

Personal Statement
Financial Mathematics
--Shilun Dai

Financial Principals for Actuarial Science I studied in this summer stimulated my passion for Financial Mathematics, the process of acquiring relevant knowledge and skills has unlocked my full potential, and my achievements have proved my talent. The competencies obtained in this course has provided me with a good foundation for studying Finance. For instance, my portfolio management and execution ability, my skills of financial risk analysis and critical thinking were enhanced in an assignment which was managing risks for ten different companies by trading realistic financial derivatives on a virtual platform called RPM. After consulting the annual financial reports of the companies, I determined to make hedge arrangements for the ones making profit from the operations such as Starbucks, and speculate for the metal price of some mining companies to gain more profit by buying low and selling high. Then I created portfolios that contain options, spreads, combinations, and futures by investigating the historical stock price of the underlying including commodities, exchange rates, Gold ETF, and other items. With allotted \$200 million dollars in the RPM account, I executed the designed strategies using the NASDAQ ticker symbol. However, the unexpected reduction of portfolio value forced me to re-evaluate my investment strategies, which also made me realize that I had to keep up with current news instead of simply relying on the historical stock price, as well as diversify my investments to reduce risk. Finally I gained a profit of \$42 million dollars in this project and won the first place in the class with a grade of 93. This achievement has increased my self-confidence and strengthened my determination to apply for Financial Mathematics for postgraduate. What's more, the Statistics I have been studying at my undergraduate has armed me with strong data collection and analysis skills, as well as research and coding skills, all of which are very critical in the financial field.

Developing initiatives in the field of machine learning is one of my research interests, and participating in various machine learning projects has improved my self-learning ability and helped me better prepare for the application of Financial Mathematics. A project of investigating the relationship between heterogeneity described by convolutional neural network (CNN) image features and the 'between-group heterogeneity' of the dataset measured by population descriptors in Python showcased my research capabilities, and analytical and problem-solving skills successfully. Any kind of variability within a dataset is likely to be termed as heterogeneity, which represents the degree to diverge from a state of perfect conformity of a system. After splitting the training dataset into 4 groups by selecting the PATHMNIST dataset which contains four classes (adipose tissue, background, debris, CRC epithelium), we were required to assess and describe between-group heterogeneity. I proposed to apply Cochran's Q as a metric measure the deviation of each group's mean from the grand when the others felt helpless. Then we used the average pixel intensity of each image as the population descriptor and implemented K-means clustering analysis to record the predicted accuracy of each cluster. Based on the predicted results, I reported the coefficients of variation (CV) accordingly to measure the heterogeneity

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described by CNN image features. Finally, it turned out that Cochran's Q was a plausible metric in quantifying the between-group and it had a positive correlation with CV. Solid theoretical knowledge strengthens my thinking ability and careful observation improves my forecasting ability, all of these are essential for financial learners.

In order to learn more professional and practical knowledge to improve my competitiveness, I strive for every precious internship opportunity. The fact that I succeeded in interning at Munich Reinsurance Company of Canada, Intact Financial Corporation and The Wawanesa Mutual Insurance Company demonstrated my excellent academic background and strong motivation, while the training I received has equipped me with both relative hard skills and soft skills, which will be greatly beneficial to my future career planning and promotion. During the internship at Munich Re, I have worked in the Reserving team and IFRS 17 team. One time, in the process of model prediction with Chain Ladder and Bornhuetter-Ferguson methods, we examined and contrasted differences in cash flow patterns between quarters in Excel pivot tables and Visual Basic for Applications (VBA). But due to the size and ongoing growth of the CSV and Excel files, the data extraction process is extremely slow, especially for those who contain VBA programs. To resolve this issue, I suggested using R rather than Excel to sum the loss to a particular granularity, which only takes 10 seconds to run the function and receive the reconciled output. Then I exported data from R to Power BI, a even smaller dataset, to better visualize patterns and trends. Finally, all analysis procedures were automated in R and Power BI, saving each quarter 80% of the work. Through this experience, I learned how to use different applications to increase the effectiveness of analysis and data visualization. In conclusion, these experience helped me be familiar with financial analysis tools and investment vehicles for asset classes, as well as improve my communication and teamwork skills.

Based on my own interests and experiences, combined with the current social development situation, I'm aspiring to work for an investment bank as a quantitative analyst, trading financial derivatives and offering algorithmic or statistical solutions. To achieve my career dream, I need to acquire comprehensive training in advanced financial theory and methodology, top research platform and rich resources to refine myself in practical applications. And your program is dedicated to training the graduate to be professional and proficient, and helping them to gain career-focused knowledge and experience at the cutting-edge field. I am looking forward to joining in your program, at the same time, I'm in full confidence that with your rigorous training and inspirations, I'll reach my full potential in financial and become an outstanding composite talent in the future.