MNRAS **000**, 1–1 (2024) Preprint 24 April 2024 Compiled using MNRAS LATEX style file v3.2

Fourier Analysis of Pulsar Data

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Accepted XXX. Received YYY; in original form ZZZ

ABSTRACT

Key words: Fourier Transform – Pulsar –

? proposes a new approach to evaluate oscillatory integrals. This class of integrals involve rapidly oscillating functions. Examples that include oscillatory integrals include phenomena like interference patterns, such as in the context of astrophysical plasma lensing in radio astronomy - which they focus on. The new method takes inspiration from quantum mechanics, condensed matter physics, and quantum gravity methods, performing path integrals with a similar fashion.

In mathematics, Runge-Kutta (R-K) methods are used to study manifolds. Manifolds are collections of points that form sets such as closed surfaces. **?** proves that any classical Runge-Kutta method can be transformed into a method of the same order on a general homogeneous manifold, and present use cases and applications.

Since the 60s, **?**

In the hope of diagnosing vascular diseases, **?** measure blood vessel tortuosity - how curved and twisted the vessel is. They do that by performing numerical integrations of the Frenet-Serret equations. Where the The Frenet-Serret equations are a set of differential equations used to describe the curvature and torsion of a curve in three-dimensional space.

? used R-K to analyse a *hyperchaotic finance system*(HFS). The HFS is represented by a dynamic model involving interest rates, investment demand, and price index, is analyzed using differential equations. These are solved by the R-K methods that are then compared, with the fifth order improved R-K (IRK5) outperforming previous R-K techniques.

? used used R-K to solve water engeneering optimization. In the article they propose a optimization algorithm they name enhanced multioperator Runge–Kutta optimization (EMRUN). EMRUN builds upon classical RK methods but add adaptive parameters and a range of new techniques. EMRUN, tailor fit to water optimisation problems, arrives to 99.99% of the global solution faster and more precisely than comparable non-RK methods.

Applied to the field of material science, **?** used Fourier-transform infrared spectroscopy (FTIR) to distinguish the proprieties of clay minerals. FTIRs produces a spectrum found by applying a fourier transform to the absorption or emission spectra. Using this spectra they could derive information concerning their structure, composition and the structural changes that occur after some chemical modifications.

This paper has been typeset from a TEX/LATEX file prepared by the author.

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