

Final Project

Head Orientation Recognition

Head pose gives information about what someone is paying attention to, and as such is important for social interaction and for mediating learning. Estimating head pose is an active area of research in computer vision.

The goal of this project is to train a neural network to classify the orientation of a centered image of a head as either left, right, or front. (see Figure 1).

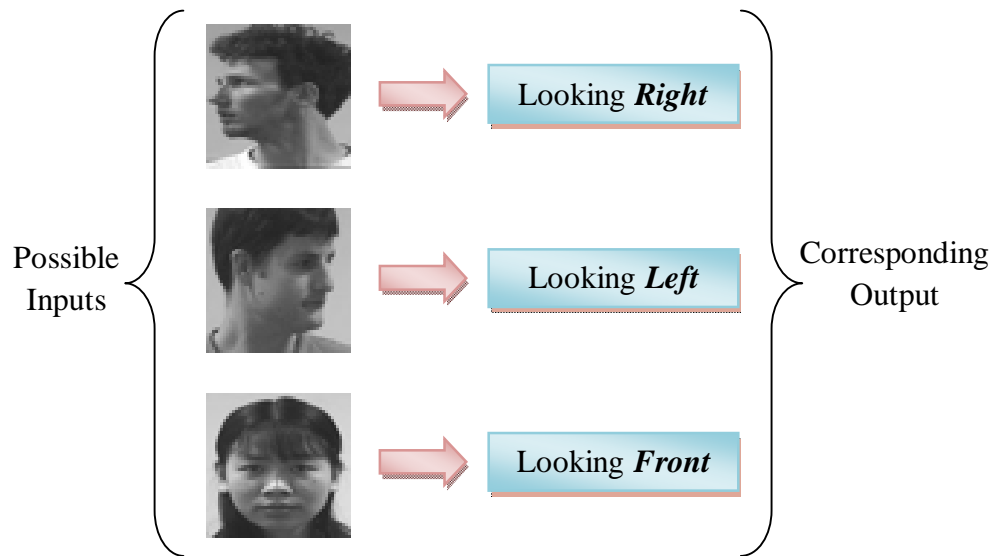


Figure 1. Desired performance of network.

1) Dataset

- Dataset, is real-world data, has 3 classes, 4000 samples each (6000 samples for training and 6000 for testing) [1]. It is given as colored images in .png format.
- The size of the samples is 50*50 pixels, without margin around the heads.
- The main characteristic of this dataset is that it has a stable background and no occlusions, so that it represents the ideal scenario where to evaluate how far a classifier can go at a given resolution.
- You can perform any useful preprocessing routines, such as converting it to grayscale images.

2) NN Architecture & Learning Algorithm

- Implement the following learning algorithms in ONE package,

No.	NN Architecture	Learning Algorithm
1	Multilayer Perceptron	Back-propagation
2	Radial-Basis Function	Least Mean Square

- For each *NN Architecture*, try using different architectures and different network parameters to achieve a maximum performance.

3) **Requirements**

- The user must be able to insert an input (sample) to the application, and the application has to find which class the user entered.
- Using the test images you will test your classifier. And find the performance of your classifier using the Overall Accuracy (OA) and Confusion Matrix.
- A report must be provided showing the different architectures and different parameters you used, and their effect on the training and testing results.

4) **Bouns**

- Feature reduction to 16*16 pixels\sample instead of 50*50 pixels using *Principal Component Analysis (PCA)* using *Generalized Hebbian Algorithm*.

5) **Deadlines**

- **Delivering the whole project: on practical exam's day.**

6) **Groups**

- The same groups of tasks (any change in group members is not allowed).
- **All** the group members must be aware of the project (anyone can be asked in any part of the project).

7) **Rules**

- It's not allowed to use any available source code in implementing learning algorithms and architectures.
- You can use any programming language and environment (C++, C#, or Java).

8) **References**

- [1] <https://sites.google.com/site/diegotosato/ARCO/iit>

Good luck! :)