Information Storage and Retrieval(CS 5604) Collaborative Filtering
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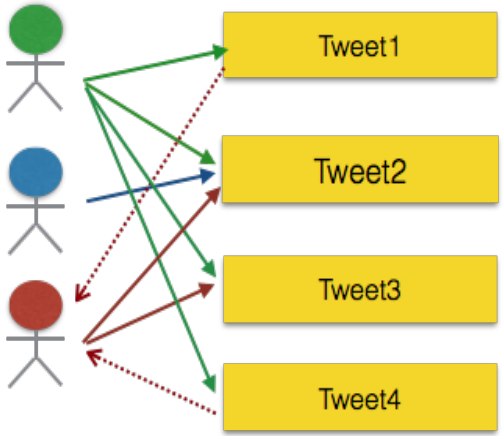
Agenda

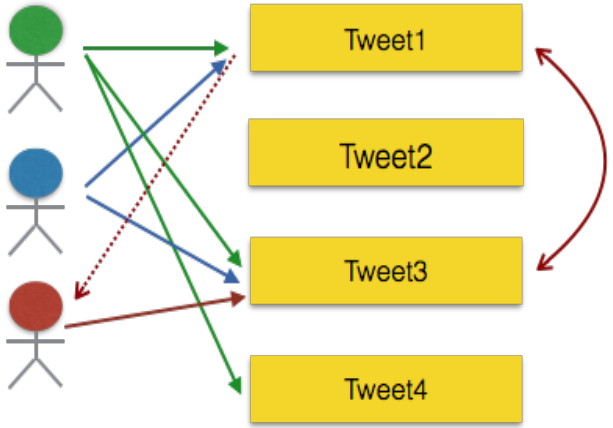
- Role and goal
- User-based recommendation
  - Recommendation process
  - Algorithm
  - Implementation
- Item-based recommendation
  - Overview
  - Algorithms and Implementation
- Build Process

Project goal

- Our project is to serve the Integrated Digital Event Archiving and Library (IDEAL) project.
- IDEAL project provides services for searching, browsing, analysing, and visualization of over 1 billion tweets and over 65 million webpages.
- Building a recommendation system and recommending tweets and webpages to assist users searching and browsing the IDEAL collection.
  - User-based recommendation
  - Item-based recommendation

