

2879. Display the First Three Rows

Problem Description

In this problem, we're working with a `DataFrame` named `employees` that has four columns with specific data types:

- `employee_id` which is of type `int`,
- `name` which is of type `object`, indicating it could be a string or a mix of different types,
- `department` which is also an `object`,
- and `salary` which is an `int`.

The task is to create a solution that will display the first `3` rows of this `DataFrame`. This means we need to write a function that takes this `DataFrame` as an input and returns a new `DataFrame` composed only of the first three entries from the original.

Intuition

When dealing with `DataFrames` in Python, the Pandas library is the go-to tool as it provides extensive functionalities for data manipulation and analysis. One of the basic methods available in Pandas for `DataFrame` objects is the `.head()` method.

The `.head()` method is used to retrieve the top `n` rows from a `DataFrame`, where `n` defaults to `5` when no argument is provided. Since in this case, we are interested in getting just the first three rows, we can simply call `employees.head(3)`. This line of code will return a new `DataFrame` with only the first three rows of the `employees` `DataFrame`.

Hence, the solution approach is straightforward:

- Import the Pandas library to be able to work with `DataFrames`.
- Define a function `selectFirstRows()` that accepts the `employees` `DataFrame` as a parameter.
- Inside the function, use the `.head()` method on the `employees` `DataFrame` with `3` as an argument to extract the first three rows.
- Return this subset of the `DataFrame`.

No complex operations or additional logic are required since this is a straight use-case of the method provided by Pandas for such tasks.

Solution Approach

The implementation of the solution for this particular problem is very straightforward because it leverages the built-in functionality provided by the Pandas library, rather than requiring a complex algorithm or data structure. Here's a step-by-step explanation:

- First, we import the Pandas library, which is a powerful tool for data manipulation in Python. It's standard to import Pandas and give it the alias `pd`, which is what we see in the solution `import pandas as pd`.
- Next, we define a function `selectFirstRows()`, which is our solution function. It expects one argument, `employees`, which is a `DataFrame` that we want to process.
- Inside the function, we use the Pandas `DataFrame` `.head()` method. The method `.head(n)` returns the first `n` rows of a `DataFrame`. By calling `employees.head(3)`, we are asking for the first three rows of the `employees` `DataFrame`.

This is the complete function:

```
1 def selectFirstRows(employees: pd.DataFrame) -> pd.DataFrame:
2     return employees.head(3)
```

The algorithm and pattern used here is direct and makes use of the high-level abstractions provided by Pandas for common data operations. Since the task does not require any conditional logic or iteration that would need to be explicitly programmed, we do not need to delve into more complex data structures or algorithms.

The function will output a new `DataFrame` object that contains only the first three rows of the `employees` `DataFrame`, maintaining the same column structure: `employee_id`, `name`, `department`, and `salary`.

In terms of computational complexity, this operation is usually $O(1)$, constant time, as it simply returns a view of the first few rows and does not involve any re-computation of data.

Example Walkthrough

Let's consider a scenario where we have a `DataFrame` called `employees` that looks like this:

employee_id	name	department	salary
1	Alice	Engineering	70000
2	Bob	Marketing	60000
3	Charlie	Sales	50000
4	Dana	HR	80000
5	Eve	Engineering	90000

Our goal is to create a function that, when given this `DataFrame`, will return a new `DataFrame` consisting only of the first three rows. We'll use Python along with the Pandas library to achieve this.

Here is a step-by-step explanation using the given `employees` `DataFrame`:

- First, we import the Pandas library using `import pandas as pd`.
- Then, we define our function `selectFirstRows()` which will accept one argument, the `employees` `DataFrame`. The function signature will look like this: `def selectFirstRows(employees: pd.DataFrame) -> pd.DataFrame`.
- Inside this function, we will call the `.head()` method on the `employees` `DataFrame`. Since we need the first three rows, we pass the integer `3` as an argument to `.head()`, which will be `employees.head(3)`.
- Finally, the function will return the result of `employees.head(3)`, which is the new `DataFrame` containing the first three rows of `employees`.

