Analysis of J-PAS

October 17, 2024

Project Overview

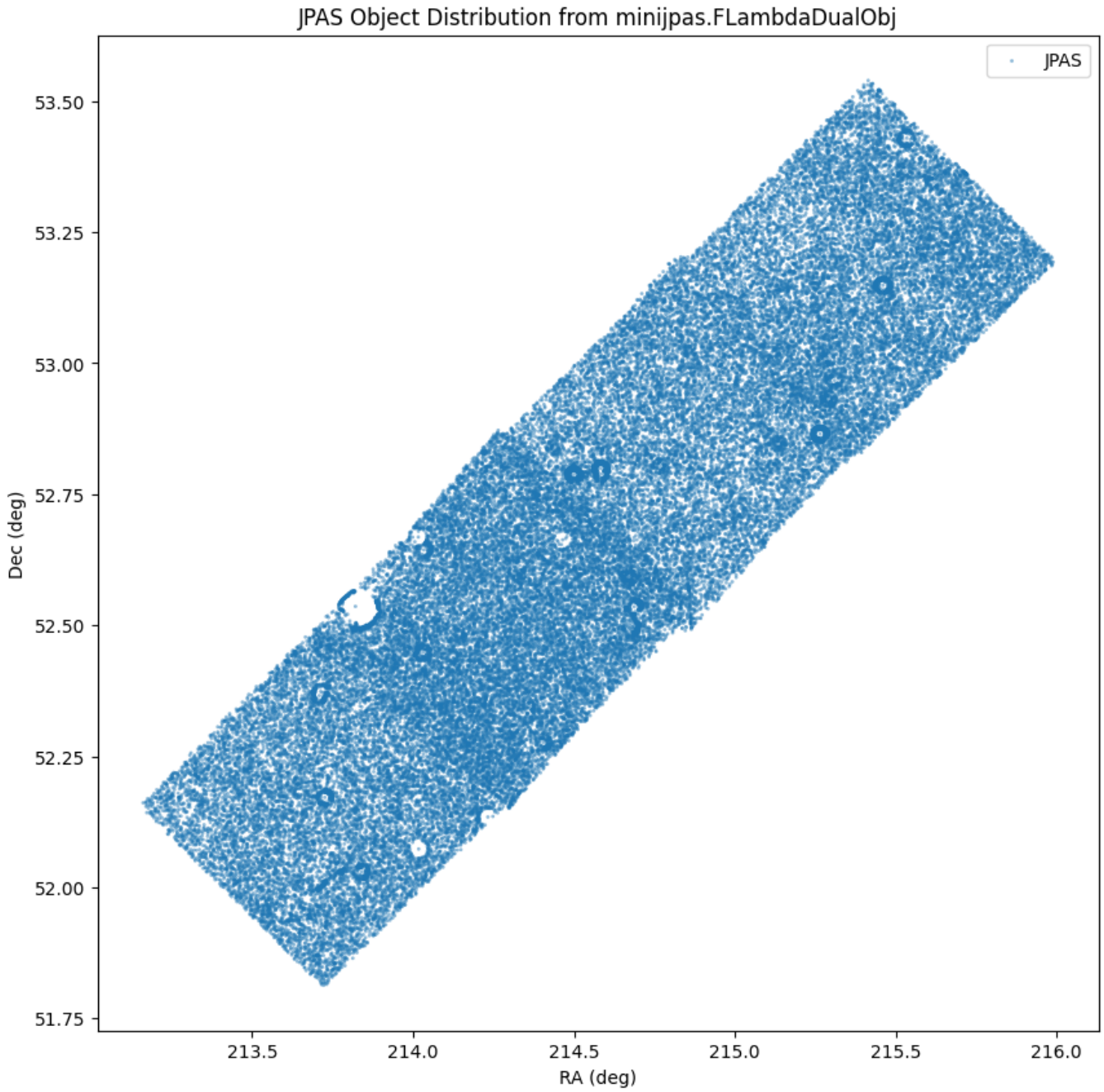
- Developed Python scripts to extract and process astronomical data.
- Utilized the J-PAS-mini database to gather JPAS objects.
- Implemented matching algorithms to correlate JPAS objects with SDSS objects.
- Performed data cleaning and preprocessing to ensure data quality.
- Conducted spectral analysis by resampling and comparing spectra from JPAS and SDSS.
- Generated visualizations to illustrate the comparison results.
- Documented the workflow and results for future reference and reproducibility.

