



K L Deemed to be University
Department of Artificial Intelligence and Data Science -- KLVZA
Course Handout
2024-2025, Odd Sem

Course Title	: OPINION MINING & RECOMMENDER SYSTEMS
Course Code	: 22SDM3202
L-T-P-S Structure	: 2-0-2-0
Pre-requisite	:
Credits	: 3
Course Coordinator	: BALAJI PENUBAKA
Team of Instructors	:
Teaching Associates	:

Syllabus : Module 1 Opinion Mining, Introduction, Aspect Based Mining Opinion Mining – History- Opinion Mining Terminologies - General Opinion Mining Tasks - Document-Level Opinion Mining- Feature-based Opinion Mining and - Sentence-Level Opinion Mining- Phrase-Level Opinion Mining - Aspect-based Opinion Mining, Language Models - N-Gram Models - Feature Extraction and -Opinion Visualisation -Probabilistic Graphical Models - PLSI Model - Multinomial LDA, Parameter Estimation - Smoothing - Model Selection. Module 2 Evaluation Metrics - Opinion Digger: A Hybrid Method for Mining Reviews -Temporal Opinion Mining -Temporality Process - Aspect Extraction- Finding Frequent Noun phrases - Mining Opinion Patterns - Filtering Out Non-Aspects - Grouping Candidate Aspects, Opinion Mining Techniques - Knowledge-based Approaches -SentiWordNet - SentiWordNet in our - Supervised Approaches -Naive Bayes -Unsupervised Approaches - Supervised versus Unsupervised, Parameter Estimation -Smoothing - Model Selection -Test Set Likelihood - LDA Models for Aspect-based Opinion Mining - LDA - S-LDA - D-LDA - PLDA - S-PLDA - D-PLDA - Inference and Estimation. Module 3 Introduction and basic taxonomy of recommender systems (RSs). Traditional and non-personalized RSs. Overview of data mining methods for recommender systems (similarity measures, classification, Bayes classifiers, ensembles of classifiers, clustering, SVMs, dimensionality reduction). Overview of convex and linear optimization principles. Content-based recommender systems, The long-tail principle. Domain-specific challenges in recommender systems. Content-based recommender systems, Advantages and drawbacks. Basic components of content-based RSs, Feature selection, Item representation Methods for learning user profiles. Collaborative Filtering (CF)-based RSs: Mathematical foundations Mathematical optimization in CF RSs. Module 4 Optimization objective. Baseline predictor through least squares. Regularization and overfitting. Temporal models. Step-by-step solution of the RS problem. Collaborative Filtering (CF)-based RSs: systematic approach Nearest-neighbor collaborative filtering (CF). User-based and item-based CF, comparison. Components of neighborhood methods (rating normalization, similarity weight computation, neighborhood selection). Hybrid recommender systems. Advanced CF methods Matrix factorization models and dimensionality reduction. Matrix Decomposition. Latent factor models. Solution via alternative projections method. Examples. The Netflix data challenge. Constraint-based RSs. Introduction to tensors and their applications. Performance evaluation of RSs Experimental settings. Working with RSs data sets. Examples. The cold-start problem. Evaluation metrics. Rating prediction and accuracy.

Reference Books : 1. Sentiment Analysis and Opinion Mining by Greame Hrist, Bing Liu Morgan Publications 2012 2. Recommender Systems by C.C. Aggarwal Springer 2016 3. Temporal Opinion Mining by Haishi Bai, Boris Scholl CRC Press 2010 4. Recommender systems handbook by Federico Pozzi, Elisabetta Fersini, Enza Messina Bing Liu 2016 5. New Opportunities for Sentiment Analysis and Information Processing by Aakansha Sharaff, G. R. Sinha, Surbhi Bhatia IGI Global 2021

Web Links : 1. <https://link.springer.com/book/10.1007/978-3-031-02145-9> 2. <https://link.springer.com/book/10.1007/978-3-319-29659-3>

