

I3A: An Intelligent Interactive Information Agent Model for Information Retrieval

ChengXiang Zhai

University of Illinois at Urbana-Champaign
Urbana, IL 61801, USA
czhai@illinois.edu

ABSTRACT

Information Retrieval (IR) can be broadly interpreted as an interactive process for connecting users with the right information at the right time to finish a task, where interaction can be multimodal (e.g., using text, speech, and gestures) and connection can be made in multiple ways (e.g., querying, browsing, and recommendation). Although many formal IR models have been developed, the existing models are generally restricted to modeling the problem of ranking information items in response to a user's query without much consideration of user interaction. As a result, how to develop a general formal model that can cover all the variations of interactive IR (IIR) remains an open challenge. In this talk, I will discuss how we can address this challenge and present a general formal model for IR, called Intelligent Interactive Information Agent (I3A) model, which provides a unified theoretical foundation for both optimizing and evaluating sophisticated IIR algorithms and application systems. In I3A, an IIR system is modeled generally as an intelligent interactive information agent which plays an interactive cooperative "game" with its user(s), where both parties would take turns to "make moves" and interact with each other with a common objective of helping a user finish a task with minimum overall user effort [1]. The optimization of IIR can be formally modelled as the agent optimizing a sequence of interaction decisions in response to each user action in a Bayesian decision framework. I will discuss how to refine the various components of the decision framework to make I3A operational and how multiple existing models, such as the Interface Card Model, the Probability Ranking Principle for IIR, formal models of users, and online learning to rank, can all be covered in the general I3A model. The I3A model also naturally suggests a new general methodology of evaluating IIR systems using search simulation [2].

CCS Concepts/ACM Classifiers

• Information Systems ~ Information Retrieval

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the Owner/Author(s).

ICTIR '22, July 11–12, 2022, Madrid, Spain.

© 2022 Copyright is held by the owner/author(s).

ACM ISBN 978-1-4503-9412-3/22/07.

<https://doi.org/10.1145/3539813.3545943>

Author Keywords

Interactive information retrieval; information retrieval models; intelligent agent; cooperative game

BIOGRAPHY

ChengXiang Zhai is a Donald Biggar Willett Professor in Engineering of the Department of Computer Science at the University of Illinois at Urbana-Champaign. His research interests are in intelligent information retrieval, data mining, natural language processing, machine learning, and their applications. He has published over 300 papers in these areas and holds 6 patents. His textbook on text data management and analysis is used worldwide by many learners of the two MOOCs that he offered on Coursera. He served as Associate Editors for several journals (e.g., ACM TOIS, IPM, ACM TKDD, and ACM TIST), Program Co-Chairs of CIKM'04, NAACL HLT'07, SIGIR'09, and WWW'15, and Conference Co-Chairs of CIKM'16, WSDM'18, and IEEE BigData'20. He is an ACM Fellow and a member of ACM SIGIR Academy. He received multiple awards, including ACM SIGIR Gerard Salton Award, ACM SIGIR Test of Time Paper Award (three times), the Presidential Early Career Award for Scientists and Engineers (PECASE), Alfred P. Sloan Research Fellowship, IBM Faculty Award, HP Innovation Research Award, Microsoft Beyond Search Research Award, UIUC Rose Award for Teaching Excellence, and UIUC Campus Award for Excellence in Graduate Student Mentoring. More information about him and his work can be found from his homepage at <http://czhai.cs.illinois.edu/>.



REFERENCES

- [1] ChengXiang Zhai, Towards a game-theoretic framework for text data retrieval. *IEEE Data Eng. Bull.* 39(3): 51-62 (2016). <http://sites.computer.org/debull/A16sept/p51.pdf>
- [2] Yinan Zhang, Xueqing Liu, and ChengXiang Zhai. 2017. Information Retrieval Evaluation as Search Simulation: A General Formal Framework for IR Evaluation. In *Proceedings of the ACM SIGIR ICTIR '17*, 193–200. <https://doi.org/10.1145/3121050.3121070>