Bachelor of Individualised Studies: Computer Science, Mathematics, Asian and Middle Eastern Languages (Arabic)

Victoria Pierce

Since I wrote my first 'Hello World' program at 13 years old, I knew Computer Science was my passion. As a homeschooled student, my father - who is an aerospace engineer - took it upon himself to supply me with various courses on programming basics, Java basics, and a plethora of other topics and I loved it! I loved the puzzles and quickly discovered the satisfaction in rapidly iterating through different solutions looking for the final piece to the puzzle. Though I was living in Uganda, and only had access to a dial-up speed internet connection, I would wait hours for e-books filled with programming tactics and puzzles to download.

I pursued this passion throughout my first few years of highschool as my family moved from Uganda to Minnesota when I was fifteen for my older sister to attend the University of Minnesota. I began attending a highschool with an incredible Computer Science department and since I had passed the Advanced Placement Computer Science course as a freshman in highschool, when I entered public school as a sophomore I was able to dive straight into a College in Schools Data Structures class. This class opened my eyes to the intense interrelation between Computer Science and Mathematics. I learned that Computer Science and Mathematics are incredibly co-dependent topics and in order to fully understand one, you must have a firm grasp on the other. Because of this realisation I began to pursue higher level mathematics and by the time I was finished with high school, I had taken 4 semesters worth of college calculus.

Throughout this journey however, I still thought that the regular Computer Science degree was the way to go and as a PSEO student I began the courses necessary to be admitted in the CSCI program at the University of Minnesota. At the end of my junior year in highschool, I won the Aspirations in Computing award from the National Center for Women & Information Technology, and as a part of the award, I got a summer internship as a Reliability Engineer Intern at SPS Commerce. It was an incredible opportunity full of priceless hands on experience. I got the chance to write code that actually affected the speed of customers' data flowing through our system and watch the results in real time. I loved every minute of it and after the summer when they asked me to stay on part time, I was elated. I ended up working at SPS Commerce for two years and I learned a significant amount about being a software engineer, working on a team and I got to the chance to solve real world data puzzles - but this experience also made me realise the limits of a degree in Computer Science. I realised that while I enjoyed solving puzzles, my career goals were more focused around solving bigger, more significant problems.

So I began taking classes in Arabic and on culture and literature in the Middle East. Growing up in a third world country, and having one of my first languages be Luganda - which is one of the over fifty Ugandan tribal languages and at the age of 13 I started studying Arabic with a Sheikh from the local Mosque. I have always had a passion for narrowing the gender gap in technology and I spoke about the difficulties being a female software engineer and the age of 17 at a tech conference in Madison, WI but as I learned more about the Middle East from the Asian and Middle Eastern Studies Program, I realised that, of course, the difficulties are far more drastic in other parts of the world.

When I heard about the ability to design my own major with the Bachelors of Individualised Studies, I jumped at the opportunity to combine my three major passions - Computer Science, Mathematics and Asian and Middle Eastern Studies. I believe this combination of concentrations will allow me to find a career somewhere in the Middle East where I would like to work to open doors for and promote women and girls interested in technical fields.

Computer Science

CSCI 2021 - Machine Architecture & Organization

CSCI 2021 teaches the critical information necessary to fully understand the operations of a Computer and technology as a whole. In order to completely comprehend the magnitude of what we can do with various programming languages, it is crucial that we understand the building blocks that make up the path from 0's and 1's to the highest level programming languages. Though we now have programs and operating systems to manage memory and manually store data, the hands on experience of learning to do that all yourself is incredibly helpful in understanding what exactly it is you are doing when you do something as simple as creating a folder on your computer.

CSCI 2041 - Advanced Programming Principles

I chose to take this course because it applies universally to infinitely many programming languages that have already been created and may even be created in the future. On the back of a

theoretical programming language, OCAML, the more advanced principles of programming are easier to understand and apply to any situation - no matter the language. I found this class invaluable because many times, programming languages can cloud the higher level principles of programming and complicate already intense problems.

CSCI 4041 - Algorithms & Data Structures

The combination between Algorithms and Data Structures is the epitome of the relationship between Computer Science and Mathematics. In this relationship, Algorithms, which is the core of Computer Science, use Data Structures, which are built completely upon the foundation of higher level mathematics. This course not only taught me how to solve a problem using an algorithm, it taught a whole new way of looking at problems and maximising their efficiency. This is based upon the best choice of algorithm and the data structures it references by having a concrete knowledge of how both algorithms and data structures operate.

CSCI 4707 - Practice of Database Systems

Since I've always been fascinated by Databases, I decided to further my knowledge by taking Practice of Database Systems. In this course, I learned about how Database Systems work and how they are used today in real world applications. The syllabus coupled a deep theoretical knowledge with case studies from tech giants such as Amazon or Google to create a well rounded experience of the very practical side of Databases.

