INFO1111:Computing 1A Professionalism

Semester 1 2021[*]

Project 2B[†]

Group Member:

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5	Full Name	Student ID

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[*]We were five members of our group, but one of us did nothing from start to finish, and chose to just ignore our messages after we pushed him repeatedly until the end of the deadline (6th June).

[†]Link: https://github.com/LouckXu/INFO1111proj2B.github.io

1 Introduction

We are group 5 in TUT16. Targeting to research the non-computing electives available at The University of Sydney, we choose some domains and electives to explore. Then we select the best non-computing electives suitable for these computing majors - Computer Science, Data Science, Information System, Software Development, Artificial Intelligence.

In this report, we are going to introduce the optional courses that we select and interpret why they are appropriate for the students enrolling in corresponding majors to learn.

We recommend BUSS1000 and ELEC2302 as the electives to Computer Science major. We think this two course can greatly improve the graduates' competence in job market and broaden their career pathway mainly because BUSS1000 can help students majoring in computer science to better understand the business environment and operations, and help pave their future career path. Meanwhile, ELEC2302 is able to help students build linear programming models and solve more problems in the real world. This can give them a chance to get in touch with more advanced knowledge in computer science.

As for Information System, we choose to recommend INFS1020 and BUSS1020 as elective courses. There is no doubt that learning to use electronic equipment and information processing software is very important for this major. In addition, graduate students majoring in information systems are likely to be employed in banks, government and other units, so mastering some banking management or finance-related knowledge can broaden the career path of students.

Software Development requires fantastic logical thinking capability. We recommend the DECO1016 to be the first elective for students enrolling in SD since it will boost their capacity on design which combines with our logical thinking ability to aid us to do comprehensive work in the workspace. The MUSC1501 will be the second one appropriate to be one of the optional courses for SD students owing to its domain - Music Compiling, combining with Software development on the application for music composing which sees an expanse at market space and development prospect.

As for Artificial Intelligence, we recommend Stochastic Process (STAT3021) and Optimisation and Financial Mathematics (MATH2070) to be the two elective courses because STAT3021 can help them better understand the dynamic process involved in the artificial intelligence research area, then they are able to do research on broaden topics related to quantitative industry. MATH2070 can help them better understand the field of financial engineering and financial mathematics, and combine artificial intelligence and quantitative finance together, which can broaden their future career path and gain more research topics in quantitative area.

Note: There is a member in our group who has been unreachable. He has not yet participated in the group task from the beginning to the end. He did not reply to us when we contacted him many times after we set our tasks individually. Therefore, the part of data science is missing in the report. The whole project plan of our group was disrupted by him again and again, which led to many of his tasks being completed by us. This was the reason why we submitted the work five days late after the deadline. We very much regret and wish for forgiveness for that.

2 Major Allocation

	Full Name	Major
1	Freya Liu	Computer science
2	Junbin Gou	Artificial Intelligence
3	Qichang Liu	Information Systems
4	Louck Xu	Software Development
5	Full Name	Student ID

3 Recommendations

3.1 Computer Science

BUSS1000

BUSS1000 would be the most recommended Commerce elective, which helps the students studying computer science to better understand the commercial society and the business they involved in the future. BUSS1000 as a degree core course in business school is aimed to provide students a basic understanding of the business practice which includes the internal and external elements of a company. By taking this elective, students will learn about the basics of dealing with business stakeholders, business challenges and the method which leaders should use to thrive on those challenges. It is going to enable students to identify major stakeholders internal and external to the business and analyze their interests thus to satisfy all business components. They are also capable to understand the pivotal business challenges, for instance, climate change and sustainability, the future of work and labor diversity, and analyze how these typical challenges might make effect on different industries, departments, stakeholders, then, construct countermeasures for them. More than this fundamental knowledge, BUSS1000 also helps students think critical thinking, strategy making and interdisciplinary researching (USYD,n.d.).

The current computer science course design mostly covered the technology and professional skills the graduates need in the future career. The knowledge about commercial society and business is lacked. Buss1000 can make up this part of lack as elective of computer science. Aside from scientific research, computer science graduates normally engage in teaching, scientific research, operation management, technology development and other aspects of the technology industry (Kowarski,2019). Every year, there are a great number of CS (computer science) graduates choose to seek jobs at some commercial companies and the mainstream careers of these graduates are mostly product design and technology development. Knowing the internal and external aspects of how a business operates will give them an advantage over many other job seekers and make them better qualified for their job.

