

Introduction

Deep learning techniques are gaining more and more traction nowadays, thanks to fast training algorithms.

Unsupervised deep learning structures are able to tackle problems such as **feature learning, dimensionality reduction and generative modeling**.

In this work, a software for unsupervised deep structures called Ruta is introduced.

Unsupervised Deep Learning

The **autoencoder** (AE) is the canonical neural network for unsupervised learning. It learns to reconstruct the input layer onto the output. There are several types according to their loss function and properties:

Undercomplete	Contractive
Sparse	Denoising
Denoising	Variational

AEs are trained via optimization algorithms such as SGD, AdaGrad or RMSProp and can be pretrained as a stack of RBMs or AEs.

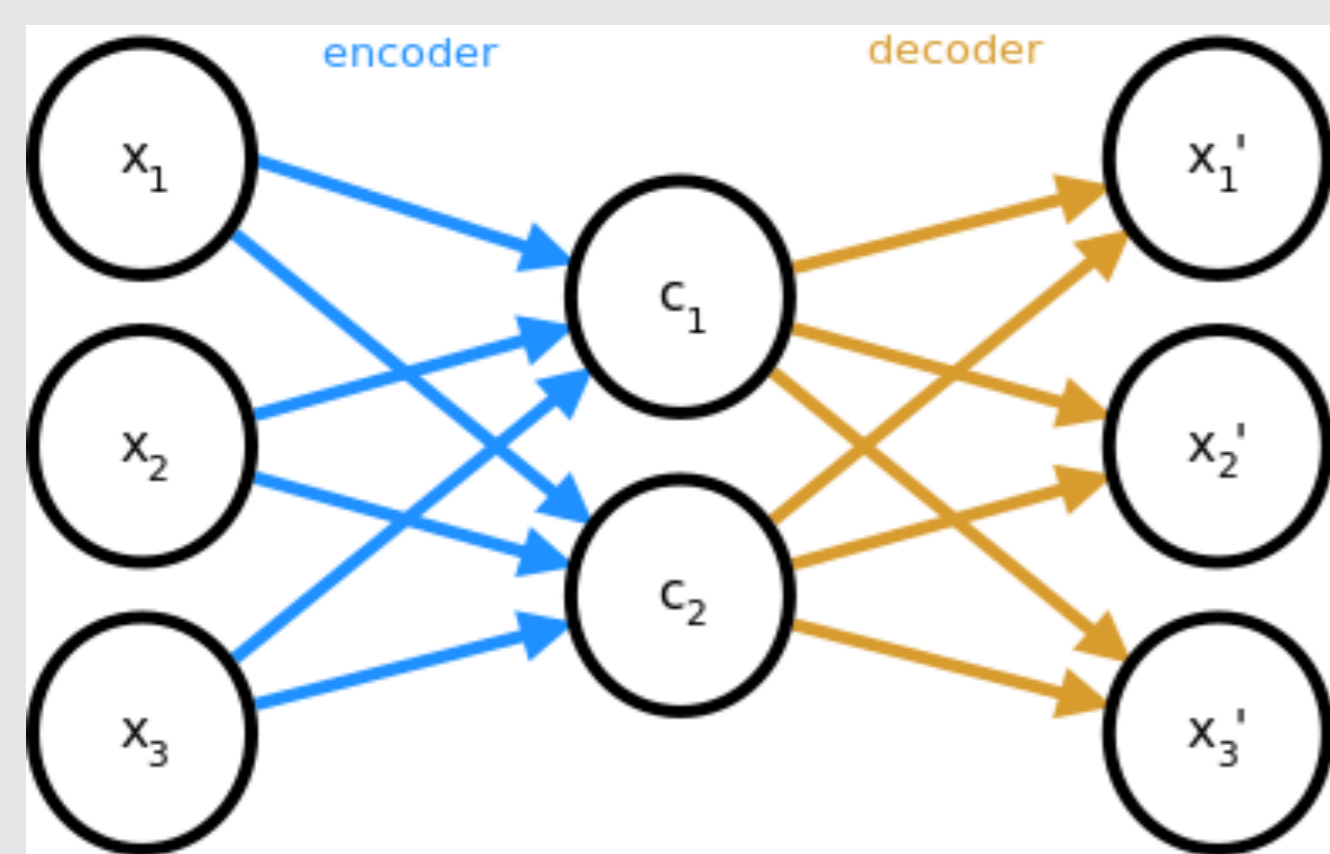


Fig. 1: Undercomplete autoencoder with a 2-variable encoding

Other available software

Software for deep neural networks is usually not specialized in specific architectures and less high-level than Ruta. Most of it is available in C++ and Python. Some of the more popular implementations are:

Tensorflow	Torch
h2o	MXNet
Caffe	Keras

The Ruta package for R

Ruta is an R package which gives uncomplicated access to unsupervised deep structures. Its default backend for neural network training is MXNet.

