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Exercise:

Constraining the Neutron Star Mass and Radius Relation

Description:

- Introduction to *the Neutron Star Equation of State (EoS)* derived from microscopic approaches;
- Calculation of the neutron star mass and radius relation by solving the Tolman-Oppenheimer-Volkoff equations numerically (using MATHEMATICA or C++);
- Introduction to *Observational applications:* pulsar glitches, neutron star oscillations and thermal relaxation of the crust;.
- Introduction to modeling *Quasi-periodic Oscillations (QPO's)* using various approaches;
- Introduction to Bayesian methods to compute probabilities for EoS identification given observational constraints.

Exercise for 1 or 2 students / PhD students interested in theoretical astrophysics.

Minimum requirements: basic knowledge of astrophysics, nuclear physics and numerical methods.

Welcome: basic knowledge of the theory of general relativity, knowledge of the package MATHEMATICA, C++ or any other programming language.

Literature:

- Compact stars: nuclear physics, particle physics, and general relativity, Norman K. Glendenning. New York : Springer, 2000. (Astronomy and astrophysics library).
- Neutron star observations: Prognosis for equation of state constraints, Lattimer & Prakash ,Physics Reports, Volume 442, Issue 1-6, p. 109-165, 2007.
- Bayes and Frequentism: a particle physicist's perspective, Louis Lyons, Contemporary Physics, Vol. 54, Iss. 1, 2013.
- Bayesian Analysis of Hybrid EoS based on Astrophysical Observational Data, David Alvarez-Castillo, Alexander Ayriyan, David Blaschke, Hovik Grigorian, JINR LIT Scientific Report 2011-2013, JINR Publishing Department, Dubna, pp. 123-126, 2014.
- Neutron stars for undergraduates, Silbar & Reddy, American Journal of Physics, Volume 72, Issue 7, pp. 892-905, 2004.