Cover Letter

Dear NBER Innovation Boot Camp Committee,

I am writing to express my strong interest in attending the NBER Boot Camp on Innovation. As a second-year Ph.D. student in Information Systems at Virginia Commonwealth University (VCU), my research focuses on the intersection of artificial intelligence (AI) and its impact on employment and mental health. Specifically, I am examining how AI, particularly deep learning and large language models (LLMs), influences various aspects of employment dynamics and mental health treatment, using advanced econometric methods. My work is currently targeted for submission to *Information Systems Research* (ISR), one of the leading journals in the field.

I am deeply interested in exploring how AI technologies drive innovation, and I aim to use the boot camp as an opportunity to broaden my research on AI's role in reshaping innovation at the product, organizational, and individual levels. I am particularly eager to expand my knowledge in applying AI-based methodologies to measure innovation and infer causal relationships in innovation research. I believe that I will benefit greatly from the rigorous discussions and insights provided by the boot camp's distinguished faculty.

My recommendation letter will be provided by Dr. Victoria Yoon (vyyoon@vcu.edu), my advisor at VCU.

I look forward to the opportunity to engage with leading researchers in the field of innovation and AI, and I am excited to contribute to the discussion with my interdisciplinary background in AI and Information Systems.

Thank you for considering my application. I look forward to the possibility of participating in the NBER Boot Camp and enhancing my research and academic development.

Sincerely,

Lingyu Li

lil13@vcu.edu

5169794198
Ph.D. Student, Information Systems
Virginia Commonwealth University

Virginia Commonwealth Univ

Unofficial Academic Transcript

ⓘ This is not an official transcript. Courses which are in progress may also be included on this transcript.

Transcript Data

STUDENT INFORMATION

Name	Birth Date
Lingyu Li	28-OCT

Current Program

Doctor of Philosophy

College	Major Concentration	Major and Department
School of Business	Information Systems	Business, Business-Dean's Office

DEGREES AWARDED

Sought

Doctor of Philosophy

Primary Degree

College	Major	Major and Concentration
School of Business	Business	Information Systems

TRANSFER CREDIT ACCEPTED BY INSTITUTION

201810 : Univ Rhode Island

Subject	Course	Title	Grade	Credit hours	Quality points	R
ECON	501	EEC 576-ECONOMETR	TR	4.000	0.00	

	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA
Current Term	4.000	4.000	4.000	0.000	0.00	0.000

201820 : Univ Rhode Island

Subject	Course	Title	Grade	Credit hours	Quality points	R
ECON	612	EEC 676-ADV ECONOMETR	TR	4.000	0.00	

	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA
Current Term	4.000	4.000	4.000	0.000	0.00	0.000

INSTITUTION CREDIT

Term : Fall 2023

College	Major	Student Type	Academic Standing
School of Business	Business	New First Time - Degree Level	N/A

Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	Start and End Dates	R	CEU Contact Hours
BUSN	701	GR	RESEARCH DESIGN IN BUSINESS	A	3.000	12.00			
INFO	610	GR	ANALYS & DESGN OF DATABASE SYS	A	3.000	12.00			
INFO	790	GR	DOCTORAL SEMINAR	A	3.000	12.00			

Term Totals	Attempt Hours	Passed Hours	CEU Hours	GPA Hours	Quality Points	GPA
Current Term	9.000	9.000	9.000	9.000	36.00	4.000
Cumulative	9.000	9.000	9.000	9.000	36.00	4.000

Term : Spring 2024

UNOFFICIAL

College	Major	Student Type	Academic Standing
School of Business	Business	Continuing	N/A

Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	Start and End Dates	R	CEU Contact Hours
BUSN	700	GR	PRINCPLS OF SCI INQUIRY IN BUS	A	3.000	12.00			
INFO	630	GR	SYSTEMS DEVELOPMENT	A	3.000	12.00			
INFO	702	GR	DESIGN SCI RESRCH METHDS IN IS	A	3.000	12.00			
INFO	790	GR	DOCTORAL SEMINAR	A	3.000	12.00			

Term Totals	Attempt Hours	Passed Hours	CEU Hours	GPA Hours	Quality Points	GPA
Current Term	12.000	12.000	12.000	12.000	48.00	4.000
Cumulative	21.000	21.000	21.000	21.000	84.00	4.000

Term : Summer 2024

College	Major	Student Type	Academic Standing
School of Business	Business	Continuing	N/A

Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	Start and End Dates	R	CEU Contact Hours
INFO	697	GR	GUIDED STUDY IN IS	A	3.000	12.00			

Term Totals	Attempt Hours	Passed Hours	CEU Hours	GPA Hours	Quality Points	GPA
Current Term	3.000	3.000	3.000	3.000	12.00	4.000
Cumulative	24.000	24.000	24.000	24.000	96.00	4.000

