Citizen Science Programme in Astronomy

Why Citizen Science?

In the current era of data-driven life, scientists often have to deal with tremendously large amounts of data: the data can come from supercomputers, satellite or ground-based telescopes, from high-end mechanical machines, chemistry/biology labs and so on.

Analysing this data requires a great deal of effort and can be highly time-consuming. As a result, traditional data analysis techniques are now supplemented with artificial intelligence methods (AI). However, even these AI approaches often fall short of the requirements, and human interventions become unavoidable.

Credits: Scitech Daily

One of the problems astronomers face is looking at massive astronomical datasets like images, spectra, time series, etc. and finding exciting features in them.
For example, astronomers may be looking for features like bars and rings in galaxies. They may want to classify spectra from stars or find faint gravitational wave signals buried in a data stream from the LIGO detectors.

AI techniques for these projects are still in the early stages, and human intervention plays a crucial role. However, there are very few astronomers to analyse the data, and that is where citizens can play a crucial role.

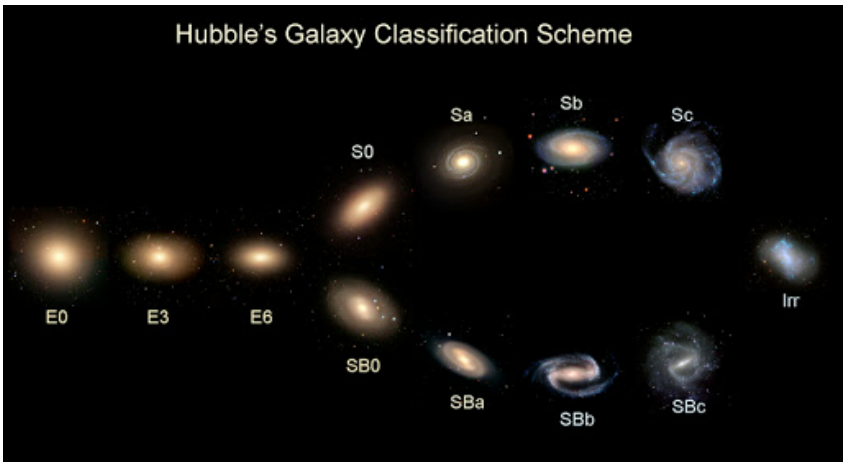
We at Pune Knowledge Cluster (PKC) are looking for contributions from science enthusiasts (like you!) to help astronomers understand astronomy data.

What citizen science projects PKC offers currently?

1. Finding features in Galaxy images:

Aim and Expected outcome:

- Detecting and understanding certain kinds of morphological features in galaxies.
- Studying these features and correlating them with other properties of the galaxies and their environment.
- It will help us understand the formation and evolution of galaxies and clusters from a new perspective.



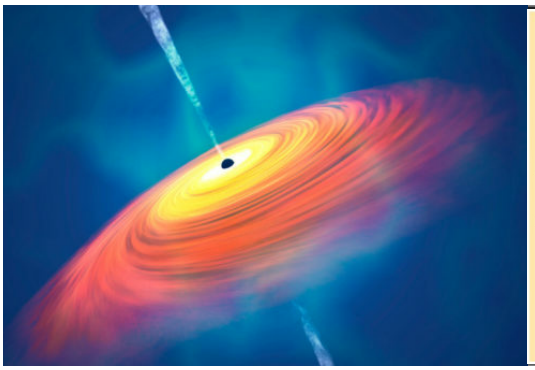
Data for the project:

- **Sloan Digital Sky Survey:**
  - Ambitious multi-wavelength observational survey
  - Dedicated 2.5mm wide-angle optical telescope at Apache Point Observatory in New Mexico, United States.
  - The project was funded by the Alfred P. Sloan Foundation, hence the name.
- **Subaru Telescope:**
  - Multi-band imaging survey with the Hyper Suprime-Cam (HSC) on the 8m Subaru Telescope.
  - The Hyper Suprime-Cam Subaru Strategic Program (HSC-SSP) is led by the astronomical communities of Japan and Taiwan, and Princeton University.

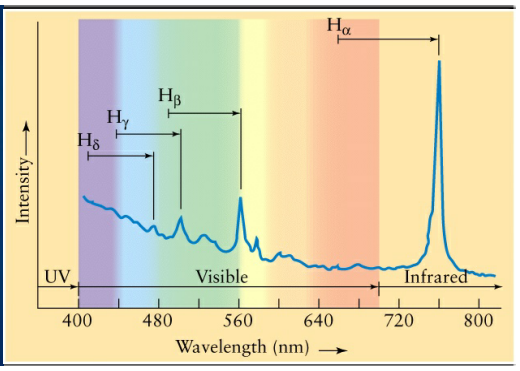
2. Understanding the variability in quasars:

Aim and Expected outcome:

- Exploring features in the spectra of astronomical objects.
- Consider the spectra of quasars, which are dominated by emission and absorption features related to their properties, their environment and the matter present between the source and the observer.
- The spectra could also change with time. Studying the spectra of many sources at different epochs will help us draw important inferences.



An Artist's impression of a Quasar (Yoshiki Matsuoka)



Spectrum of Quasar 3C 273 (Credits: UA Alberta)

Data for the project:

- **SDSS DR16 quasar catalogue:**
  - In the tradition of previous SDSS data releases, DR16 is accompanied by a quasar catalog.
  - Largest quasar catalog to date, contains data for 750,414 quasars, of which 225,082 are new.

What is in store for you?

- Through such exciting citizen science projects, we aim to provide you with an opportunity to participate in data science-related activities and to learn about all the hard work that goes into discoveries and inventions by scientists. Your work will create a useful astronomical database, based on which further research can be done. You could also intern with the projects!
- Based on the accuracy and quality of your contribution, we will be giving you "expert/ advanced/ super-advanced" badges. In future, we may involve you as our project trainers!
- Long term engagement with PKC will get you a "PKC Alert Citizen" certificate, and you will feature on our website and social media!
- You will have credits and possibly authorship in scientific publications emerging from the data analysis, depending on your contribution level!

Interested citizens, please register here.