30)

Submission requirements:

1. All code must be written using Jupyter Notebooks, or Matlab Live Script
2. Written components will need be written in a markup or similar format within the Notebook/Live Script
3. Submission is via GIT Classroom, and Turnitin. Copy the code as plain text to a document and submit.