CSCI 3921W - Social, Legal, and Ethical Issues in Computing

As I was choosing my final class for my Computer Science concentration, I came across this class and I realised that it was a major area of computer science that my classes thus far have lacked and I was fascinated. This class focuses on the impact that computers have on our society. Whether intentional or accidental, the technology we create and have already created has the possibility to have epochal affects on how we function as a society and this course launches us into a discussion of the social, legal and ethical issues that Computing brings about.

Mathematics

MATH 2243: Linear Algebra and Differential Equations

Linear Algebra delves into the theory behind matrices, vector spaces and eigen vectors where as Differential Equation allows you to calculate solutions to differential equations based on the knowledge of linear algebra. I chose this course because I was fascinated by the connection between data structures and higher level mathematical theory. While it is usually a natural sequence after finishing Calculus I & II, I mostly decided to take this class because of what it allows you to understand about data structures and how it allows your to manipulate them through computing.

MATH 2263: Multivariable Calculus

Similar to Linear Algebra and Differential Equations, this course further builds on what was taught in Calculus I & II but rather than expanding on topics relating to a physical space, it examines the parts of Calculus that have to do with equations that predict curves in space - arc

length and curvature - and velocity and acceleration. Multivariable Calculus connects real world concepts such as velocity and acceleration with the theoretical calculations that predict these things. I believe this course is crucial to anyone interested in technology because it is a key stepping stone that allows the use of computing power to further investigate how physics works in our everyday lives.

MATH 3283W: Sequences, Series, and Foundations: Writing Intensive

Sequences, Series and Foundations is the first course that deals with how to begin to understand highly complex theoretical concepts by proving them in a rigorous, systematic way. This course teaches students not only how to write proofs but also how to make sure ever case is covered and how to think outside the box when it comes to proving these theoretical concepts. After building a firm foundation on knowledge of proof writing techniques, this course discusses how and why various sequences and series are created and what they are. Taking this course will give me a firm basis in the foundations that make higher level mathematics possible.

MATH 5335: Geometry I

As 3D graphics take off at an exponential rate, I felt that my combination of Computer Science and Mathematics lacked a more physical mathematical understanding so I decided to take Geometry I. In this course, proofs will play a big role as we strive to push our understanding of the study of Euclidean geometry in the plane and how that compares to hyperbolic and elliptic geometry. This course will give me a better understanding of geometry and how theoretical mathematical planes can be applied to physical 3D planes predicted using computing.

Asian and Middle Eastern Languages: Arabic

ALL 3856W: Palestinian Literature & Film

In this course, we explored various aspects of modern literature and film of the Palestinian people and looked into how they interacted with the historical and political context that surrounded them. I chose this class because I wanted to learn about Palestinian culture and history, since literature and film are usually a reflection on both culture and history as well as artistic significance, reading and watching the material presented in this class opened my eyes to Palestinian stories. The material, discussion and writing that stemmed from this class didn't just teach me about Palestinian history and culture as a whole, it allowed me a glance at the individual lives of the authors and their subjects.

ALL 3820: Topics in Arab Culture - Arab Feminisms

As someone who is passionate about feminism and the Arab world, this class was a natural selection for me yet I learned so much more than I ever thought I would. This class delved into the intricacies of feminism in a proudly patriarchal culture. This class was incredibly enlightening and taught me the importance of recognising that every culture, every human being's version of feminism is completely unique and equally valid. I learned that as I strive to be an advocate for people around me, I need to consider the culture from which they come and this course gave me context for those considerations.

AMES 3867: Orientalism and the Arab World

Orientalism and the Arab World explores the discourse that is Orientalism and how "the Arab World" is presented in western discourses. This course discusses how the construction of an 'Arab World' that follows all the stereotypes set out by the Western World effects how westerners are prone to view the 'Arab World' and inversely shapes the western identity itself. I was fascinated by this course because I was interested in how it explores the big picture of how the Western and 'Arab' Worlds have interacted historically and learning about how I might be subconsciously biased by the environment I was raised in.

ARAB 3102: Intermediate Arabic II

Intermediate Arabic II was a natural choice for me as I hope to one day move to an Arab country, and this course gives a very practical knowledge of Modern Standard Arabic as well as a dip into Arab culture. Conversation tables, movie screenings and daily discussion classes helped me further my understanding of the Arabic language and begin to learn about the intricacies of the grammar and the root and pattern system. Speaking Arabic daily was also very helpful as I work to master the language.

ARAB 5101: Advanced Arabic I

Similarly to Intermediate Arabic II, Advanced Arabic I furthers grammatical knowledge and speaking ability. It also focuses on advanced reading in classical/modern Arabic and longer compositions based on texts as well as conversational sessions with displaced refugees who are native speakers of Arabic. This course will offer me the opportunity to expand my knowledge of Arabic to a professional level when it comes to reading and writing as well as speaking.

Conclusion:

I am passionate about using my technical skills to make a difference in the world around me and I believe that the BIS program I have created will best allow me to combine my technical skills with language and culture knowledge as I move forward into my career. Designing my degree allowed me to take courses that I know will help me best in the future whether I am living in an Arab country or working with refugees who have been displaced into a different country. It has taught me about the issues that are prevalent in the world right now and has given me the skills to help contribute to a solution.