Term : Fall 2024

College	Major	Student Type	Academic Standing
School of Business	Business	Continuing	N/A

Last Academic Standing
N/A

Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	Start and End Dates	R	CEU Contact Hours
INFO	697	GR	GUIDED STUDY	A	3.000	12.00			
INFO	701	GR	QUALITATIVE RSRCH IN INFO SYS	A	3.000	12.00			
INFO	740	GR	AI-BASED DECISION SUPP SYSTEMS	A	3.000	12.00			

Term Totals	Attempt Hours	Passed Hours	CEU Hours	GPA Hours	Quality Points	GPA
Current Term	9.000	9.000	9.000	9.000	36.00	4.000
Cumulative	33.000	33.000	33.000	33.000	132.00	4.000

TRANSCRIPT TOTALS

Transcript Totals - (Graduate)	Attempt Hours	Passed Hours	CEU Hours	GPA Hours	Quality Points	GPA
Total Institution	33.000	33.000	33.000	33.000	132.00	4.000
Total Transfer	8.000	8.000	8.000	0.000	0.00	0.000
Overall	41.000	41.000	41.000	33.00	132.00	4.000

COURSE(S) IN PROGRESS

Term : Spring 2025

College	Major	Student Type
School of Business	Business	Continuing

UNOFFICIAL

Subject	Course	Level	Title	Credit Hours	Start and End Dates
GRAD	602	GR	TEACH & LEARN IN HIGHER ED	2.000	
INFO	697	GR	GUIDED STUDY: INFO SYSTEMS	3.000	
INFO	750	GR	INFORMATION SYSTEMS SECURITY	3.000	
INFO	898	GR	DISSERTATION RESEARCH	1.000	

UNOFFICIAL

Lingyu Li

CFA Level III Candidate
VCU School of Business
Virginia Commonwealth University
Richmond, VA 23284

Office: 516-979-4198
Email: lil13@vcu.edu

EDUCATION

Virginia Commonwealth University, Richmond, VA — August 2023 - now
Ph.D. in **Information Systems**

University of Massachusetts Dartmouth, North Dartmouth, MA — August 2015 - Jan 2017
MBA major in **Finance**

Central University of Finance and Economics, Beijing, China — August 2010 - June 2014
B.Sc., **Finance**

RESEARCH INTERESTS

Domains:

- Artificial Intelligence
- Fintech

Methodologies:

- Applied Econometrics

WORK-IN-PROGRESS

IP1. "**The spillover impact of AI technology on real estate employment**." with Yeongin Kim, Xiaojin Liu. Status: Preparing a manuscript ***for Information Systems Research (Lead Author)***

IP2. "**Exploring the Characteristics and Effectiveness of Generative Artificial Intelligence for Mental Support Provision.**" with Xunyu Chen, Victoria Yoon and Xiaojin Liu. Status: Preparing a manuscript ***for Information Systems Research (Co-Author)***

IP3. "**Information security compliance intentions in the remote environment.**" with Victoria Yoon, Dan Kim and Jose Cortina. Status: Preparing a manuscript ***for Journal of Management Information Systems (Lead Author)***

PRESENTATIONS

The spillover impact of AI technology on real estate employment.

-2024, Production and Operations Management Society (POMS) Conference
-2024, Conference on Information Systems and Technology (CIST) Conference
-2024, Informs Conference

Exploring the Characteristics and Effectiveness of Generative Artificial Intelligence for Mental Support Provision.
-2024, Conference on Information Systems and Technology (CIST) Conference

AWARDS, HONORS, AND FELLOWSHIPS

- Small Research Grants ($2500), VCU 2024
- Graduate Student Travel Grant ($500), VCU 2024/2025

SERVICE

Conference Reviewer
International Conference on Information Systems (ICIS) 2024
Southeast Decision Sciences Institute 2025 Conference

Conference/Workshop Session Host
POMs Annual Meeting 2024

COMPUTATIONAL SKILLS

Programming Languages:	R, Python, MATLAB, MySQL
Analytics Packages:	STATA, SAS
Other:	LaTex, Mathematica

Application for NBER Innovation Boot Camp

Dear NBER Innovation Boot Camp Committee,

I am writing to express my strong interest in attending the upcoming NBER Boot Camp on Innovation. As a Ph.D. student in Information Systems (IS), I am deeply committed to conducting rigorous, data-driven research at the intersection of AI and innovation. My current work examines the impact of AI on social welfare, specifically in real estate employment and mental health treatment, using econometric methods such as Difference-in-Differences. Those two papers have already been accepted and presented at the prestigious CIST 2024 conference, and I am currently preparing them for submission to top-tier IS journals. My long-term research goal is to explore how AI technologies, such as deep learning and large language models (LLMs), interact with and drive innovation. I am particularly interested in how AI can be integrated into innovation research across three key dimensions:

1. AI as an Antecedent of Innovation

AI is increasingly shaping innovation at the product, individual, firm, and regional levels. It has been documented to facilitate the development of innovation. Expanding on its impact on R&D in pharmaceuticals, Myers and Pauly (2019) explored AI's role, while Lou et al. (2021) narrowed the focus and empirically found that AI boosts drug discovery for moderately innovative medicines. Brynjolfsson et al. (2023) found that AI enhances productivity, and at a more granular product level, Babina et al. (2024) found that AI drives product innovation.

One critical challenge is accurately measuring AI. Previous research has employed AI Occupational Exposure (Felten et al., 2021), job postings (Babina et al., 2024), and real-world AI adoption (McElheran et al., 2024; Bonney et al., 2024; Brynjolfsson et al., 2023; Acemoglu & Restrepo, 2020). My approach is to use quasi-experimental methods, such as the announcement of ChatGPT-4o or major algorithmic shifts as disruptive events, leveraging Difference-in-Differences and Regression Discontinuity techniques. More specifically, I am interested in how AI influences or corrects the direction of innovation,

particularly in relation to the distorted innovation pathways identified by Bryan et al. (2021). As documented in Lou et al. (2021), AI has the potential to shift the R&D process in drug development, and this shift could also influence the direction of innovation in other domains. I am particularly interested in thoroughly exploring the potential effects of AI on the direction of innovation across various industries. Furthermore, I aim to investigate AI's impact on individual innovation, as emphasized by Choudhury et al. (2023), who highlighted its critical role in economic development. Based on my findings from the project examining the impact of AI on real estate agent employment, I observed that employees' ability to effectively utilize AI significantly influences their job performance and employment outcomes. I hope to extend my research and investigate the impact of AI on individual innovation capability.

Attending this boot camp will enhance my understanding of innovation foundations, allowing me to refine my measurement techniques and empirical strategies. I am eager to deepen my understanding of the foundational principles of innovation, particularly how rigorous researchers conceptualize and model innovation, as well as how its dynamics evolve in the era of AI.

2. AI as a Methodological Tool for Causal Inference in Innovation Research

AI is not only an innovation driver but also a powerful tool for establishing causal relationships.Recent research (Athey, 2018) has emphasized the role of machine learning in economics, and deep learning models are now being explored for causal inference (Montagna et al., 2024; Berrevoets et al., 2023; Luo et al., 2020). I am eager to explore how transformer-based models (Montagna et al., 2024) can improve causal inference in innovation research.

3. AI as a Tool for Measuring Innovation

Traditional measures of innovation, such as patent counts and trademarks (Babina et al., 2024), do not fully capture the scope of modern innovation. With the rise of big data, I am interested in leveraging LLMs to construct innovation indices from text, news, and social media data while ensuring consistency and replicability. By attending this boot camp, I hope to gain a deeper understanding of the foundations of innovation measurement, which will guide my development of new AI-driven metrics.

The NBER community has deeply influenced my academic perspective, and I regularly engage with NBER papers even though my primary field is IS. The high-quality, impactful research published by NBER aligns closely with my academic aspirations. This boot camp would provide me with an opportunity to: learn from leading innovation scholars such as Dr. Heidi Williams, whose work on patents and innovation measurement directly relates to my research; gain insights from industry and policy perspectives—I am particularly interested in how Dr. Ronnie Chatterji, given his role at OpenAI, perceives AI's influence on innovation; engage with a diverse and interdisciplinary research community, which would help me bridge the gap between IS, AI, and innovation studies. I sincerely hope that I will contribute a unique IS perspective to the NBER community, enriching discussions on AI's role in innovation. My background in AI, econometrics, and finance enables me to explore how AI reshapes innovation measurement, direction, and methodology. Furthermore, I am committed to producing research with practical implications for policymakers and businesses. This opportunity would accelerate my academic growth by immersing me in cutting-edge innovation research and allowing me to interact with leading scholars in the field. I am eager to refine my research questions, enhance my methodological toolkit, and contribute meaningfully to the NBER research community.

Thank you for your time and consideration. I would be honored to participate in the NBER Boot Camp and look forward to the opportunity to engage with the esteemed faculty and fellow researchers.

Best regards,

Lingyu Li

Ph.D. Student, Information Systems
Virginia Commonwealth University

lil13@vcu.edu

Reference:

Acemoglu, D., & Restrepo, P. (2020). Robots and jobs: Evidence from US labor markets. *Journal of political economy*, *128*(6), 2188-2244.

