DUE: 2023 Nov. 17 by 11:59 p.m.

The Hubble Ultra Deep Field is an area of the sky that is often used in the study of galaxy evolution. In this project we will perform some basic data comparisons and visualizations using available archive data.

Start a new git repository that will contain this submission. Your code must have documentation strings and sufficient comments. Your functions must check their inputs and throw readable exceptions when errors occur. Your code should also report its progress using the logging facility.

Obtain a 3-color imaging mosaic of the Hubble UDF at optical wavelengths. You will need to plot this as an RGB image. The plot axes should be equatorial coordinates.

The galaxies in the field have photometrically determined redshifts. Obtain a catalog of galaxies aimed at providing photo-z measurements, and overplot the source detections on the mosaic. Be sure that the plot is appropriately labeled.

Other galaxies have had spectroscopic redshift measurements. Obtain a catalog of spectroscopic redshifts (distinct from the photometric redshift catalog). Cross-match the sample of galaxies with photometric redshifts with the sample with spectroscopic redshifts. In your overplot of source detections, uniquely indicate whether a galaxy has a spectroscopic redshift or only a photometric one (e.g. by color).

Separately, show the distribution of photometric vs. spectroscopic redshifts for sources that have both.

Using a new development branch in your git repository, alter the plot to have a multi-panel configuration. This will show inset views of selected square subregions, with the locations of those subregions indicated on the main full-frame mosaic. Annotate both the subregion indicators as well as the additional panels (e.g. '(a)' '(b)' etc.). Use a function call to create each inset. An example layout is shown in Fig. 1.

Once the multi-panel plot is successfully developed on the development branch, be sure to commit it. Then merge the development branch into your master branch, resolving any conflicts.

Submit a brief writeup describing your methods, including citations for your data. Submit this along with your git repository.

Extra problem (not for credit): Obtain Hα, Hβ, [OIII], and [NII] fluxes for sources in this field. Make the corresponding BPT diagram. Try to distinguish HII regions from AGN/LINERs on all your plots.

Extra problem (not for credit): Compute the redshift distance and examine the 3d distribution of the galaxies in the field.

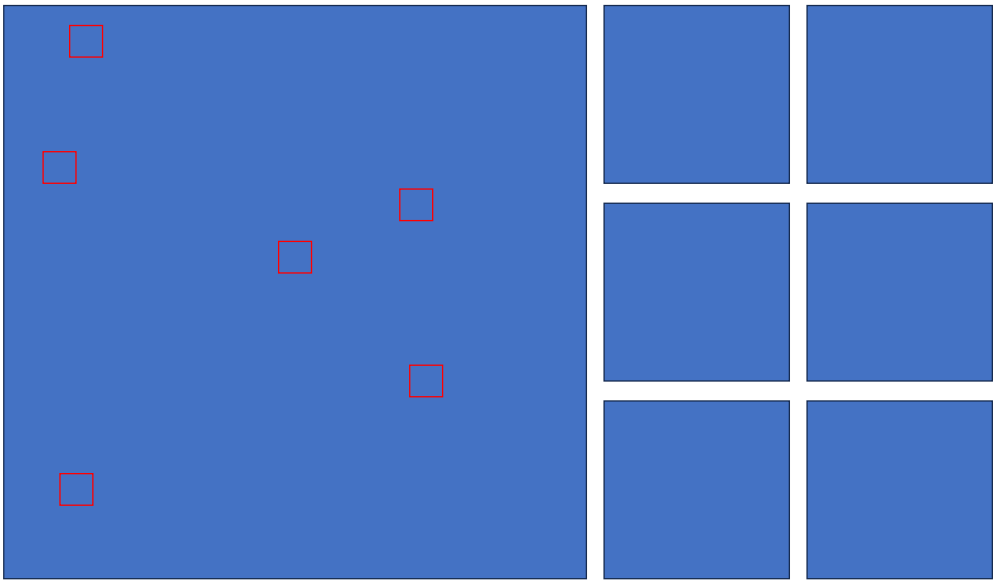

Fig. 1.— Mock layout for mosaic and insets.