

Supplementary Information: Training-free AI for Earth Observation Change Detection using Physics Aware Neuromorphic Networks

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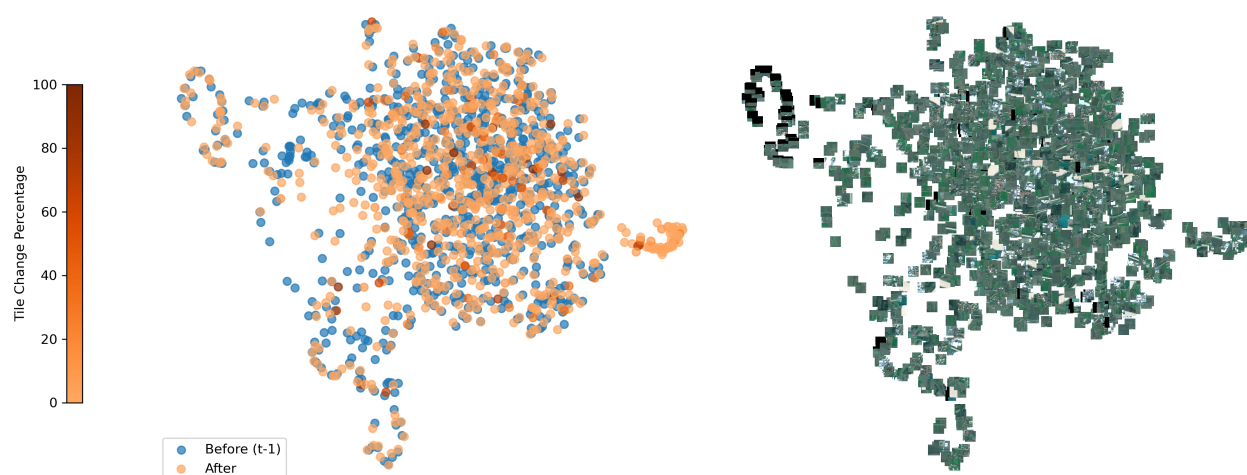


Figure S1. The 2D Uniform Manifold Approximation and Projection (UMAP) projection of the pixel space for a flood natural disaster event: Left – position of the before (blue) and after (orange) tiles and with percentage change in the after tiles indicated by the colour bar; Right – the corresponding tile images.