MOOCS : 1. <https://www.coursera.org/learn/text-mining-analytics> 2. <https://www.coursera.org/learn/recommender-systems-introduction?>

authType=google&completeMode=existingCourseraAccount

Course Rationale : 1. Introduction In today's data-driven world, the ability to harness and interpret vast amounts of unstructured data, particularly opinions expressed in textual form, is invaluable. Opinion mining (or sentiment analysis) and recommender systems are two crucial areas within data science and machine learning that focus on understanding user preferences and making personalized recommendations. This course aims to equip students with the theoretical knowledge and practical skills needed to develop and deploy opinion mining and recommender system applications. 2. Relevance and Importance Growing Volume of User-Generated Content: With the proliferation of social media, review sites, and online forums, there is a massive influx of user-generated content. Analyzing this data can provide deep insights into public opinion, customer satisfaction, and market trends. Personalization in Services: Modern consumers expect personalized experiences. Recommender systems are at the core of services provided by companies like Amazon, Netflix, and Spotify, enhancing user engagement and satisfaction. Business and Market Impact: Effective opinion mining and recommendation systems can lead to better decision-making in marketing strategies, product development, and customer relationship management. Interdisciplinary Application: These technologies are not limited to e-commerce but are also applicable in healthcare, education, finance, and more, making them valuable across various sectors.

Course Objectives : The main aim to provide students with both theoretical knowledge and practical skills, preparing them to apply opinion mining and recommender system techniques in various real-world applications.

COURSE OUTCOMES (COs):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Utilize the feature extraction tools for different opinion mining levels and their uses in real world applications	PO1,PO2,PSO2	3
CO2	Apply evaluation metrics and opinion mining techniques by using VADER and NLTK tools in opinion mining	PO2,PO5,PSO2	3
CO3	Make use of data mining methods for recommender systems, classifiers, optimization of recommender systems	PO2,PO3,PSO2	3
CO4	Examine the optimization methods for different recommender systems.	PO2,PSO2	4
CO5	Justify the opinion mining techniques and recommend optimization methods of RSs by using VADER, NLTK, etc. tools in real world applications	PO3,PO5,PSO2	5

COURSE OUTCOME INDICATORS (COIs)::

Outcome No.	Highest BTL	COI-2	COI-3	COI-4	COI-5
CO1	3	Btl-2 Identify the levels of opinion mining, opinion mining tasks and extraction tools.	Btl-3 Apply the language models for feature extraction, visualization and LDA in opinion mining		
CO2	3	Btl-2 Demonstrate the evaluation metrics, opinion mining	Btl-3 Make use of the knowledge based, supervised, unsupervised		

		patterns, and opinion mining techniques	approaches in opinion mining and apply LDA models for Aspect based opinion mining.		
CO3	3	Btl-2 Illustrate the data mining methods , convex and linear optimization principles	Btl-3 Organize the content based recommender systems, item based recommender systems, and collaborative filtering based recommender systems.		
CO4	4	Btl-2 Demonstrate the regularization and overfitting of base line predictor, RS problem solution steps and collabarative filtering (CF) based RSs	Btl-3 Apply user based CF, item-based CF, advanced CF based methods for recommender systems and hybrid RSs	Btl-4 Analyze constraint based RSs, performance evaluation of RSs, rating and accuracy of RSs	
CO5	5				Btl-5 To evaluate the optimization methods and analyze the opinion mining techniques for recommender systems.

PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES (POs/PSOs)

Po No.	Program Outcome
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
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PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
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PO4	Conduct Investigations of Complex Problems:Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
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PO5	Modern Tool Usage:Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
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PO6	The Engineer and Society:Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
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PO7	Environment and Sustainability:Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
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PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
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PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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PO10	Communication:Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
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PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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PO12	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
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PSO1	An ability to design and develop Artificial Intelligence technology into innovative products for solving real world problems

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PSO2	An ability to design and develop Data Science methods for analyzing massive datasets to extract insights by applying AI as a tool.
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Lecture Course DELIVERY Plan:

Sess.No.	CO	COI	Topic	Book No[CH No] [Page No]	Teaching-Learning Methods	EvaluationComponents
1	CO1	COI-2	Opinion Mining, Introduction, Aspect Based Mining Opinion Mining	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
2	CO1	COI-2	History- Opinion Mining Terminologies - General Opinion Mining Tasks - Document-Level Opinion Mining-Feature-based Opinion Mining	Book1	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM1
3	CO1	COI-2	Sentence-Level Opinion Mining- Phrase-Level Opinion Mining - Aspect-based Opinion Mining	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,Home Assignment,SEM-EXAM1
4	CO1	COI-3	Language Models - N-Gram Models	Book1	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM1
5	CO1	COI-3	PLSI Model - Multinomial LDA, Parameter Estimation -Smoothing - Model Selection.	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
6	CO1	COI-3	Flipped learning: Feature Extraction and -Opinion Visualisation -Probabilistic Graphical Models	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
7	CO2	COI-2	Evaluation Metrics - Opinion Digger: A Hybrid Method for Mining Reviews - Temporal Opinion Mining - Temporality Process	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
8	CO2	COI-2	Aspect Extraction- Finding Frequent Noun phrases - Mining Opinion Patterns - Filtering Out Non-Aspects - Grouping Candidate Aspects, Opinion Mining Techniques	Book1	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM1

Sess.No.	CO	COI	Topic	Book No[CH No] [Page No]	Teaching-Learning Methods	EvaluationComponents
9	CO2	COI-2	Flipped learning: Knowledge-based Approaches -SentiWordNet - SentiWordNet in our - Supervised Approaches - Naive Bayes	Book1	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM1
10	CO2	COI-3	Unsupervised Approaches - Supervised versus Unsupervised, Parameter Estimation -Smoothing - Model Selection	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,Home Assignment,SEM-EXAM1
11	CO2	COI-3	Test Set Likelihood - LDA Models for Aspect-based Opinion Mining - LDA - S-LDA - D-LDA - PLDA - S-PLDA - D-PLDA - Inference and Estimation.	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
12	CO2	COI-3	Test Set Likelihood - LDA Models for Aspect-based Opinion Mining - LDA - S-LDA - D-LDA - PLDA - S-PLDA - D-PLDA - Inference and Estimation.	Book1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
13	CO3	COI-2	Flipped learning- Introduction and basic taxonomy of recommender systems (RSs). Traditional and non-personalized RSs.	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2
14	CO3	COI-2	Overview of data mining methods for recommender systems (similarity measures, classification, Bayes classifiers, ensembles of classifiers, clustering, SVMs, dimensionality reduction)	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,Home Assignment,SEM-EXAM2
15	CO3	COI-2	Overview of convex and linear optimization principles. Content-based recommender systems, The long-tail principle.	Book2	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM2
16	CO3	COI-3	Domain-specific challenges in recommender systems. Content-based recommender	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2

Sess.No.	CO	COI	Topic	Book No[CH No] [Page No]	Teaching-Learning Methods	EvaluationComponents
			systems, Advantages and drawbacks			
17	CO3	COI-3	Basic components of content-based RSs, Feature selection, Item representation Methods for learning user profiles.	Book2	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM2
18	CO3	COI-3	Collaborative Filtering (CF)-based RSs: Mathematical foundations Mathematical optimization in CF RSs.	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2
19	CO4	COI-2	Optimization objective. Baseline predictor through least squares. Regularization and overfitting. Temporal models. Step-by-step solution of the RS problem.	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2
20	CO4	COI-2	Collaborative Filtering (CF)-based RSs: systematic approach Nearest-neighbor collaborative filtering (CF).	Book2	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM2
21	CO4	COI-3	User-based and item-based CF, comparison. Components of neighborhood methods (rating normalization, similarity weight computation, neighborhood selection).	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,Home Assignment,SEM-EXAM2
22	CO4	COI-3	Hybrid recommender systems. Advanced CF methods Matrix factorization models and dimensionality reduction	Book2	Chalk,PPT,Talk	ALM,ATTN,End Semester Exam,SEM-EXAM2
23	CO4	COI-4	Flipped learning-Matrix Decomposition. Latent factor models. Solution via alternative projections method. Examples. The Netflix data challenge. Constraint-based RSs.	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2
24	CO4	COI-4	Introduction to tensors and their applications. Performance evaluation of	Book2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2

