Peer-graded Assignment: Final Assignment

Reviews 2 left to complete

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Healthcare: Predicting Patient Readmission Rates

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August 20, 2024

Translated from English View original

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PROMPT

Which topic did you choose to apply the data science methodology to? **(2 points)**

Predicting Patient Readmission Rates

RUBRIC

Did the student pick one of the three topics proposed in the assignment overview?

- 0 pts
  No
- 2 pts
  Yes

PROMPT

Next, you will play the role of the client and the data scientist.

Using the topic that you selected, complete the Business Understanding stage by coming up with a problem that you would like to solve and phrasing it in the form of a question that you will use data to answer. **(3 points)**

You are required to:

1. Describe the problem, related to the topic you selected.
2. Phrase the problem as a question to be answered using data.

For example, using the food recipes use case discussed in the labs, the question that we defined was, "Can we automatically determine the cuisine of a given dish based on its ingredients?".

In healthcare, predicting patient readmission rates is critical for improving patient care and reducing hospital costs. High readmission rates can indicate issues with the quality of care or patient management. By identifying patients at high risk of readmission, healthcare providers can implement targeted interventions to improve patient outcomes and optimize resource use.

RUBRIC

The student is required to come up a problem related to the topic they selected and the problem must be phrased as a question that can be answered using data. Use your best judgement to rate the student's completion of the Business Understanding stage.

- 1 pt
  Poor. Some description is provided about the problem, but the question to be answered is missing.
- 2 pts
  Good. The problem to be solved is described and a question is submitted but the question does not match the problem described.
- 3 pts
  Excellent. The student gave sufficient description of the problem, and the question to be answered reflects the problem described.

PROMPT

Briefly explain how you would complete each of the following stages for the problem that you described in the Business Understanding stage, so that you are ultimately able to answer the question that you came up with. **(5 points)**:

1. Analytic Approach
2. Data Requirements
3. Data Collection
4. Data Understanding and Preparation
5. Modeling and Evaluation

You can always refer to the labs as a reference with describing how you would complete each stage for your problem.

1. **Analytic Approach**

Objective: Determine the most effective methods and models for predicting patient readmissions based on historical data.

Steps:

- **Define the Analytical Goals:** Identify key factors that might contribute to patient readmission (e.g., medical conditions, treatment types, demographics).
- **Select Modeling Techniques:** Choose appropriate predictive modeling techniques such as logistic regression, decision trees, or ensemble methods based on their suitability for classification tasks.
- **Formulate Evaluation Metrics:** Decide on metrics like accuracy, precision, recall, and the ROC curve to evaluate model performance and ensure it meets the project objectives.

2. **Data Requirements**

Objective: Specify the data needed to build and evaluate predictive models for patient readmissions.

Steps:

- **Identify Key Variables:** Determine which variables are essential, such as patient demographics, medical history, treatment details, and previous admission records.
- **Define Data Formats and Sources:** Specify formats (e.g., CSV, SQL databases) and sources (e.g., electronic health records, hospital databases) for the data.
- **Determine Data Granularity:** Define the level of detail required for each variable to ensure accurate predictions.

3. **Data Collection**

Objective: Gather and compile the necessary data from various sources to build and test the predictive models.

Steps:

- **Source Identification:** Access relevant data sources like electronic health records, patient management systems, and historical admission data.
- **Data Extraction:** Extract data using SQL queries or APIs from healthcare systems.
- **Data Integration:** Merge data from different sources to create a comprehensive dataset that includes all necessary variables.

4. **Data Understanding and Preparation**

Objective: Prepare the data for analysis by understanding its characteristics and cleaning it to ensure quality.

Steps:

- **Exploratory Data Analysis (EDA):** Conduct EDA to understand the data distribution, identify missing values, and detect outliers.
- **Data Cleaning:** Handle missing values (e.g., imputation or removal), address inconsistencies, and correct errors.
- **Feature Engineering:** Create new features if needed, such as aggregating variables or encoding categorical data, to enhance model performance.
- **Data Splitting:** Split the dataset into training and testing sets to evaluate model performance accurately.

5. **Modeling and Evaluation**

Objective: Develop, train, and evaluate predictive models to determine which patients are at risk of readmission.

Steps:

- **Model Training:** Train selected models (e.g., logistic regression, decision trees) using the training dataset.
- **Hyperparameter Tuning:** Optimize model parameters to improve performance.
- **Model Evaluation:** Evaluate models using the test dataset and assess performance using metrics like accuracy, precision, recall, F1 score, and ROC curve.
- **Model Refinement:** Based on evaluation results, refine models by adjusting parameters or trying different algorithms to improve predictive accuracy.

Final Output: Using these stages, the goal is to develop a reliable model that can predict patient readmissions, which will help healthcare providers target interventions and reduce unnecessary hospital readmissions.

RUBRIC

The student is required to explain how they would complete each stage for the problem that they described in the Business Understanding stage. Use your best judgement to rate the student's description of each stage.

- 1 pt
  Poor. Many stages are missing and insufficient description is provided.
- 3 pts
  Good. At least three stages are described and the description is clear and applies to the question defined in the Business Understanding stage. However, some stages are missing.
- 5 pts
  Excellent. All stages are described appropriately and the description is clear and applies to the question that they defined in the Business Understanding stage.

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