

COS40007 Artificial Intelligence for Engineering

Week 10 Studio Activities

ILO	Understand Recommendation Systems algorithms
Aim	<ul style="list-style-type: none"> Understand the concept of recommendation systems and their applications Develop and evaluate a recommendation system using Collaborative filtering and content-based recommendation methods.
Resources	<p>Books:</p> <ol style="list-style-type: none"> Prosise, Jeff. Applied machine learning and AI for engineers. "O'Reilly Media, Inc.", 2022. Ricci, Francesco. Rokach, Lior. Recommender Systems Handbook. Springer, 2022. Aggarwal, Charu. Recommender Systems: The Textbook. Springer. 2016 <p>Web Resources:</p> <ol style="list-style-type: none"> https://realpython.com/build-recommendation-engine-collaborative-filtering/ https://www.geeksforgeeks.org/recommendation-system-in-python/?ref=gcse_indz https://www.kaggle.com/code/gspmoreira/recommender-systems-in-python-101
Requirements for to be marked as complete	The best requirement to be marked as completed is to successfully develop and demonstrate a functional recommendation system using the given manufacturing dataset, achieving a minimum accuracy of 85% in predicting optimal product configurations based on historical data.

Note: This session's dataset can be taken from
<https://snap.stanford.edu/data/telecom-graph.html>
 or
<https://github.com/RUCAIBox/RecSysDatasets>.



Studio Activity 1: Data Exploration and Preprocessing

- Load the dataset and perform data cleaning and preprocessing.
- Analyze the data distribution and identify key features for the recommendation system.
- Encode categorical variables and normalize numerical features as needed.

Studio Activity 2: Build a Collaborative Filtering Model

- Develop a collaborative filtering model using matrix factorization techniques like SVD.
- Train the model on manufacturing data to recommend product configurations based on historical production outcomes.
- Evaluate the model's accuracy and optimize hyperparameters.

Follow this [tutorial](#) to make a collaborative filtering model.

Studio Activity 3: Content-Based Recommendation System

Explore and try to:

- Create a content-based recommendation system using product attributes and production data.
- Implement similarity measures (e.g., cosine similarity) to recommend similar product configurations.
- Analyze the recommendations and tune the model based on evaluation metrics.

Studio Activity 4: Comparing Collaborative Filtering and Content-Based Recommendation Systems

- Evaluate both models using the same test dataset.
- Compare the models based on key metrics such as accuracy, precision, recall, and F1-score.
- Create visualizations to illustrate the differences in model performance.
- Analyze the results to determine which model performs better for the given dataset.
- Summarize the findings and recommend the most suitable model for the manufacturing recommendation system based on the comparison.
- Example in this [link](#).

Next Steps:

You have learned to apply recommendation systems using real-world data in this studio. These resources and activities should help develop a recommendation system tailored to manufacturing needs.