

Data Engineering 101

Pandas vs SQL



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Select all rows

Pandas

df

SQL

SELECT * FROM table;



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Select specific columns

Pandas

```
df[['col1', 'col2']]
```

SQL

```
SELECT col1, col2  
FROM table;
```



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Filter rows based on a condition

Pandas

```
df[df['col1'] > 5]
```

SQL

```
SELECT *  
FROM table  
WHERE col1 > 5;
```



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Filter rows based on multiple conditions

Pandas

```
df[(df['col1'] > 5) & (df['col2'] < 10)]
```

SQL

```
SELECT *  
FROM table  
WHERE col1 > 5 AND  
col2 < 10;
```



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Group by a column and count

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Pandas

```
df.groupby('col1').size()
```

SQL

```
SELECT col1, COUNT(*)  
FROM table  
GROUP BY col1;
```



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Group by a column and sum another column

Pandas

```
df.groupby('col1')['col2'].sum()
```

SQL

```
SELECT col1, SUM(col2)  
FROM table  
GROUP BY col1;
```



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Order by a column

Pandas

```
df.sort_values(by='col1')
```

SQL

```
SELECT *  
FROM table  
ORDER BY col1;
```



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Order by a column descending

Pandas

```
df.sort_values(by='col1',  
               ascending=False)
```

SQL

```
SELECT * FROM table  
ORDER BY col1 DESC;
```



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Join two tables

Pandas

```
pd.merge(df1, df2, on='id')
```

SQL

```
SELECT * FROM table1
JOIN table2
ON table1.id = table2.id;
```



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Left join two tables

Pandas

```
pd.merge(df1, df2, on='id', how='left')
```

SQL

```
SELECT * FROM table1
LEFT JOIN table2
ON table1.id = table2.id;
```



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Right join two tables

Pandas

```
pd.merge(df1, df2, on='id', how='right')
```

SQL

```
SELECT * FROM table1
RIGHT JOIN table2
ON table1.id = table2.id;
```



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Full outer join two tables

Pandas

```
pd.merge(df1, df2, on='id', how='outer')
```

SQL

```
SELECT * FROM table1
FULL OUTER JOIN table2
ON table1.id = table2.id;
```



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Calculate the average of a column

Pandas

```
df['col1'].mean()
```

SQL

```
SELECT AVG(col1)  
FROM table;
```



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Calculate the sum of a column

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Pandas

```
df['col1'].sum()
```

SQL

```
SELECT SUM(col1)  
FROM table;
```



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Calculate the maximum of a column

Pandas

```
df['col1'].max()
```

SQL

```
SELECT MAX(col1)  
FROM table;
```



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Calculate the minimum of a column

Pandas

```
df['col1'].min()
```

SQL

```
SELECT MIN(col1)  
FROM table;
```



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Count distinct values in a column

Pandas

```
df['col1'].nunique()
```

SQL

```
SELECT  
COUNT(DISTINCT col1)  
FROM table;
```



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Rename a column

Pandas

```
df.rename(columns=  
{'old_name': 'new_name'})
```

SQL

```
ALTER TABLE table  
RENAME COLUMN  
old_name TO new_name;
```



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Add a new column

Pandas

```
df['new_col'] = value
```

SQL

```
ALTER TABLE table  
ADD COLUMN new_col INT;
```



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Drop a column

Pandas

```
df.drop(columns=['col1'])
```

SQL

```
ALTER TABLE table
DROP COLUMN col1;
```



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Replace null values

Pandas

```
df['col1'].fillna(0)
```

SQL

```
SELECT  
COALESCE(col1, 0)  
FROM table;
```



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Calculate the difference between two columns

Pandas

```
df['col1'] - df['col2']
```

SQL

```
SELECT col1 - col2  
FROM table;
```



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Concatenate two columns

Pandas

```
df['col1'] + df['col2']
```

SQL

```
SELECT CONCAT(col1, col2)  
FROM table;
```



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Extract year from date

SQL

Pandas

```
df['date_col'].dt.year
```

SQL

```
SELECT YEAR(date_col)  
FROM table;
```



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Extract month from date

SQL

Pandas

```
df['date_col'].dt.month
```

SQL

```
SELECT  
MONTH(date_col) FROM  
table;
```



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Extract day from date

Pandas

```
df['date_col'].dt.day
```

SQL

```
SELECT DAY(date_col)  
FROM table;
```



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Filter rows based on string matching