Extracting JPAS Objects

We extracted JPAS objects from the J-PAS-mini database, using SQL queries and Python scripts. We got 64293 objects. Used J-PAS-mini tables:

- FLambdaDualObj (All astronomical objects that was detected in the J-PAS-mini survey and for which detection and aperture definition was performed using SExtractor)
- Filter (Table about the filters used in the J-PAS-mini survey)

Extracting JPAS Objects



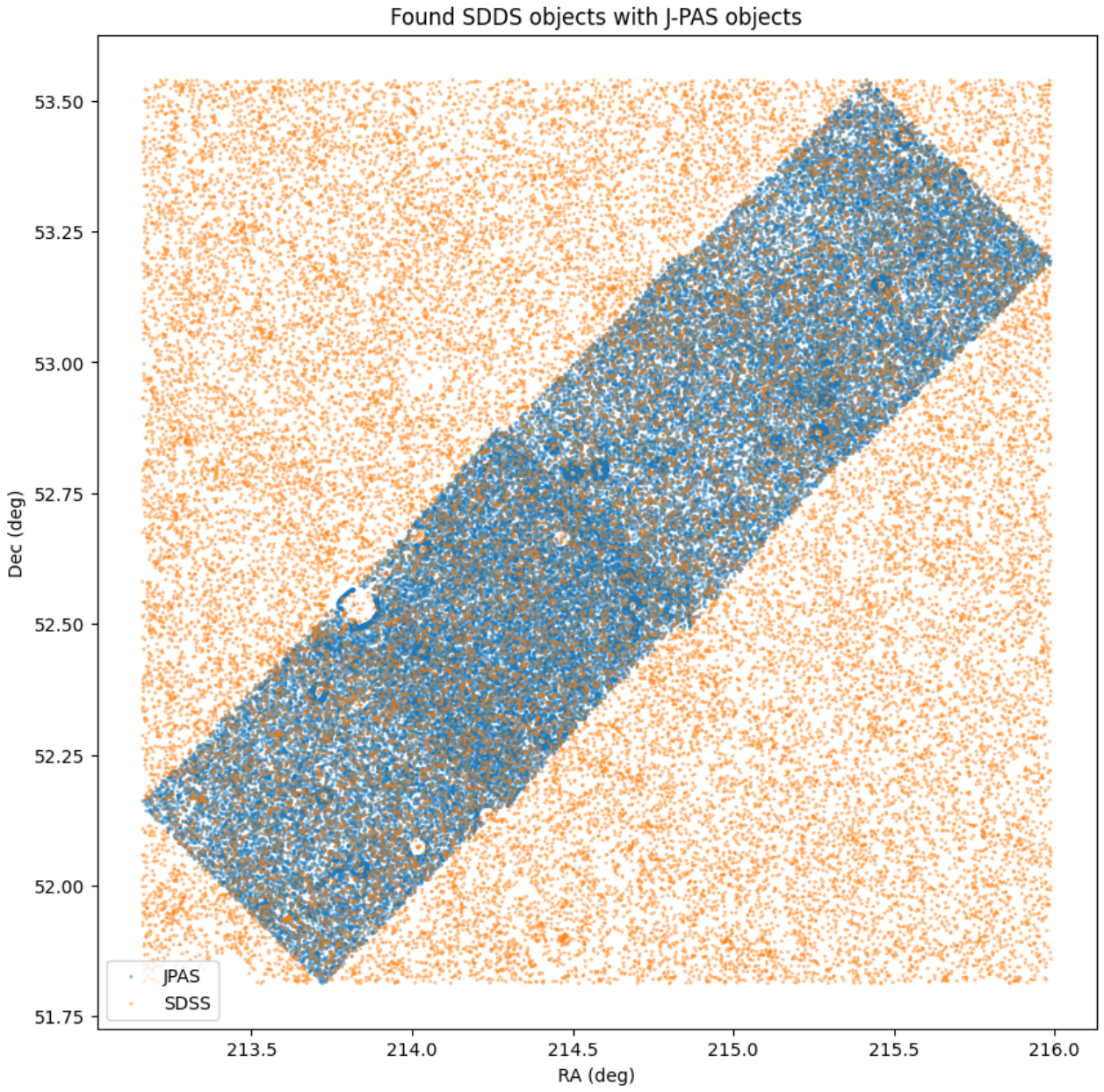
Matching with SDSS Objects

To match JPAS objects with SDSS objects, first extracted SDSS objects from the SDSS database, using SQL query:

```
SELECT
p.objid, p.ra, p.dec, p.u, p.g, p.r, p.i, p.z,
    p.run, p.camcol, p.field, p.specObjID
FROM PhotoPrimary AS p
WHERE p.ra BETWEEN {df_dual['ALPHA_J2000'].min()}
    AND {df_dual['ALPHA_J2000'].max()}
AND p.dec BETWEEN {df_dual['DELTA_J2000'].min()}
    AND {df_dual['DELTA_J2000'].max()}
AND p.r BETWEEN 14 AND 22.0
```