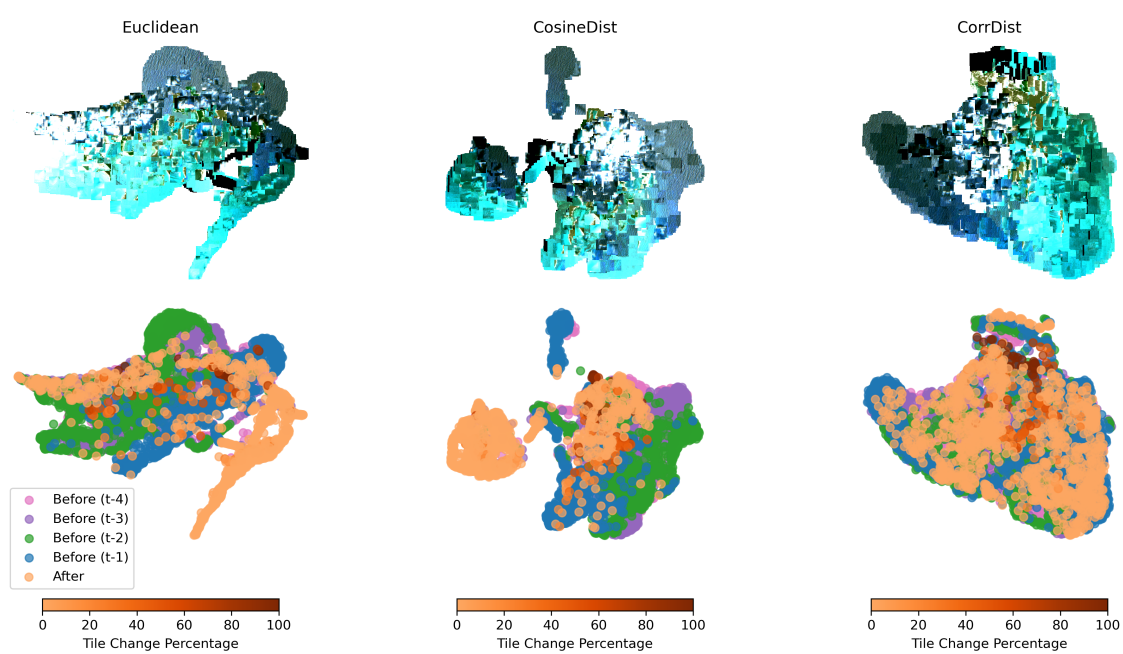


Figure S2. Visual comparison between the 2D UMAP projection of the Physics Aware Neuromorphic Network feature space for a hurricane natural disaster, for the full tile sequence, using three different distance metrics: Euclidean, Cosine and Correlation distances.