Working in industry not only requires the practitioners in the technology industry understand the technology, but also requires them to understand the business they involved to some extent. Even programmer cannot just know how to code and develop some results. Deep understanding to the business they involved would make them communicate more smoothly and work more effectively in the workplace. The knowledge learners gained in buss1000 greatly assistant them to be familiar with and understand business operation quickly. For example, if the computer science graduates seek to be product manager, the capabilities developed in BUSS1000 would also be a great bonus. The role of product manager requires them to analyze business mode and balance the team work according to the commercial goal. Hence the knowledge and capabilities developed in BUSS1000 assist computer science graduates' professional career.

In the career pathway, when they get promoted to the management level, the importance of understanding to business operation will become more obvious. The managers must take more responsibility to the stakeholders and monitor the teamwork to maker it fit the commercial goal (Zhou,2018). In addition, in the current time massive start-ups flourish in the technology industry. Establishing start-ups is also a good career choice for computer science students(Buffardi,Robb Rahn,2017) . If the computer science graduate has this decision, the insight to commercial society is essential. Technology is one thing; Business mode is another thing and even more important to establish an enterprise. The capability developed in BUSS1000 would give the graduates more opportunities and more choices when they plan their career pathway.

ELEC2302: Signals and Systems

The unit is from electronic engineering. It aims to teach how to use mathematical tools to analyze basic properties and nature of engineering signals and systems. Model of linear time invariant systems based on frequency and time domain is particularly emphasized. The content learnt in this unit would benefit future learning of control, signal processing and power systems communication. The assumed knowledge is differentiation, integration and linear algebra(USYD,n.d.).

By undertaking this course, the learner can deeply understand the propagation process of electronic signals in the circuit, how to filter, sample, and perform frequency domain analysis. For example, for audio signals, the learner can use what have learned to remove the noise and restore high-quality music effects. In addition, pictures belong to the scope of signal processing, which can display blurred pictures, such as pictures that are blocked by clouds, to show the things under the clouds(Khan Academy,n.d.).

However, the knowledge in this elective is just a base for following more advanced knowledge in computer science. There are lots of various branches of computer science have prerequisites on the understanding of signal and system. Because the process of electronic signals in the circuit is more like the bottom knowledge of how computers run and deal with information. Speech processing, image processing and neural network, which are the branches of computer science, are all the advanced signal processing algorithms based on signal and system(Al- Rababah, Al-Marghilani, Hamarshi,2018).For example, any picture we browse on a computer or mobile phone is a collection of a set of digital signals. Image processing, which is the research area of computer science, takes the knowledge of signal as prerequisites. However, given the current course plan, signal and system isn't covered . Thus this elective signal and system can be a very good complement to computer science major.

After undertaking this elective and master the knowledge of signal and system, the career path of computer science would be greatly broadened. First of all, the knowledge of signal and system makes it more possible for the learner to learn and research the branches of computer science like speech processing, image processing and neural network. The capability developed in this elective assistant the learner to earn achievements more smoothly if they have already touched this knowledge before.

In addition, given on the current computer science course design, the knowledge of programming language, algorithmic processes and computational methods are emphasized. Aside from these, the understanding of signal and system, which emphasize more on the hardware knowledge, can greatly improve the competence of graduates on job market especially to some tech hardware companies. Compare with graduates without the capability relating to signal and system, the graduates selected it would have more choices and decide their career path more freely.

3.2 Data Science

Didn't do anything from start to end and just ignore our messages until the deadline (6th June).

3.3 Information Systems

INFS 1020

Domain of the course IFNS 1020

INFS1020 is an elective course from Business Information System. A business information system is a set of interrelated programs that use the IT infrastructure in a business enterprise to generate and disseminate the required information. Such systems are designed to support people associated with the enterprise in making decisions in the process of achieving their goals. The business information system obtains data and other resources of the IT infrastructure from the environment as input and processes them to meet the information needs of different entities associated with the business enterprise. There are systems to control the use of IT resources, and the feedback system provides useful clues for increasing the benefits of the information system to the business. The business information system is a subsystem of the business system, and they themselves play a feedback and control role in the business system ("Business Information System: Meaning, Features and Components", 2021).