Sess.No.	CO	COI	Topic	Book No[CH No] [Page No]	Teaching-Learning Methods	EvaluationComponents
			RSs Experimental settings. Working with RSs data sets. Examples. The cold-start problem. Evaluation metrics. Rating prediction and accuracy.			
25	CO2	COI-2	Revision of CO 1 and CO 2 Concepts	Book 1	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM1
26	CO4	COI-4	Revision of CO 3 and CO 4 Concepts	Book 2	Chalk,PPT,Talk	ATTN,End Semester Exam,SEM-EXAM2

Lecture Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 Identify the levels of opinion mining, opinion mining tasks and extraction tools.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Identify the levels of opinion mining, opinion mining tasks and extraction tools.	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 Explain different opinion mining levels terminologies and tasks

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	History- Opinion Mining Terminologies - General Opinion Mining Tasks - Document-Level Opinion Mining-Feature-based Opinion Mining	2	PPT	One minute paper
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 Demonstrate the levels of opinion mining

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Sentence-Level Opinion Mining- Phrase-Level Opinion Mining - Aspect-based Opinion Mining	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 4**Session Outcome: 1** Apply different language models on opinion mining

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Language Models - N-Gram Models	3	PPT	Group Discussion
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 5**Session Outcome: 1** Utilize the PLSI and LDA models for model selection

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	PLSI Model - Multinomial LDA, Parameter Estimation - Smoothing - Model Selection.	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 6**Session Outcome: 1** Organize the feature extraction and probabilistic graphic models

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
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5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Flipped learning: Feature Extraction and -Opinion Visualisation -Probabilistic Graphical Models	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 7**Session Outcome: 1** Illustrate the evaluation metrics and temporal opinion mining

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Evaluation Metrics - Opinion Digger: A Hybrid Method for Mining Reviews -Temporal Opinion Mining - Temporality Process	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 8**Session Outcome: 1** Demonstrate the finding frequent noun phrases and opinion mining techniques

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Aspect Extraction- Finding Frequent Noun phrases - Mining Opinion Patterns - Filtering Out Non-Aspects - Grouping Candidate Aspects, Opinion Mining Techniques	2	PPT	Fish Bowl
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 9**Session Outcome: 1** Summarize the knowledge based and supervised approaches

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---

35	Flipped learning: Knowledge-based Approaches - SentiWordNet - SentiWordNet in our - Supervised Approaches -Naive Bayes	2	PPT	Debate
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 10**Session Outcome: 1** Apply supervised and un-supervised parameter estimation for model selection

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Unsupervised Approaches - Supervised versus Unsupervised, Parameter Estimation -Smoothing - Model Selection	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 11**Session Outcome: 1** Build different LDA models for Aspect based opinion mining

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Test Set Likelihood - LDA Models for Aspect-based Opinion Mining - LDA - S-LDA - D-LDA - PLDA - S-PLDA - D-PLDA - Inference and Estimation.	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 12**Session Outcome: 1** Apply different LDA models for aspect based opinion mining

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Test Set Likelihood - LDA Models for Aspect-based Opinion Mining - LDA - S-LDA - D-LDA - PLDA - S-PLDA - D-PLDA - Inference and Estimation.	3	PPT	--- NOT APPLICABLE ---

