

PERSONAL ESSAY

Shreyas Kalvankar

PhD Applicant

Since childhood, my curiosity about science has sparked an interest in many fields, including computer science and mathematics. As a kid, I constantly strived to understand how complicated systems work, which fueled my desire to build such systems in the future. The idea of complex patterns arising from interactions of simple components stems from the notion of emergence mentioned in Hofstadter's "*Gödel, Escher, Bach*." This idea resonated strongly with me and was further reinforced in my mind as I started researching deep learning systems for galaxy morphology classification. These systems elegantly constructed the fundamental building blocks found in linear algebra, resulting in straightforward yet intuitive descriptions of complex behaviours of pattern recognition. This project proved to be a turning point in my life and helped me discover my primary area of interest.

My academic interests have enabled me to explore novel approaches for uniting two seemingly unconnected fields. The skills I developed working on applying deep learning to galaxy morphology classification paved the way for further investigation into connecting the fields of astrophysics and computer science. Throughout my college, I have embraced several roles – serving as an academic mentor for the theory of computation, machine learning and more such courses, leading teams in both academic and cocurricular domains, including the robotics club and my bachelor's thesis project. I have taken numerous lectures talking about the potential of computer science in mathematics and physics. My teaching experiences and research endeavours have instilled in me a desire to contribute to the academic community and I am excited to pursue a career in academia where I can share my experiences and apply my skills.

Apart from academics, I am interested in studying Japanese and have been learning *shodō*, a form of Japanese calligraphy. Drawing a letter is a daunting task because of the intricacies involved but it is extremely gratifying. As I started learning Japanese and calligraphy, I was drawn to the world of typography and soon after graduation, I started working at Dalton Maag, a type design studio in London. My professional experiences proved to be quite different than my academic ones. I found myself navigating through a landscape of problems which extended far beyond my academic curriculum. Drawing Japanese letters, especially Kanji, is a time-consuming task. To address this, I developed a system to generate these glyphs using a set of design parameters like stroke length, width, brush pressure, etc. To provide a consistent design, I used genetic algorithms to fine-tune these parameters by learning from a set of input glyphs. I realized how my past research experiences had helped me discover new ways of thinking and apply my skills effectively to certain problems. Working at Dalton Maag also provided me the opportunity to collaborate with a diverse and global team. Interacting with colleagues from various corners of the world allowed me to delve into their cultures, fostering an appreciation for linguistic diversity. This ignited a curiosity about the connections between languages and scripts, sparking my interest in linguistic anthropology. I spend my free time studying languages like Latin and Gaelic and their origins in geographical and cultural contexts. I wish to find individuals who share a similar affinity for studying languages and typography at Caltech.

Reflecting on my journey in art and science, I find a striking resemblance to the exploration of the interconnectedness of math, music, and art in Hofstadter's *Eternal Golden Braid*. Much like the dialogues in the book between Achilles and the tortoise that unravel the interconnected nature of mathematics, art, and music, my own experiences seem to echo the profound interplay between these seemingly distinct realms. My academic and professional experiences have provided me with an eclectic background and a diverse set of interests. I find that this diversity resonates well with the vibrant community at Caltech and I am confident that I can bring valuable contributions to further enrich this dynamic tapestry.