New Insights Into Time-Series Analysis

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The society is technologically advanced than ever, however the most advanced software is still struggling to management and to provide facilities to access the science in big-data sets. The first step towards this goal is teach computer in a proper mathematical language how and which information must be researched. From variability viewpoint, there were many empirical approaches that have being adopted without an appropriated mathematics formalism, like the accuracy of correlated and non-correlated indices or optimal sampling frequency. New insight into time-series to analyze big-data sets were begun in 2015 to review and improve all steps into time-series analysis. New insights and parameters proposed in this project are useful for vast number of different fields to draw conclusions. From where, the misclassification rate was reduced by about 250% and 520% for correlated and non-correlated data, respectively. Indeed, the reduction of misclassification at the selection is crucial to follow up the development of the instruments themselves. Optimized constraints to perform period search were also proposed. The errors on estimation of period and amplitude uncertainties are discussed. We also demonstrate the underlying meaning of the oversampling factor. Such results allow us reassess the frequency resolutions required to find any signal type. For instance, the variability periods of EA Catalina stars previously classified as having insufficient number of observations at the eclipses were determined. Moreover, "New Insight into Time-series Analysis" (*NITSA*) results are being used to analyse the VVV database. The summary of recommendation provided in this project were adopted. As result 20 millions VVV variable stars candidates were selected. In order to validate our approach the Catalina and WFCAM stars are used to validate our approach. The current status of *NITSA* project and VVV variability analysis are presented.

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