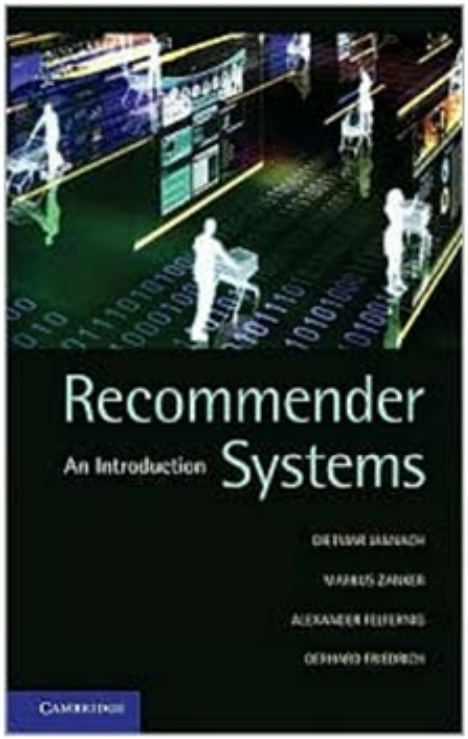
Recommender Systems – An Introduction

Dietmar Jannach, Markus Zanker, Alexander Felfernig, Gerhard Friedrich
Cambridge University Press

*Which digital camera should I buy**?** What is the best holiday for me and my family**?** Which is the best investment for supporting the education of my children**?** Which movie should I rent**?** Which web sites will I find interesting**?** Which book should I buy for my next vacation**?** Which degree and university are the best for my future**?***



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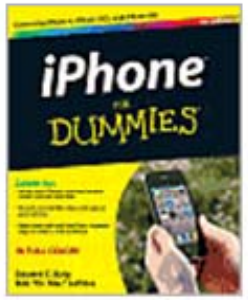


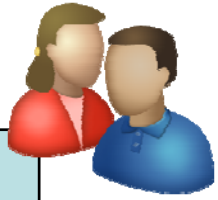
Agenda

- **Introduction**
  - Problem domain
  - Purpose and success criteria
  - Paradigms of recommender systems
    - Collaborative Filtering
    - Content-based Filtering
    - Knowledge-Based Recommendations
    - Hybridization Strategies

Introduction

Problem domain

- **Recommendation systems (RS) help to match users with items**
  - Ease information overload
  - Sales assistance (guidance, advisory, persuasion,…)



RS are software agents that elicit the interests and preferences of individual consumers […] and make recommendations accordingly.

They have the potential to support and improve the quality of the decisions consumers make while searching for and selecting products online.

» (Xiao & Benbasat 2007[1])

- **Different system designs / paradigms**
  - Based on availability of exploitable data
  - Implicit and explicit user feedback
  - Domain characteristics

(1) Xiao and Benbasat, *E-commerce product recommendation agents: Use, characteristics, and impact*, MIS Quarterly **31** (2007), no. 1, 137–209

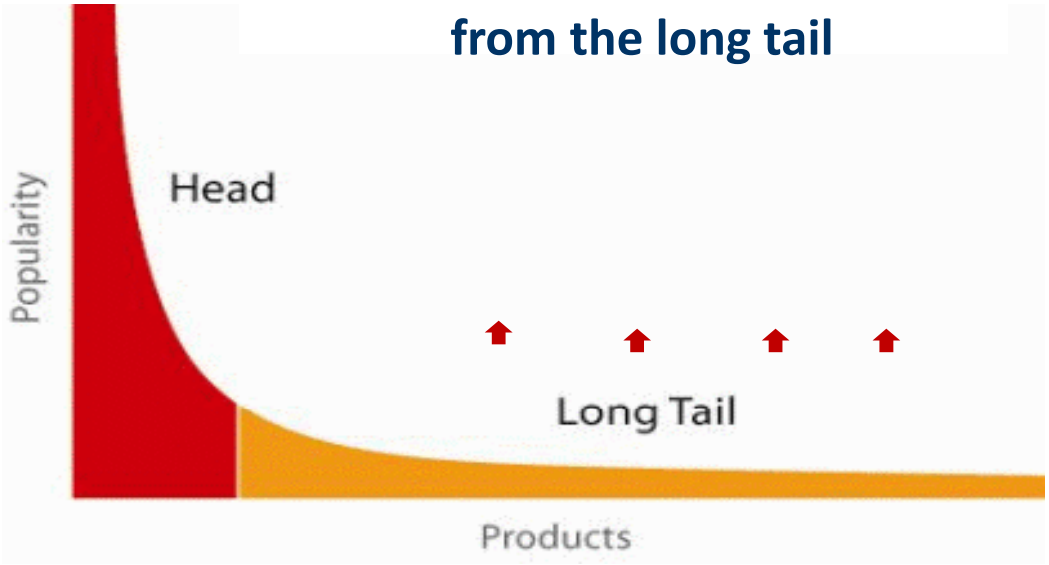
Purpose and success criteria (1)

