Week 3: numpy basics

Array creation

a) Create a 1D array with entries from 0 to 100 in steps of 2
b) Create a 2D with 3 rows and 3 columns, with row entries 1,1,1..., 2,2,2,..., 3,3,3,...
c) Create a 2D with 3 rows and 5 columns that has the value 55 everywhere **d)** Create a 3D tensor with shape (5,4,3) with uniform random entries between 0 and 1.

Numpy basics and slicing

Assume that the 3D array 'traind' contains 2000 images of dimension 20x20. You can, e.g., generate it using traind = np.random.uniform(0,255,[2000,20,20]). Give code snippets for the following operations:
a) Slice out the 1000th sample into an array x and print it!
b) Set the 5 topmost and the 5 lowermost columns of sample 1000 to 0
c) Print the smallest and highest pixel value in the 10th data sample
e) Generate the following variations of the 10th sample and store them in a new variable z:
- just keep every 2nd row
- just keep every 2nd column
- inverse all rows and all columns
- invert rows, invert colums, just take every 2th row and every 2th column
f) Apply the in-place transform

$$1 - x$$

to all samples.

Reduction

Take the array 'traind' from the previous exercise and ...
a) Compute the pixel sum for pixel 0,0 over all samples
b) Compute the pixel mean for pixel 0,0 over all samples
c) Compute the image mean over all samples
d) Compute the row-wise max over all samples
e) Compute the row-wise sum over all samples

Broadcasting

Using ‘traind’ from ex. 1, ...
a) create a 20-element vector with entries from 1 to 20, and add it to all rows of all samples using broadcasting
b) create a 20-element vector with entries from 1 to 20, and add it to all columns of all samples using broadcasting
c) add sample 0 to all other samples of ‘traind’.

Fancy indexing and mask indexing

a) create a 20-element vector with entries from 1 to 20, and copy out all elements that are smaller than 10 using mask indexing!
b) create a 20-element vector with entries from 1 to 20, and set elements 1,5 and 19 to 0 using fancy indexing!