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| **Objective** | **Students will be able to understand Recommendation Systems and predict the next purchase of a customer using Nearest Neighbor Classifier Algorithm** |
| **Prior Knowledge** | Basic concepts of algorithms  Basic concepts about comparing similar quantities and objects, natural numbers from mathematics |

**Session 4: Session time:** 60 minutes

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| **Goal:** | Students will be able to understand Various Recommendation Systems  Students will be able to build a simple recommendation system for an online shopping application  Students will be able to predict the next purchase of a customer using Nearest Neighbor Classifier |
| **Description:** | Highlight the importance and usage of Recommendation Systems in day-to-day life  Walk through examples of Recommendation Systems and introduce an algorithm known as “**Nearest Neighbor Classifier Algorithm**” |
| **Material required:** | **Shopping History:** Collect data from customers about their purchase for preparing training data. 🡪 **Customer names, objects purchased and recent purchase**  **Students can choose one product and must collect the data before the session begins.**  **Other Material:** 2 A4 sheets for students to work on the Recommendation Systems Activity |
| **Essential Questions and Understanding** | **How similar are my choices with others in the digital world?**  **Can AI predict similarity between choices of two people?**  **Always calculate the similarity between recommendation\_answer and previous data.** |
| **Procedure Summary:** | This lesson plan helps a teacher to explain the concept of Recommendation Systems using Nearest Neighbor Classifier Algorithm |
| **Opening Discussion** | Follow the slides 2-3:   * The students are asked to observe and describe the given image * The image clearly shows that the world is an over-crowded place with lot of information * This leads to the fact that we are overloaded with lots of information and facing difficulties in taking decisions.   Teacher can ask following questions to students  Can you describe the given picture?  Can you imagine the situation of a person confusing with loads of information?  How many news articles and blog posts each day? |
| **Teacher Led Practice of the Recommendation Systems** | Slide 8-12:   1. Run through the examples of Recommendation Systems in our day-to-day life. 2. Explain the common recommendation systems    1. Amazon 🡪 Product Recommendation system    2. Netflix 🡪 Movie Recommendation system    3. Linkedin 🡪 Job Recommendation system    4. Facebook 🡪 Friends Recommendation system 3. Give some more example of Recommendation Systems for different categories of services.   Follow the slides from slide 13 to slide 14:   1. How recommendation system works, exactly?  * Predict how much you may like a certain product/service * Compose a list of N best items for you * Compose a list of N best users for a certain product/service * Explain to you why these items are recommended to you * Adjust the prediction and recommendation based on feedbacks from everyone   2. Explain the students what is “**Nearest Neighbor Classifier Algorithm”**  “When given an item to classify, it finds the training data item that is most similar to the new item, and outputs its label.”   1. Explain with the diagram for classification by measuring the distance.     Figure . Before nearest neighbor Classification     * In the above diagram, we show a collection of training data items, some of which belong to one class (Red) and other to another class (blue). * In addition, there are two test data items, the stars, which we are going to classify using the nearest neighbour method.     Figure . After nearest neighbor classification   * You can measure the distance between any two items using scale or thread and calculate approximately just by observing. * The above diagram should be taken just as a visual tool to illustrate the general idea, which is to relate the class values to **similarity or proximity** (“nearness”). * The nearest neighbour classifier can easily be applied to items that are characterized by many more properties.     Follow slide 15:   1. Build a simple recommendation system for an online shopping application 2. Ask the students to collect the data from customers (including recent purchase) to create a training data.   (**Note: If the number of students are less**, a teacher can provide the training data to the students so that similarities among the data can be found)  Follow slide 16:   1. Provide the test data to the students to predict the next purchase of a customer. 2. Ask the students to calculate the similarities by comparing the test data with the training data   Follow slide 17 to 18:   1. Explain to the students on how to predict the next purchase of a customer 2. Calculate the similarity of **a customer “X”** relative to the other users in the training data (done by adding together the number of similar purchases by the users). 3. Having calculated the similarities, identify the user who is most similar to **the customer “X”** by selecting the largest of the calculated similarities. 4. Predict what **customer “X”** is likely to purchase next by looking at the most recent purchase (the rightmost column in the table) of the most similar user from the previous step.   Follow slide 19:   1. Ask the students “Who is the user most similar to **customer X**”? 2. Ask the students “What is the predicted purchase for **customer X**”? 3. Justify the answers   Follow slide 20 to 24:   1. Ask few questions to the students to evaluate their understanding about the activity   Follow slide 25:  Discuss on “What else can be recommended by Machines/Computers?” |
| **Higher Order Thinking Skill** | 1. Ask students to build a simple recommendation system. 2. Collect data from 20 friends – Training Data 3. Collect data from 1 friend whose next purchase to be recommended – Test data 4. Apply nearest Neighbor classifier 5. Find the next purchase to be recommended 6. Ask the students to experience the Microsoft Paint and Auto draw (An application that provides recommendation for your drawing - <https://www.autodraw.com/> ), and ask them to note down the advantages of Recommendation System. |