- **Different perspectives/aspects**
  - Depends on domain and purpose
  - No holistic evaluation scenario exists

- **Retrieval perspective**
  - Reduce search costs
  - Provide "correct" proposals
  - Users know in advance what they want

- **Recommendation perspective**
  - Serendipity – identify items from the Long Tail
  - Users did not know about existence

When does a RS do its job well?



- "Recommend widely unknown items that users might actually like!"
- 20% of items accumulate 74% of all positive ratings
- Items rated > 3 in MovieLens 100K dataset

Purpose and success criteria (2)

- **Prediction perspective**
  - Predict to what degree users like an item
  - Most popular evaluation scenario in research
- **Interaction perspective**
  - Give users a "good feeling"
  - Educate users about the product domain
  - Convince/persuade users - explain
- **Finally, conversion perspective**
  - Commercial situations
  - Increase "hit", "clickthrough", "lookers to bookers" rates
  - Optimize sales margins and profit

Recommender systems

- **RS seen as a function**
- **Given:**
  - User model (e.g. ratings, preferences, demographics, situational context)
  - Items (with or without description of item characteristics)
- **Find:**
  - Relevance score. Used for ranking.

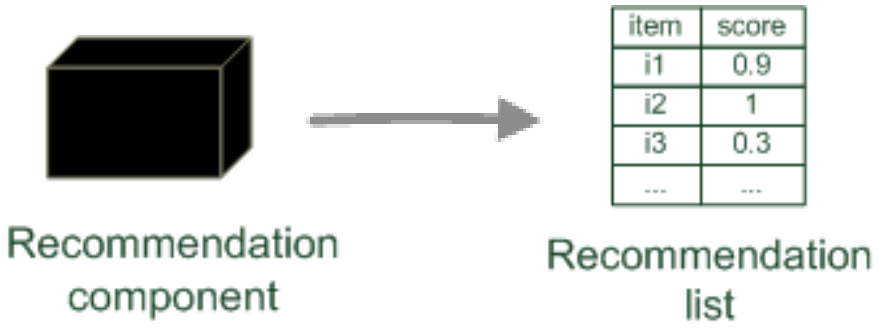
- **Relation to Information Retrieval:**
  - IR is finding material [..] of an unstructured nature [..] that satisfies an information need from within large collections [..].

» (Manning et al. 2008[1])

