CLASSIFICATION OF YOUNG STELLAR OBJECTS AMONG GAIA ALERT CANDIDATES

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Many Gaia alerts are unclassified (Class = unknown)
  • possibly many young stellar objects (YSOs)

Can we identify YSOs from
GAIA light-curves alone?
  • and also determine subclass (e.g., EXor, UXor)
  • need automatic classification

GAIA sampling: roughly monthly cadence
Motivation

- Richards et al. (2012)
  - classification of variable stars
    - 28 classes
    - probabilistic
    - machine learning
  - application to the All-Sky Automated Survey (ASAS)
    - < 20% error
- our experiment: apply a similar approach
  - to GAIA light-curves
Data

– use sources classified by ASAS as a training set

– plan:
  • use real GAIA light-curves for YSOs in ASAS catalog

– as a first step:
  • resample ASAS data to GAIA epochs
    – simulated GAIA light-curves
- aperiodic variations are common
- what fraction of the variability can be detected by the GAIA sampling?
- test with UX Orionis type stars
  - periodic fadings (few weeks)
YSO light-curve sampling

- synthetic light-curves sampled at GAIA epochs
  - randomly shift the starting epoch
  - repeat sampling many times
  - measure
    - variability amplitude
    - period

- results
  - variability can be recovered
    > 1 mag amplitude
  - large scatter in the period
Automatic classification I

- Principal component analysis (PCA)
  - no separation between classes
  - no success
Deep learning algorithm

- neural network
- apply directly to the light-curves

- Result: no success

- Main difficulty:
  finding a suitable, homogeneous representation for the GAIA light-curves
Future plans

– use real GAIA light-curves
  • find a suitable representation
  • might not work
– or try an analytic representation
  • like in Richards et al. (2012)
– further possibility:
  • use GAIA spectra
    – promising possibility

Thank you for your attention