

# ASTROPHYSICS

## **T Tauri stars in Cepheus and Ophiuchus complexes.**

supervisor: doc. Mgr. Štefan Parimucha, PhD. (stefan.parimucha@upjs.sk)

study form: full time

**The aim:** To analyze photometry and spectroscopy of T Tauri stars and detect their variability and possible binarity

**Annotation:** T Tauri stars are young stars that are located near large molecular clouds. These stars are the pre-main sequence stars in the stage of contraction to the main sequence. They show large optical activity and strong chromospheric lines in their spectra. In this work we will analyze long-term photometry of selected stars from both complexes obtained by SuperWasp, NSVS and TESS projects. In the case of detection of significant periods and their changes we will continue with their photometric monitoring. We will also analyze the spectroscopic observations of T Tauri stars obtained by the AU SAS instruments and from the archives to reveal their possible binarity.

## **Application of machine-learning to the eclipsing binary stars.**

supervisor: doc. Mgr. Štefan Parimucha, PhD. (stefan.parimucha@upjs.sk)

study form: full time

**The aim:** To apply machine-learning methods for the determination of the intervals of physical parameters from light-curves of eclipsing binaries.

**Annotation:** Eclipsing binary stars are variable stars whose light curve analysis allow us to determine the basic parameters of the components, such as their effective temperatures, radii, luminosity and in combination with radial velocities also the mass and distance of the components. These variable stars are one of the most commonly discovered type of variable stars. Archived data from satellite (KEPLER, TESS, GAIA) as well as from ground-based projects (SuperWASP, ASASS...) contain tens of thousands of eclipsing binary stars. It is assumed that planned large scale surveys such as PLATO, Vera C. Rubin Observatory (LSST) will discover several millions of eclipsing binaries. Their analysis using up to date methods is practically impossible. One of the possible ways of their study is the application of machine-learning methods to large data sets.

## **Multifrequency study of activity of symbiotic stars.**

supervisor: doc. RNDr. Rudolf Gális, PhD. (rudolf.galis@upjs.sk)

study form: full time

**The aim:** To analyze photometric and spectroscopic observations of selected symbiotic stars and study their long-term variations.

**Annotation:** Symbiotic systems belong to a group of interacting binaries, in which the physical mechanisms related to the mass transfer and accretion are responsible for observable activity of these eruptive variable stars. Our previous investigation showed, that a long-term monitoring of the objects during the whole cycle of their activity in a broad spectral range is necessary for better understanding of these physical processes. The main goal of the PhD thesis is study of behaviour of accretion disks, impacts, jets and other phenomena related to the mass transfer in different phases of activity in the symbiotic systems that have recently manifested Z-type outbursts (e.g. AX Per, AG Dra and Z And) using own photometric and spectroscopic observational data and modelling of their light curves and spectra.