

R1 Nomination for Research and Scholarship Excellence

Collaborative Research Cluster on
Explainable Artificial Intelligence for Responsible Business Decisions

Title of the Collaborative Cluster:

Explainable Artificial Intelligence for Responsible Business Decisions

Participating Disciplines/Academic Units/Departments:

Department of Management, Belk College of Business (BCOB)

Department of Computer Science, College of Computing and Informatics (CCI)

Department of Mathematics and Statistics, College of Liberal Arts and Sciences (CLAS)

Organizational Science (OS), College of Liberal Arts and Sciences (CLAS)

School of Data Science (SDS)

Coordinators:

Victor Zitian Chen, Associate Professor of Management, BCOB; Affiliate Faculty, OS and SDS

Wlodek Zadrozny, Professor of Computer Science, CCI; Core Faculty, SDS

Target Category: Future Opportunity and Investment

Keywords:

Explainable Artificial Intelligence, Responsible Business, Knowledge Synthesis, Knowledge Graph, Natural Language Processing

Executive Summary

Artificial intelligence (AI) could add \$15.7 trillion to the global economy by 2030 (PwC, 2020). Yet, on questions around how much AI can be trusted, opinions are less optimistic –84% of CEOs in a recent global survey suggest that AI-based decisions need to be explained in order to be trusted (PwC, 2020). To our knowledge, none of any major universities worldwide has established a research center specifically for explainable AI solutions. The opportunity to be a groundbreaker is huge!

Our collaborative research cluster was formed to be the groundbreaker and tackle this emerging challenge through deep interdisciplinary integration. With 8 members from 3 colleges and 2 interdisciplinary programs, our cluster focuses on the development of explainable artificial intelligence (XAI) solutions to optimize decision-making for responsible business practices. Responsible business practices refer to corporate, managerial, and leadership practices that deliver broad economic and social benefits to all stakeholders of an enterprise; XAI refers to machine learning that can elucidate the algorithmic process to subject matter experts.

Our cluster represents a unique interdisciplinary collaboration across business studies, organization science, data science, natural language processing, visualization, and the mathematics of machine learning. Our collaboration is driven to accomplish three collective goals: (1) synthesizing fragmented science on responsible business practices; (2) democratizing the scholarly knowledge access across disciplines as well as for the public; and (3) connecting research synthesis timely with commercial and societal needs.

Our cluster members are among the leading scholars in the following areas that give rise to XAI solutions for responsible business decisions: (a) developing a comprehensive knowledge base on responsible business practices through research synthesis of causal knowledge concerning different business stakeholders; (b) advancing mathematical methods for research synthesis such as meta-analysis and meta-learning; (c) developing natural language processing (NLP) models to accelerate and scale research synthesis; (d) visually representing knowledge synthesis into a knowledge graph (KG); (e) KG embedding to enable causal modeling for explainable machine learning; and (f) technology development of interactive user interfaces to interpret machine learning models.

Collectively, our cluster has demonstrated very strong evidence for outstanding research productivity, scholarly and broad impact, external funding, and commercialization in the aforementioned areas. Together, we have published **527 refereed papers**, earned **42,124 Google Scholar cites** (as of 02/22/2021), secured more than **\$13 million in external grants and gifts** in the last five years, and submitted new proposals for an additional **\$5.74 million pending external grants**. Our research has been sponsored by such industry, government, and community partners as US Army, IBM, Dell, and the Center for Open Science. In terms of commercialization, our research has led to **2 NSF I-Corps teams, 1 NSF I/UCRC site, and 3 successful spinoffs**.

Our research has achieved national and international recognition at very high levels, such as earning the Best Paper Award at the Academy of Management, Sage/CARMA Early Career Award at the Academy of Management, AAI Feigenbaum Prize, Humboldt Fellow, and being Elected Fellows at American Psychological Association, as well as media coverage by Financial Times, CNBC, New York Times, the Wall Street Journal, and NPR news. Some notable examples of collaboration include two SDS Seed Grants, a publication on causal knowledge extraction, 2021 NSF I-Corps, two working projects on meta-analysis, and **\$2 million** grant proposals under review. **Additional resources would fund us to establish the world's first and foremost university Center of Excellence for XAI and business, and help us get long-term commitments of graduate/Ph.D. students from multiple disciplines to work together as a team.**

Supplement Documents

S1A. Names, Titles, and Expertise of Cluster Members

	Titles	A Short Description of Expertise
George Banks	Associate Professor of Management, Core Faculty at OS	Dr. Banks specializes in leadership, strategic human resource management, ethics, and organizational research methods (e.g., open science, meta-analysis). His scholarly contribution to this cluster is research methods for organizational research synthesis.
Razvan Bunescu	Associate Professor of Computer Science	Dr. Bunescu specializes in the general area of machine learning, with a major focus on applications in natural language processing and more recently computational creativity. His scholarly contribution to this cluster is NLP methods to automate and scale knowledge synthesis.
Duan Chen	Associate Professor of Mathematics, Affiliate Faculty at SDS	Dr. Chen specializes in randomized numerical linear algebra, numerical analysis and its applications in machine learning algorithms, as well as modeling and computational methods. His scholarly contribution to this cluster is mathematical methods for evidence synthesis from multiple data sources.
Victor Zitian Chen*	Associate Professor of Management, Affiliate Faculty at SDS and OS	Dr. Chen specializes in organizational performance, business strategy, and knowledge synthesis of scholarly research in social/economic sciences. His scholarly contribution to this cluster is developing overarching frameworks for business/management knowledge synthesis, research methods for synthesis, knowledge graph embedding for ML, and XAI user technology development.
Wenwen Dou	Assistant Professor of Computer Science, Affiliate Faculty at SDS	Dr. Dou specializes in visual and text analytics, interactive visualization, and machine learning. Her scholarly contribution to this cluster is knowledge graphs and interactive visualization for XAI users.
Scott Tonidandel	Professor of Management, Core Faculty at OS, Affiliate Faculty at SDS	Dr. Tonidandel specializes in leadership, big data in organizational science, and organizational research methods (e.g., meta-analysis). His scholarly contribution to this cluster is research methods for organizational research synthesis.
David Woehr	Belk Distinguished Professor of Management, Core Faculty at OS	Dr. Woehr specializes in performance measurement, managerial assessment, and organizational research methods (e.g., applied psychometrics, meta-analysis). His scholarly contribution to this cluster is research methods for organizational research synthesis.
Wlodek Zadrozny*	Professor of Computer Science, Core Faculty at SDS	Dr. Zadrozny specializes in natural language understanding and its application of concept embeddings and topological data analysis of scholarly and business documents. His scholarly contribution to this cluster is NLP methods to automate and scale knowledge synthesis.

*Cluster coordinators