Athey, S. (2018). The impact of machine learning on economics. In *The economics of artificial intelligence: An agenda* (pp. 507-547). University of Chicago Press.

Babina, T., Fedyk, A., He, A., & Hodson, J. (2024). Artificial intelligence, firm growth, and product innovation. *Journal of Financial Economics*, *151*, 103745.

Berrevoets, J., Kacprzyk, K., Qian, Z., & van der Schaar, M. (2023). Causal deep learning. *arXiv preprint arXiv:2303.02186*.

Bonney, K., Breaux, C., Buffington, C., Dinlersoz, E., Foster, L. S., Goldschlag, N., ... & Savage, K. (2024). *Tracking firm use of AI in real time: A snapshot from the Business Trends and Outlook Survey* (No. w32319). National Bureau of Economic Research.

Bryan, K. A., Lemus, J., & Marshall, G. (2022). R&D competition and the direction of innovation. *International Journal of Industrial Organization*, *82*, 102841.

Brynjolfsson, E., Li, D., & Raymond, L. R. (2023). *Generative AI at work* (No. w31161). National Bureau of Economic Research.

Choudhury, P., Ganguli, I., & Gaulé, P. (2023). Top talent, elite colleges, and migration: Evidence from the Indian Institutes of Technology. Journal of Development Economics, 164, 103120.

Felten, E., Raj, M., & Seamans, R. (2021). Occupational, industry, and geographic exposure to artificial intelligence: A novel dataset and its potential uses. *Strategic Management Journal*, *42*(12), 2195-2217.

Lou, B., & Wu, L. (2021). AI on drugs: Can artificial intelligence accelerate drug development? Evidence from a large-scale examination of bio-pharma firms. *Evidence from a Large-scale Examination of Bio-pharma Firms,(March 15, 2021). MISQ Forthcoming*.

Luo, Y., Peng, J., & Ma, J. (2020). When causal inference meets deep learning. *Nature Machine Intelligence*, *2*(8), 426-427.

McElheran, K., Li, J. F., Brynjolfsson, E., Kroff, Z., Dinlersoz, E., Foster, L., & Zolas, N. (2024). AI adoption in America: Who, what, and where. *Journal of Economics & Management Strategy*, *33*(2), 375-415.

Montagna, F., Cairney-Leeming, M., Sridhar, D., & Locatello, F. (2024). Demystifying amortized causal discovery with transformers. *arXiv preprint arXiv:2405.16924*.

Myers, K., & Pauly, M. (2019). Endogenous productivity of demand-induced R&D: evidence from pharmaceuticals. *The RAND Journal of Economics*, *50*(3), 591-614.

VCU School of Business

February 13, 2025

To Whom It May Concern,

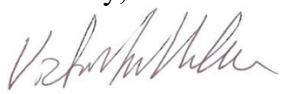
It is my pleasure to provide this letter of reference to nominate Ms. Lingyu Li for the National Bureau of Economic Research (NBER) Innovation Research Boot Camp 2025. For the last two years I have closely worked with her as her Ph.D. advisor.

Lingyu is truly an outstanding Ph.D. student. She has demonstrated exceptional analytical skills and a strong grasp of complex research methodologies, earning an 'A' grade in all her courses. She has received comprehensive and advanced training in AI, particularly in the AI-based Decision Support Systems seminar course I taught. Lingyu's research strengths lie in her rigorous, data-driven approach to studying the intersection of AI and innovation. She leverages advanced econometric methods, such as Difference-in-Differences, to analyze AI's impact on social welfare, employment, and mental health treatment—demonstrating both theoretical depth and practical significance.

Her future research aims to explore AI as (1) an antecedent of innovation, (2) a methodological tool for causal inference, and (3) a means of measuring innovation. Through this work, she seeks to advance a comprehensive understanding of how AI shapes economic and technological progress. A key innovation in her research is integrating AI-driven measurement techniques with causal inference methods to refine how innovation is conceptualized and studied. She is particularly focused on AI's role in shaping innovation's direction, correcting distortions, and enhancing individual innovative capacity—aligning with pressing global challenges in technology adoption and economic development. Lingyu's interdisciplinary perspective bridges Information Systems, AI, and innovation studies, positioning her research at the forefront of emerging fields.

In summary, her dedication, strong work ethic, and expertise make her both an ideal beneficiary of and a valuable contributor to the NBER Innovation Research Boot Camp. The NBER Boot Camp will help guide and refine her work, allowing her to contribute novel insights on AI's transformative role in innovation research. The academic discourse contributed by the other participants will, no doubt, guide her work into better, more solid contributions. I, therefore, strongly recommend Lingyu for the NBER Innovation Research Boot Camp.

Sincerely,



Victoria Y. Yoon, Ph.D.
Professor
Co-Editor-in-Chief, Decision Support Systems