

Runaway stars are stars that have abnormally high velocities relative to the average star. Runaway star research is still quite unknown. Therefore, it is important that we identify and study more of these stars to better our understanding of the formation mechanism and life cycle of these stars. Gaia, a space observatory sent by the European Space Agency, is designed specifically for high precision position and astrometry measurements. Although Gaia's full release isn't set till mid 2020's, their first release was made available to the public in September 2016. It is hypothesized that stars in Gaia's first data release which have higher than average proper motion values will be runaway stars.

To test the hypothesis, a program was written in Python that grouped stars by blocks of the sky. The average and standard deviation for the proper motion were then calculated for each block, and stars that had higher than average proper motions were selected as candidate runaway stars. These candidates were then cross-referenced against two other databases to search for any indication that the candidates were in fact runaway stars.

The method narrowed down a list of 1 billion targets to 1,107 candidate runaway stars. Many of the candidates were found on the SIMBAD database with the note: "high proper motion" or "high-velocity star". This is an indication that the candidates selected are likely to be runaway stars. It is concluded that the hypothesis was supported, and that the candidates selected are worthy of further research.