Feature extraction in evolved/optimized spiking neural networks

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Aachen, August 2020

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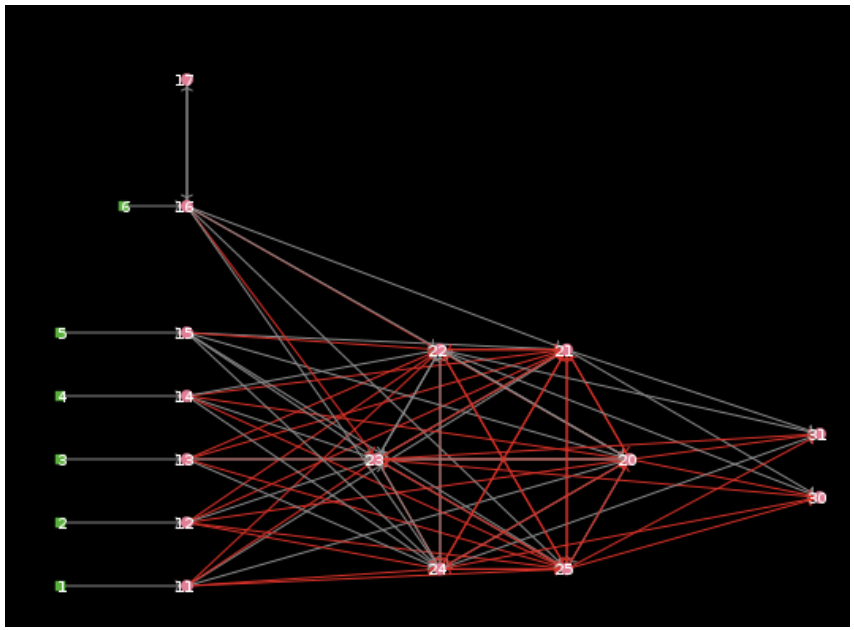

Figure: 1a. A spiking neural network.

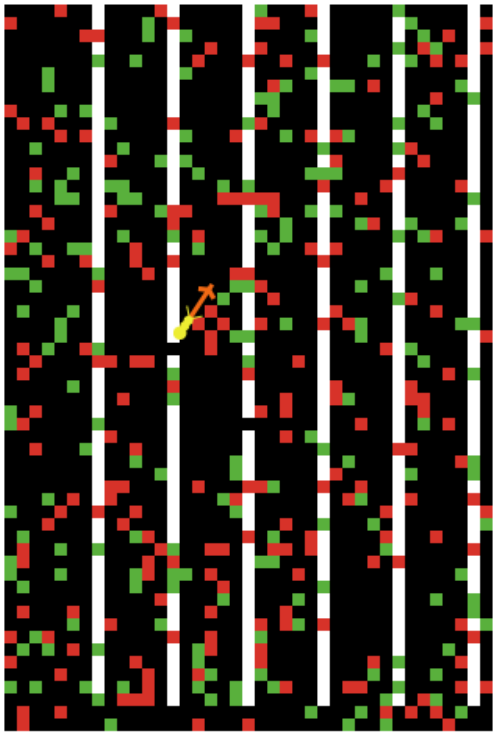

Figure: 1b. Ant searching for food.

- Connections attributes are weights and delays
- Changing weights and delays changes the performance of the network

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Background

Locating good parameter configurations is an intractably hard problem because of the:

- High dimensionality of the parameter space (many weights and delays)
- Limited compute resources
- Hard to chose appropriate search algorithm
- Lack of heuristics connecting parameter configurations to network

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Optimisation Approach

The parameters (connection weights and delays) in the network are optimized according to a fitness function using a Genetic Algorithm. This procedure is iterated until convergence is reached.

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Problem

the relationship between the evolved/optimized parameters and the observed fitness is not clear.

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Given

The **data set** consists of 96 csv files. Each file corresponds to an individual agent from the final generation of a population optimized by a genetic algorithm. Each csv file contains:

- Weights of the 78 connections between neurons in the network. The range of the values is from -20.0 to 20.0
- Transmission delays of the 78 connections between neurons in the network. The range of the values is from 0.0 to 10.0
- Fitness value of the individual. The higher the value, the better the performance.

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Wanted

- Reduce the dimensionality of the data with the help of principal component analysis (PCA).
- Plot the sub-space that is defined by the first three (and subsequent) principal components of the data.
- Is there a relation between principal components and the fitness of the data?
- Extension of project in various ways (other feature extraction methods, other plotting techniques, entropy methods, inference strategies)

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Goal

To identify what makes the fittest individual different in comparison to the other individuals regarding the parameter space.

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Thank you!