The functionality of the package is organized into three categories:

Tasks are composed of a dataset and extra metadata, can be created with `ruta.makeTask`.

Learners gather the structure and properties of a neural network, can be generated with `ruta.makeLearner` and trained with the `train` method.

Models are created after a learner is trained with a task. For autoencoders, one can extract the deep features from the model with `ruta.deepFeatures`. Other available operations are `predict` and `predictPartial`.

The source code of the package is available at <http://github.com/fdavidcl/ruta>.

Visualizations with Rutavis

Rutavis is a complementary package aimed at creating **meaningful visualizations** out of trained models. It also incorporates a **web interface** that allows to easily generate new models and visualize them.

The `plot` method produces new 2D and 3D visualizations. The labels of the dataset can be used to color the points in the graph.

The source code of the package is available at <http://github.com/fdavidcl/rutavis>.

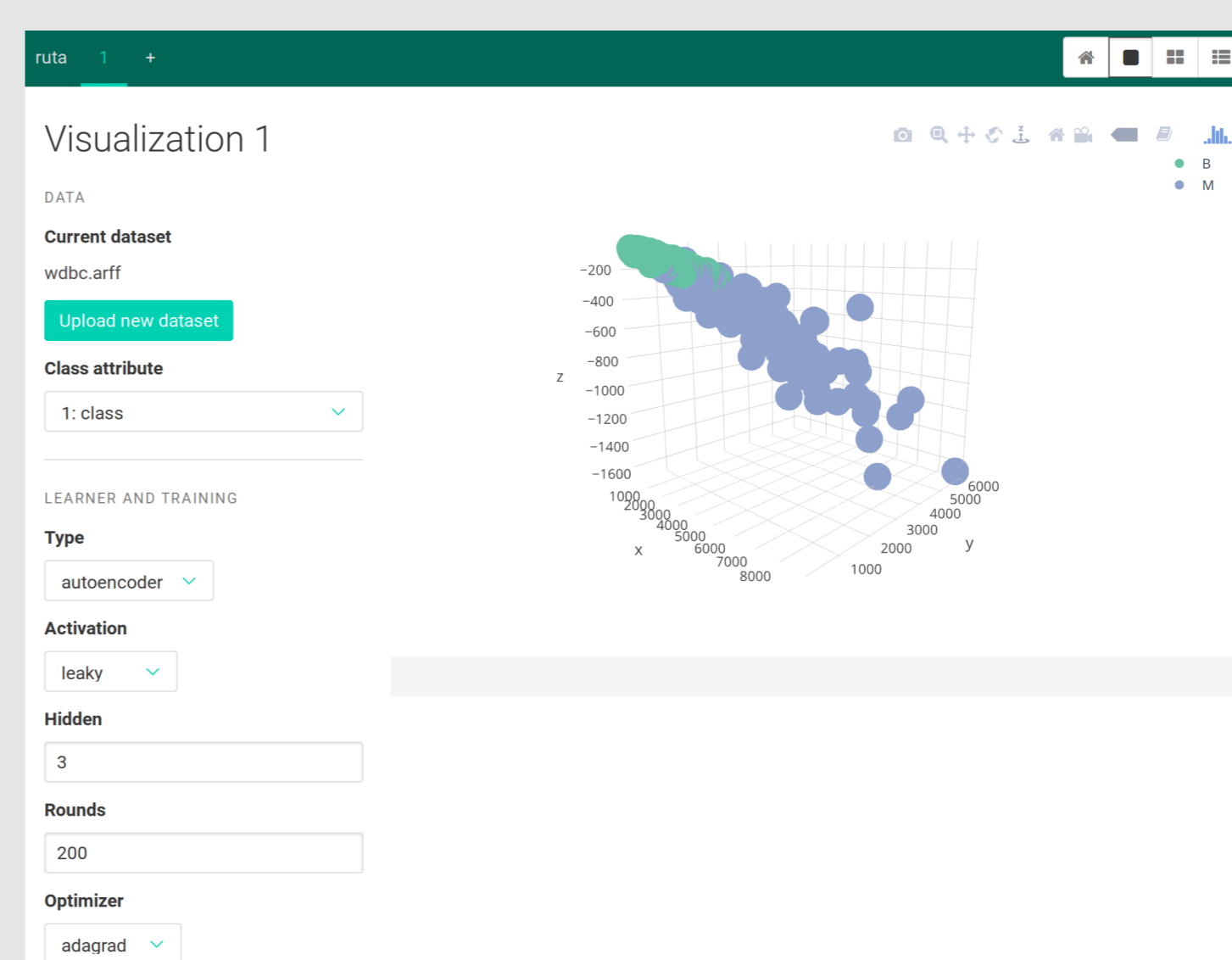


Fig. 2: Web interface in Rutavis