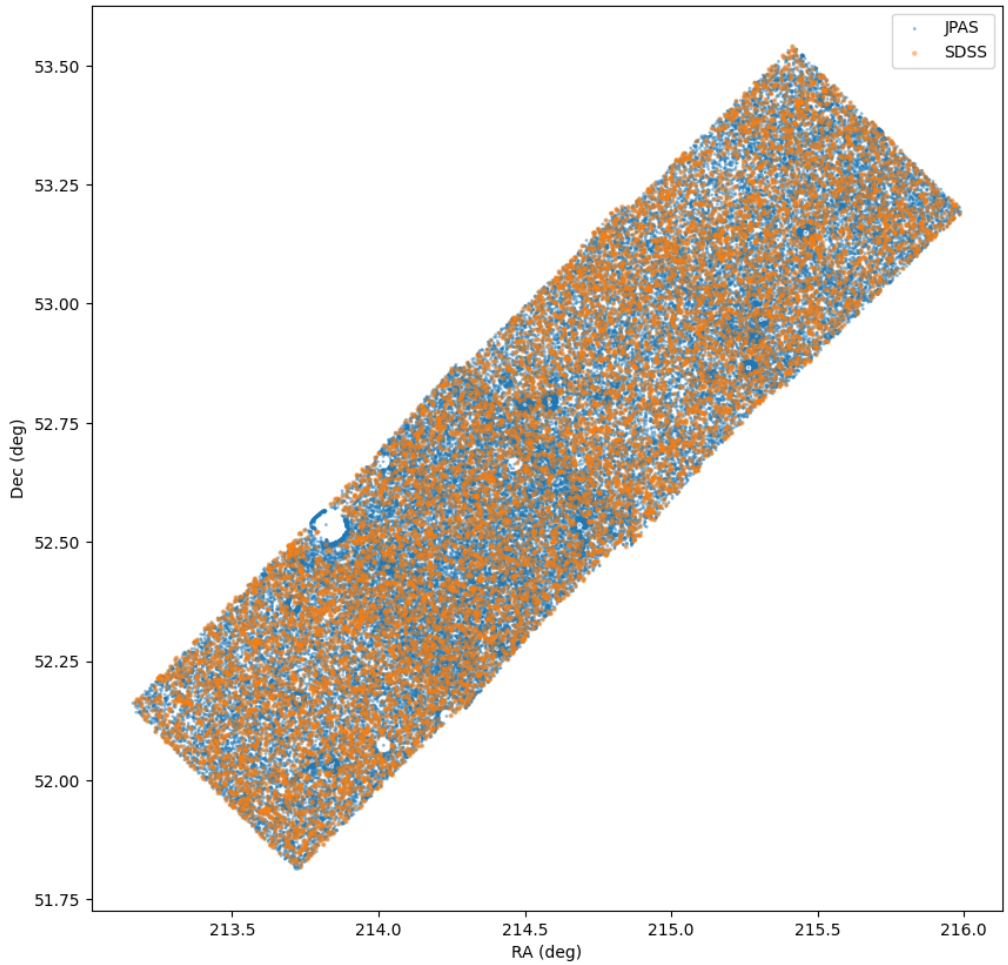
We got 35030 objects from the SDSS database.

Matching with SDSS Objects



Matching with SDSS Objects

We matched JPAS objects with SDSS objects by angular distance between objects (less than 1 arcsec). And then filtered the matched objects to include only unique matches.



In this way we got 11229 matched objects.

