**Capstone Project**

**Student Competency Analysis**

Competency of the students is the key to success of a certain college. To ensure competency level of student performance in various courses he participated and trained. The college placement officer is interested to getting insights on each student and recommend the core companies according to his core strength.

* What are the various courses available for a student?
* How many students participated on specific courses?
* How many students are completed the courses?
* How many students have cleared the course in first attempt?
* What is the competency level of a student for the courses?

**Prerequisites**: All the services discussed in the sessions needs to be configured in your Free Azure subscription account.

**Technical Requirements:**

1. Create a GitHub repo(source), add all the documents related to the capstone project.
2. Use the medallion architecture to place the data in the Bronze, Silver and Glod layer in ADLS storage.
3. Create a pipeline in ADF,
   1. Add copytool activity to inject the data from github, place the raw data in Bronze layer.
   2. Create a notebook activity, the notebook activity will read the data from Bronze / Silver L1 layer.
   3. Below mentioned transformations needs to be performed on this data read and they need to be written to Gold layer.
   4. Data transformation logic has been mentioned below. Once the processing in ADB notebooks is complete, use web activity and Logic apps to trigger an email to yourself with a success message.
   5. Once this transformed data is written onto Gold layer, create views using serverless synapse and Read the data from synapse view.
   6. Do the necessary visualization on the transformed data using SQL pool / spark pool.

**Transformation Logic:**

As stated above, you will be reading the data from Bronze / Silver layer, Transforming the data and writing it to Gold layer.

1. Extract data from different data sources such as CSV, Parquet etc, by define the schema for the dataset.
2. Using the above schema read the data and the data frame in the delta format.
3. Verify the schema.
4. Check the datatypes.
5. Cache the dataframe.
6. Verify the first few records.
7. Clean the data by removing duplicates, null values, and invalid data.
8. Check for data accuracy by validating the data against the business rules.
9. Ensure the data is complete by checking for missing values and filling them with appropriate values.
10. Ensure the data is consistent by checking for data type consistency and format.
11. Verify the total number of rows and columns.
12. Verify the summary statistics.
13. Find the maximum and minimum values in each column.
14. Find if there are any duplicate values in the columns.
15. create a table/view on the spark dataframe to run SQL queries.
16. Complete the preprocessing steps by bringing any required analysis and give the insights you have identified.

**Technical Solution Approach:**

1. Extract the data from different sources using PySpark's built-in API.
2. Store the data in a centralized data lake such as Delta Lake, which provides ACID transactions and scalable storage.
3. Use PySpark's API to clean the data by removing duplicates, null values, and invalid data.
4. Validate the data against the business rules using PySpark's DataFrame API.
5. Check for missing values using PySpark's DataFrame API and fill them with appropriate values.
6. Check for data type consistency and format using PySpark's DataFrame API.

**General Instructions:**

1. The project must be done by an individual.
2. Queries regarding the project need to be discuss with allotted mentor / SME / Trainer.
3. Design the project as per the problem statement given below.
4. The project evaluation is for 100 marks.

**Submission:**

* Detailed presentation(Fractal PPT template) needs to prepare by taking a screen shot of all the steps mentioned above with your name/id that is present in ADB and ADF on top left corner in a document.
* Also attach the notebook code files (Download the DBC archive file from ADB) in the respective folders you will be creating for submission.
* ipynb, ppt, screenshot, dataset, any relevant document
* System will accept only ZIP file submissions i.e., in .zip format (Max size- 100 MB).
* Review the .zip file before uploading it.
* Please ensure that your submission is complete in all aspects.
* Multiple submission is not accepted.
* We strongly recommend you submit at least 60 minutes before your deadline.
* There will be no extension so please make sure to submit before the deadline.
* Result of capstone project will be declared after the presentation.

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| Project Start Date | 04-10-2023 |
| Project End Date | 16-10-2023 |
| Project Submission Date | 16-10-2023 |
| Naming Convention for the file | <empid\_firstname\_Capstone\_Project>  F11035\_Kiran\_Capstone\_Project.zip |

Capstone Presentation: -

* Individual viva
* Duration of viva: 30 min
* Mode of Viva : Online
* Date: 17.10.23 to 20.10.23
* Meeting Link & detailed schedule will be shared later.

Assessment Criteria

Participants will be graded on Approach, Solution and Presentation (25%,50%,25%)

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| --- | --- | --- | --- |
| S.No | Criteria | | Marks |
| 1 | Approach (25) | Design of the solution | 12.5 |
| 2 | Domain, Azure Services and Technical Understanding | 12.5 |
| 3 | Solution (50) | Best programming practices, Completeness & Readability | 15 |
| 4 | Data Ingestion & Pipeline | 15 |
| 5 | Data exploration | 20 |
| 6 | Presentation (25) | Domain Business understanding | 7.5 |
| 7 | Completeness of presentation | 7.5 |
| 8 | Visualization Approach | 5 |
| 9 | Future Work | 5 |

All the Best!!!