

Professional Leave Report Cover Sheet

Name: Jiaochen Liang

Department: Agricultural Business

College: Jordan College of Ag Sciences & Technology

Leave taken: ☒ Sabbatical ☐ Difference in Pay ☐ Professional Leave without Pay

Time Period: ☐ Fall
 ☒ Spring 2023
 ☐ Academic Year
 ☐ Other

Your report will be sent to your Dean for your PAF and to the Library Archives.

Sabbatical Report (Spring 2023)

Dr. Jiaochen Liang, Department of Agricultural Business

1. Background

I took a one-semester sabbatical for the Spring 2023 semester, and the main topic for it was the applications of big data on agribusiness analysis. Data science is playing an increasingly important role in modern business analytics. Big data techniques and artificial intelligence (AI) methods are more frequently used in recent research of different areas, and the wide applications of data-driven decision-makings in business also makes it important for students to learn data-related skills. I spent one semester's academic leave in Spring 2023 to complete this big-data project on agricultural business analytics, which helped me better comprehend the research and teaching skills in this field. During the sabbatical, I successfully completed all my planned academic activities, and achieved the expected goals, which are briefly summarized below.

2. Activities

a) Reviewed literature and new textbooks

The application of big data techniques in agricultural business is a new phenomenon of the recent a few years, so I carefully reviewed the relevant literature and textbooks, which helped me gain better understanding of this subject. In particular, I focused on the areas of agricultural finance, commodity prices, business decision making, and other agriculture and natural resource-related topics that I am interested in. Because in these fields I had previous research experiences and was teaching related courses. A thorough review of the most up-to-date literature helped me better incorporate the new methods of big data analysis into future research and teaching activities. I also carefully reviewed more than ten college-level textbooks in big data and business analytics. Because another important goal of this sabbatical project was to improve my existing courses and prepare for new curriculum plans in this subject.

b) Completed a research paper and develop new research proposals

I completed a research paper titled *Agricultural commodity prices and regional economic development*. In this paper I used big data methods and AI algorithms to study the relationship between the volatilities of agricultural commodity prices and regional economic development in

Central California. This paper focused on the most important crops of the area, including almonds, walnuts, and citrus, and analyzed their bilateral impacts with local economic indexes including land value, housing price, employment, and income. Given the complicated inter-relationships between the multiple variables and the large volume of data, this paper served as a very good example to show the application of big data and AI methods in agricultural business research. Besides, the datasets, methods, and empirical results obtained from this paper could be used as teaching materials and case study topics in my teaching.

c) Big-Data Lab

A Big-Data Lab (<https://sites.google.com/view/big-data-lab>) was successfully built. The main purpose of this lab is to provide a learning and research hub for students and researchers at Fresno State to share and access scholarly materials related to big data, artificial intelligence (AI), and agribusiness analytics. Its short-run mission is to use big data, AI, and business analytics tools to turn data into insights, and support agribusiness and sustainable development in the Central California area and beyond. Now I am actively using this lab and its resources to engage students in my courses, helping them better understand the power of data and related tools in agribusiness.

d) Networking with scholars and industry stakeholders

Big data is an inter-disciplinary subject, and thus networking with scholars of different fields, both within and beyond the CSU system, is very important for my future research and teaching activities. During my sabbatical leave, I reached out to many faculty members in and beyond the Fresno State campus who share similar research interests. We discussed possible research and teaching collaborations. I also took a few short-term travels to present my research and to network with different scholars, including an academic conference in San Diego, and a few Growers' Meetings across the state.

3. Accomplishments

With the above activities, I have effectively accomplished the following goals.

First, the review of recent literature and textbooks in the subject resulted in two outcomes: literature review that were incorporated into my two publications during this period, and a list of textbooks for my teaching. The literature review was about big-data, AI, and their applications in agribusiness and sustainability, which benefited all related research. It will also benefit my research mentees such as honors students who are interested in this field. The shortlist of

textbooks on big data and business analytics turned out to be very helpful for the courses I currently teach at Fresno State.