10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---
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SESSION NUMBER : 13**Session Outcome: 1** Demonstrate the basic taxonomy of recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Flipped learning-Introduction and basic taxonomy of recommender systems (RSs). Traditional and non-personalized RSs.	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 14**Session Outcome: 1** Summarize the data mining methods for recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Overview of data mining methods for recommender systems (similarity measures, classification, Bayes classifiers, ensembles of classifiers, clustering, SVMs, dimensionality reduction)	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 15**Session Outcome: 1** Illustrate the convex and linear optimization principles of recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Overview of convex and linear optimization principles. Content-based recommender systems, The long-tail principle.	2	PPT	Quiz/Test Questions
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 16**Session Outcome: 1** Apply domain specific challenges in recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Domain-specific challenges in recommender systems. Content-based recommender systems, Advantages and drawbacks	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 17**Session Outcome: 1** Make use of basic components of recommender systems and feature selection

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Basic components of content-based RSs, Feature selection, Item representation Methods for learning user profiles.	3	PPT	Brain storming session
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 18**Session Outcome: 1** Organize the collaborative filtering and mathematical optimization in recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Collaborative Filtering (CF)-based RSs: Mathematical foundations Mathematical optimization in CF RSs.	4	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 19

Session Outcome: 1 Demonstrate the optimization , baseline predictor, regularization and overfitting in recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Optimization objective. Baseline predictor through least squares. Regularization and overfitting. Temporal models. Step-by-step solution of the RS problem.	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 20

Session Outcome: 1 Summarize the collaborative filtering based recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Collaborative Filtering (CF)-based RSs: systematic approach Nearest-neighbor collaborative filtering (CF).	2	PPT	Case Study
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 21

Session Outcome: 1 Utilize the user based and item-based CFs with components of neighborhood methods for recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	User-based and item-based CF, comparison. Components of neighborhood methods (rating normalization, similarity weight computation, neighborhood selection).	3	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 22

Session Outcome: 1 Build the hybrid recommender systems by using advanced CF methods

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Hybrid recommender systems. Advanced CF methods Matrix factorization models and dimensionality reduction	3	PPT	Puzzle, Enigma, Contradiction
10	Summary/Discussions/QA	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 23

Session Outcome: 1 Analyze the latent factor models and projection methods in recommender systems

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Flipped learning-Matrix Decomposition. Latent factor models. Solution via alternative projections method. Examples. The Netflix data challenge. Constraint-based RSs.	4	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 24

Session Outcome: 1 Examine the performance of recommender systems with an examples

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Introduction to tensors and their applications. Performance evaluation of RSs Experimental settings. Working with RSs data sets. Examples. The cold-start problem. Evaluation metrics. Rating prediction and accuracy.	4	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 25

Session Outcome: 1 Apply different opinion mining techniques on real time applications

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Revision of CO 1 and CO 2 Concepts	2	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 26

Session Outcome: 1 Apply hybrid recommender systems for online reviews

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
35	Revision of CO 3 and CO 4 Concepts	4	PPT	--- NOT APPLICABLE ---
10	Summary/Discussions/QA	2	PPT	--- NOT APPLICABLE ---

Tutorial Course DELIVERY Plan: NO Delivery Plan Exists

Tutorial Session wise Teaching – Learning Plan

No Session Plans Exists

Practical Course DELIVERY Plan:

Tutorial Session no	Topics	CO-Mapping
1	Text Preprocessing in Opinion Mining	CO5
2	Sentiment analysis using VADER or SentiWordNet	CO5
3	Training and evaluating a sentiment classifier using logistic regression or SVM	CO5
4	Building a sentiment analysis model using LSTM or BERT	CO5
5	Extract and analyze sentiments on specific aspects of reviews	CO5
6	Summarize opinions from a set of reviews	CO5

Tutorial Session no	Topics	CO-Mapping
7	Visualize sentiment trends over time using line charts	CO5
8	Simple popularity-based recommender system	CO5
9	Make recommendations based on similar users' preferences	CO5
10	Calculate item similarity and making recommendations based on similar items	CO5
11	Combine collaborative filtering and content-based methods.	CO5
12	Evaluation of Recommender Systems	CO5