The introduction of the course INFS 1020

The main learning direction in this course of INFS1020 is that digital technologies, such as social media, mobile devices, and data analytics, have changed the way we collect and present ideas, communicate, and work together. Students are introduced to various digital work environments in this unit and their implications for how work is done. Students learn about how employers recruit graduates online, what it is like to join and

work in a modern, digital workplace, and the tensions that arise when traditional, structured workplaces are transformed through digital, flexible, and networked ways of working. Students engage in hands-on activities to acquire skills for how to present themselves effectively and professionally online (personal branding), how to communicate in digital channels in an organizational context (professional communication), how to effectively search for and work with digital information (data literacy), and how to digitally coordinate work in teams ("Digital Work Environments", 2021).

The knowledge and abilities that this course brings to students

nformation-based learning can improve students' information literacy. Information literacy includes three basic points: basic knowledge and application skills of information technology, which refers to the skills of information acquisition, processing, and presentation and communication using information technology; the ability to analyze, criticize and understand information content, that is, the information retrieval strategy , The information source to be used and the content of the information obtained can be evaluated one by one. Before accepting the information, it will seriously consider the validity of the information, the accuracy of the information statement, and identify the logical contradictions or fallacies in the information reasoning. Determine the adequacy of the argument; the attitude and ability to integrate information, create information, and use information according to social needs, and integrate into the information society, means that information users must have a strong sense of social responsibility, have a good spirit of cooperation with others, and the integration of information and creativity serve as a force to promote social progress Digital learning. 2021).

Prospects and opportunities for the combination of the two aspects

At present, information technology is developing rapidly. Big data, Internet of Things, virtualization, cloud computing, mobile Internet, Internet of Everything, ubiquitous access and other technologies continue to innovate and become increasingly mature, which strongly promotes the development of informatization, in order to achieve high-level information Chemical construction provides technical feasibility ("Analysis of the current situation and development trend of informatization of smart universities in 2020", 2021).

BUSS1020

Domain of the course BUSS 1020

Banking research uses applied methods to teach students the different roles of banks in a dynamic financial system, the management and supervision of domestic and international banks, and the activities of private and investment banks ("Banking - Interdisciplinary Studies - The University of Sydney", 2021).

The introduction of the course BUSS 1020

As a compulsory course for all business students, BUSS1020 is not very difficult. The main purpose of this course is to enable students to use data analysis and statistical tools proficiently. The course focuses on how to model and analyze the relationships in the data, and how to make correct inferences from the data and identify Incorrect inference. BUSS1020 This course requires the use of Excel to help calculations, involving Excel formulas and tools ("The University of Sydney BUSS1020 Quantitative Business Analysis", 2021).

Why this course is suitable for learning

Information system has three dimensions — organizational dimension, management dimension and information technology dimension. One of these three dimensions is the technical dimension: Information technology is one of the many task tools for managers to respond to change. Including computer hardware, software, data management technology, network and telecommunications technology, Internet technology and required operations, management personnel, all represent resources that can be shared by the entire organization, and constitute the enterprise's information technology infrastructure (information technology infrastructure) . Information technology infrastructure is the cornerstone and platform for enterprises to construct specific

information systems. Therefore, through the study of this course, students can better master the directional analysis of data, and can master a tool for data analysis, which is conducive to students learning information systems.

The knowledge and abilities that this course brings to students

Through the study of this course, students will combine social science theory and reality, and provide comprehensive training in statistics, social data analysis, deduction and demonstration. Students will master high-level quantitative research methods and apply them to the analysis and processing of social data, as well as comprehend and understand social theories and facts related to research. In addition, students also need to learn the skills of identifying research problems, collecting and managing complex social data and analysis, as well as proposing hypotheses, testing, developing and perfecting social science theories ("Quantitative social data analysis", 2021).

The prospects and opportunities of the combination of the two and the help to careers

Students who work after graduation can choose to study elective courses based on practical experience methods and analyze social data in a forward-looking way. Students who plan to continue their studies can focus on more theoretical courses, including higher-level courses in the Department of Mathematics and other departments. Prepare for work in business, government, and non-profit organizations to meet the needs of society and become employees who have quantitative analysis skills, understand the complexity and challenges of using social data, and can communicate their results to decision makers. With the advancement of technology, various forms of social data are accumulating rapidly, resulting in a lack of employees with appropriate skills for effective analysis. Graduates of this subject will be in demand in all departments. Graduates will be prepared for social studies or professional institutions ("Quantitative social data analysis", 2021).