Pandas

```
df[df['col1'].str.contains('pattern')]
```

SQL

```
SELECT * FROM table  
WHERE col1 LIKE '%pattern%';
```



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Aggregate functions with group by

Pandas

```
df.groupby('col1')['col2'].mean()
```

SQL

```
SELECT col1, AVG(col2)
FROM table
GROUP BY col1;
```



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Pivot table

Pandas

```
df.pivot_table(values='col1',  
index='col2', columns='val1')
```

SQL

```
SELECT * FROM table  
PIVOT (SUM(col1)  
FOR col2 IN (val1, val2));
```



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Unpivot table

Pandas

```
df.melt(id_vars=['id'],  
value_vars=['col1', 'col2'])
```

SQL

```
SELECT col1, col2  
FROM table  
UNPIVOT (col FOR val  
IN (col1, col2));
```



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Calculate cumulative sum

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Pandas

```
df['col2'].cumsum()
```

SQL

```
SELECT col1, SUM(col2)
OVER (ORDER BY col1)
FROM table;
```



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Calculate moving average

SQL

Pandas

```
df['col2'].rolling(window=3).mean()
```

SQL

```
SELECT col1, AVG(col2) OVER
(ORDER BY col1 ROWS
BETWEEN 2 PRECEDING
AND CURRENT ROW)
FROM table;
```



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Find the row with maximum value in a column

Pandas

```
df.loc[df['col1'].idxmax()]
```

SQL

```
SELECT * FROM table  
ORDER BY col1 DESC  
LIMIT 1;
```



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Find the row with minimum value in a column

SQL
Pandas

`df.loc[df['col1'].idxmin()]`

SQL

```
SELECT * FROM table  
ORDER BY col1 ASC LIMIT 1;
```



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Drop duplicate rows

Pandas

```
df.drop_duplicates()
```

SQL

```
DELETE FROM table WHERE rowid  
NOT IN (SELECT MIN(rowid)  
FROM table GROUP BY col1, col2);
```



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Calculate the length of a string

Pandas

```
df['col1'].str.len()
```

SQL

```
SELECT LENGTH(col1)  
FROM table;
```



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Convert string to uppercase

Pandas

```
df['col1'].str.upper()
```

SQL

```
SELECT UPPER(col1)  
FROM table;
```



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Convert string to lowercase

Pandas

```
df['col1'].str.lower()
```

SQL

```
SELECT LOWER(col1)  
FROM table;
```



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Strip whitespace from string

Pandas

```
df['col1'].str.strip()
```

SQL

```
SELECT TRIM(col1)  
FROM table;
```



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Replace a substring

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Pandas

```
df['col1'].str.replace('old',  
'new')
```

SQL

```
SELECT REPLACE(col1,  
'old', 'new')  
FROM table;
```



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Check for null values

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Pandas

```
df[df['col1'].isnull()]
```

SQL

```
SELECT * FROM table  
WHERE col1 IS NULL;
```



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Check for non-null values



Pandas

```
df[df['col1'].notnull()]
```

SQL

```
SELECT * FROM table  
WHERE col1 IS NOT  
NULL;
```



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Conditional column based on other columns

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Pandas

```
df['col3'] =  
df['col2'].apply(lambda x:  
'High' if x > 10 else 'Low')
```

SQL

```
SELECT col1, CASE  
WHEN col2 > 10 THEN  
'High' ELSE 'Low' END AS  
col3 FROM table;
```



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Drop rows with null values

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Pandas

```
df.dropna()
```

SQL

```
DELETE FROM table  
WHERE col1 IS NULL;
```



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Create new column from existing columns

Pandas

```
df['col3'] = df['col1'] +  
df['col2']
```

SQL

```
SELECT col1, col2, (col1  
+ col2) AS col3  
FROM table;
```



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10
40

Calculate percentage of a column

Pandas

```
df['percentage'] =  
df['col1'] /  
df['col1'].sum() * 100
```

SQL

```
SELECT col1, (col1 /  
SUM(col1) OVER()) * 100  
AS percentage  
FROM table;
```



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Insert a new row

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4

Pandas

```
df.loc[len(df)] = [val1, val2]
```

SQL

```
INSERT INTO table (col1, col2)  
VALUES (val1, val2);
```



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Update a row

Pandas

```
df.loc[df['col2'] == val2, 'col1'] = val1
```

SQL

```
UPDATE table
SET col1 = val1 WHERE
col2 = val2;
```



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THANK
you