Practical Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Implementation of Text Preprocessing in Opinion Mining	5	PPT	--- NOT APPLICABLE ---
25	Evaluation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	5	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Implement the Sentiment analysis using VADER or SentiWordNet	5	PPT	--- NOT APPLICABLE

25	Evaluation	4	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	ImTraining and evaluating a sentiment classifier using logistic regression or SVMplement	5	PPT	--- NOT APPLICABLE ---
25	Evaluation	4	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Building a sentiment analysis model using LSTM or BERT	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Extract and analyze sentiments on specific aspects of reviews	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Summarize opinions from a set of reviews	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Visualize sentiment trends over time using line charts	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---

20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---
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SESSION NUMBER : 8

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Simple popularity-based recommender system	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Make recommendations based on similar users' preferences	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
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5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Calculate item similarity and making recommendations based on similar items	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 11

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Combine collaborative filtering and content-based methods.	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 12

Session Outcome: 1 To evaluate the optimization and Analyse the contextual information model and reinforcement learning.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	1	Talk	--- NOT APPLICABLE ---
50	Evaluation of Recommender Systems	5	PPT	--- NOT APPLICABLE ---
25	Evaluation/Implementation	5	PPT	--- NOT APPLICABLE ---
20	Summary/QA/Viva	4	PPT	--- NOT APPLICABLE ---

Skilling Course DELIVERY Plan: NO Delivery Plan Exists

Skilling Session wise Teaching – Learning Plan

No Session Plans Exists

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDED PROBLEM-SOLVING EXERCISES etc:

Week	Assignment Type	Assignment No	Topic	Details	co
3	Weekly Homework Assignments	1	Phrase-Level Opinion Mining and Aspect-based Opinion Mining	1. Compare phrase-level opinion mining and aspect-based opinion mining in terms of their objectives and methodologies. 2.Explain how contextual embeddings (e.g., BERT, GPT) can be utilized in phrase-level opinion mining. Provide an example. 3.Discuss the potential benefits of combining lexicon-based and machine learning-based approaches in aspect-based opinion mining. 4.Describe the steps involved in preprocessing text data for aspect-based opinion mining, including tokenization, POS tagging, and dependency parsing.	CO1
10	Weekly Homework Assignments	2	Supervised and Un-supervised approaches used in opinion mining	1. Discuss the strengths and weaknesses of using traditional machine learning models (e.g., SVM, Naive Bayes) versus deep learning models (e.g., LSTM, BERT) for supervised opinion mining. 2. Explain the difference between static word embeddings (e.g., Word2Vec, GloVe) and contextual embeddings (e.g., BERT, GPT). How do these impact the performance of sentiment analysis models? 3. Compare and contrast Latent Dirichlet Allocation (LDA) and Non-Negative Matrix Factorization (NMF) for unsupervised aspect extraction. When would you choose one over the other? 4. Discuss the importance of	CO2

				different evaluation metrics (e.g., Precision, Recall, F1 Score, AUC-ROC) in the context of opinion mining. How do these metrics help in assessing the model's performance?	
14	Weekly Homework Assignments	3	Data mining methods for recommender systems	<p>1. Compare user-based and item-based collaborative filtering. What are the strengths and weaknesses of each approach? 2. Explain the concept of matrix factorization in recommender systems. How does Singular Value Decomposition (SVD) help in identifying latent factors? 3. Discuss how neural collaborative filtering differs from traditional collaborative filtering. What are the benefits of using deep learning models in recommender systems? 4. What are the ethical concerns in implementing recommender systems? Discuss issues related to privacy, bias, and fairness, and propose strategies to mitigate these concerns.</p>	CO3
21	Weekly Homework Assignments	4	User based and Item-based CFs methods for recommender systems	<p>1. Analyze the cold start problem in both user-based and item-based collaborative filtering. What strategies can be employed to mitigate this issue? 2. Evaluate the scalability challenges of user-based and item-based collaborative filtering. How do techniques like locality-sensitive hashing (LSH) and clustering help improve scalability? 3. Analyze the interpretability of recommendations made by user-based versus item-based collaborative filtering. How can you explain the recommendations to end-users? 4. Compare and contrast cosine similarity, Pearson correlation, and Jaccard similarity in the context of user-based and</p>	CO4

				item-based collaborative filtering. What are the strengths and weaknesses of each metric?	
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COURSE TIME TABLE:

