# Project Title

Exploring Disk-Hosting Radio Galaxies: Unveiling Large-Scale Radio Emission in Non-Elliptical Galaxies

# Project Description

## Statement of Purpose

The primary objective of this project is to explore radio emissions from disk-hosting galaxies, focusing on spiral and lenticular galaxies. Through a comprehensive examination of both the radio and optical characteristics of these galaxies, our goal is to enhance our comprehension of how active galactic nuclei (AGN) are interconnected with their host galaxies.

## Background

## AGN, or Active Galactic Nuclei, have conventionally been associated with powering radio lobes that extend beyond their host galaxies, primarily found in elliptical galaxies. Nonetheless, recent progress in low-frequency telescope technology has facilitated the identification of extensive radio emissions in galaxies possessing disks. This occurrence was previously concealed due to their low surface brightness. Through a combination of fortunate discoveries and methodical investigations, numerous disk-hosting galaxies exhibiting significant radio lobes have come to light. These revelations defy established notions regarding radio emission in galaxies, inciting a call for deeper exploration into the attributes and processes contributing to their formation.

## Project Scope

This project will involve the development of a machine learning model using both existing and newly discovered data, aimed at predicting potential new radio galaxies with a certain degree of confidence. The analysis will encompass a comprehensive examination of both radio and optical observations, with specific emphasis placed on crucial factors such as the structure of radio lobes, the existence of AGN, and the distinctive attributes of the galaxies hosting these phenomena. The scope of this investigation will encompass a wide variety of disk-hosting galaxies, spanning from spiral to lenticular morphologies.

# Supervisor

The project is under the Curtin Institute of Data Science (CIDS). The project supervisor is Professor Melanie Johnston-Hollitt (Director, CIDS).

# Deliverables

1. **Comprehensive Dataset**: Compile a comprehensive dataset that includes radio and optical observations, morphological characteristics, and AGN-related information for all analysed disk-hosting galaxies. The details of characteristics come from the NASA Extragalactic Database (NED), and the data about its attributes come from the RACS survey. This dataset should be well-organized and ready for sharing.
2. **Machine Learning Model**: Develop and refine a machine learning model capable of predicting potential new radio galaxies within disk-hosting galaxies. The model should utilize both existing and newly discovered data to make predictions with a specified degree of confidence.
3. **Predictive Analysis Results**: Present the outcomes of the machine learning model, including the list of potential new radio galaxies with associated confidence levels. This would serve as a valuable resource for future research and observations.
4. **Presentation Materials:** Prepare presentations summarizing the project's objectives, methodology, findings, and potential impact. These materials can be used for conferences, seminars, and workshops to share knowledge with fellow researchers and enthusiasts.
5. **Project Report:** Develop a comprehensive project report that encompasses the entire project lifecycle. This report should include the project's goals, methodologies, data sources, results, discussions, and conclusions. It will serve as a reference document for future studies and provide a holistic view of the project's outcomes.

# Student

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