# Background

*Introduce the research topic. Place the project in academic or professional context by referring to major works by others on the subject.*

Understanding the accelerated expansion of the is one of the most important unsolved problems in fundamental physics. This was recognized by the Nobel Prize on Physics to three astronomers who first found observational evidence for this phenomen. A complete understanding of the accelerated lies either on a new kind of negative pressure energy component (dubbed under the generic name of Dark Energy) or in the modification of Einstein's General Relativity.

The Dark Energy Spectroscopic Instrument (DESI) is a world-class experiment that is designed to bring the most significant experimental advance on this front. DESI will make the most accurate measurement of the expansion history of the Universe on the timescale 2019-2024. DESI will take the spectra of 35 million galaxies, increasing by an order of magnitude the state-of-the-art of current experiments such as its predecessor the Baryon Oscillation Spectroscopic Survey.

One of the significat milestones in the design period of DESI is the simulation of the full experiment. This allows to stress-test all the software that will be used on the real data and also identify possible strategies to maximize DESI's scientific return.

The simulation of this kind of large spectroscopic instruments has already started a few years ago and its an integral part to prepare an experiment that will operate at world class level.

# Objectives

*Clearly define the aims of the project.*

The main objetive of this project is to analyze the simulation of five years DESI operations.

This will allow us to reach three goals:

- Forecast the accuracy at which the Dark Energy Spectroscopic Instrument will be able to constraint the expansion history of the Universe.
- Quantify the degree to which different instrumental systematic errors can degrade the experiment's performance.

- Test strategies to mitigate systematic effects and maximize DESI's scientific return.

# Methodology

Perform simulations

# Significance

Importance to the international community.
Importance to the national community.
Importance to my research.
In my teaching.
In Astronomy for Development.

# Evaluation and Dissemination

*Evaluation and Dissemination: Describe plans for assessment and distribution of research results in your home country and elsewhere.*
Contribution to software.
Publications by the collaboration.
Assesment by the collaboration leaders.
Presentation in the collaboratio meeting.
Presentations in the Colombian Congress of Astronomy.

# Justification

*Justification for Residence in the United States for the Proposed Project: Indicate why it is necessary to conduct the research onsite in the United States.*

DESI is coordinated by the Lawrence Berkeley National Laboratory. Most of the simulation work is done in different locations around the world (incluing Bogota) and it is coordinated via virtual meetings. However, to consolidate progress (i.e. by releasing software or data) it is crucial to spend a minimal amount of time in face-to-face meetings.

Since 2014 I have made great efforts to spend one week per semester at BerkeleyLab to efficiently contribute my effort to the collaboration. As DESI gets closer to start operations, the experiment has reached a point where the end-to-end simulation effort has matured and gained relevance to the operationl aspects of the project.

A significant contribution at this time needs the focused effort on site that a Fulbright fellowship can provide.

# Duration

*Duration: Explain how the project can be completed within the time period proposed.*

I expect to spend a total of 16 weeks working on site at Berkeley lab.