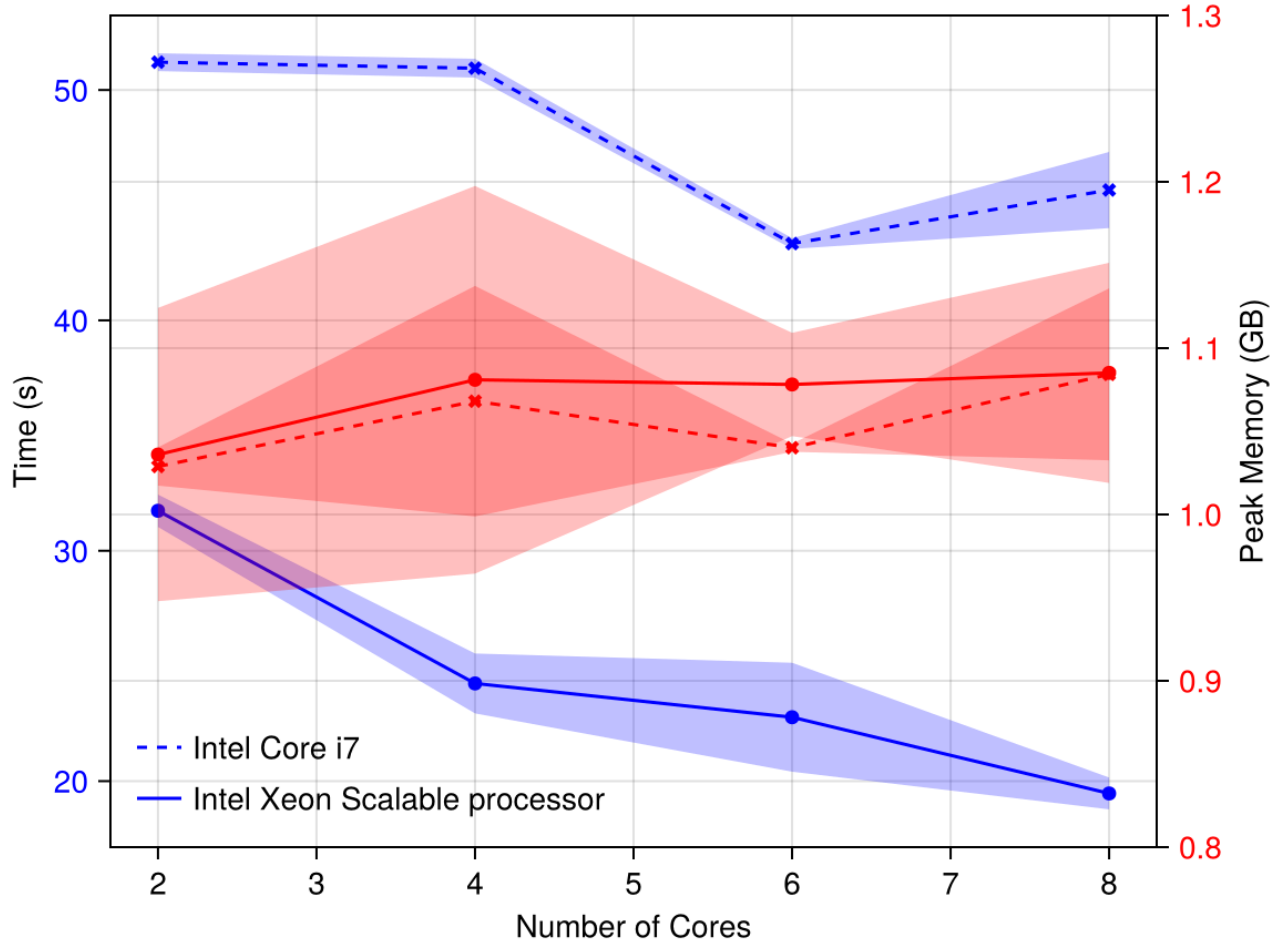


Figure S3. The Physics Aware Neuromorphic Network (PANN) model time and peak memory usage for two different CPUs with varying number of cores. The processing time (blue) and peak memory usage (red) results are for a test region of size 574×509 pixels (approximately a 25 km^2 area). Results were recorded using an Intel Xeon Scalable processor (solid lines) and an Intel Core i7 (dotted lines). Shaded region shows the SEM over 5 runs.

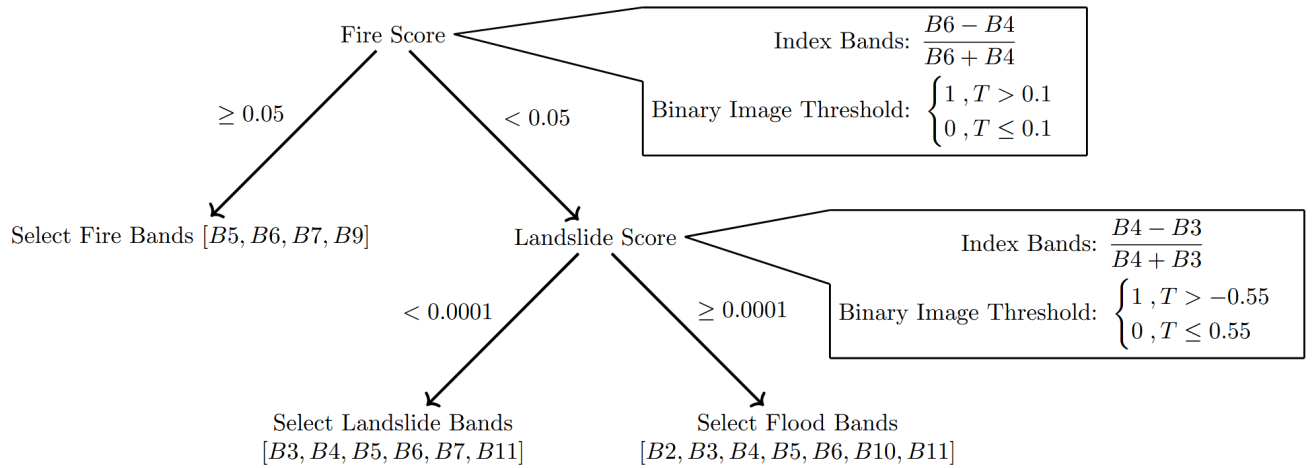


Figure S4. Decision tree for the automatic feature engineering step for the LandSat-8 dataset. At each branch a natural disaster score is calculated for the different categories. For each score the bands and threshold values used to create the index image are given. The bands used for each natural disaster type once selected are also shown.