

7 October 2021

Admissions

Re: Letter of Reference for *Harry Van Der Ark*

To whom it may concern,

I am writing to express my very enthusiastic support for Harry Van Der Ark's application

I have known Harry for a few years now, and he is clearly an outstanding and motivated student. He approached me in 2018 to request some extension work to supplement his schoolwork, as he was keen on pursuing a research career and was interested in physics and astrophysics. Given that he seemed to be at a high level I gave him a challenge to do part of one of the projects that I get my third-year astrophysics students to do. This involved using Python to do numerical integration to calculate the expansion rate of the universe as a function of time, for different cosmological models (varying the amount of normal matter, dark matter, dark energy, curvature etc...). I was impressed that with very little oversight he independently went and learnt the coding skills he needed and was able to complete the task.

Moving on from that I next gave him another coding challenge that was to make a small simulation of a universe by populating it randomly with particles and coding the gravitational attraction to demonstrate how structure forms over time. Again, he enthusiastically dived into this endeavour and was able to generate simple simulated universes.

Since he proved reliable in these exercises, we decided to get him directly involved in the research projects we are working on. In particular, we are working as part of the Dark Energy Survey (DES) to map the large-scale distribution of galaxies in the universe and use this to measure the properties of dark energy. One part of this project is measuring the spectra of distant galaxies using the Anglo-Australian Telescope here in Australia. Once we make the observations, we need to perform visual inspection on the spectra to confirm the redshift of the galaxy (related to how fast it is receding from us due to the expansion of the Universe). To do this we use some software called Marz that allows the user to inspect individual spectra, examine different possible spectral templates (e.g. for elliptical galaxies or spiral galaxies), and decide on the best redshift solution. Harry did the necessary training to be able to use this tool, and then performed some of the visual inspection of the real data. The results he generated are going to be used in some of the scientific papers we will produce from the survey, and Harry will be acknowledged for his efforts in those papers.

Overall my impression of Harry is that he is one of the most determined young students I have encountered, who is an absolute pleasure to work with. Importantly, he's a leader – he is someone who makes things happen. He does not wait for opportunities to be given to him, he goes out and creates them. And in doing so he enhances the opportunities of those around him. I think he will make an exceptional researcher one day and I give him my highest recommendation.

Sincerely,



Professor Tamara Davis AM
The University of Queensland