Advances in computing are enabling physicists to tackle previously unanswerable questions about our universe, and my deep desire to leverage and help build these technologies to contribute to our cosmic understanding motivates my application to your graduate program. I thoroughly explored several different paths in college before landing in physics—I’ve collected minors in music and applied mathematics—experiences that make me a well-rounded student capable of appreciating interdisciplinary work while simultaneously reinforcing my decision to continue in astrophysics. I have thought carefully about whether graduate school is right for me, and I distinctly remember when I first concluded I needed to continue in the field: last year as part of a scientific computing course I wrote a physics simulator almost entirely from scratch that faithfully reproduced the Apollo 8 mission trajectory with a simulated multi-stage Saturn V, and this culminating experience quelled any doubts I might have had about continuing in graduate school—it left me feeling capable and motivated of joining modern computational astrophysicists to answer broader questions in cosmology and high-energy astrophysics.

My undergraduate experience uniquely prepared me to succeed in graduate studies—the intimate instructional setting in the Boise State Physics Department enabled me to develop close and supportive relationships with my professors in both my academic and research pursuits, and their patient support is largely responsible for the 4.0 I’ve attained in my physics coursework. I also have had a productive research experience with my mentor, Prof. Daryl Macomb, whose interests involve the search for and analysis of accreting x-ray binary pulsars using archival CHANDRA and XMM Newton data. For that work, we’ve analyzed x-ray time-series observations of putative pulsar sources in the Small Magellanic Cloud to search for changes in period (using Fourier analysis) over many years driven by accretion. The trickiest problem for us has been trying to eke out detections from lower power sources that have thus far gone unnoticed, and my largest individual contribution has been developing an algorithm to test the statistical significance of finding lower-power pairs from a large background observation map I created and thus strengthen our detection confidence. For this project I’ve learned Linux, the command line and shell-scripting, learned a new programming language—Julia, have been exposed to deeper languages like Perl and Fortran, and learned to process and reduce datasets with tools like HEAsoft and SAS. Our analysis contributes to our understanding of high-energy accretion events involving dense stellar objects, as well as putting forward new candidates for further study by the astronomical community—we are in the process of writing a paper on our results that we hope will be submitted by early spring.

Outside of research I spend a large portion of my time teaching—another benefit of our smaller department is that I have been invited to teach undergraduate physics and astronomy labs and helped run our department’s drop-in tutoring lab, experiences that prepare me well for the teaching requirements in graduate school and beyond—I hope to one day be a professor who succeeds both as a researcher and a teacher. In the broader Boise community I’ve helped run the largest public observatory in the state at Bruneau Sand Dunes State Park, where I’ve given public talks and had the privilege of sharing the cosmic perspective our dark skies afford with thousands of visitors. It’s important for grad students and scientists in general to be able to teach and communicate technical knowledge in a succinct and accessible way, and I’m grateful that I’ve had a wealth of opportunities here in Boise to develop these crucial skills. I’m also passionate about ensuring education is accessible and equitable to everyone regardless of demographic, and I’ve put these skills to work in my latest outreach project: teaching physics and computer programming in local prisons as a volunteer for the Idaho Department of Corrections.

Given the broad applications of computational science to astrophysics, I could fit well into nearly any project at Berkeley, but the two groups that especially interest me are Prof. Kasen’s and Prof. Parson’s. During my previous work involving pulsar time-series, both the topic and the techniques have fascinated me and II would like to continue developing expertise in these techniques in graduate school. As a result I’m interested in working with Prof. Kasen’s research on energetic transient events like supernovae and neutron star mergers, both from a theoretical and observational perspective. I would also enjoy applying my data manipulation and processing skills in Prof. Parsons’s HYPERION project, searching for the monopole reionization signal of neutral hydrogen from one of the earliest epochs of our universe.

Tackling such fundamental questions about our universe is one thing that makes Berkeley attractive to me, but the way the department and the university foster diversity and inclusion within that academic excellence are at least equally important. The opportunity to collaborate with such a supportive community is rarer than it should be in academia. That’s ultimately what makes it my top choice in continuing my academic journey. I hope to use the knowledge and skills I gain in graduate school not only to advance our cosmic quest but to uplift and inspire others—especially those whose privilege hasn’t been as great as mine. I’ve been fortunate to have a wealth of opportunities to practically demonstrate these ideals, from working with inmates in prison to designing and teaching STEM programs for financially challenged youth through the YMCA. I hope to continue to help advance a more welcoming astronomy and physics culture throughout my future career, and there seems to me no better place to be trained for this than at Berkeley.