

Inverse equation of state construction from mass-radius-relations of compact stars

Bachelor

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1 Introduction

2 Preparations

2.1 The Tolman-Oppenheimer-Volkoff equation

Before we get to the main topics of this thesis, it is important to set up a basis that our work emerges from.

Firstly, this involves a derivation of the equation used for determining the structure of compact stars; here, we will use the Tolman-Oppenheimer-Volkoff [TOV] equation. We choose our unit system as $c = G = 1$, so that every unit is a power of a length.

The derivation is based off assuming the star matter as a perfect/ideal fluid. The system shall further not evolve in time, therefore staying spherically symmetric. In terms of the metric components, we are left with;

2.2 Numerical solution

In order to generate an initial mass-radius relation to test our reverse algorithm with, we use a fourth order Runge-Kutta algorithm to solve the TOV equation along with the mass differential equation numerically. By looking at both equations, our ODE system is in the form

Messung der Fadenlänge	l (m)
1	
2	
3	
4	
5	
Mittelwert \bar{l}	
Standardabweichung σ_l	

References

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