One shot learning with *Omniglot*

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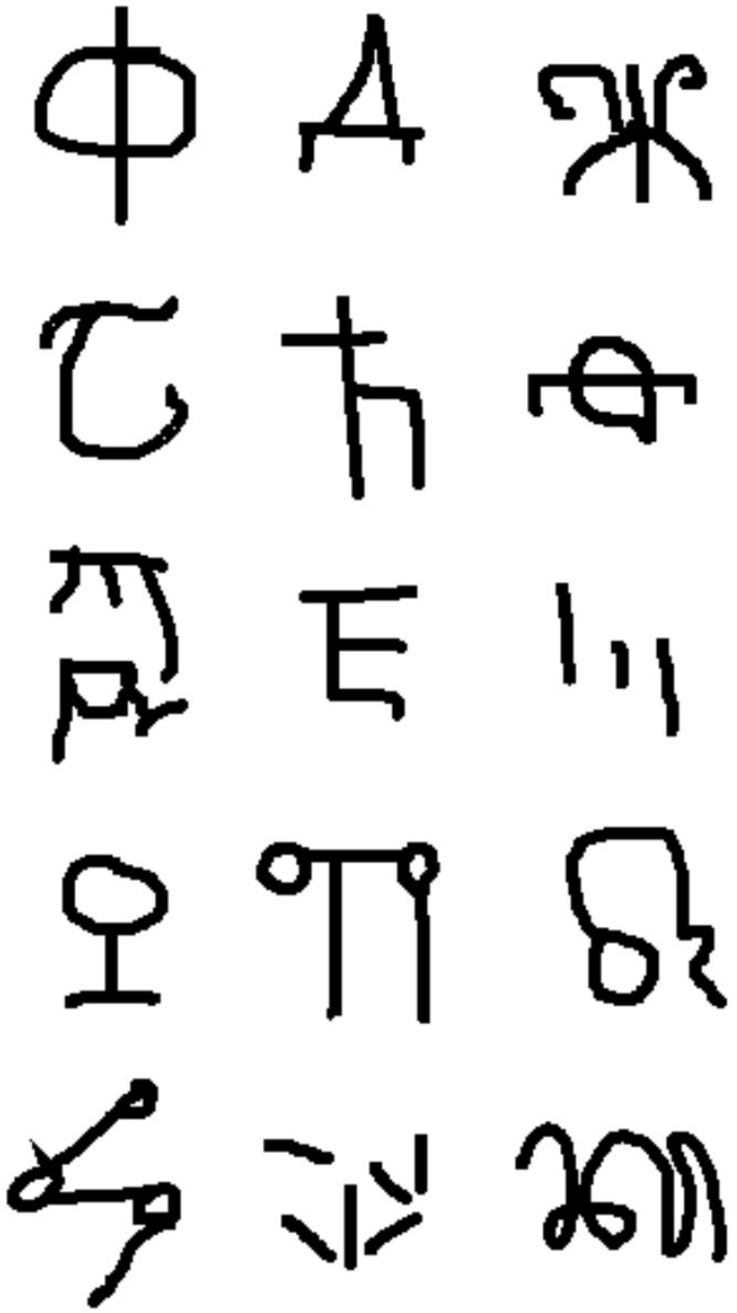


One-shot learning task:

- Goal: categorise data by training a single example per category
- Extracted features used to generalise knowledge applicable to novel categories

Omniglot dataset:

