

# Equinox Project - Pulsars

*A study of Pulsars, their detection and image stacking algorithms*



Team Pulsars, Equinox 2020

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## INTRODUCTION

Pulsars, one of the most infamous and amazing phenomena in the universe, have a lot of mysteries hidden within the bright burst of EM waves. Here in this project, we are trying to detect the pulsar from the data we received by radio telescopes, also understand, learn about them in the process and come up with an algorithm to solve the Image Stacking challenges.

### Problem statement

1. Pulsars detection and properties
2. Challenges faced during Pulsars detection
3. Detection of Pulsars by Image stacking in larger datasets using Binapprox algorithm

### Tools

1. Jupyter notebook (Python)
2. DS9, FITS Liberator
3. Numpy, Astropy

## PROCEDURE

1. Perform image stacking using binapprox algorithm in sample FITS Imagefile fits file.
2. Perform image stacking using binapprox algorithm in 1000 FITS file.
3. Perform image stacking using binapprox algorithm in larger datasets ~10000 FITS file.

## DATA

Datasets	How many fits files	Result
Pulsar 1	12	<a href="#">Stacking successful</a>
Pulsar 2	1000	<a href="#">Stacking successful</a>
Pulsar 3	10,000	<a href="#">Stacking successful</a>

### Goals achieved in week 1

1. Study about the mass of stars and how it helps to understand the future of the star's life cycle.
2. Dive into the history of pulsars, and follow the chronology from its discovery to the latest advancements in detections and study of pulsars/neutron stars.
3. Understanding properties of pulsars, their rotation, precision and generation of magnetic fields.

### Goals achieved in week 2

1. Finding out how pulsars are used as probes of interstellar medium and space time.
2. Study about Detection techniques.
3. Applications
4. Challenges in modern world while detecting a Pulsars

### Goals achieved in week 3

1. Calculating the mean stack of a set of FITS images
2. Calculating the median stack
3. Binapprox on FITS

## Goals achieved in week 4

1. Testing the algorithm on larger data sets
2. Validating efficiency on resource datasets
3. Analysis and result conclusion of final output

## CONCLUSION

After analysis and visualisation of data of the binary system Pulsar signal was detected and distortion on field was seen due to gravitational lensing.

## REFERENCES

1. [www.naxxatra.com](http://www.naxxatra.com)
2. [You can find the work in Github](#)
3. [Seminar report](#)