Cover Letter

My Key Learning Outcomes

My key learning outcomes were:

- Developing a better understanding of mathematical optimization: the different types of optimization problems and how to represent them mathematically.
- Learning about the ways mathematical optimization is applied in finance.
- Developing an in-depth understanding of constraint programming.
- Improving my Python programming skills in CVXPY, SciPy, and Google OR-Tools.
- Enhancing my LaTeX document writing skills.

My Artifact Creation Process

My artifact creation process comprised three main parts:

1. Selecting a topic I am passionate about.
2. Researching how mathematics is applied within this topic on the internet.
3. Choosing a specific application problem, initially outlining the background and mathematics, and then using Python to solve the problem.

Most Proud Artifact

The artifact I am most proud of is the optimizing trade through intermediate facilitation literature summary. This artifact was quite challenging for me because the ideas in the paper were outside my knowledge base, making it difficult to summarize the material in detail. The mathematics in that paper was not very intuitive to me, so I decided not to delve deeply into the math beyond the main optimization problem.

Challenges in my Portfolio

My biggest challenge was coming up with good solutions to the problems addressed in my artifacts. For example, in my last artifact on the N-Queens problem, developing the mathematical solution was quite tricky. Another example is the Black-Scholes stochastic differential equation, which was challenging to explain in plain English terms, but I believe I managed to provide a clear explanation at a high level.

Enjoyable Part of my Portfolio

In general, I enjoyed every aspect of the portfolio. I am very proud of the quality and detail in my artifacts. However, the most enjoyable part was learning the new material needed to write my artifacts. All my artifacts were topics I cared a lot about, so I was highly motivated to develop a high-quality portfolio.

Portfolio Guidance to Other Students

I believe the best piece of advice I can offer to other students is to work on optimization problems they are passionate about. This passion will drive motivation and contribute to the creation of a high-quality portfolio.

Grade Proposal

I think I deserve a grade of 95%. This is due to the below reasons:

Effort

	Grade	Reasoning
Attend lectutures and contribute to discussions	60%	I attended the initial two months of lectures; however, my attendance declined thereafter. Reflecting on this, I recognize that I could have exerted greater effort in consistently attending classes and actively participating in discussions.
Meet with instructors to ask questions and receive feedback	100%	I met with Patrick once to align on his expectations, and since then, I've maintained a consistent practice of submitting my artifacts for feedback. Given my understanding of the expectations for these artifacts, I haven't felt the need to schedule additional meetings.
Interact with other MATH 441 students	100%	I've actively engaged with my classmates, particularly with my project partners, to discuss course material and exchange ideas for our artifacts.
Generate original artifacts and spend considerable time formulating and solving problems	100%	I've dedicated significant time and effort to crafting my artifacts, striving for originality within the course framework. For instance, in my literature review focused on optimizing trade through intermediaries, I went beyond summarization by creating original examples to enhance comprehension of the concepts. Similarly, in another artifact, I merged the Black-Scholes equation with optimization principles, demonstrating its application within a broader problem-solving context.

Growth

	Grade	Reasoning
Discover new mathematical concepts	100%	Throughout the course, I've delved into numerous new mathematical concepts, broadening my understanding and application of mathematical principles. In my portfolio optimization artifacts, I explored concepts such as quadratic programming and various optimization algorithms, enhancing my ability to analyze and optimize portfolios effectively. Additionally, my research on optimization with the Black-Scholes equation introduced me to stochastic differential equations, providing valuable insights into financial modeling. Furthermore, I acquired knowledge of constraint satisfaction programming, expanding my toolkit for addressing complex computational problems.
Learn new technical skills such Python and LaTeX programming	100%	I gained proficiency in utilizing Google OR-Tools for solving constraint satisfaction problems, acquiring a valuable skill set in tackling complex computational challenges. Moreover, through my research on optimizing with the Black-Scholes equation, I mastered techniques for solving non-convex optimization problems, further enhancing my problem-solving capabilities. Additionally, I honed my LaTeX skills throughout the course, as all my artifacts were meticulously crafted using this sophisticated typesetting system, thereby refining my ability to present mathematical concepts with precision and clarity.
Demonstrate mathematical maturity	100%	I believe my artifacts exhibit a notable level of mathematical maturity, showcasing my ability in synthesizing advanced mathematical concepts. For instance, my exploration of optimization with the Black-Scholes equation underscores my capability to integrate stochastic differential equations into complex optimization frameworks, illustrating a sophisticated understanding of mathematical modeling. Additionally, my analysis of constraint satisfaction problems, a topic beyond the scope of the course curriculum, underscores my capacity to independently acquire and apply new mathematical concepts, reflecting a strong aptitude for learning and problem-solving.

Quality

	Grade	Reasoning
Artifacts demonstrate good presentation	100%	I have compiled all my artifacts on a dedicated website, ensuring each piece is appropriately categorized with clear headers for easy navigation and comprehension. Patrick has provided positive feedback on the impeccable structure and clarity of my artifacts, acknowledging the effort invested in crafting well-written and organized content.
Artifacts demonstrate good clarity and creativity	100%	Patrick's feedback on the accessibility and comprehensibility of my artifacts underscores their clarity and effectiveness in conveying complex concepts. Additionally, the aggregation of all my artifacts onto a single platform demonstrates creativity and resourcefulness, facilitating seamless access and navigation for readers. Moreover, my innovative approach in the optimizing trade artifact, where I not only summarized existing research but also expanded upon it with practical examples, exemplifies creativity and critical thinking in synthesizing and extending established ideas.