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**Academic Enrichment Courses:**

- M365D Real Analysis II
- M 365G Curves and Surfaces
- M 361 Functions of a Complex Variable
- M 364K Vector and Tensor Analysis
- M 373K Algebraic Structures I

A deeper education in mathematics will enable me to better understand the arguments and techniques which underlie topics in my primary core. I currently plan to become a researcher in data science and machine learning. A reliable familiarity with mathematical reasoning is vital for enabling the creativity and technical competence that is needed for research in this field. Many new machine learning techniques have been inspired by very simple and intuitive ideas but clearly required a fluency in mathematical expression to capture and implement. This has been my growing impression on the nature of research in many technical fields but especially in data science. Furthermore, since taking Intro to Data Mining (EE361M) last fall, I have become more directly aware of what is practically possible with greater powers of mathematical expression,

By completing these Academic Enrichment courses, my specific aims are to (1) gain a more solid understanding of calculus, (2) learn to describe complex geometric ideas clearly, and (3) familiarize myself with modern mathematical thought.

Real Analysis II will lead to a more wholesome understanding of calculus. Real Analysis II continues the themes Real Analysis I, which I am currently enrolled in. So far, Real Analysis I has already been very helpful to me, because I am gaining a better fundamental grasp of the logical basis for limiting processes, which underlie all of calculus. Just as every small detail must be understood when studying a computer, so it must be with math for a data scientist.

Curves and Surfaces is just as it sounds. There will be a geometric focus to this course. In addition, among the machine learning techniques I surveyed last fall, quite a few complex ones could be explained most naturally with geometric metaphors (even though data can often be in hundreds of dimensions rather than just three). These experiences lead me to believe that describing things geometrically is not only good for my own understanding, but also useful as a way of designing or envisioning new machine learning techniques.

Continuing on the topic of geometry, there is one concept of particular curiosity to me in Functions of a Complex Variable, and that is analytic continuation. From my observation, there is again a particular geometric motif shared in both math and data science when it comes to understanding a phenomenon. Ironically, sometimes when looking at a picture it will not make sense or appear organized unless viewed in higher dimensions.

With these greater mathematical capabilities, I feel I will not only be able to read the literature of my primary field with possible ease, but also reason and create similarly sophisticated arguments and meaningful contributions. Learning more math will surely help me to formulate and capture ideas in a more creative, technically sophisticated, and effective way than I can today.