**Non-Parametric Learner**

*Project Report*

Michel Mansour, Edwin Odeimi

**Abstract —** This report describes an intelligent human facial age classifier agent, developed as a project for COE544, in the form of a non-parametric learner allowing to categorize faces presented in passport photos in a two distinct age categories: such as young and old. The first batch of input facial photos will be given to the intelligent agent, and then the intelligent agent will be able to automatically classify any input it’s given, based on a decision tree.

**Index Terms —** KNN, Machine Learning, Multi-Level Perceptron, Validation

—————————— ◆ ——————————

**CONTENTS**

**1 INTRODUCTION**

T

His report will be detailing the design procedure followed to cream train and test and intelligent human facial age classifier agent, developed as a first project for the Intelligent Engineering Algorithm course. The paper will follow the overall steps followed in order to create such an intelligent design, from concept to mathematical algorithms used, to finally reach the desired trained agent along its accuracy in recognizing and classifying photos into the age categories.

**2 BACKGROUND**

**3 DESIGN AND IMPLEMENTATION**

In this section we will discuss our design, and dive more deeply into its different parts and we will be diving it into 2 parts:

* Conceptual design (including the logic of our intelligent system)
* The software implementation of our design and the different tools used

**CONCEPTUAL DESIGN**

We started our project by defining our agent, using the PEAS system. PEAS stands for Performance, Environment, Actuators, and Sensors. Each agent has these following properties defines for it.

* Performance: The output which we get from the agent. In our case is the classification of the inputs between young and old
* Environment: It basically consists of all the things under which the agents work. From getting the inputs (images) analyzing them according to the software and classifying them accordingly
* Actuators: Are the different results given by the system through training phase, which will then be used to classify random inputs relying on the algorithm used which is KNN in our case.
* Sensors: The devices through which the agent observes and perceives its environment, which can be in our case the image reader and processing code.

**TRAINING AND EVALUATION**

As for training our intelligent algorithm, we learned in the course several evaluations techniques. From separate validation which splits the labelled data into 70% training set and 30% validation set. To cross-validation, which is consisted of k-fold cross validation where the learning set is partition into k subsets of equal size where one is used for validation and the others for training, and then permuting the subsets so that all subsets were used for training.

**CONCLUSION**

This project focused on implementing an intelligent learning agent, which is able to categorize faces presented in passport photos in a two distinct age categories: such as young and old. It takes as input and image of a face and consequently outputs a decision with a very high degree of certainty and precision.

After working on such a project, we as team members and beyond any doubt can say that we dived deeply into the different machine learning algorithms from classification, training and testing. We worked on very distinct optimization techniques in order for the learner to be able to interact easily with the users. There are many ways to improve this project, and hopefully will be implemented in different sectors where its use will be beneficial.

**REFERENCES**

2020. [online] Available at: <https://benchpartner.com/what-are-peas-descriptors-give-peas-descriptors-examples/> [Accessed 3 November 2020].