Second, two research papers were completed (forthcoming):

- J. Liang, A.E. Levi, and A. Westphal, California walnut growers are willing to pay more for disease-resistant rootstocks, *California Agriculture*, (forthcoming)
- Woolwine, D., Vieira, D., Liang, J., Levi, A., Housing prices, labor market, and agricultural commodity prices: new evidence from California San Joaquin Valley. *Agricultural Economics Review*, (forthcoming)

Third, networking with scholars and industry stakeholders provided me with more contacts of people who can be potential collaborators in my future research projects and teaching activities. They would not only provide insights of diverse perspectives for new research and teaching ideas, but also help us increase the exposure of our Department and CSU Fresno in different academic and industry settings.

Lastly, as a very important objective of this sabbatical project, the data-related courses that I teach at Fresno State are improved with the activities I completed. These activities and outcomes provided enriched teaching materials, relevant case study topics, and industry-related hands-on skills for students. They will help students not only better understand the principles and trends of big data and AI methods, but also learn the skills that their potential employers will value.

4. Future Plans

As the next steps, I plan to fully utilize the knowledge and experience that I gained from this sabbatical leave, and further enhance my research and teaching activities at Fresno State. In teaching, the Big-Data Lab will be incorporated into more courses, and students will be included in the data collecting and analysis work; the research papers I recently published will be used as new reading and case-study materials to engage students in real-world research topics. For research, I will seek to finish one or two research proposals focusing on big-data analysis of agribusiness or sustainability. Priority will be given to data-driven new business tools, such as market-targeting or generative AI for business strategies, and how they may affect the new practices of agribusiness in California.

Professional Leave (Sabbatical) Proposal

Dr. Jiaochen Liang

Department of Agricultural Business

1. Background

Data science is playing increasingly important roles in modern business analytics. Big data techniques and artificial intelligence (AI) methods are more and more used in recent research of different areas, and the wide applications of data-driven decision makings in business also makes it important for students to learn data-related skills.

In recent years I have been working in several research projects that involved large amount of data processing, which included topics in agricultural price volatilities, water resource and natural disaster, and rural economics. I noticed that an increasing number of recent studies used new big-data methods to replace or to complement traditional data analysis methods. For example, k-neighbors method is widely applied in substituting clustering analysis, and AI-related techniques such as neural network algorithms are used by many researchers as cross-validations for classic LSM regressions.

I am currently teaching two data-intensive undergraduate courses: AGBS131 Agricultural Financial Markets and AGBS185T Big Data in Agribusiness, both of which are designed for junior or senior undergraduate students as upper-level electives. According to the feedbacks from students of these courses, hands-on skills of data collection, processing, and analytics are highly helpful for their career. This is also supported by people in the industry and our AGBS Department's advisory board who I talked to.

In these backgrounds, I plan to spend one semester to complete a big data project on agricultural business analytics, which will not only lead to greater command of the subject matter and research skills, but also allow me to better design curricula in the big data area.

2. Objectives and Activities

The general purposes and objectives of this proposal include: (1) studies leading to greater command of subject matter; and (2) studies leading to improved curricula. The specific objectives and activities are listed below.

a) Review literature and new textbooks

The application of big data techniques in agricultural business is a new phenomenon of the recent a few years, so I will first review the relevant literature and textbooks to gain better command of this subject. In particular, I will focus on the areas of agricultural finance, commodity prices, business decision makings, and other agriculture and natural resource-related topics that I am interested in. Because in these fields I have previous research experiences and/or am teaching related courses, a thorough review of the most up-to-date literature would help me better incorporate the new methods of big data analysis into future research and teaching activities. I will also carefully review some college level textbooks in big data and business analytics. Because another important goal of this sabbatical project is to improve my existing courses and prepare for new curriculum plans in this subject.

b) Complete a research paper and develop new research proposals

I will complete a research paper titled *Agricultural commodity prices and regional economic development*. In this paper I seek to use big data methods and AI algorithms to study the relationship between the volatilities of agricultural commodity prices and regional economic development in Central California. This paper will focus on the most important crops of the area, such as almonds, walnuts, and citrus, and analyze their bilateral impacts with local economic indexes including land value, housing price, employment, and income. Given the complicated inter-relationships between the multiple variables and the large volume of data, this paper can serve as a very good example to show the application of big data and AI methods in agricultural business research. Besides, the datasets, methods, and empirical results obtained from this paper will also be used as teaching materials and case study topics in my teaching.

