their morphology classified by eye, we inferred the morphological type of the aforementioned $\sim$ 800,000 galaxies.

Using the R suite of statistical analysis, we then compared the distribution of the inferred morphologies of galaxies of different dominant activity types, showing the significance of the difference in the median morphological type between the activity-type samples. We also tested the significance of the difference in the mean morphological type between all the activity-type samples using an ANOVA model with a modified Tukey test that takes into account heteroscedasticity and the unequal sample sizes. We show this test in the form of simultaneous confidence intervals for all pairwise comparisons of the mean morphological types of the samples.

VEJA - Visual Exploration Just Anywhere

André Moitinho[1], Tiago Mendes[2], Bruno Rodrigues[2], Miguel Gomes[1], Alberto Krone-Martins[1] & Francisco M. Couto[3]

1. SIM – Universidade de Lisboa, Portugal

2. Universidade de Lisboa, Portugal

3. LASIGE – Universidade de Lisboa, Portugal

Visual data exploration is essential to the scientific process. It can provide scientific insight that blind statistical analysis cannot. Often, this visual insight is the starting point and even the guiding reference for scientific thought.

The extremely large archives produced by today's astronomical surveys and observatories, together with the Virtual Observatory standards for data interexchange and application messaging are producing a paradigm shift in the way data is explored. The tendency is becoming not to download the data to the user's workstation and explore it locally, but instead to use on-line services for querying and exploring those archives. Thus, it also becomes natural to address modern visual data exploration with on-line services. Indeed, this is becoming a reality and recent services such as *rapidgraph* and *plotly* are receiving attention from the astronomical community.

Here we present VEJA , a package for implementing an interactive visual exploration web service. VEJA is being developed as part of a course work in the Bioinformatics master at the University of Lisbon and is the result of collaboration between astronomy (SIM) and informatics (LASIGE) Centres. Although conceived for the needs of astronomers, it can be used with any kind of tabular point data. VEJA supports multiple panels with linked views for easing the exploration of multi-dimensional data sets. It currently accesses any table made available by CDS-Vizier. The plots can be annotated and published on social networks, providing a collaborative data exploration facility. Because VEJA is web based, no software besides a browser is required on the client side, thus enabling data exploration and collaboration also on mobile phones and tablets.

Pulsar data interpolation via curvlet transform and Radon transform based dedispersion

Hao Shan

Xinjiang Observatory of Chinese Academy of Sciences, China

Curvelet is a multiresolution and multidirection transform, which belong to a family, including redgelet, shearlet, physical wavelet. They all come from wavelet, adding a direction information. The algrithm of curvelet is first transform the original image into frequency doman, then use a wedge like window to split the whole frequency plane, at last take a inverse fourier transform for every window. Curvelet is proven to be the optimal sparse representation for 2-order continuous curve. We assume that pulsar data has missing data of some frequencies for filterbank. A simultaneous denoise and interpolation method is taken. A simple idea of compressive sensing is to transform the objective function to a proximate operator and solve a more simple problem. Then the non-differential l1 term can be split into two differential term. We take iterative threshold/shrinkage method to solve this problem in this work. Radon tranform is another sparse transform for pulsar data. Different from curvlet tranform, it is not multiscale or multidirection, but it is not necessary for pulsar data. The interpolation result with radon transform shows bad performance. Thus we know, radon transform is used for dectetion, not for processing, except special designed radon transform. Radon transform is an idea, or a theory frame. We can construct radon transform for integration on any continuous curve and a fast radon transform accompanied. We know that in theory pulse arrive time has a hyperbolic relationship with frequency. So we can construct a hyperbolic radon transform for pulsar data. A parabolic in original is transformed into a point in radon domain. One axis coresponding to time and another to curve bending degree, which is related to DM. So this method is a fast algrithm to find the right DM value. Once the DM is found, we can use incoorelated method to continue dedispersion.