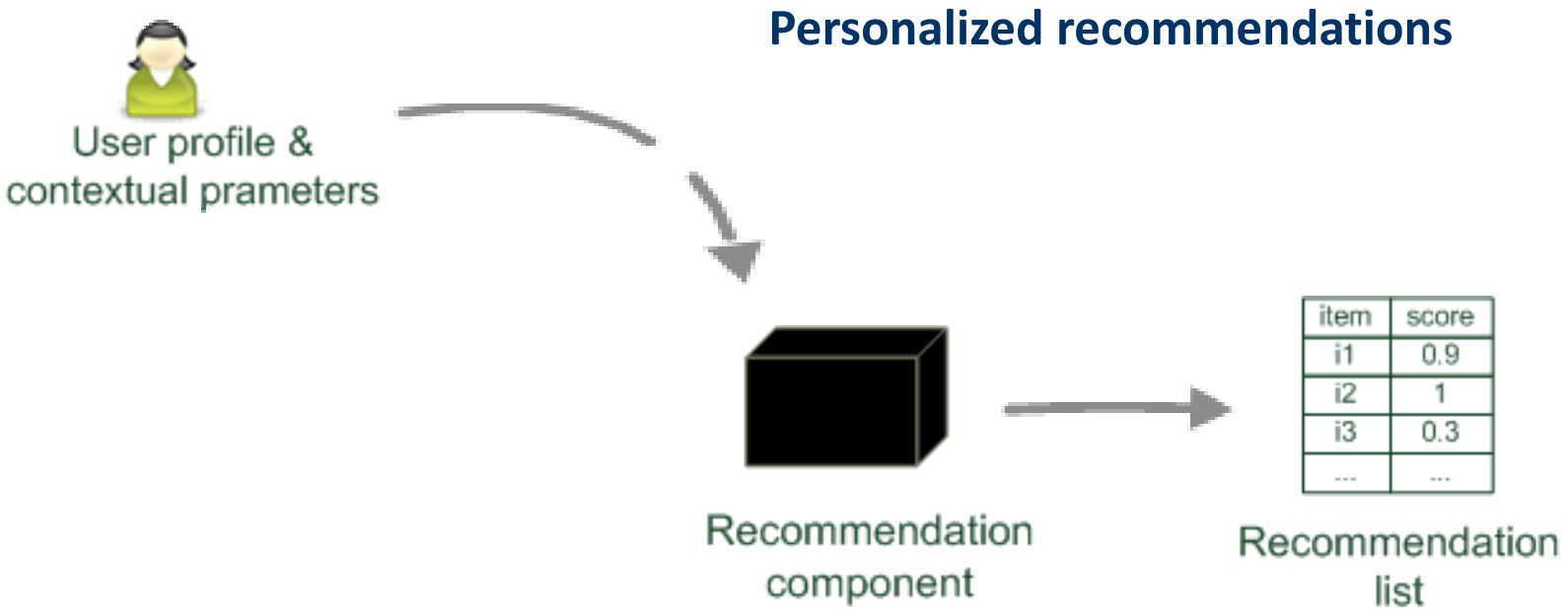
(1) Manning, Raghavan, and Schütze, *Introduction to information retrieval*, Cambridge University Press, 2008

