Detection and Characterization of Astronomical Dwarfs using CatWISE

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In an effort to complete the census of Astronomical objects in the solar neighborhood, I have been searching for objects such as brown dwarfs, low mass dwarfs stars, white dwarfs, etc. Due to their low luminosity, dwarfs(especially cold dwarfs) make up the majority of missing objects in a census of a certain region. However, CatWISE has improved upon the motion and infrared measurements of AllWISE by leveraging archival WISE and NEOWISE data collected from 2010 to 2018 at W1 and W2. This improved astrometric accuracy will lead to the discovery of previously unrecognized motion dwarfs. I used a test dataset of high-proper motion objects from CatWISE made by novel candidate selection criteria. I then implemented a self-created data reduction pipeline that first pairs these objects with their counterparts in various infrared databases through a cone search. I then made color-color diagrams of the motion candidates and then manually searched for interesting outliers. From numerous implementations of the pipeline on the dataset, I present the discovery of 30 new dwarfs including two nearby M Dwarfs(<25 pc), 3 T Dwarfs, 3 L Dwarfs, and 5 subdwarfs. In the future, I plan to go through our dataset and analyze objects with no additional imaging(other than CatWISE) in hopes of finding the very faint Y Dwarfs. In addition, I hope to automate the pipeline through a machine learning classifier which will allow me to run the pipeline on large datasets, reduce possible human error and increase the discovery field.

Awards Won: