magic dataset

▼ Description

The
MAGIC04 dataset (sometimes called just **MAGIC dataset**) comes from a physics experiment aimed at detecting gamma rays using the **MAGIC (Major Atmospheric Gamma Imaging Cherenkov) Telescope**.

Aspect	Details
Name	MAGIC Gamma Telescope Data Set
Purpose	Classify events as gamma rays or hadrons (background noise).
Instances (Rows)	19,020 samples
Features (Columns)	10 continuous input features
Target Label	Binary classification: 'g' (gamma) or 'h' (hadron)
Source	UCI Machine Learning Repository (link)

MAGIC detects particle showers released by gamma rays, using **the Cherenkov** radiation, i.e., faint light radiated by the charged particles in the showers.

Feature	Type	Description
fLength	Continuous	Major axis of ellipse (in mm)
fWidth	Continuous	Minor axis of ellipse (in mm)
fSize	Continuous	10-log of the sum of all pixel contents (#photons)
fConc	Continuous	Ratio of the sum of the two highest pixel values over fSize
fConc1	Continuous	Ratio of the highest pixel value over fSize
fAsym	Continuous	Distance from highest pixel to center, projected onto major axis (mm)
fM3Long	Continuous	Cube root of the 3rd moment along major axis (mm)
fM3Trans	Continuous	Cube root of the 3rd moment along minor axis (mm)
fAlpha	Continuous	Angle between major axis and vector to origin (degrees)
fDist	Continuous	Distance from origin to ellipse center (mm)
class	Categorical	'g' = gamma (signal), 'h' = hadron (background)

Feature	In 1 line
fSize	Total brightness of the event (in log scale).
fConc	How much light is concentrated in the 2 brightest pixels.
fM3Long	Skewness (asymmetry) of the light along the major axis.
fDist	Distance from the camera center to the shower center.

In the **MAGIC04 dataset**, when they mention an **ellipse**, they are talking about the **shape of the light signal** that a cosmic particle (like a gamma ray or hadron) leaves **on the telescope's camera**.

Here's the idea:

- When a **high-energy particle** enters Earth's atmosphere, it causes a **shower** of secondary particles.
- The MAGIC telescope detects the **Cherenkov radiation** (blue light) produced by those showers.
- This light hits the telescope’s camera, making a **bright pattern of light across many pixels**.
- That pattern usually looks like an **elongated blob** — and they **approximate it mathematically as an ellipse**.

▼