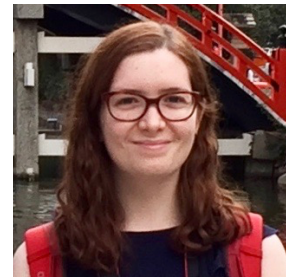


Dr Fran Lane

POSTDOCTORAL RESEARCH ASSISTANT · THEORETICAL COSMOLOGIST

Institute for Astronomy, Royal Observatory, Blackford Hill, Edinburgh, EH9 3HJ

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Postdoctoral Research Assistant - Royal Observatory Edinburgh

Sept. 2020 - Feb. 2021

PhD Astrophysics - Edinburgh University

Sept. 2016 - Aug. 2020

COMPLETED VIVA EXAMINATION WITH MINOR CORRECTIONS

- Thesis title: Modelling cosmological structure formation in the non-linear regime
- Supervisors: Prof. Andy Taylor and Dr. Daniele Sorini

MMath Pure and Applied Mathematics - Newcastle University

Sept. 2012 - Sept. 2016

UPPER 2:1 - 67 PER CENT

- Thesis title: Alternative dark matter theories: modelling fuzzy dark matter
- Supervisor: Dr. Gerasimos Rigopoulos

Research interests

I work on the development of **perturbative methods to model large-scale structure** formation in the non-linear regime. My technique, the **Cosmological Trajectories Method (CTM)**, is based on Lagrangian Perturbation Theory and Kinetic Field Theory. The CTM can be used with multiple approximations, at a range of redshifts, and with a range of cosmological parameters. In my PhD thesis I demonstrate that observables, such as the power spectrum and correlation function, can be calculated numerically for the CTM. I then use the CTM in conjunction with a range of approximations to study features such as **Baryon Acoustic Oscillations (BAO)** (in both real and redshift-space) and **redshift-space distortions**. The ultimate goal of this work is to **produce mock observables** that can be compared to data in order to constrain cosmological parameters. I am currently working on a pair of papers, based on my PhD thesis, describing this work.

Awards

2019 **Scottish Universities Physics Alliance Postgraduate and Early Career Researcher Award**

Worked with Dr. Zvonimir Vlah and Dr. Marko Simonovic on BAO reconstruction techniques during a month at CERN

2019 **Durham Edinburgh Extragalactic Conference XV talk prize**

Selected Talks

Jan. 2020 **Durham Edinburgh Extragalactic Conference XVI, Durham, UK**

Talk

Dec. 2019 **Texas Symposium, Portsmouth, UK**

Talk

Dec. 2019 **SUPA Cormack meeting, Edinburgh, UK**

Talk

Sept. 2019 **Cosmo19, Aachen, Germany**

Talk

Mar. 2019 **University of Geneva, Geneva, Switzerland**

Invited talk

Jan. 2019 **Durham Edinburgh Extragalactic Conference XV, Edinburgh, UK**

Talk

Publications

2021 **The Cosmological Trajectories Method: Modelling cosmic structure formation in the non-linear regime** [Arxiv: 2102.01698](#)

2021 **The Cosmological Trajectories Method: Modelling redshift-space distortions** [In prep](#)

Supervision experience

2020 **School of Physics and Astronomy Senior Honours Project: Syaza Izzati Suhairulazrin**

Project title: Cosmological Structure Formation in the Non-linear Regime

1st supervisor

2019 **School of Physics and Astronomy Career Development Scholarship Programme: Niall Rodgers**

Project title: Entering the Golden Age of Cosmology: Are our N-body simulations good enough?

1st supervisor