**NIR Spectra of Type Ia Supernovae**

**Introduction**

This folder contains the Near-Infrared (NIR) spectra data of Type Ia Supernovae (SNe Ia) published in Lu et al. 2023, titled "Carnegie Supernova Project-II: Near-infrared spectral diversity and template of Type Ia Supernovae". The data includes 339 spectra from 98 individual SNe Ia, obtained as part of the Carnegie Supernova Project-II (CSP-II). These spectra were captured using the FIRE spectrograph on the 6.5m Magellan Baade telescope, covering a spectral range of 0.8–2.5 µm.

* **Link to the publication**: [Lu et al. 2023](https://ui.adsabs.harvard.edu/abs/2022arXiv221105998L/abstract)

**Note:** All wavelengths in the files are expressed in micrometers (µm).

**File Details**

**1. Lu2023\_TableA1\_extension.csv**

This file lists the SNe Ia and their NIR spectra as published in Lu et al. 2023. It extends the information presented in Table A1 of the paper, including the following columns:

* **Supernova Information**:
  + name: SN name
  + untargeted?: Indicates whether the SN was discovered via "targeted" or "untargeted" search
  + zhel: Heliocentric redshift of the SN
  + Tmax(MJD), e(Tmax): The time of the rest-frame B-band maximum in Modified Julian Date (MJD) and its error
  + sBV, e(sBV): The color stretch sBV fitted with SNooPy, and its error
  + EBV\_MW: The Milky Way extinction E(B-V)
  + spec\_counts: The number of spectra available for this SN
* **Spectra Information**:
  + filename: The file name of the spectrum
  + Date: The UT date when the spectrum was observed
  + MJD: The MJD when the spectrum was observed
  + epoch: The rest-frame phase of the spectrum
  + EXPTOT: On-target exposure time of the spectrum (excluding overhead)
  + SNRY, SNRJ, SNRH, SNRK: The median signal-to-noise ratio of the spectrum in Y, J, H, K bands
  + host\_contamination: Indicates if the spectrum is contaminated by the host galaxy

**2. Folder: observed\_spectra**

This folder contains the observed NIR spectra in .txt or .fits format. The file names (excluding the file extensions) correspond to the filename column in Lu2023\_TableA1\_extension.csv.

* **For FITS files from FIRE**:
  + To read the FITS files, use the following code snippet
  + from astropy.io import fits
  + hdu = fits.open(file)
  + wv, fx, fx\_err = hdu[0].data[0], hdu[0].data[1], hdu[0].data[2]

**Folder Structure**

The data is organized as follows:

* **Data/**
  + Lu2023\_TableA1\_extension.csv: The extended table with details of the SNe Ia and their spectra.
  + **observed\_spectra/**
    - **spec\_fits/**: Contains the FITS files for the NIR spectra.

**Installation**

To access and use the data locally, follow these steps:

1. **Clone the repository**

git clone https://github.com/Antonyevan/FINAL-PROJECT.git

2.Navigate to the data directory

cd FINAL-PROJECT/Data

**Usage**

To load and analyze the spectra:

1. **Loading a CSV file**:

import pandas as pd

df = pd.read\_csv('Lu2023\_TableA1\_extension.csv')

1. Reading a FITS file

from astropy.io import fits

hdu = fits.open('observed\_spectra/spec\_fits/<filename>.fits')

wv, fx, fx\_err = hdu[0].data[0], hdu[0].data[1], hdu[0].data[2]

**Dependencies**

* pandas
* numpy
* astropy
* scipy

Install dependencies via:

pip install pandas numpy astropy scipy

**Data Access**

The data files are available in the following GitHub repository paths:

* **CSV File**: Antonyevan/FINAL-PROJECT/Data/Lu2023\_TableA1\_extension.csv
* **FITS Files**: Antonyevan/FINAL-PROJECT/Data/observed\_spectra/spec\_fits