	Hour	1	2	3	4	5	6	7	8	9
Day	Component									
Mon	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Tue	Theory	-- -	-- -	V-S21,V-S22	V-S21,V-S22	---	---	-- -	-- -	-- -
	Tutorial	-- -	-- -	--	--	---	---	-- -	-- -	-- -
	Lab	-- -	-- -	--	--	---	---	-- -	-- -	-- -
	Skilling	-- -	-- -	--	--	---	---	-- -	-- -	-- -
Wed	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Thu	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Fri	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Sat	Theory	-- -	-- -	---	---	--	--	-- -	-- -	-- -
	Tutorial	-- -	-- -	---	---	--	--	-- -	-- -	-- -
	Lab	-- -	-- -	---	---	V-S21,V-S21,V-S21,V-S22,V-S22,V-S22	V-S21,V-S21,V-S21,V-S22,V-S22,V-S22	-- -	-- -	-- -
	Skilling	-- -	-- -	---	---	--	--	-- -	-- -	-- -
Sun	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified according

SELF-LEARNING:

Assignments to promote self-learning, survey of contents from multiple sources.

S.no	Topics	CO	ALM	References/MOOCs
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DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.no	Advanced Topics, Additional Reading, Research papers and any	CO	ALM	References/MOOCs
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EVALUATION PLAN:

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4	CO5
End Semester Summative Evaluation Total= 40 %	Lab End Semester Exam	Weightage	16		90					16
		Max Marks	50							50
	End Semester Exam	Weightage	24		180	6	6	6	6	
		Max Marks	100			25	25	25	25	
In Semester Formative Evaluation Total= 24 %	Continuous Evaluation - Lab Exercise	Weightage	10		90					10
		Max Marks	50							50
	Home Assignment and Textbook	Weightage	6		50	1.5	1.5	1.5	1.5	
		Max Marks	100			25	25	25	25	
	ALM	Weightage	8		50	2	2	2	2	
		Max Marks	100			25	25	25	25	
In Semester Summative Evaluation Total= 36 %	Lab In Semester Exam	Weightage	8		90					8
		Max Marks	50							50
	Semester in Exam-II	Weightage	14		90			7	7	
		Max Marks	50					25	25	
	Semester in Exam-I	Weightage	14		90	7	7			
		Max Marks	50			25	25			

ATTENDANCE POLICY:

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course

In every course, student has to maintain a minimum of 85% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 75% to 85% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments

DETENTION POLICY :

In any course, a student has to maintain a minimum of 85% attendance and In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY :

Supplement course handout, which may perhaps include special lectures and discussions

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Supplement course handout, which may perhaps include special lectures and discussions

Name of Faculty	Delivery Component of Faculty	Sections of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty:
Praveena Mandapati	P	22-C	-	-	-	-
Raveendra Enumula	P	21-C	-	-	-	-
BALAJI PENUBAKA	L	21-MA	-	-	-	-
BALAJI PENUBAKA	P	21-A	-	-	-	-
prakasarao yallamati	P	21-B	-	-	-	-
ARUNDATHI JILLAPALLI	P	22-B	-	-	-	-
Tarak Hussain	L	22-MA	-	-	-	-
Tarak Hussain	P	22-A	-	-	-	-

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

Most of the notices are available on the LMS platform.

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR

(BALAJI PENUBAKA)

Signature of Department Prof. Incharge Academics & Vetting Team Member

Department Of AI&DS

HEAD OF DEPARTMENT:

Approval from: DEAN-ACADEMICS

(Sign with Office Seal) [object HTMLDivElement]