Task Intelligence for Search and Recommendation

Synthesis Lectures on Information Concepts, Retrieval, and Services

Editor
Gary Marchionini, ***University of North Carolina, Chapel Hill***

Synthesis Lectures on Information Concepts, Retrieval, and Services publishes short books on topics pertaining to information science and applications of technology to information discovery, production, distribution, and management. Potential topics include: data models, indexing theory and algorithms, classification, information architecture, information economics, privacy and identity, scholarly communication, bibliometrics and webometrics, personal information management, human information behavior, digital libraries, archives and preservation, cultural informatics, information retrieval evaluation, data fusion, relevance feedback, recommendation systems, question answering, natural language processing for retrieval, text summarization, multimedia retrieval, multilingual retrieval, and exploratory search.

Task Intelligence for Search and Recommendation
Chirag Shah and Ryen W. White
2021

Trustworthy Communications and Complete Genealogies: Unifying Ancestries for a Genealogical History of the Modern World
Reagan W. Moore
2021

Word Association Thematic Analysis: A Social Media Text Exploration Strategy
Michael Thelwall
2021

Simulating Information Retrieval Test Collections
David Hawking, Bodo Billerbeck, Paul Thomas, and Nick Craswell
2020

Automatic Disambiguation of Author Names in Bibliographic Repositories
Anderson A. Ferreira, Marcos André Gonçalves, and Alberto H. F. Laender
2020

Visual Information Retrieval using Java and LIRE
Mathias Lux and Oge Marques
2013

On the Efficient Determination of Most Near Neighbors: Horseshoes, Hand Grenades, Web Search and Other Situations When Close is Close Enough
Mark S. Manasse
2012

The Answer Machine
Susan E. Feldman
2012

Theoretical Foundations for Digital Libraries: The 5S (Societies, Scenarios, Spaces, Structures, Streams) Approach
Edward A. Fox, Marcos André Gonçalves, and Rao Shen
2012

The Future of Personal Information Management, Part I: Our Information, Always and Forever
William Jones
2012

Search User Interface Design
Max L. Wilson
2011

Information Retrieval Evaluation
Donna Harman
2011

Knowledge Management (KM) Processes in Organizations: Theoretical Foundations and Practice
Claire R. McInerney and Michael E. D. Koenig
2011

Search-Based Applications: At the Confluence of Search and Database Technologies
Gregory Grefenstette and Laura Wilber
2010

Information Concepts: From Books to Cyberspace Identities
Gary Marchionini
2010

Estimating the Query Difficulty for Information Retrieval
David Carmel and Elad Yom-Tov
2010

iRODS Primer: Integrated Rule-Oriented Data System
Arcot Rajasekar, Reagan Moore, Chien-Yi Hou, Christopher A. Lee, Richard Marciano, Antoine de Torcy, Michael Wan, Wayne Schroeder, Sheau-Yen Chen, Lucas Gilbert, Paul Tooby, and Bing Zhu
2010

Collaborative Web Search: Who, What, Where, When, and Why
Meredith Ringel Morris and Jaime Teevan
2009

Multimedia Information Retrieval
Stefan Rüger
2009

Online Multiplayer Games
William Sims Bainbridge
2009

Information Architecture: The Design and Integration of Information Spaces
Wei Ding and Xia Lin
2009

Reading and Writing the Electronic Book
Catherine C. Marshall
2009

Hypermedia Genes: An Evolutionary Perspective on Concepts, Models, and Architectures
Nuno M. Guimarães and Luís M. Carrico
2009

Understanding User-Web Interactions via Web Analytics
Bernard J. (Jim) Jansen
2009

XML Retrieval
Mounia Lalmas
2009

Faceted Search
Daniel Tunkelang
2009

Introduction to Webometrics: Quantitative Web Research for the Social Sciences
Michael Thelwall
2009

Task Intelligence for Search and Recommendation

Chirag Shah and Ryen W. White

ISBN: 978-3-031-01198-6 paperback
ISBN: 978-3-031-02326-2 ebook
ISBN: 978-3-031-00233-5 hardcover

DOI 10.1007/978-3-031-02326-2

A Publication in the Springer series
SYNTHESIS LECTURES ON INFORMATION CONCEPTS, RETRIEVAL, AND SERVICES

Lecture #74
Series Editor: Gary Marchionini, *University of North Carolina, Chapel Hill*
Series ISSN
Print 1947-945X Electronic 1947-9468

