**Gamma Rays Identification from the radiations recorded in MAGIC telescope**

**Purpose**:

The purpose of this project is to aid the group of Physicists and Scientists in space research Laboratory center in Spain to study the properties and nature of Gamma rays emitted in outer space.

**Background**:

MAGIC (Major Atmospheric Gamma Imaging Cherenkov Telescope), located in Spain, is designed to record radiations released by Gamma rays in space. High Energy gamma rays initiates electromagnetic showers and charged particles are produced inside this shower which emits radiation. These radiations that leaks through our atmosphere is detected and recorded by MAGIC telescope.

**Problem** **Statement**:

In addition to the Gamma ray radiation, radiation from hadronic (background) showers created by cosmic rays also gets recorded in MAGIC telescope. These radiations from hadronic showers have wavelength comparable to gamma ray radiation. So, scientists are having hard time trying to discriminate signals generated by gamma rays from those generated by unintended hadronic rays.

**Solution**:

Radiation recorded in Telescope has certain dimensional attributes like pixel size, shape, axis length, axis orientation. These attributes show subtle differences for Gamma Rays and Hadronic rays. On exploring these measurements, radiation emitted by gamma rays can be discriminated from the other.

**Goal**:

As a data scientist, goal is to accurately classify the radiations emitted by Gamma rays based on the numerical data recorded by the Telescope. This will help the Physicists to work on the right radiation measurements and avoid unnecessary radiation measurements.

**Approach:**

Classification algorithm implemented using Artificial Neural Networks

**Data Source:**

<https://archive.ics.uci.edu/ml/datasets/MAGIC+Gamma+Telescope>

**Data Attributes:**

This dataset has 19020 records with 11 attributes. Below is the description of attibutes.

1. fLength: continuous # major axis of ellipse [mm]

2. fWidth: continuous # minor axis of ellipse [mm]

3. fSize: continuous # 10-log of sum of content of all pixels [in #phot]

4. fConc: continuous # ratio of sum of two highest pixels over fSize [ratio]

5. fConc1: continuous # ratio of highest pixel over fSize [ratio]

6. fAsym: continuous # distance from highest pixel to center, projected onto major axis [mm]

7. fM3Long: continuous # 3rd root of third moment along major axis [mm]

8. fM3Trans: continuous # 3rd root of third moment along minor axis [mm]

9. fAlpha: continuous # angle of major axis with vector to origin [deg]

10. fDist: continuous # distance from origin to center of ellipse [mm]

11. class: g,h # gamma (signal), hadron (background)