In addition, I will also develop a new research proposal in this field and seek to apply for external fundings. Currently big data and AI techniques are receiving increasing attention and supports from both the industry and the government. But their applications in agricultural business may

have not yet obtained enough attention proportionate to the importance of agriculture. From this sabbatical research I will seek to find some appropriate topics where big data methods can excel traditional tools, such as agricultural commodity prices and complex regional economic linkages, and then complete a research proposal to apply for external fundings.

c) Network with scholars and industry stakeholders

Big data is an inter-disciplinary subject, and thus networking with scholars of different fields, both within and beyond the CSU system, would be very important for my future research and teaching activities. Over the past few years, I have collaborated with many colleagues at Fresno State in data-related research projects, and I will contact more faculty in the campus who share similar research interests to discuss possible research and teaching collaborations. Depending on the travel restrictions during my sabbatical leave, I plan to take a few short-term travels to other domestic and/or international institutions to present my research and network with different scholars. But priority will be given to researchers in the central California area who have similar research interests in big data and the local agricultural business.

Another very important plan regarding networking is to build more connections with local industry stakeholders and try to better understand their expectations of our students in data-related skills. It is a consensus in our AGBS Department that data-related hands-on skills, such as Excel and other softwares, are very important in our students' future career. More communications with our industry stakeholders will allow us better to understand those potential employers' needs, which will be helpful for our course designs and benefit our students.

d) Modify and enhance curriculum

With the outcomes of the above objectives and activities, I will modify my current courses related to big data and agricultural business, seeking to enhance the teaching materials and make them more relevant to the industry. Specifically, more recent textbooks and reading materials can be added to the course contents; the data and models used in my research paper can be included in the case study parts; and industry networking may help me find guest speakers and provide updates about the market trends of the local agricultural business.

3. Expected Outcomes

The expected outcomes of the above objectives are summarized as below:

First, the review of recent literature and textbooks in the subject should result in two outcomes: a literature review report and a shortlist of textbooks for future curriculum. The literature review report can be used for research papers in the future, and it can also benefit my research mentees such as honors students who are interested in this field. The shortlist of textbooks in big data and business analytics will be helpful for the courses I teach and will teach in this subject.

Second, a research paper titled *Agricultural commodity prices and regional economic development* will be completed and submitted to an academic journal in the areas of either agricultural business or quantitative economics. In addition, I will also complete a research proposal for external funding, which utilizes big data methods to analyze economic questions that are relevant to California agricultural business or environmental issues.

Third, networking with scholars and industry stakeholders will result in more contacts of people who can be potential collaborators in my future research projects and teaching activities. They can not only provide insights of diverse perspectives for new research and teaching ideas, but also help us increase the exposure of our Department and CSU Fresno in different academic and industry settings.

Lastly, as a very important objective of this sabbatical project, the data-related courses that I teach at Fresno State will be improved. The above proposed activities and outcomes will provide enriched teaching materials, relevant case study topics, and industry-related hands-on skills for students. They will help students not only better understand the principles and trends of big data and AI methods, but also learn the skills that their potential employers will value.

4. Benefits to the University

As a faculty member of the University, I will gain greater command of the subject matter in Big Data and Agricultural Business Analytics. This will make me more capable of collaborating with other faculty, publishing high-quality academic papers in this area, applying for external research fundings, and providing professional service to the community.

In additional, the curriculum in the subject area will be improved. The expected outcomes of this sabbatical project as explained in the above sections will provide enhanced and divers teaching materials in my courses that are related to big data. The research and networking experiences gained from this project will help me better understand the educational trends and industry needs in this field, which will significantly benefit our students and the University.

5. Time Requested and Project Timeline

The time requested for this sabbatical leave is one semester (Fall 2022), and a projected timeline for each of the projected activities is shown below:

Project Timeline – Fall 2022 Semester

Objectives and Activities:	Aug	Sep	Oct	Nov	Dec
a) Literature and new textbook review	✓				
b) Complete a research paper and develop new research proposals	✓	✓	✓	✓	
c) Networking with scholars and industry stakeholders		✓	✓	✓	
d) Modify and enhance curriculum				✓	✓
Writing sabbatical report					✓