

Physics Colloquium

Michigan Technological University

January 19 (Thursday) 4:00 to 5:00 pm
Room 139, Fisher Hall

Astronomical Image Processing Using Fuzzy Logic

Lior Shamir

Adviser: Dr. Robert Nemiroff

In the past few years, pipelines providing astronomical data have been becoming increasingly important. The wide use of robotic telescopes has provided significant discoveries, and sky survey projects such as SDSS and the future LSST are now considered among the premier projects in the field astronomy. The huge amount of data produced by these pipelines raises the need for automatic processing. Astronomical pipelines introduce several well-defined problems such as astronomical image compression, cosmic-ray hit rejection, transient detection, meteor triangulation and association of point sources with their corresponding known stellar objects. We developed and applied soft computing algorithms that provide new or improved solutions to these growing problems in the field of pipeline processing of astronomical data. One new approach that we use is fuzzy logic-based algorithms, which enables the automatic analysis of the astronomical pipelines and allows mining the data for not-yet-known astronomical discoveries such as optical transients and variable stars. The developed algorithms have been tested with excellent results on the Night Sky Live sky survey, which provides a pipeline of 150 astronomical pictures per hour, and covers almost the entire global night sky.

An exposition on the Nonlinearity of Gravitation

Biju R. P.

Advisor: Dr. Robert Nemiroff

General Relativity (GR) has been, so far, the most elegant and successful theory which explains gravity. The topology of GR and Classical Electromagnetism bear striking similarities, albeit the later being a linear theory. We investigate the possibility of predicting new solutions to the field equations of GR, by considering the motion of test charges over warped background geometries. We'll shed some light on the progress made in theory, whether gravity itself can be enhanced creating unusual "gravitational hollows" of enhanced gravity in the outer Solar System.