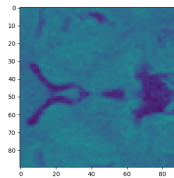


# Challenges for Deep Learning Researcher

## 1 Build a machine learning model

In this challenge you have to build a supervised classifier that detects pixels that belong to a given class using a labeled training set. The performance must be reported in terms of Jaccard index (mandatory) and you can provide other metrics if you consider them relevant.

We provide for the task 4 files: `train_data.csv` / `train_label.csv` for training and `test_data.csv` and `test_label.csv` to assess the performance. The dataset represents 2D image examples in lines (e.g 135 training lines in `train_data.csv`) and pixels in columns (1800). The first column is the identifier (key/ID) of the image and that can be used to match the labeled data. Each line represent an 2D image when it is reshaped in 90 x 90 pixels. If you reshape the data you can retrieve the original image as illustrated below for the first line of the training data. Most relevant information is between 0 and 100 so data can be clipped in that range (see below).



### 1.1 Code and performance assessment

Please submit your implementation as source code with comments using whatever language you like (recommended Python, but can be C++, Bash script calling executables...) together with basic instructions of how to run it on the test file (`test_data.csv`)

You need to provide your classification results that correspond to your assessment of performance (Jaccard) of the validation set (**`test_data.csv`**).

### 1.2 Explanations (max. half a page)

1. Please justify the selection and implementation of your model
2. Please comment on the performance that you have achieved and suggest improvements

## 2 Describe a CNN for 3D segmentation

In this challenge, we would like to get a description (**maximum one page**) of a model of your choice that would be a deep convolutional neural network able to perform a 3D segmentation of the thalamus and hippocampus of the left and right cerebral hemispheres. Please try to answer the 3 items below.

1. Justify the type of architecture you would choose and how you would proceed with training.
2. Describe the difficulties that you can anticipate in the different stages of this task from the design up to its validation.
3. Finally, explain your expectations in terms of performance of the model for accuracy and time (training and running time) and what could be done to tackle those.