Description

Aims:
The module is aimed at an entry level study of information retrieval and data mining techniques. It is about how to find relevant information and subsequently extract meaningful patterns out of it. While the basic theories and mathematical models of information retrieval and data mining are covered, the course is primarily focused on practical algorithms of textual document indexing, relevance ranking, web usage mining, text analytics, as well as their performance evaluations.

Learning outcomes:
On successful completion of the module, a student will master both the theoretical and practical aspects of information retrieval and data mining, and will be able to understand:
1. the common algorithms and techniques for information retrieval (document indexing and retrieval, query processing, etc);
2. the quantitative evaluation methods for the IR systems and data mining techniques;
3. the popular probabilistic retrieval methods and ranking principles;
4. the techniques and algorithms existing in practical retrieval and data mining systems such as those in web search engines and recommender systems, including the recently popular topic of deep learning;
5. basic algorithms that can be used to make predictions out of data;

Content:
Overview of the fields:
Study some basic concepts of information retrieval and data mining, such as the concept of relevance, association rules, and knowledge discovery. Understand the conceptual models of an information retrieval and knowledge discovery system;

Indexing and Text Processing:
- Introduce various indexing techniques for textual information items, such as inverted indices, tokenization, stemming and stop words. Techniques used for text compression, such as the Lempel-ziv algorithm and Huffman Coding will be covered;

Retrieval Methods:
Study popular retrieval models (boolean, vector space, binary independence, language modelling). Probability ranking principle. Other commonly-used techniques such as relevance feedback, pseudo relevance feedback, and query expansion will also be covered;

Measurements:
Online and offline Evaluation techniques to evaluate retrieval quality. Commonly used evaluation metrics such as average precision, NDCG, etc. Cranfield Paradigm and TREC conferences, as well as some recently popular techniques such as interleaving will be discussed;

Data Mining:
Study basic techniques, algorithms, and systems of data mining and analytics, including frequent pattern and correlation and association analysis, basic machine learning algorithms such as linear regression and logistic regression. Discussion on basic personalisation and usage mining techniques;

Emerging Areas:
Study new emerging areas such as learning to rank, deep learning, word embeddings and topic modelling;

Requisites:
In order to be eligible to select this module, a student must be registered on a programme for which it is a formally-approved option or elective choice AND must have (i) an understanding of probability and statistics; and (ii) proficiency in Java or Python programming (as demonstrated by a least one programming project in the past).
Information Retrieval and Data Mining (COMP0084)

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