Paradigms of recommender systems

Recommender systems reduce information overload by estimating relevance



Paradigms of recommender systems



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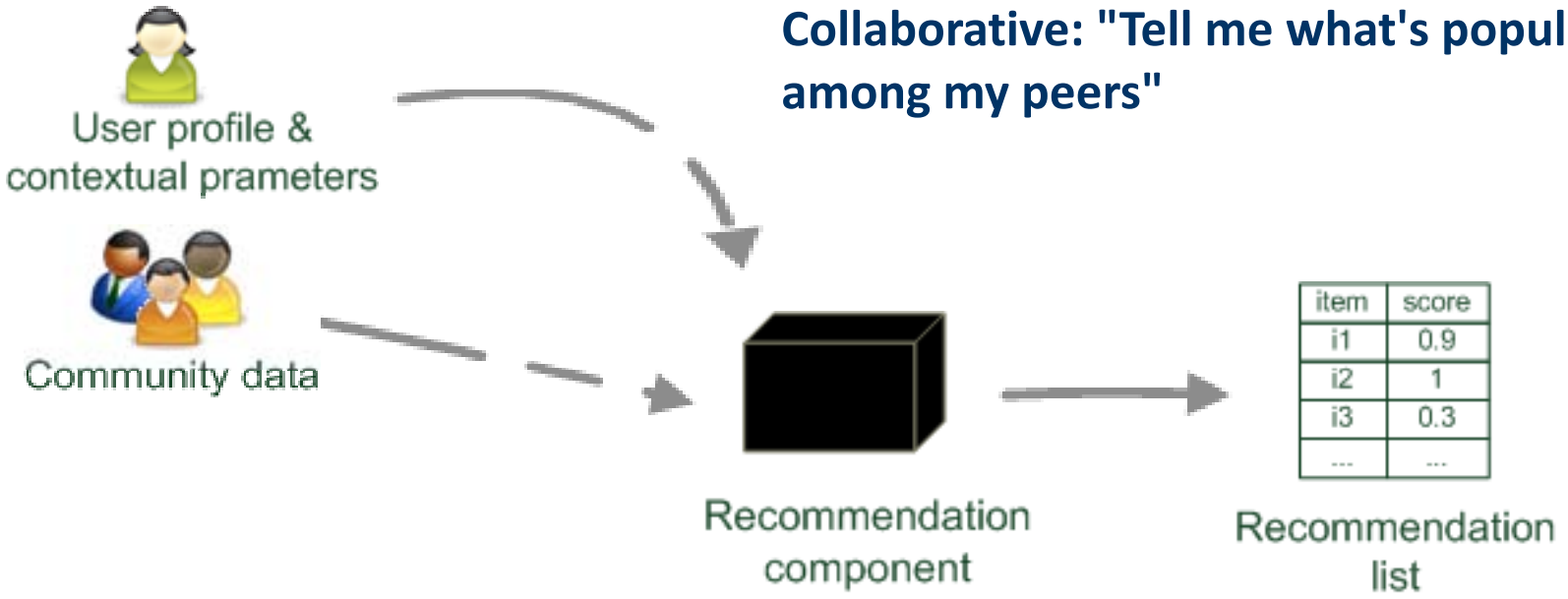
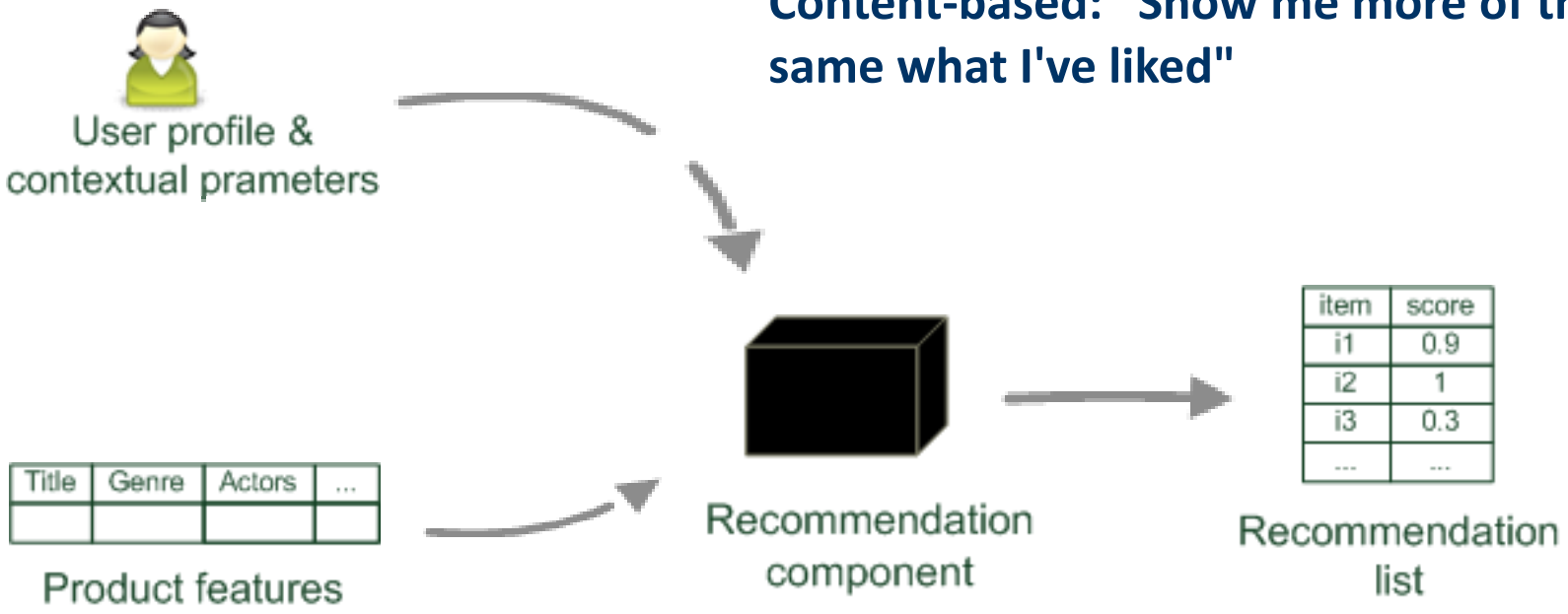


Paradigms of recommender systems

Content-based: "Show me more of the same what I've liked"



