Model Driven Approach to Risk Aware Recommender System

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Big-Data (Volume, Velocity, Variety…)

To support Effective Decision Making

Recommender Systems

Collaborative filtering
(grouping users based on similarity)

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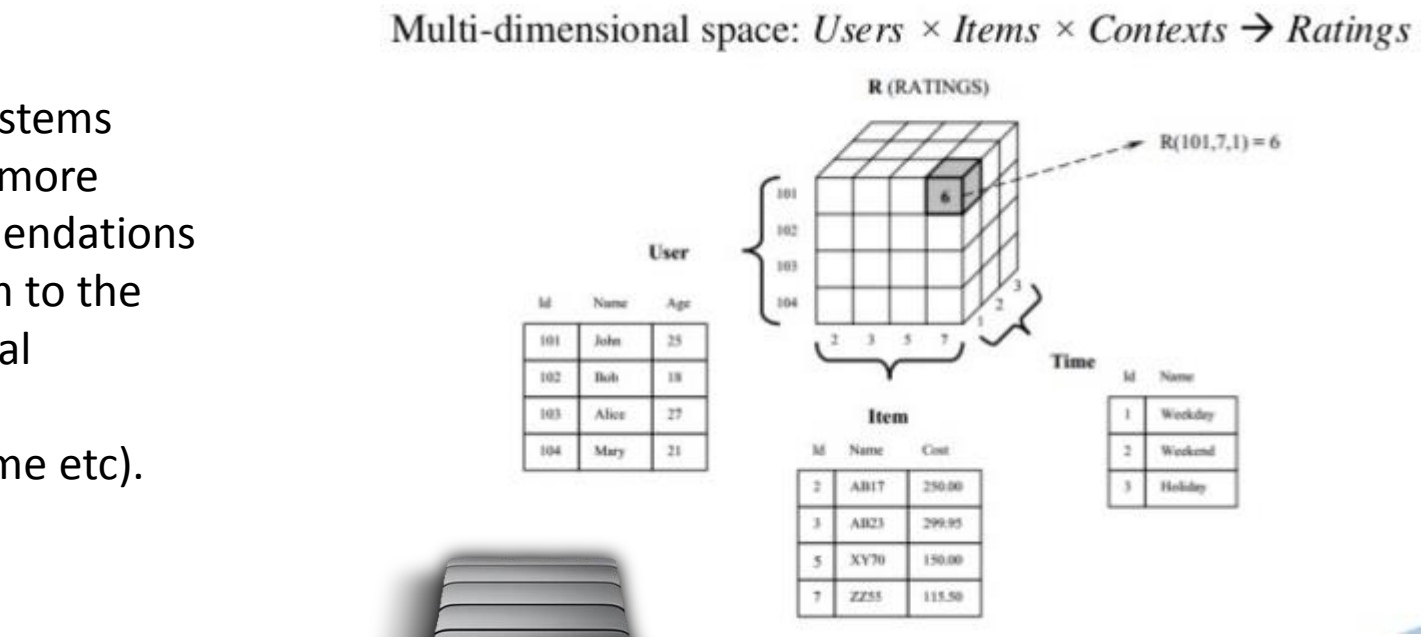
Context Aware Recommender System

Context-aware recommender systems (CARS) generate more relevant recommendations by adapting them to the specific contextual situation of the user(Location, time etc).



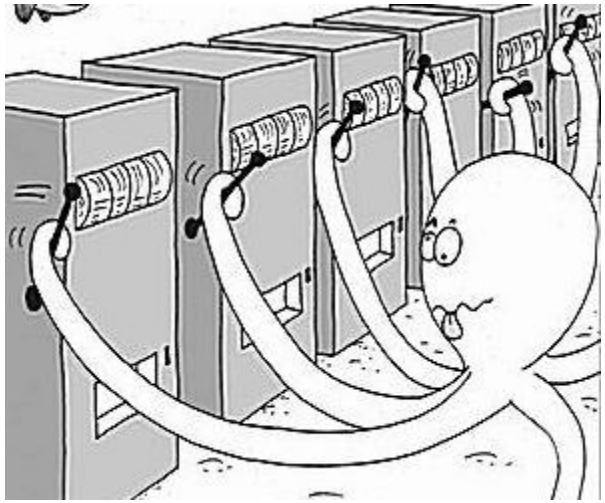
Multi-armed bandit Problem (MBP)

The name "multi-armed bandits" comes from a scenario in which a gambler faces several slot machines, a.k.a. "one-armed bandits", that look identical at first but produce different expected winnings. The crucial issue here is the trade-off between acquiring new information (exploration) and capitalizing on the information available so far (exploitation).

Actions
$\{1, 2, \ldots, K\}$

Reward(s)
$\mathbf{x}(t) \in [0, 1]^K$

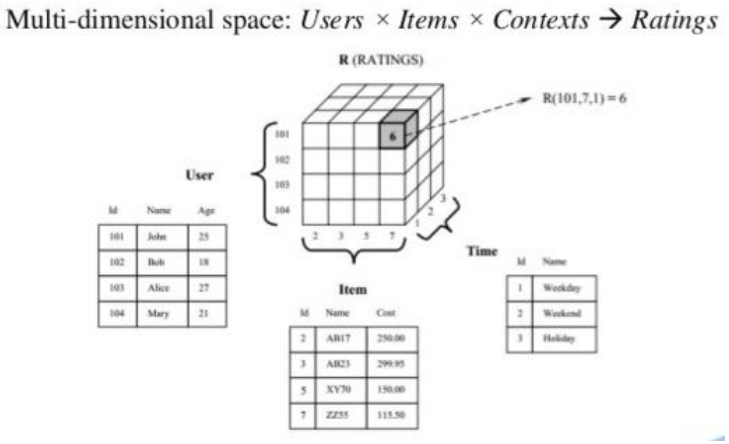
$t = 1, 2, \ldots, T$
Sequence of trials



- **Trade-off between Exploration and Exploitation**
- **Regret = Player reward – Reward of best action**

Research Problem

- Traditional algorithms used for context aware recommender system are not efficient enough to accommodate the increase in the number of sources(sensors and usage data) available (Re-calculation and re-programing to accommodate a new data source).

