studied using the 3.6m DOT and the back-end instruments. It is also planned that the new transients and variables including thermonuclear SNe Type Ia and CCNSNe discovered the using upcoming 4.0m international liquid mirror telescope (ILMT) at Devasthal Nainital would also be studied (Kumar 2014; Kumar et al. 2015) using 3.6m DOT and the back-end instruments.

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MIRA AND SR TYPE VARIABLE STARS FROM THE ROTSE-IIID ARCHIVE

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RESUMEN

Las aplicaciones de algoritmos de autoaprendizaje en el campo de clasificación variable han sido muy populares ya que son fáciles de implementar y representar también. Hace una década, una pequeña aplicación MPI fue desarrollada para la detección de variables en el archivo del telescopio robótico ROTSE-IIID. Ahora se ha extendido para involucrar la aproximación paralela para clasificaciones por autoaprendizaje, y aplicarlas a variables de largo periodo como las Mira y las Variables Semi-regulares. Este trabajo cubre los esfuerzos para hacer esta metodología realidad.

ABSTRACT

Applications of machine-learned algorithms in the field of variable classification have been popular as they are simple to implement and performing as well. A few years back, a small MPI application developed as the core of a variable detection pipeline for the ROTSE-IIID robotic telescope archive. Now it has been extended to involve the parallel approach for machine learned classification specifically for the long-term variables like Mira and Semi-regular variables. This presentation mainly covers the efforts to put the methodology in reality.

Key Words: methods: numerical — stars: fundamental parameters — stars: variables

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1. INTRODUCTION

Robotic Optical Transient Search Experiment (ROTSE - Akerlof et al, 2003) is a network of telescopes located all around the world. The primary goal of the ROTSE–IIIproject is to observe Gamma-Ray Bursts (GRB) in optical light. Each ROTSE–IIItelescope consists of 45 cm with a wide field of view (1.85).

The ROTSE–IIIcollaboration uses 70% of each ROTSE–IIItelescope's observation time. The rest of the time is allocated for discretion by the local organization. The ROTSE–IIIdtelescope is located at TÜBİTAK National Observatory (TUG), Bakırlıtepe, Antalya, Turkey. In this work, all of the public Turkish observations have been used.

2. METHOD

We decided to use Python3.4 and scikit-learn and Random Forest Classifier method. Advantage of our choice is, learn and implement in very short time. However finding the right questions i.e. forming the training set might take quite long.

Existing pipeline for reduction that we used inclueds:

- Crossmatching with USNO B1
- Time-series light curve formation
- Multi differential photometry
- Works in parallel with MPI

We trained the classifier using Mira and SR (Semiregular) type of LPVS (Long Period Variable Stars). But the critical part was decision for non-variable type sources. We tried AAVSO (American Association of Variable Star Observers) constant stars.

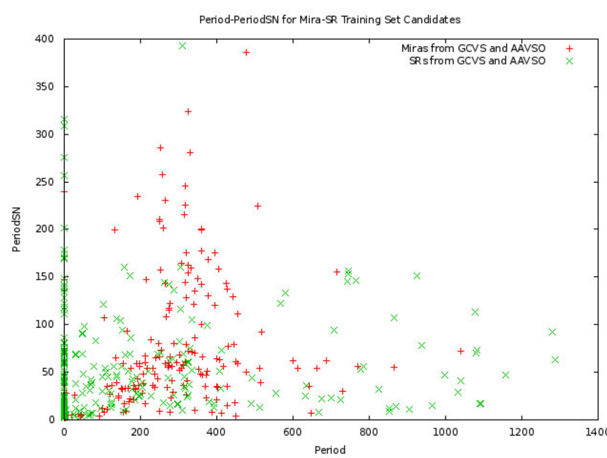

Fig. 1. Period-PeriondSN for Mira-SR Training Set Candidates.

A statistics database holding the properties for all of the sources in the archive has been used to determine the constants. It is important to prepare

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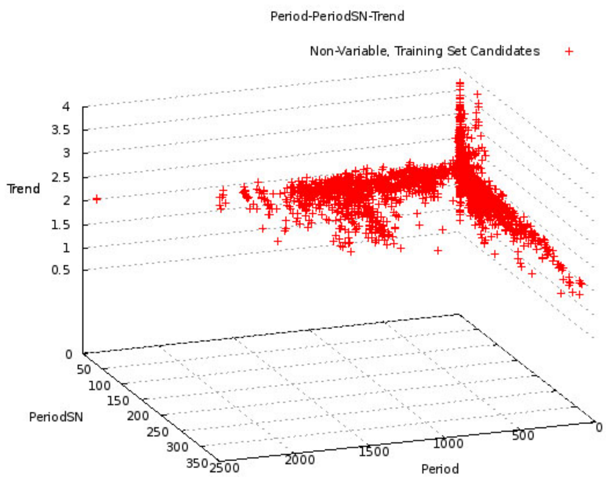

Fig. 2. Period-Periond SN-Trend.

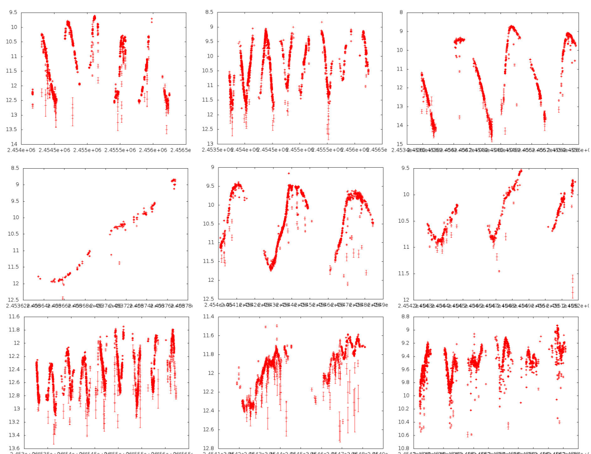

Fig. 3. A bunch of Mira-SR Variables Detected.

a good representing set. Some of the properties used are:

- sample count
- mean brightness
- error of mean brightness
- sampling distribution

Training features set:

- Lomb Scargle Period
- S/N of the period
- Metric for the trend
- A cumulative diff. for magnitude intensities
- Skewness of the lc
- Kurtosis of the lc
- Stetson K index (only)

3. CONCLUSIONS

- The percentage of variable detection is too low, is it because of the telescope optics, or is it because of the light curve generator's fault. i.e. Too much blending, is it worthwhile to discuss about 'the catalog crossmatching?
- A richer feature set is needed. One major drawback, single band observations limits the possibilities

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