3.4   Software Development

As students studying in Software Development at Sydney University, we will acquire plenty of knowledge about Computing, majorly on Programming. Through a high-intensive programming study and practice, we have an admirable logical thinking capability, which is also an unparalleled advantage. With the progress of time and the development of science and technology, the domain of Computing and IT is in a dramatically advancing process as well. Programmers and students major in Computing, nevertheless, are increasingly tough to gain an advantage in the job market by simplex ability on Programming. Therefore, developing an aided capacity will enable our programming to be more characteristic and targeted, and we can be successful in the workspace.

In terms of my comprehensive research and analysis, DECO1016 and MUSC1501 are very suitable electives for students who study Advanced Computing and choosing Software Development as the principal major. They have features in different domains, Design Computing and Music, which could assist us to be more well-rounded. I am going to introduce them detailedly and interpret why they will be the most appropriate electives.

The first elective, DECO1016, is called Introduction to Web Design. It is one of the primary and fundamental courses of students majoring in Bachelor of Design Computing, and that they require to study DECO1016 in the first year at the University of Sydney is essential.

Although the domain of DECO1016 is Design Computing, it is a major of design, instead of Computing. **This course will teach students the fundamental knowledge of design thinking, coding in a creative way, and digital data. It will help the students to take advantage of their skills for dealing with real-world problems, as well as explore the opportunities taken by the new technologies. (the University of Sydney, the handbook for Bachelor of Design Computing, 2021).** Design Science is a newly developing domain from the late 20th century. It targets to create aesthetic projects involving everything in daily life, which could help people work and live efficiently and healthily. All the branches of Design Science are interlinked, including costume design, product design, artistic design, advertisement design, architectural design, landscape design, package design. Designers all require strong

abilities in aesthetics and design technique.

DECO1016 is about the Introduction to Web Design. **Students enrolling in this unit will learn web technologies and prototype web-based user interfaces by using scripting and markup languages such as HTML, CSS. It will provide foundational skills in web design that can be used to implement and communicate design ideas using various media and platforms. Students will be capable of programming dynamic web-based user interfaces and interactive designs. (The University of Sydney, handbook for DECO1016, 2021)**

Comparing with others, it is one of the most suitable electives for students of Software Development. First and foremost, Design Science is one of the domains which assist Computing well. Even if they are in different domains, Computing exercises students' ability of logical thinking and programming, and Design Science enables students to develop design technology. These two features supplement each other, improving our skill sets together. Furthermore, students can learn the technology on Web Design and acquire knowledge about design process and methods. Hence, no matter for other domains or other elective courses in this field, it is undoubtedly suitable for students of Software Development to choose as an introduction to Design Science.

Students will learn two crucial scripting and markup languages – HTML, CSS. **HTML is called Hypertext Markup Language, which is used to design the structure and framework of the webpage by creating the text, pictures, videos, hyperlinks, and other elements of webpages. (W3schools.com, HTML Introduction).** CSS (Cascading Style Sheets) is a tool for the layout of Web pages and a supplement of HTML. It is applied to revise the Web pages by adding some aesthetic components, such as font size, color, background images, and some basic dynamic elements. For our Advanced Computing students, they will be helpful after learning Java and JavaScript, which means that we are capable of building up general websites through the combination of them. Students could also learn mountains of designing skills in DECO1016, and we can take advantage of them to apply the design thought in our projects, which also enhances our computing skills.

Learning Web design and design thinking will be extremely helpful to our career and boost our employment competitiveness. Firstly, Web design will help us in several cases when we work in a company. After graduating from university, most Advanced Computing graduates, especially from Software Development, will work as programmers in companies. The programming skills and professional quality we learned in university can help us being established in workspaces, whereas our tasks will be more than just typing down the codes generally. We require more skills about computer, such as computer maintenance, server maintenance, and Web development. Especially in some small businesses, the comprehensive ability is indispensable for programmers. **There are three types of Web developers. The appearance, user feelings, and interactive components of websites are designed by the Front-End Engineer. The Back-End developers perform a significant role in web development. They build and maintain what is under the hood to keep your website running and functioning properly. The full-stack developer can do the programming job for both the Front-End and Back-End in web development. (MADCAP, The Three Types of Web Developers).** Commonly, graduates from Software Development will work for the back-end. In some small companies, however, owing to the lack of human resources, they allocate more comprehensive projects to programmers. In some cases, back-end developers require to undertake the work as full-stack developers. Moreover, for students studying Software Development, learning the front-end technique will help them qualify as a full-stack developer, which will be a higher-paying job. HTML and CSS are the core tools of front-end development, so learning them through DECO1016 will be a fantastic opportunity to enhance employment prospects.

