## PHAROS Conference 2020: The multi-messenger physics and astrophysics of neutron stars



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## A computational method for differentially rotating polytropic models in post-Newtonian approximation

In this study, we develop an iterative method for computing both rigidly and differentially rotating polytropic models in critical rotation. We work in the framework of post-Newtonian theory in order to simulate fully relativistic rotating neutron stars. Our method results as combination of three methods: the "Hybrid Approx-imative Scheme" (HAS), the "Complex-plane Iterative Technique" (CIT), and the "Seguin's Post-Newtonian Iterative Method". We implement this method to the computation of various physical characteristics of a neutron star (eg., gravitational, proper and baryonic mass, gravitational potential energy, rotational kinetic energy, equatorial and polar radius, etc.). We verify the validity of the method by comparing its numerical results with the corresponding results of other reliable numerical methods.

Author: Mr FOTOPOULOS, Athanasios (University of Patras)

**Co-authors:** KARAGEORGOPOULOS, Vasileios (University of Patras); Prof. GEROYANNIS, Vassilis (University of Patras)

Presenter: Mr FOTOPOULOS, Athanasios (University of Patras)

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