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| Description: SRM Institute of Science and Technology Vector Logo - (.SVG + .PNG) -  VectorLogoSeek.ComRegister Number |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**SRM Institute of Science and Technology**

**Set - D**

**College of Engineering and Technology**

**School of Computing**

**Department of Networking and Communication**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

**Academic Year: 2023-24 (EVEN)**

**Test: CLA-T3** **Date: 7.05.2024**

**Course Code & Title: 18CSC305J – Artificial Intelligence Duration:** 60 minutes

**Year & Sem: III Year / VI Sem** **Max. Marks:**25

**Course Articulation Matrix:**

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| S.No | Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| 1 | CO1 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| 2 | CO2 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| 3 | CO3 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | - |
| 4 | CO4 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| 5 | CO5 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |

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| **Answer all Questions**  **(1 x 10 = 10 Marks)** | | | | | | |
| Q. No | Question | Marks | BL | CO | PO | PI Code |
| 1,2. | In the logistics industry mapped under --------------- domain, optimizing supply chain routes using optimization techniques mapped under ----------- domain such as Linear Programming can minimize transportation costs.  **Problem , Knowledge** | 2 | 3 | 4 | 2 | 2.1.3 |
| 3-7 | Solve the above cross word puzzle related to Natural Language Processing  **ACROSS** 3. Application of NLP to determine data is Positive , Negative or Neutral 5. Sentence into Individual Words  **DOWN** 1. Vectorization of Words 2. Collection of Texts 4. Process of removing affixes   1. **Vectorization of Words – Embedding** 2. **Collection of Texts - Corpus** 3. **Application of NLP to determine data is Positive , Negative or Neutral  – Sentiment Analysis** 4. **Process of removing affixes -Stemming** 5. **Sentence into Individual Words-Tokens** | 5 | 4 | 5 | 3 | 2.1.3 |
| 8. | A healthcare organization wants to identify subgroups of patients with similar medical characteristics. They can utilize \_\_\_\_\_\_\_\_\_\_\_ techniques like to cluster patients into different cohorts.  **Unsupervised** | 1 | 2 | 4 | 3 | 2.2.3 |
| 9. | The mapping of data to higher dimension to create a hyper plane in Support Vector Machine is called ------------------  **Kernelling** | 1 | 2 | 4 | 2 | 2.1.3 |
| 10. | An autonomous vehicle is navigating through city streets using reinforcement learning. Initially, the vehicle explores various routes and driving behaviors to understand the environment and traffic patterns. As it gains experience, the vehicle starts to emphasize \_\_\_\_\_\_\_\_\_\_\_ to ensure safe and efficient navigation.Top of Form  **Exploitation** | 3 | 4 | 4 | 2 | 2.2.3 |