In the eventual part of the DECO1016 recommendation, I will illustrate the prospects and opportunities of combining Design Science and Computing. Web Design is already a daily common thing, and we can do a more advanced design of Webpages for more earnings. Nonetheless, the design ability will create a great market prospect for the graduates from Software Development. Nowadays, MOBA games are unbelievably popular, and video game companies obtain an excessive profit from selling the game characters and their skins. **MOBA games revolve around the playable characters, and that gives certain specifics to the character design. It's a wide and popular subject since the process of producing a character**

involves so many different areas of expertise. According to a videogame research firm EEDAR, revenues in MOBA games come mostly from avatar cosmetics—meaning, from selling skins or other customization options for characters. (ROOM 8 STUDIO. Skins Concept Art for MOBA Games: Process Specifies. 2019). Therefore, students learning both programming skills and Design concepts will have a fantastic opportunity to join game companies or establish their game companies.

The second elective which I would like to recommend is MUSC1501 from Music major. It may not be a popular choice for students majoring in Advanced Computing as many of them are not fans of music. Having said that, it does not mean that the combination of Music and Computing cannot take a suitable occupation. Instead, they have a surprising development prospect and opportunity.

Music is widespread in our daily life, in some videos, in films, in the theater. We can listen to music everywhere, while actually music is not simple stuff. Music is a kind of art for arranging sounds in time to produce a composition through several components, such as melody, harmony, rhythm, and timbre. **General definitions of music include common elements such as pitch (which governs melody and harmony), rhythm (and its associated concepts tempo, meter, and articulation), dynamics (loudness and softness), and the sonic qualities of timbre and texture (which are sometimes termed the "color" of a musical sound). Different styles or types of music may emphasize, de-emphasize or omit some of these elements. Music is performed with a vast range of instruments and vocal techniques ranging from singing to rapping. (Wikipedia. Music). For the music major at the University of Sydney. It shows excellent performance on music, composition, and teaching. Lots of famous music professors in Australia graduated from the University of Sydney. It aims to enrich Australia through a fantastic multicultural music education, broadly based on studies of society, culture, and performance. (the University of Sydney. Handbook for Bachelor of Music. 2021)**

MUSC1501 is called Extended Fundamentals of Music. As one of the fundamental units of Music, **MUSC1501 will teach students an integrated and research-based approach to music composition and analysis, extending the knowledge of music theory and compositional techniques of students, by covering a range of musical styles. (The University of Sydney. Handbook of MUSC1501. 2021). MUSC1501 is also a compulsory unit of students majoring in Bachelor of Music. The music theory and compositional techniques it delivers will help students gain an elementary insight into this field.**

As I mentioned, for Advanced Computing students, due to a tremendous difference between Music and Computing, MUSC1051 may not be a popular choice. Nevertheless, combining the music composition with programming will show a superb market prospect and development space, and I will expound it in the following parts. In the domain of music, selecting MUSC1501 as the first introductory course for acquainting Software Development students with composing music will be a suitable option. If we enroll in this elective unit, we will not spend most of our time researching music, while other choices are too theoretical and focus on a narrow aspect. That MUSC1501 teaching the fundamentals of music composition will be a starting point for students from Software Development.

By learning this unit, we will be able to write some simple music scores of several styles of music. We can combine programming and music composition to create a music compiler application after further learning of music. The reason why I mention the music compiler application is that this industry shows a great development space. Many companies are developing and updating the music compiler application, and they require lots of programmers who show an admirable ability in music analysis and composition. However, few graduates can meet this requirement, which reveals a potential staff vacancy in this field. By contrast, the more remarkable thing is the imperfection of this industry. Recently, the number of companies that are capable of producing a music compiler is limited, while a few famous brands occupy most of the market shares. Many background music of singers is generated by these more famous brands of the compiler. On the other hand, they are expensive for general people. For instance, people spend more than 500$ for purchasing the copyrighted software of one of the most famous music compiler applications – Cubase. It results in the widespread of pirates at the same time. Besides, they are excessively professional general people. Opening the main workspace with one of them, nearly 100 compiling parameters adapting bottoms and control strips are

densely set up here. These complicated and abstract functions will let people waive their attempts once they see. Currently, the Garageband designed by APPLE makes composition visible, free of charge, and accessible on mobile devices, while the function after simplifying cannot qualify the professional music composition. It shows limit progress on intellectualized music composition as well.