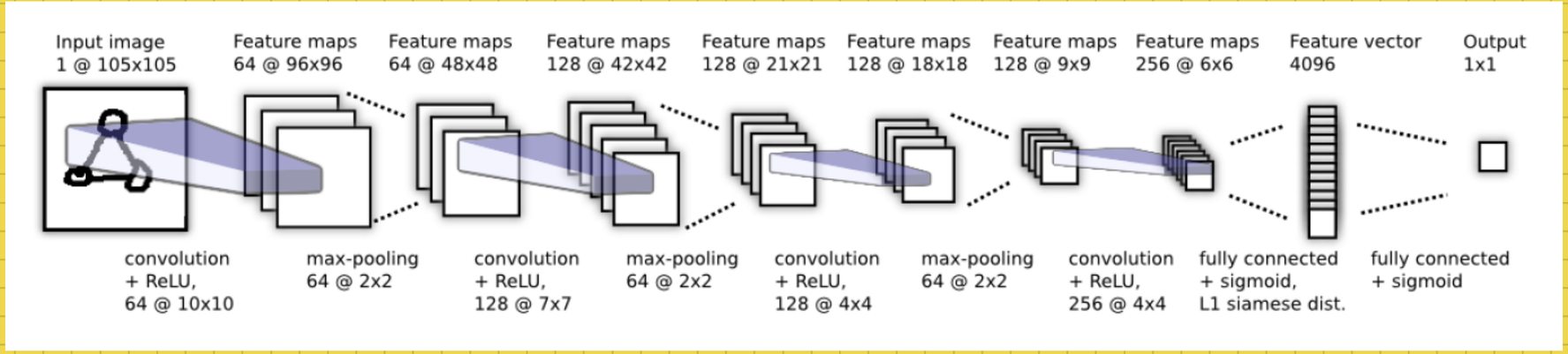
- 50 natural and fictitious alphabets with 15-40 characters
- 20 handwritten 105x105 binary images per each character
- 1623 character classes

Siamese network

Current top performing “vanilla”* deep learning model for the one-shot learning task on the Omniglot dataset is a Siamese CNN proposed by Koch et al. [1]

Siamese network:

- Two identical branches (same weights)
- Input: pair of data, with each branch taking one of the two
- Target: learn a distance metric and estimate the probability that the pair is similar

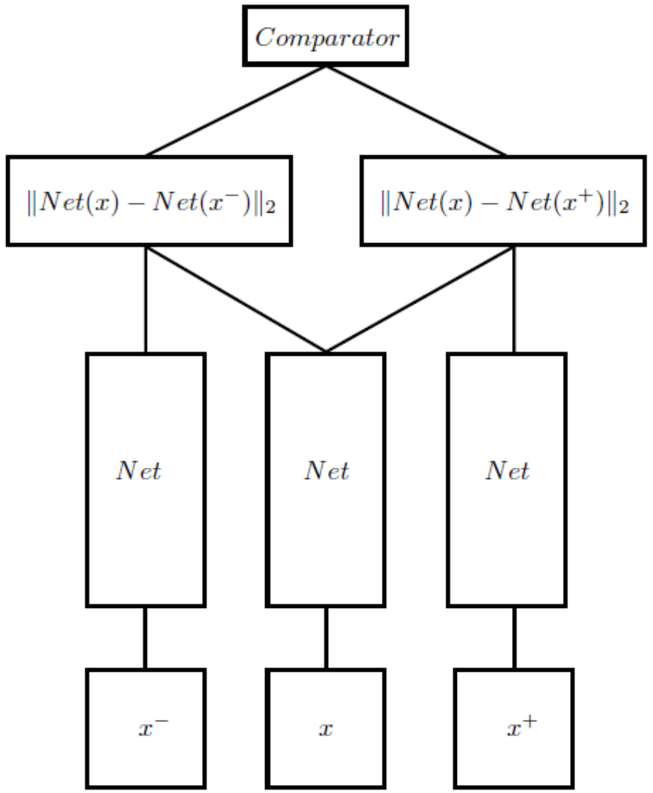


Proposed Siamese CNN by Koch et al. for the one-shot learning task on the Omniglot dataset, which is currently the top performing deep learning model [1]

*no generative/memory units

[1] G. Koch et al., Siamese Neural Networks for One-shot Image Recognition, 2015

Triplet network



An abstract representation of a triplet network [2]

Triplet network:

- Use of three branches (anchor, positive and negative) and a triplet as input
- Calculation of metric distance between anchor-positive and anchor-negative

Network specific experiments:

- Loss functions (triplet, softmax, global and global+triplet)
- Sampling methods (random and hard-positive/negative mining)
- Joint/disjoint anchor with positive and negative branches

Final model:

- Use of global loss function as defined by Kumar et al. [3]
- Random sampling

[2]E. Hoffer and N. Ailon, Deep metric learning using Triplet network, 2014

[3]V. Kumar et al., Learning Local Image Descriptors with Deep Siamese and Triplet Convolutional Networks by Minimising Global Loss Functions, 2016

Results

Model	**20-way one-shot validation accuracy**	**20-way one-shot test accuracy**
Koch *et al.* Siamese CNN	93.42%	92%
Siamese CNN	87.81%	84.50%
Triplet CNN	90.31%	89.25%