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| **Answer any Three Questions**  **(3 x 5 = 15 Marks)** | | | | | | |
| Q. No | Question | Marks | BL | CO | PO | PI Code |
| 1. | Explain goal stack planning with an block world problem as an example  **Goal Stack Planning -1 Mark**  **Example – 4 Marks**  Goal Stack Planning is a planning technique used in artificial intelligence and robotics for solving problems where the agent needs to achieve a set of goals by performing a sequence of actions. It involves breaking down complex goals into simpler sub-goals, which are then achieved through actions. One classic example domain for illustrating goal stack planning is the Block World problem.  **Block World Problem:** In the Block World problem, you have a set of blocks placed on a table. Each block has a unique name, and you can stack them on top of each other or move them around. The goal is to rearrange the blocks to match a given configuration. For instance, let's say you have blocks A, B, and C, and you want to arrange them in the following order:  C  B  A  **Goal Stack Planning with Block World Problem:**   1. **Initial State:**    * Blocks are initially arranged in some arbitrary order. 2. **Goal State:**    * The goal state specifies the desired arrangement of blocks. 3. **Goal Stack:**    * Initially, the goal stack contains the top-level goal (the final configuration of blocks). 4. **Sub-Goals:**    * Break down the top-level goal into sub-goals, such as "move A on top of B", "move B on top of C", and "move C to the bottom". 5. **Action Selection:**    * Select actions that can achieve each sub-goal. In the Block World problem, actions include picking up a block, putting a block down, and stacking one block on top of another. 6. **Execution:**    * Execute the selected actions, updating the state of the environment after each action. 7. **Goal Achievement:**    * Continuously check whether the current state satisfies the top-level goal or any of its sub-goals. If not, continue selecting actions and executing them.   **Example:( Students can give any example states)**  Let's say the initial state is:  A B C  The goal is to rearrange the blocks to match the configuration:  C B A   * Top-Level Goal: Arrange blocks C, B, and A in the specified order. * Sub-Goals:   1. Move block A on top of B.   2. Move block B on top of C.   3. Move block C to the bottom.   Each sub-goal is then further broken down into actions and executed step by step until the overall goal is achieved.  Goal stack planning provides a systematic approach to solving complex problems by decomposing them into simpler sub-problems, making it easier to find a sequence of actions that lead to the desired outcome.Top of Form | 5 | 2 | 4 | 2 | 2.1.3 |
| 2. | You work for a sports analytics company that specializes in predicting the outcomes of teams with respect to runs scored, specifically in IPL. Your company has collected data from previous IPL seasons, including various factors such as team’s score, player statistics, match venue, weather conditions, and more. Which model can be used for predicting the runs that can be scored by the team based on the historical data? Justify the same.  **Identification and Formulation of Linear Regression - 4 marks**  **Justification – 1 mark**  For predicting the runs scored by an IPL team based on historical data, several machine learning models can be considered. One of the commonly used models for this task is the **Multiple Linear Regression / Linear Regression** model.  The general form of the Multiple Linear Regression equation is:  𝑌=𝛽0+𝛽1𝑋1+𝛽2𝑋2+…+𝛽𝑛𝑋𝑛+𝜖*Y*=*β*0​+*β*1​*X*1​+*β*2​*X*2​+…+*βn*​*Xn*​+*ϵ*  Where:   * 𝑌*Y* is the dependent variable (runs scored). * 𝑋1,2,…,𝑋𝑛*X*1​,*X*2​,…,*Xn*​ are the independent variables (factors such as team’s score, player statistics, match venue, weather conditions). * 𝛽0,𝛽1,𝛽2,…,𝛽𝑛*β*0​,*β*1​,*β*2​,…,*βn*​ are the coefficients of the independent variables. * 𝜖*ϵ* is the error term.   In the context of predicting runs scored by an IPL team, we can represent the linear equation as:  Runs=𝛽0+𝛽1(Team Score)+𝛽2(Player Statistics)+𝛽3(Match Venue)+𝛽4(Weather Conditions)+𝜖Runs=*β*0​+*β*1​(Team Score)+*β*2​(Player Statistics)+*β*3​(Match Venue)+*β*4​(Weather Conditions)+*ϵ*  Here:   * RunsRuns is the dependent variable (the runs scored by the team). * Team ScoreTeam Score is the average score of the team in previous matches. * Player StatisticsPlayer Statistics represent various player metrics such as average runs scored, strike rate, etc. * Match VenueMatch Venue includes factors related to the venue, such as home/away match, pitch conditions, etc. * Weather ConditionsWeather Conditions includes variables like temperature, humidity, chance of rain, etc. * 𝛽0,1,𝛽2,𝛽3,𝛽4*β*0​,*β*1​,*β*2​,*β*3​,*β*4​ are the coefficients representing the impact of each factor on the runs scored. * 𝜖*ϵ* represents the error term.   This linear equation form allows us to estimate the runs scored by the team based on the values of the independent variables and their coefficients. By fitting this model to the historical data, we can predict the runs scored by the team in future matches.  **Justification:**   1. **Interpretability**: Multiple Linear Regression provides a clear interpretation of the relationship between the independent variables (such as player statistics, match venue, weather conditions) and the dependent variable (runs scored 2. **Feature Importance**: By examining the coefficients of the independent variables in the regression equation, we can identify which factors have a significant impact on the runs scored.   However, it's important to note that Multiple Linear Regression assumes a linear relationship between the independent variables and the dependent variable. If the relationship is highly non-linear, Linear Regression cant be used | 5 | 3 | 4 | 3 | 3.3.1 |
| 3. | Compare Business Analytics and Business Intelligence with the sample scenario  **Comparison – 3 Marks**  **Example – 2 Marks**   | **Aspect** | **Business Analytics** | **Business Intelligence** | | --- | --- | --- | | Purpose | Focuses on using data analysis to identify trends, patterns, and relationships in the data to make data-driven decisions and solve business problems | Focuses on gathering, analyzing, and visualizing data to provide actionable insights and support decision-making at operational and strategic levels | | Approach | Involves advanced statistical analysis, predictive modeling, and data mining techniques to extract insights and predict future outcomes | Involves querying, reporting, and visualization of data to provide insights into the current state of the business | | Example Activities | Predictive Modeling, Customer Segmentation, Market Basket Analysis, Churn Analysis | Dashboard Creation, Ad Hoc Reporting, Data Visualization, Performance Monitoring | | Tools and Techniques | Statistical modeling, machine learning, data mining | Data warehousing, querying, reporting, visualization | | Time Horizon | Focuses on long-term strategic planning and forecasting | Provides immediate insights for day-to-day operational decisions | | Audience | Data scientists, analysts, strategic decision-makers | Managers, executives, operational staff | | **Scenario: E-commerce Company Performance Analysis** | | | | | | Business Analytics | | | | | | - Use historical sales data to forecast future sales trends | | | | | | - Identify customer segments based on purchasing behavior | | | | | | - Analyze transaction data to understand product associations | | | | | | - Identify factors leading to customer churn | | | | | | Business Intelligence | | | | | | - Create interactive dashboards for real-time visibility into KPIs | | | | | | - Generate on-demand reports for specific business questions | | | | | | - Create visualizations to communicate trends and patterns in the data | | | | | | - Track KPIs over time to monitor business performance and identify areas for improvement | | | | | | 5 | 4 | 5 | 2 | 2.3.1 |
| 4. | Sketch and explain the architecture of Artificial Neural Networks  Introduction to Neural Networks, Advantages and Applications | by Jahnavi  Mahanta | Towards Data Science  **Architecture:**  An Artificial Neural Network (ANN) consists of multiple layers of interconnected neurons. Each neuron receives input from the neurons in the previous layer, performs a computation, and passes the result to the neurons in the next layer. The basic architecture includes:   1. **Input Layer**: This layer consists of neurons that receive the input data. 2. **Hidden Layers**: These are intermediate layers between the input and output layers. Each hidden layer contains neurons that process the input data through weighted connections and activation functions. 3. **Output Layer**: The output layer produces the final output of the neural network. The number of neurons in this layer depends on the nature of the problem (e.g., binary classification, multi-class classification, regression). 4. **Connections (Weights)**: Each connection between neurons in adjacent layers has an associated weight, which determines the strength of the connection. These weights are adjusted during the training process to minimize error. 5. **Activation Functions**: Each neuron applies an activation function to its weighted sum of inputs. Activation functions introduce non-linearity into the network, allowing it to learn complex patterns. 6. **Bias**: Each neuron typically has an associated bias term, which allows the network to shift the activation function horizontally, adding flexibility to the model. | 5 | 2 | 5 | 3 | 3.1.6 |