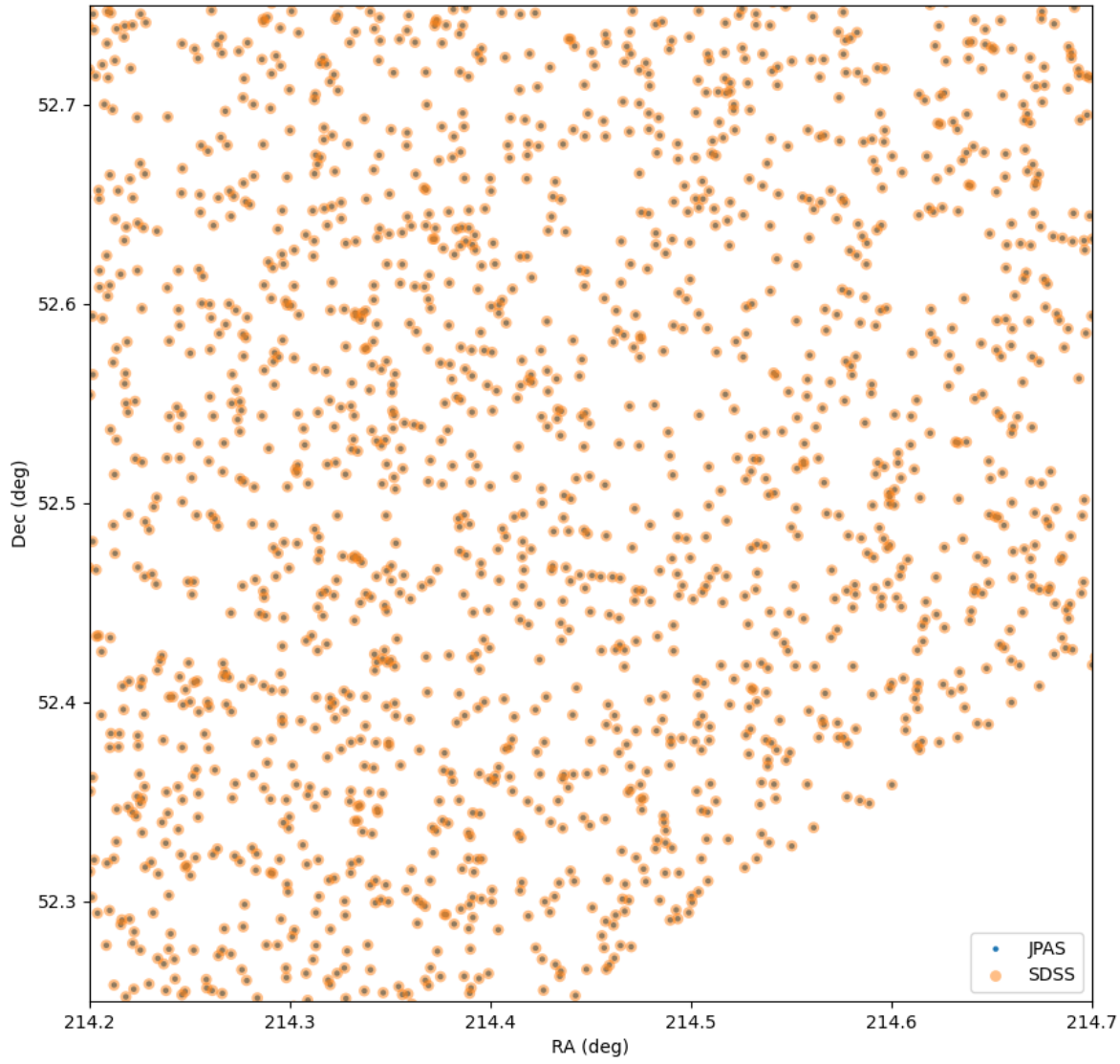