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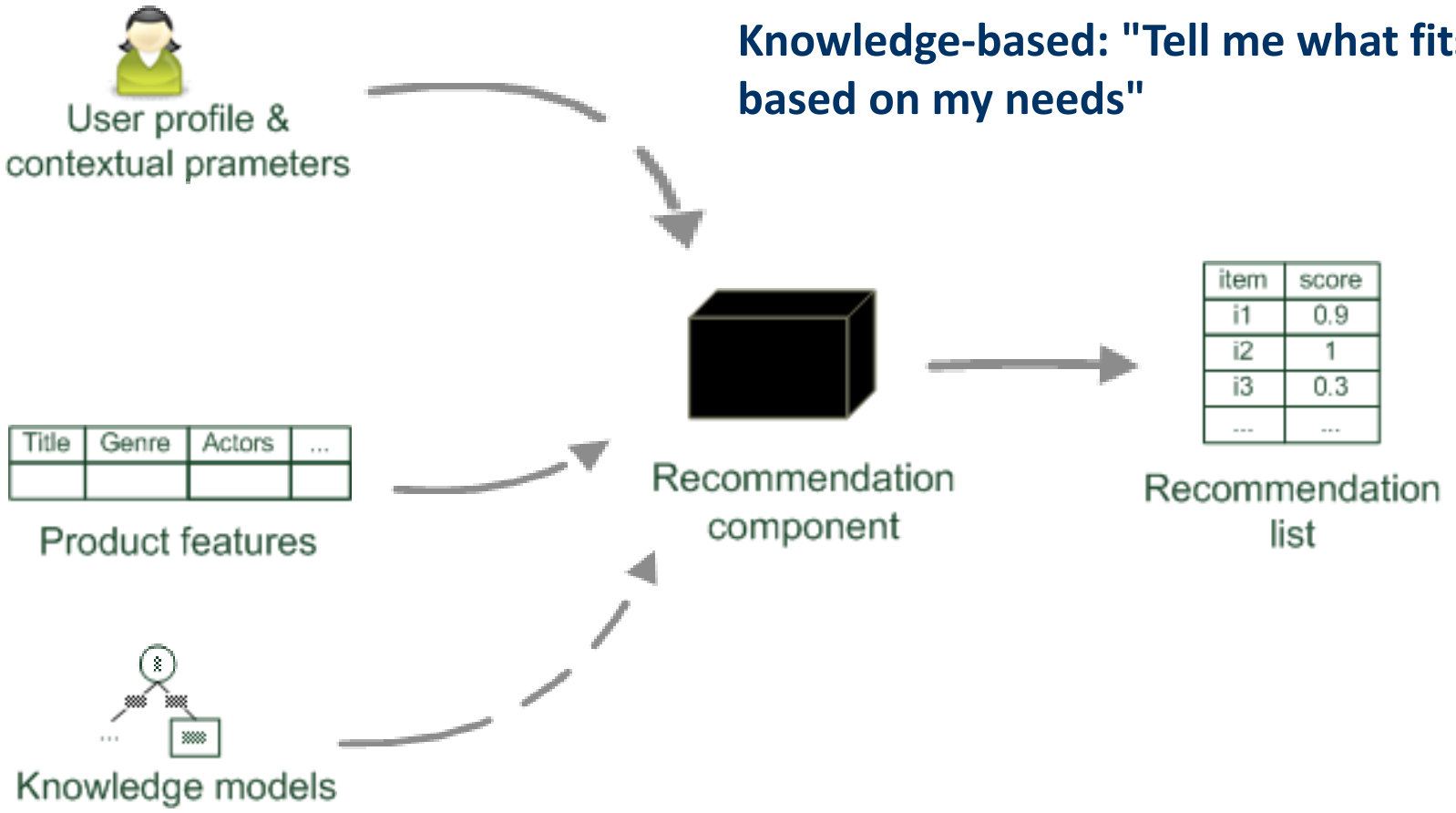
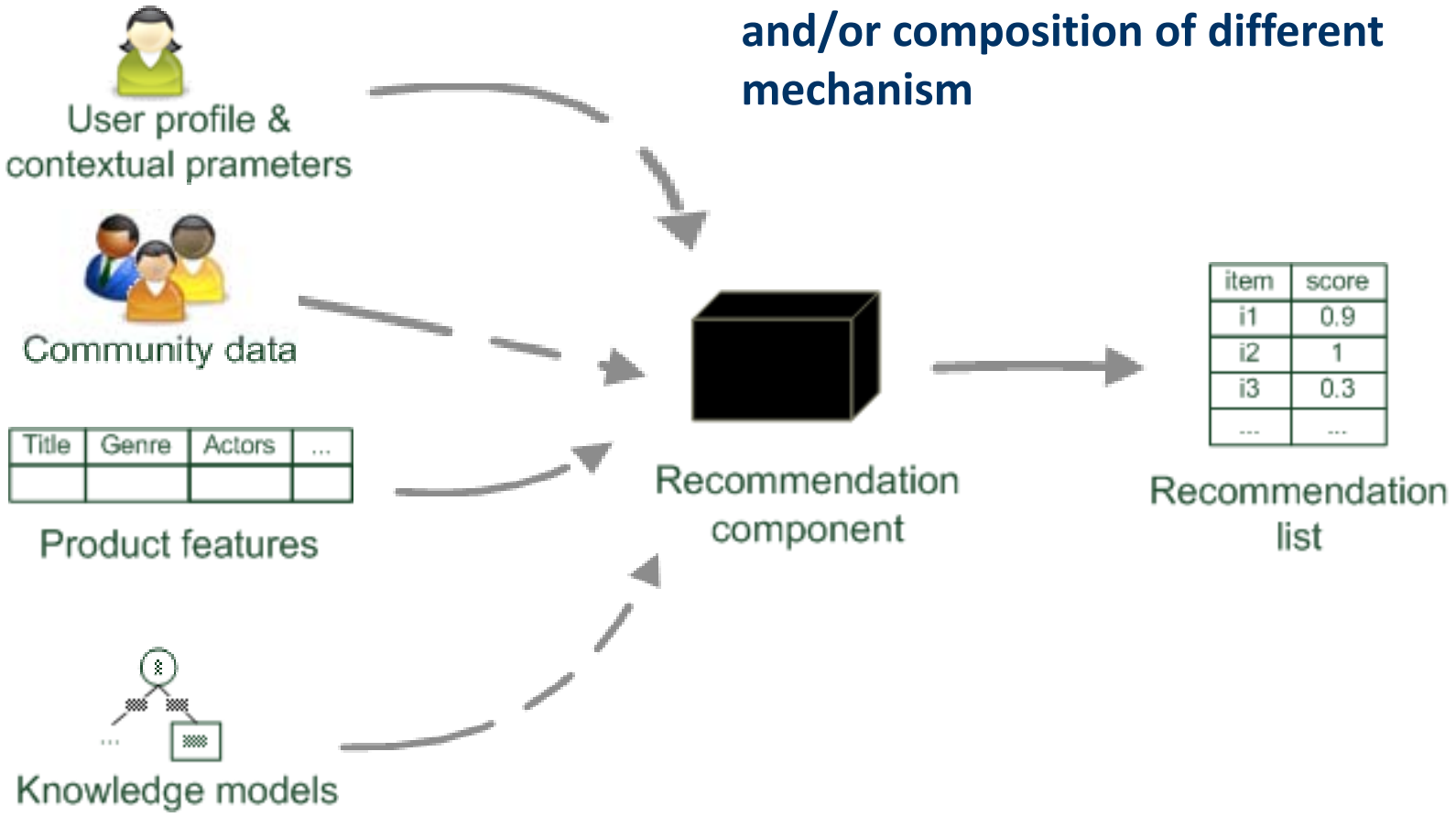


Paradigms of recommender systems

Hybrid: combinations of various inputs and/or composition of different mechanism



Outlook

- **Part I** (Basic Concepts)
  - Basic paradigms of collaborative,
  - content-based, and
  - knowledge-based recommendation,
  - as well as hybridization methods.
  - Explaining the reasons for recommending an item
  - Experimental evaluation
- **Part II** (Recent Research Topics)
  - How to cope with efforts to attack and manipulate a recommender system from outside,
  - supporting consumer decision making and
  - potential persuasion strategies,
  - recommendation systems in the context of the social and semantic webs, and
  - the application of recommender systems to ubiquitous domains