Applying the function `selectFirstRows()` to our `employees` `DataFrame` will look like this:

```
1 import pandas as pd
2
3 # The DataFrame 'employees' is defined as shown in the example above
4 employees = pd.DataFrame({
5     'employee_id': [1, 2, 3, 4, 5],
6     'name': ['Alice', 'Bob', 'Charlie', 'Dana', 'Eve'],
7     'department': ['Engineering', 'Marketing', 'Sales', 'HR', 'Engineering'],
8     'salary': [70000, 60000, 50000, 80000, 90000]
9 })
10
11 # Definition of our function
12 def selectFirstRows(employees: pd.DataFrame) -> pd.DataFrame:
13     return employees.head(3)
14
15 # Calling the function with our DataFrame
16 first_three_employees = selectFirstRows(employees)
17
18 # The 'first_three_employees' DataFrame now holds:
19 # | employee_id | name      | department | salary |
20 # |-----|-----|-----|-----|
21 # | 1          | Alice    | Engineering | 70000 |
22 # | 2          | Bob      | Marketing   | 60000 |
23 # | 3          | Charlie  | Sales       | 50000 |
```

In this case, the output we get from `first_three_employees` is exactly as we expect: the top three entries from our original `employees` `DataFrame`, maintaining the integrity of the data's structure.

Python Solution

```
1 import pandas as pd
2
3 def selectFirstRows(employees_df: pd.DataFrame) -> pd.DataFrame:
4     # Select and return the first three rows of the DataFrame
5     return employees_df.head(3)
6
```

Java Solution

```
1 import java.util.List;
2 import java.util.Map;
3 import java.util.stream.Collectors;
4
5 public class EmployeeSelector {
6
7     /**
8      * Selects and returns the first three rows of the employee data.
9      * This method assumes that there is a List of Maps where each Map represents
10      * a row in a DataFrame, with the key being the column name and the value being the cell data.
11      */
12     * @param employeesData List of Maps representing employee data.
13     * @return A List containing the first three Maps (rows) of the employee data.
14     */
15     public List<Map<String, Object>> selectFirstRows(List<Map<String, Object>> employeesData) {
16         // Check if employeesData is large enough; if not, return the original list
17         if (employeesData.size() <= 3) {
18             return employeesData;
19         }
20
21         // Return the first three elements of the List using stream
22         return employeesData.stream()
23             .limit(3)
24             .collect(Collectors.toList());
25     }
26 }
27
```

C++ Solution

```
1 #include <iostream>
2 // Assume a DataFrame class that stores employee records and provides a head() function similar to pandas
3 class DataFrame {
4 public:
5     // Constructor, destructor, and other necessary methods would go here
6
7     // Method to get first N rows of the DataFrame
8     DataFrame head(int n) {
9         // Implementation would go here
10        // For now, let's assume it returns a new DataFrame with the first n rows
11        return DataFrame(); // Placeholder
12    }
13 };
14
15 // Function that selects and returns the first three rows of a DataFrame
16 DataFrame selectFirstRows(const DataFrame& employeesDf) {
17     // Select and return the first three rows of the DataFrame
18     return employeesDf.head(3);
19 }
20
21 // The rest of your C++ code would go here...
22
```

Typescript Solution

```
1 // Assuming the use of a library similar to pandas in TypeScript for DataFrame operations,
2 // like danfo.js, because TypeScript/JavaScript does not have a native DataFrame type
3
4 import { DataFrame } from 'danfojs-node'; // Replace with the appropriate import based on the DataFrame library used
5
6 // Function to select the first three rows of a DataFrame
7 function selectFirstRows(employeesDf: DataFrame): DataFrame {
8     // Select and return the first three rows of the employees DataFrame
9     const firstThreeRows: DataFrame = employeesDf.head(3);
10
11     return firstThreeRows;
12 }
13
14 // Usage of the function assumes that DataFrame is populated
15 // For example:
16 // let employeesDf = new DataFrame({ // Data populated here });
17 // let firstRows = selectFirstRows(employeesDf);
18 // firstRows.print(); // This would be the equivalent of viewing the DataFrame in a Python context
19
```

Time and Space Complexity

The time complexity of the `selectFirstRows` function is $O(1)$ because retrieving the first few rows of a dataframe is a constant time operation. It does not depend on the size of the dataframe, as the number of rows to retrieve is always fixed at 3.

The space complexity of the function is also $O(1)$ since it creates a new dataframe containing only a constant number of rows, regardless of the input dataframe's size.