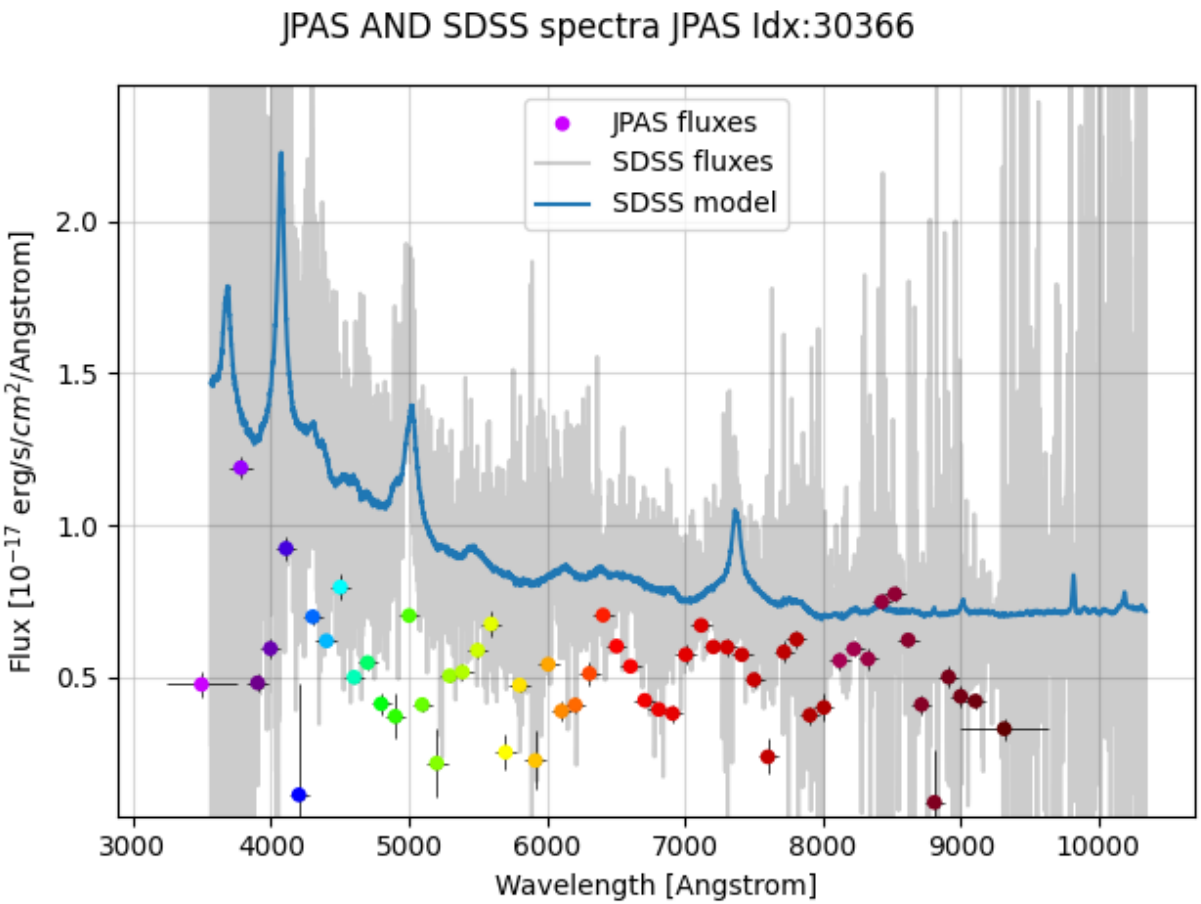