Task Intelligence for Search and Recommendation

Chirag Shah
University of Washington

Ryen W. White
Microsoft Research

SYNTHESIS LECTURES ON INFORMATION CONCEPTS, RETRIEVAL, AND SERVICES #74

ABSTRACT

While great strides have been made in the field of search and recommendation, there are still challenges and opportunities to address information access issues that involve solving tasks and accomplishing goals for a wide variety of users. Specifically, we lack intelligent systems that can detect not only the request an individual is making (what), but also understand and utilize the intention (why) and strategies (how) while providing information and enabling task completion. Many scholars in the fields of information retrieval, recommender systems, productivity (especially in task management and time management), and artificial intelligence have recognized the importance of extracting and understanding people's tasks and the intentions behind performing those tasks in order to serve them better. However, we are still struggling to support them in task completion, e.g., in search and assistance, and it has been challenging to move beyond single-query or single-turn interactions. The proliferation of intelligent agents has unlocked new modalities for interacting with information, but these agents will need to be able to work understanding current and future contexts and assist users at task level. This book will focus on *task intelligence* in the context of search and recommendation. Chapter 1 introduces readers to the issues of detecting, understanding, and using task and task-related information in an information episode (with or without active searching). This is followed by presenting several prominent ideas and frameworks about how tasks are conceptualized and represented in Chapter 2. In Chapter 3, the narrative moves to showing how task type relates to user behaviors and search intentions. A task can be explicitly expressed in some cases, such as in a to-do application, but often it is unexpressed. Chapter 4 covers these two scenarios with several related works and case studies. Chapter 5 shows how task knowledge and task models can contribute to addressing emerging retrieval and recommendation problems. Chapter 6 covers evaluation methodologies and metrics for task-based systems, with relevant case studies to demonstrate their uses. Finally, the book concludes in Chapter 7, with ideas for future directions in this important research area.

KEYWORDS

tasks, task intelligence, search, information seeking and retrieval, recommendation, evaluation

Contents

Preface

Tasks are a driving force behind interactions with search and recommendation systems. Task-based intelligent systems can assist users in a variety of ways, including generating search results, presenting contextual reminders, organizing to-do tasks, scheduling time for tasks, and supporting task completion directly, e.g., in task-oriented dialog systems. Task is often regarded as a latent factor in interactions with these systems and users are frequently unassisted in managing tasks across query, session, application, and device boundaries.

There have been many research studies on tasks, spanning the information retrieval (IR), recommender systems, and human–computer interaction (HCI) research communities, among others, including several by the two of us. There have also been several well-attended workshops and tracks at venues such as the Text REtrieval Conference (TREC), designed to build community and drive progress in this area. However, there has been no real attempt to bring together much of the relevant work in a single place, especially as it relates to IR.

We wanted to write a book to address this shortcoming and help the community grasp the extent of the significant opportunity in task-based search and recommendation. We also wanted to present our point of view on the challenges and opportunities in this area. This book builds on our SIGIR 2020 tutorial of the same name, providing additional commentary and detail to augment the slides and the oral presentation. These narratives are built on the shoulders of many past and present scholars in the field. We have done our best to honor and introduce their ideas in the context pertinent to this book. In addition, we have taken co-authored works with our collaborators and students for several of the case studies described here. This list of scholars include Nicholas Belkin, Jiqun Liu, Matthew Mitsui, Shawon Sarkar, and Yiwei Wang. Presenting their work in the context of this book and its narrative warranted some repetitions or re-narrations, but the reader is encouraged to read those original works and cite them appropriately.

As outlined in the Abstract, the book is organized in seven chapters with what we believed to be a logical structure. Each reader can decide where they should start and how deep they should go into the provided material. In case of no prior exposure to this topic, one should certainly start with Chapter 1. Those who already have some familiarity with this area can choose to review Chapters 2 and 3 to ensure they are not missing any important or recent works and then move to a more careful examination of the chapters that follow. Seasoned scholars in the field may want to jump straight to several case studies presented in Chapters 3–5 and round it out with special emphasis on evaluation in Chapter 6. Almost everyone, regardless of their background, should consider reviewing and reflecting on Chapter 7.

No matter what your background is and how much you intend to work in this area, we hope that you find the content helpful and that it inspires you and your colleagues to do more work on this important topic.

Chirag Shah and Ryen W. White
May 2021

Acknowledgments

We are grateful to our families for their constant love and support; for our colleagues, collaborators, and students for their contributions to our scholarship; and our critics and reviewers for helping us question that which we may take for resolved.

Chirag Shah and Ryen W. White
May 2021