User-based recommendation vs. Item-based recommendation





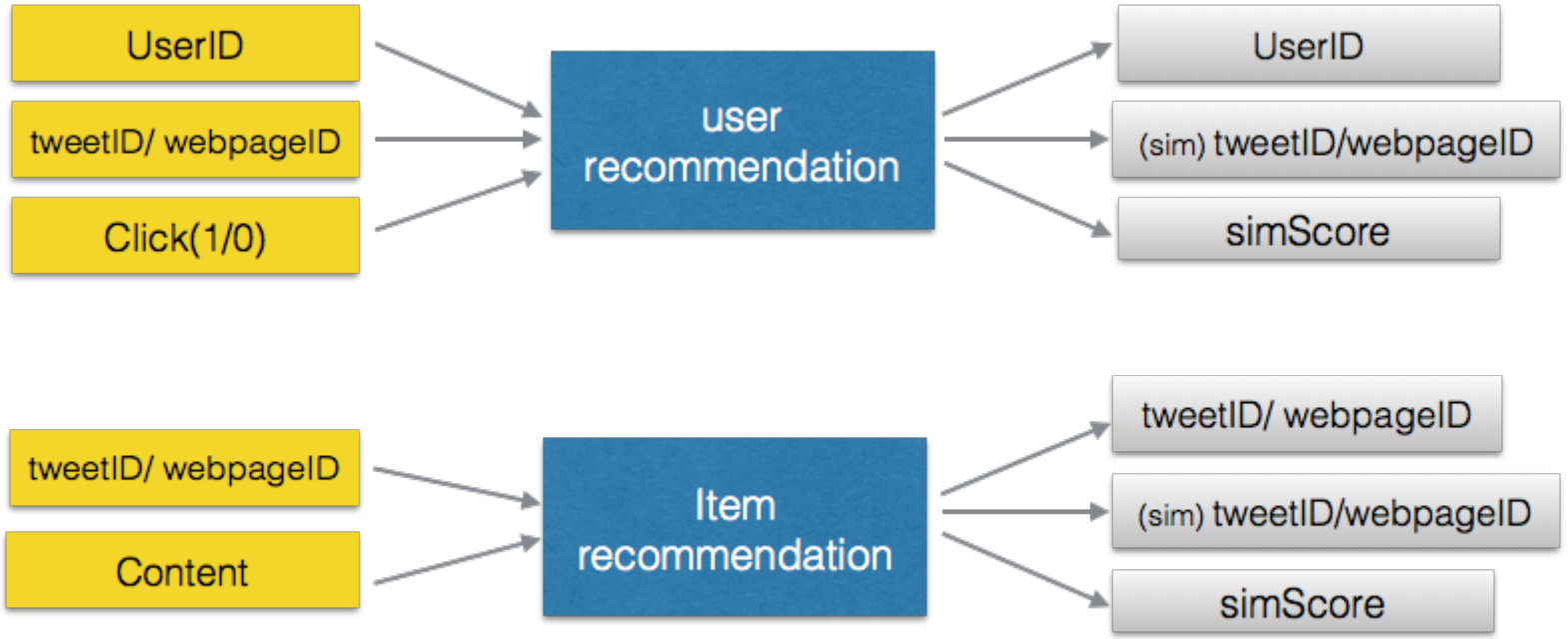
User recommendation

- Clicking history
  User-item matrix
  determining relationships
  between user and item.

Item recommendation

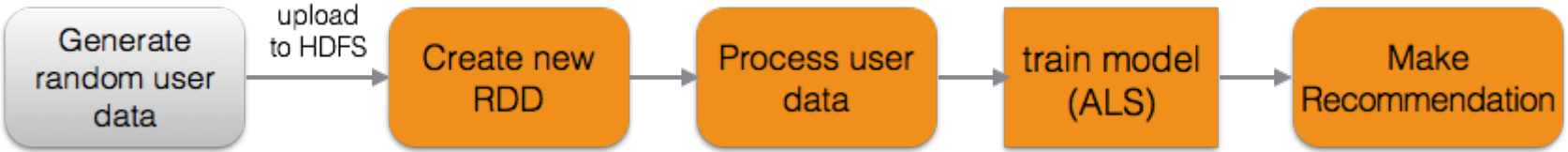
- Content similarity
  Build an item-item matrix
  determining relationships
  between pairs of items.

Data requirement



User-based recommendation

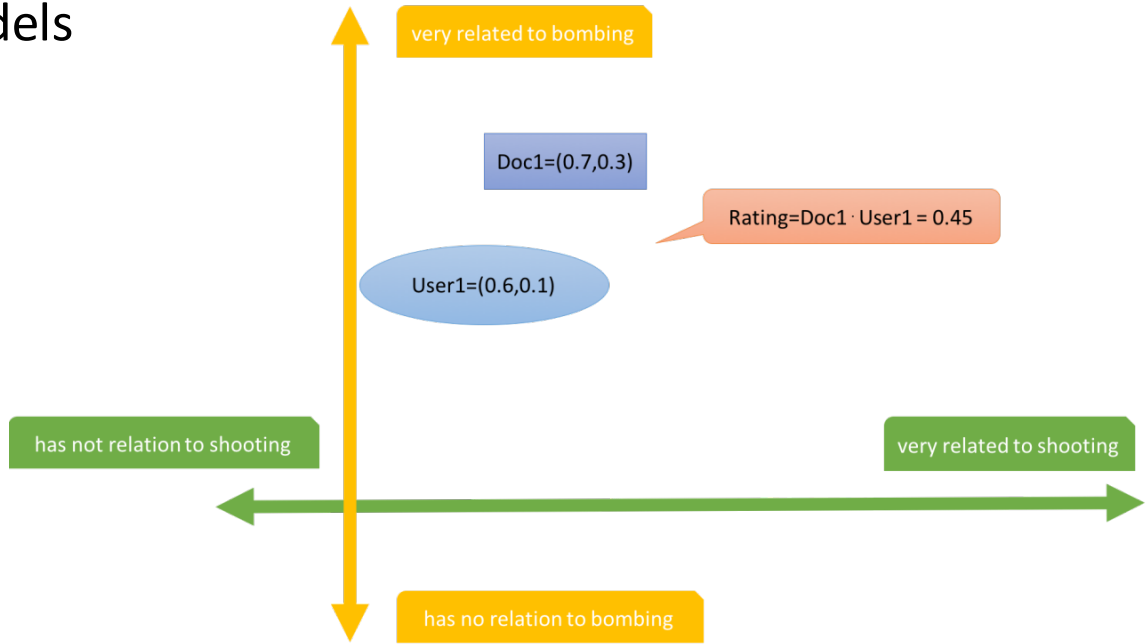
Spark MLlib




```
val data = sc.textFile("fakeUser.data")
val ratings = data.map(_.split(',') match { case Array(user, item, rate) =>
Rating(user.toInt, item.toInt, rate.toDouble)})
// Build the recommendation model using ALS
val rank = 10
val numIterations = 10
val model = ALS.train(ratings, rank, numIterations, 0.01)
val productuser=model.recommendProductsForUsers(3).collect()
```