Figure: Matched SDSS and J-PAS objects

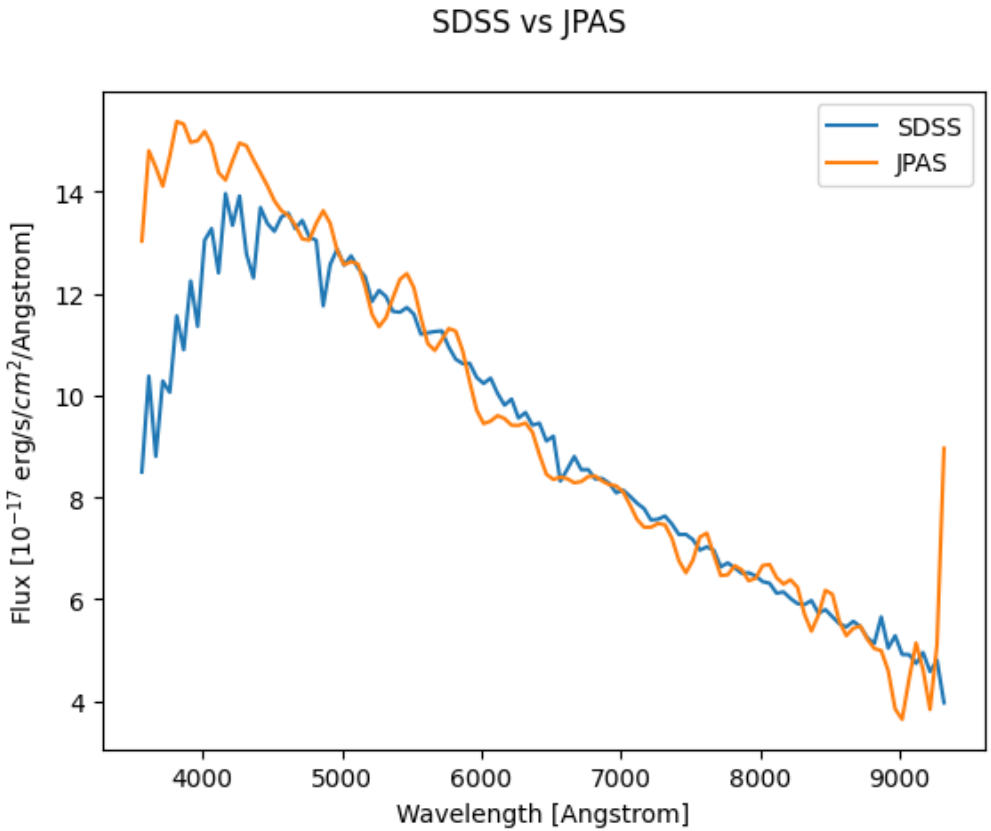
Comparing Spectra

To compare spectra we first selected objects with spectra in the SDSS database and although filtered them by defined class of object. So in the end we get matched objects with spectra and defined class (1007 objects).



Resampling Spectra

We resampled JPAS and SDSS spectra to the same wavelength grid (50 Angstrom), so we can compare them properly. First, we interpolate the spectra to have evebly spaced wavelength grid for each spectra. Then we resample the spectra using scipy.signal.resample function.



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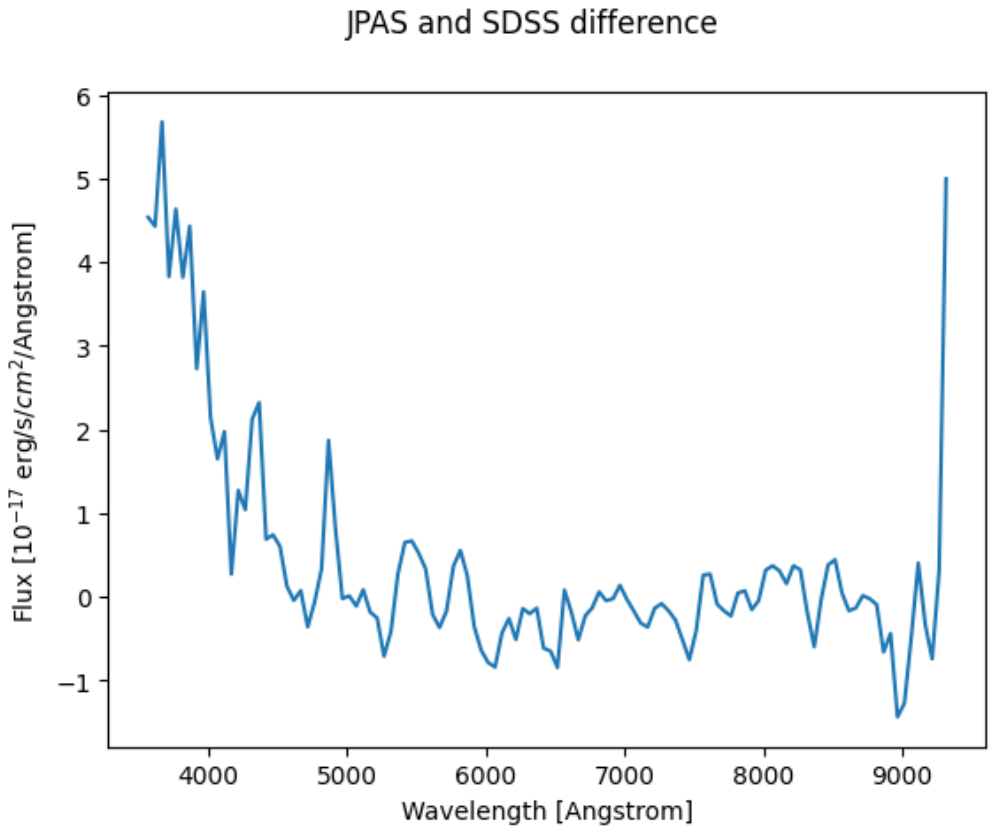

Future Work

- Map the spectral features of JPAS and SDSS objects to known classes of objects.
- Develop a classification model using machine learning to predict the class of JPAS objects based on their spectra.
- Test the classification model on new JPAS objects from new release.

Thank you for your attention!