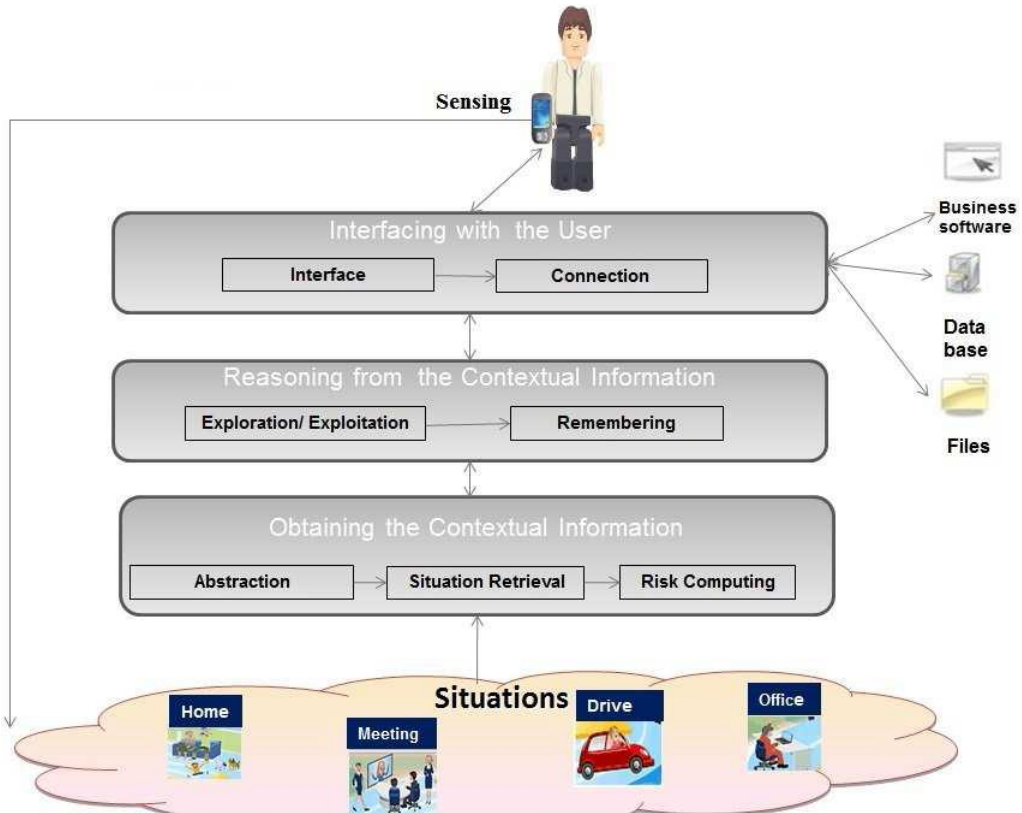


- We have algorithms that generate good recommendations but no criteria to decide when to deliver those recommendations to the user. In many applications, such as recommending personalized content, it is also important to consider the risk of upsetting the user so as not to push recommendations in certain circumstances, for instance, during a professional meeting, early morning, late-night. Therefore, the performance of the recommender system depends in part on the degree to which it has incorporated the risk into the recommendation process.

Possible Solution

- **Model-driven Approach**: The model-driven approach separates the analytics logic from the technical big data platform. This allows you to change platform components later, without rewriting your analytics.
- A dynamic risk sensitive recommendation system called **DRARS (Dynamic Risk-Aware Recommender System**), which models the context-aware recommendation as a bandit problem.

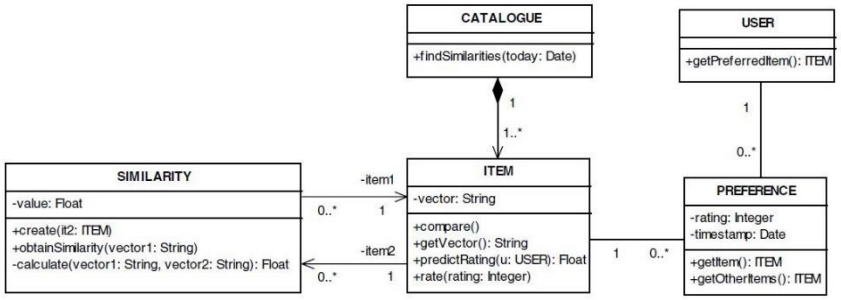
Djallel Bouneffouf. DRARS, A Dynamic Risk-Aware Recommender System. Computation and Language [cs.CL], 2014



Approach & Research Progress

1. Models and Abstraction(Almost Complete)

To model the recommender system using user data such as location, browsing history, dwell time and click through rate(CTR). This will be followed by integrating risk factor into model by using Bayesian optimization for MBP.



Class diagram of a generic recommender system

2. Verification and Validation (In-progress)

In order to test the validity of the system, the model will be studied in terms of its scope of implementation in Equity Portfolio management.

3. Domain Specific Language (DSL) (In-progress)

The purpose of the domain specific language for our system is to allow its users to implement a risk aware recommendation system with reduced complexity of achieving. Domain specific languages aim at raising the abstraction level, thereby lowering the complexity of achieving a specific task.

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Questions ?