Consequently, there is an opportunity to create a music compiler application combining professionalization and easy operation, using intellectualized music compiling. For example, developing new music compiling approach which can record and precisely identify the singing from users to generate the music scores will be potential. In the present, for Software Development students, learning MUSC1501 for building up the fundamentals of music composition is the beginning point of the opportunity to combine their programming and music composing skills to be successful.

To sum up, DECO1016 and MUSC1501 are the two electives suitable for students majoring in Software Development. They may not be a popular choice, but the combination of their prime skills and programming skills will take an incredible development opportunity.

3.5 Artificial Intelligence

The two elective courses of Stochastic Process (STAT3021) and Optimisation and Financial Mathematics (MATH2070) belong to the field of financial mathematics and financial engineering. Stochastic Process specifically refers to a set of random variables (The University of Sydney, handbook for STAT3021, 2021). Stock fluctuations, voice signals, video signals, Brownian motion, etc. are all examples of stochastic processes in the real world. Optimisation and Financial Mathematics specifically refers to the application of probability theory and mathematical statistics, optimization methods, linear algebra and other related mathematical theories and methods, according to the established target return and risk tolerance, the process of recombining investments and diversifying risks (The University of Sydney, handbook for MATH2070, 2021). It reflects the process of investors' willingness and the constraints imposed on investors, which are the maximization of returns under a certain level of risk or the minimization of risks under a certain level of return.

Optimisation and Financial Mathematics will let us learn various portfolio models and optimization methods, such as linear programming, non-standard LP problems and two-phase simplex algorithm and nonlinear optimisation with and without constraints. At the same time, we can also learn about financial investment models, such as Utility theory and Capital asset pricing model, etc.

Stochastic Process will let us learn all kinds of knowledge about random variables and various random process models and analysis methods, which are mainly divided into two parts: probability methods and mathematical analysis methods. The former includes orbital properties, stopping time, and stochastic differential equations, while the latter includes measurement theory, differential equations, semi-group theory, function stacks, and Hilbert space. The main focus of this course is on stationary processes, Markov processes, martingale theory, limit theorem and stochastic differential equations. Finally, we will learn some examples of the combination of stochastic process and real finance.

These two courses can help us better combine the application of artificial intelligence and reality. For instance, when we deploy computing methods that support artificial intelligence, we need to model stochastic processes. There are many examples of stochastic processes in artificial intelligence, such as random walks and Brownian motion processes, both of which can be used in trading algorithms (Bhattacharya et al., 2009). Trading is another popular area of artificial intelligence applications. Taking into account the growth rate and complexity of transactions, artificial intelligence technology is becoming an indispensable part of transaction practice (Dunis et al., 2016). A particularly attractive feature of artificial intelligence is its ability to process large amounts of data to generate trading signals. Algorithms can be trained to automatically execute transactions based on these signals, which gave birth to the quantitative trading industry. In addition, artificial intelligence technology can reduce transaction costs by automatically analyzing the market and then determining the best transaction time, scale and method. Therefore, artificial intelligence also has a huge impact on portfolio management. Since the 2008 global financial crisis, the optimal management and risk control of asset portfolios have been at the forefront of asset management practices. As financial assets and global markets become more complex, traditional models may no longer be sufficient for asset allocation analysis. At the same time, artificial intelligence technology through the use of data learning and

development can provide additional tools for optimizing asset portfolios (Dunis et al., 2016). In conclusion, artificial intelligence can well assist investment managers in asset allocation and back-testing of different portfolio risk models.

