Course on Recommender Systems in E-Business

Objective:
Recommender Systems have been a prevalent area of E-Business research for a long time. They have been applied to various online applications, ranging from marketing, social media, financial services, and more. Recommender systems have changed the way people find products, information, and even other people over the internet. Such systems discover information items (e.g., people, products) that are likely to be of interest to users. They study patterns of behavior to know what someone will prefer from among a collection of things he has never experienced. At a high-level, recommendation systems are pieces of software equipped with analytics tools that aim to recommend products or information to users, based on certain preferences. The proposed course aims to cover the following aspects of recommender system with a focus of developing such systems in Web based environment

1. Theoretical foundations
2. Data preprocessing and preparation
3. Algorithms
4. Performance evaluation

Detailed Syllabus

1. Introduction: Types of recommender systems, examples, basic framework to understand a recommender system

2.Foundations: ***S****imilarity measures:* rank correlation, cosine similarity; *dimensionality reduction:* latent semantic indexing, singular value decomposition, principal component analysis; *clustering: k*-means, hierarchical clustering; *classification*: nearest neighbors, decision trees, ruled-based classifiers, Bayesian classifiers, artificial neural networks, support vector machines; *association rule mining*: interestingness measures, frequent patterns, algorithms for association rule generation; *text analytics*: the nature of unstructured and semi-structured text; *text encoding*: tokenization, stemming, lemmatization; Handling large datasets.

3.Recommendation systems design and evaluation: *Collaborative Filtering:* User based, item based, ratings, data sparsity, cold start problem, matrix factorization/latent factor models, slope one predictors; *Content based***:** content representation and similarity, vector space model and TF-IDF rating, probabilistic method for text classification; *Knowledge based***:** constraint-based recommenders, case-based recommenders; *Association rule based*, *Hybrid approaches*; *evaluating recommender systems***:** evaluation settings, popular evaluation designs.

4. Recommendations in next generation web: Trust metrics, folksonomies, ontological filtering, context-aware recommendation

Class wise distribution of topics

CLASS	TOPIC
1	**Orientation Class – Introduction to the course**
2	**Unit 1 starts - Recommender Systems** Recommender systems function, Data and knowledge sources
3	Recommendation techniques I
4	Recommendation techniques II
5 ,6 & 7	**Unit 2 starts - Data Mining and Text Mining Methods for Recommender System** Introduction to data mining **Unit 2.1** - Data preprocessing-Similarity measures, sampling, dimensionality reduction, denoising
8	**ACTIVITY BASED ON DENOSING OF DATA**
9,10 & 11	**Unit 2.2** - Introduction to text mining, document classification, information retrieval, structured and semi-structured text. Text encoding: tokenization, lemmatization stemming
12,13,14 & 15	**Unit 2.3** - Classification techniques- nearest neighbors, decision trees, rule based classifiers, Bayesian classifiers, support vector machines, artificial neural networks
16	**ACTIVITY BASED ON CLASSIFICATION TECHNIQUES**
17 & 18	**Unit 2.4** - Introduction to clustering, Cluster analysis-k-means, alternative to k-means.
19	**ACTIVITY BASED ON CLUSTERING TECHNIQUES**
20	Association rule mining
21	**ACTIVITY ON ASSOCIATION RULE MINING**
22	**Unit 3 starts – Collaborative Recommendation** User based, item based, about ratings
23	Data sparsity, cold start problem, similarity metrics
24, 25, 26 & 27	Matrix Factorization model, latent factor model, slope one predictors
28	**ACTIVITY ON COLLABORATIVE RECOMMENDATION**
29	**Unit 4 starts - Content Based Recommendation** Content representation and content similarity
30	Vector space model and TF-IDF
31	Probalistic model for text classification, **ACTIVITY ON CONTENT BASED RECOMMENDATION**
32	**UNIT 5 Starts – Knowledge Based Recommendation** Knowledge representation and reasoning, interacting with constraint based recommenders
33	Interacting based case based recommenders
34	**UNIT 6 starts – Hybrid Recommendation Approaches** Opportunities for hybridization, recommendation paradigms

35	Hybridization designs- monolithic and parallelized hybridization design
36	Pipelined hybridization
37	**UNIT 7 starts – Explanations In Recommender Systems and Evaluating Recommender Systems** Explanations in constraint-based recommenders, generating explanations by abduction, Well founded explanations , explanations in case-based recommenders
38	Explanations in collaborative filtering recommenders, General properties of evaluation research- general remarks, subjects of evaluation design, Evaluation settings, popular evaluation designs
39	**UNIT 8 STARTS – Recommendations Inn Ubiquitous Environments And Next Generation Web** Trust-aware recommender systems, trust metrics and effectiveness, Introduction to folksonomies, Using folksonomies for recommendations, ontological filtering
40	Augmentation of filtering by taxonomies, augmentation of filtering by attributes, Context-aware recommendation and its application