Algorithm: Recommendation strategy

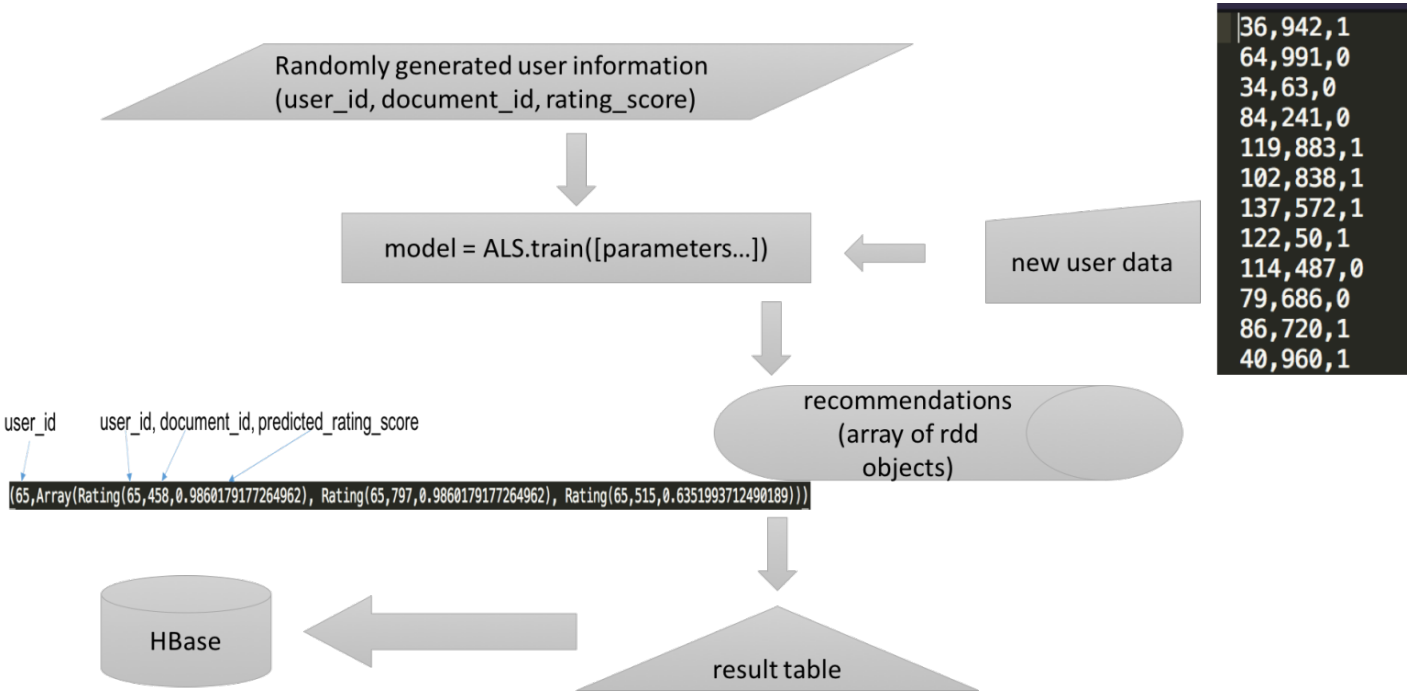
- ~~Neighborhood methods~~
- Latent factor models



Algorithm: Matrix factorization

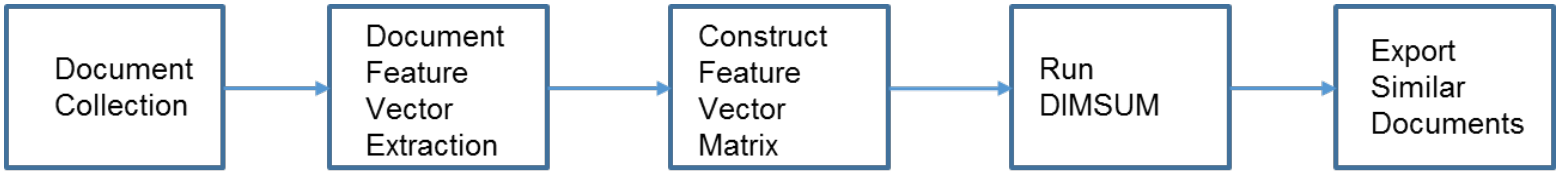
- ALS (alternating least squares)
  - Parallelization
  - Implicit data

Implementation



Item-based recommendations

- Recommendations based on the text of the documents
- Useful for retrieving related documents
- System Pipeline



Implementation details

- Document preprocessing - Word lemmatization
- Feature extraction and transformation using TF-IDF method
- Repartitioning the RDD to increase parallelization
- DIMSUM algorithm by Twitter!
- Results collection and post-processing
- Configuration parameters for spark job - Similarity threshold (DIMSUM), spark executor memory, shuffle memory size

Build process

- Code compilation
- JAR file creation
- SBT script
- Spark-submit
- Evaluation - Mean squared error (MSE)

Acknowledgement

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Thank you!

Q&A