In the future professional career, if we choose to use artificial intelligence for quantitative investment, then the stochastic process and portfolio management and optimization will help us better integrate artificial intelligence and future professional career. Let's take the multi-factor model in quantitative investment as an example, where artificial intelligence can be used, one is to construct factors, and the other is to assign weights to factors. The construction factor here is to use machine learning methods to mine as much information as possible in the existing database. For example, based on the traditional EP and DP (the reciprocal of the price-to-earnings ratio and the price-to-book ratio), we explore whether there is valid information such as EP*DP, or EP raised to the DP power. In other words, it is to use artificial intelligence's fast and large-scale processing capabilities to mine useful information as much as possible (Emerson et al., 2019). However, this kind of method seems reasonable, but it is inconsistent with the traditional investment logic. The traditional logic is that I know what exactly I want to invest in, and the computer is just a tool for me to implement. In other words, factors such as EP or DP have a strong theoretical basis behind their construction. The artificial intelligence searching for factors is searching for unknown islands in the ocean. Even if we find it, we don't know whether this is the result of data fitting or whether it is really effective. Furthermore, even if we gain good results, in real trading, it takes a lot of confidence to really use this factor. But when we combine the knowledge of stochastic process, use probabilistic methods and measurement theory to deduce, regard the price changes of the transaction target as a financial time series sequence, and decompose and reconstruct it, and make predictions of the sequence on this basis. This will make our model more valid and greatly improve our work efficiency and accuracy.

When we have successfully developed an investment strategy, we always need to optimize the parameters of this strategy. At this time, we need to use the knowledge of the optimization strategy, and we can learn from Optimisation and Financial Mathematics. The basics of these knowledge are learned in the class. The convex optimization theory involved in this course, or more broadly, the optimization theory, is used in current artificial intelligence, data mining, or deep learning neural networks (Emerson et al., 2019). The status of convex optimization theory is equivalent to the human backbone, and it supports the learning process of the entire model. Because models, in general, are like people learning to think. We know what we should learn, how we should learn, and how to adjust our knowledge when we find that we have learned it wrong, but no elements in computers is so smart, knowing what to learn and where learn. The optimization theory is a tool that tells the model what to learn and how to learn. The model learning is often a mapping function, that is, the parameter W in the model. The quality of this parameter depends on the answer. But after knowing what is wrong, where to learn, how to learn, and how to adjust, which is the role of optimization theory in it. If there is no optimization theory, then the model does not know how to learn, that is, without optimization, the learning of the model will always be stagnant.

After we have studied these two elective courses, we will have more opportunities to choose employment, and at the same time, we will have more research topics to choose from. In our career path planning, we can include quantitative hedge funds. The investment position construction of quantitative hedge funds mainly relies on quantitative investment models. Compared with the traditional qualitative analysis-based combination construction idea, the quantitative model has obvious advantages in objectivity and rigor. It can cover a wider range of stocks, more repeatable strategy logic, and research and analysis process. The efficiency is also higher. The abilities of compound talents required by quantitative hedge funds mainly lie in three fields: computer, mathematics and finance. It happens that our Optimisation and Financial Mathematics corresponds to the financial field and part of the field of mathematics, and the Stochastic Process corresponds to the field of mathematics. Artificial intelligence, which is our major, corresponds to the computer field. When we have these three abilities and know and understand in all three areas, we can get the opportunity to work in these quantitative hedge funds, such as Bridgewater Associates, Citadel and so on.

In terms of research, we will have more opportunities to combine artificial intelligence with financial and stochastic processes to construct better investment models based on time series, such as the 2017 article "Forecasting Foreign Exchange Rate Movements with k-Nearest- Neighbour, Ridge Regression and Feed-Forward Neural Networks", this article uses three different data mining methods to quantitatively trade 10

simulated time series and 10 real time series of currency exchange rates (Fičura, 2017). According to the theory of stochastic processes and optimization, principal component analysis (PCA) was used to reduce the dimensionality of the prediction set, and to optimize the parameters of the verification sample, and finally the currency exchange rate strategy with the highest profit and the most stable was screened out. The 2018 article "A novel data-driven stock price trend prediction system" proposed a novel stock price trend prediction system that can predict the changes and growth rates of stock prices within a preset forecast time (or rate of decline) interval. It uses an unsupervised heuristic algorithm to cut the raw transaction data of each stock into multiple predefined fixed-length fragments (Zhang et al., 2018). These are employment and research opportunities that we can get after studying these two elective courses. They can not only improve our knowledge level, but also broaden our future career path and research direction.

In summary, these two elective courses should be the most suitable courses for artificial intelligence based on the case of quantitative investment.

4   Contributions

1. Introduction : Four people together
2. Major Allocation : Four people together
3.1 Computer Science : Freya Liu
3.2 Data Science : This person can't be reached, not participated at all
3.3 Information System : Qichang Liu
3.4 Software Development : Louck Xu
3.5 Artificial Intelligence : Junbin Gou
4 Contributions : Four people together
5 Bibliography : Four people together

5   Bibliography

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