Physics 10263 Lab #8:
Citizen Science – The Galaxy Zoo

Introduction

Astronomy over the last two decades has been dominated by large sky survey projects.   The Sloan Digital Sky Survey was one of the first attempts to create a precise digitized map of the sky.   Large telescopes with sensitive megapixel digital cameras were held in place while strips of the sky drifted past. Many strips were combined to make a large sky map, and then the process was repeated with different filters.

Since then, many more precise and more sensitive surveys have been conducted, resulting in an enormous database of millions of galaxy images culled from the large survey maps.   Classifying the properties of many of these galaxies is a task that requires judgement and creativity, and in many cases, this is not something computers can do better than humans.

The Galaxy Zoo project is very simple.   It shows you a tiny square patch of the giant sky map with a galaxy in the center of the image.   It then asks you a series of questions about that image, and all you need to do is examine the image closely and answer the questions as accurately as you are able.

A good analogy is that you are acting like a census-taker. The idea behind a census is that you ask a large number of people about their "properties" (like age, weight, height, ethnicity, marital status, income, living arrangements, etc). Sociologists can then use this information to see if there are any surprising relationships that reveal deeper truths about the human condition or at least are worth further exploration.

Here, you are recording galaxy properties, like size, shape, mass distribution, color, relationship status (e.g. mergers with other galaxies), etc.   Astronomers will then use this collected data to search for deeper truths about galaxies, such as how and when they formed, how they change over time, where different types of galaxies are found, what kinds of stars do each type of galaxy have, etc.

The Zooniverse project does not expect you to be perfect. There are going to be some questions about galaxies for which you are not sure of the answers, and you may find yourself

making a few educated guesses about whether there is a merger going on, whether you are seeing a disk or a bar, and you may guess wrong. That's okay! Zooniverse is going to be showing the same objects to dozens or hundreds of other people as well, hoping to use crowdsourcing to achieve some kind of consensus on the correct answers to these questions. So you don't have to be perfect, but your best effort is appreciated.

Keep in mind that there will be some objects you are the first human to lay eyes on since new data is entering the project all the time from various sources. Keep a sharp eye out, therefore, for anything unusual, and you may be credited with assisting in the discovery of a new, interesting object never before studied by any human!

Part 1

Once you have logged in to galaxyzoo.org, click the "About" tab to read some background on galaxy morphology and what we hope to learn from it. You will learn why you are being asked to classify properties of galaxies, then you will need to answer the associated questions below.

Q1. Explain how the presence of black holes in galaxy centers can cripple star formation in the galaxy.

Q2. Why are galaxy mergers not likely in the centers of galaxy clusters, where galaxies are packed closely together?

Q3. Why are galaxy mergers not likely in the outer edges of clusters or in between clusters of galaxies?

Now proceed to the following online exercise about galaxy classification and the Sloan Digital Sky Survey:
https://bit.ly/2ReQ2wJ

We are not going to perform the exercise itself, but I would like you to read through it (click the "Next" box at the bottom of each page to proceed through the explanations) to familiarize yourself with how galaxies are classified. Answer the associated questions below.

Q4. On the page "Classifying Galaxies": Who developed the first galaxy classification system, still in use today?

Q5. On the page "Spiral Galaxies": Describe the difference between type a, b and c spirals.

Q6. On the page "Spiral Galaxies": Describe the main differences between the disk and the bulge of a spiral galaxy in terms of their color, activity, and composition.

Q7. From the page "Elliptical Galaxies": Explain the difference between an E0 galaxy and an E7 galaxy.

Q8. From the page "Lenticular Galaxies": Explain what a lenticular galaxy is and how it appears.

Q9. From the page "Irregular Galaxies": How common are irregular galaxies? And what is a starburst galaxy?

Q10. From the page "The Hubble Tuning Fork": Sketch and label the Hubble Tuning Fork diagram in the space below.

Q11. From the same page, explain which types of galaxies are "early" and which type are "late" type galaxies are and why Hubble designated them as such.

Q12. From the page "Galaxy Collisions": What often happens to the brightness of a galaxy after it interacts with another galaxy and why?

Part 2

Time to return to Galaxy Zoo (**galaxyzoo.org**). Click on "Classify" and click through the Tutorial, then read through the tabs in the "Field Guide" (available on the right side of the browser window), then start classifying!

Once you have completed your contribution to the project, show your lab instructor your profile page (click your username on the top right, then select "Home"). You will need to submit a screen shot showing your progress clearly, like below.

The little ring around the circular icon can be hovered over to indicate how many data sets you have completed for any given project (each part of the ring is color-coded for a different project, so you have to find the right project to hover over). The number below the ring is the total number of data sets for all projects combined. Your lab instructor is looking for a number of at least 50 in the white box with the colored border.

zooniverse/galaxy-zoo
11 classifications (1%)

Hello ingram527,
you have made 833 classifications to date.

🕘 My recent projects   ✉ Messages

▦ My collections   ⚙ My builds