WINDOW FUNCTION

- **Window functions** applies aggregate, ranking and analytic functions over a particular window (set of rows).
- And **OVER** clause is used with window functions to define that window.

Give output one row per aggregation

The rows maintain their separate identities

WINDOW FUNCTION SYNTAX

```
SELECT column_name(s),
       fun( ) OVER ( [ <PARTITION BY Clause> ]
                     [ <ORDER BY Clause> ]
                     [ <ROW or RANGE Clause> ] )
FROM table_name
```

Select a function

- Aggregate functions
- Ranking functions
- Analytic functions

Define a Window

- PARTITION BY
- ORDER BY
- ROWS

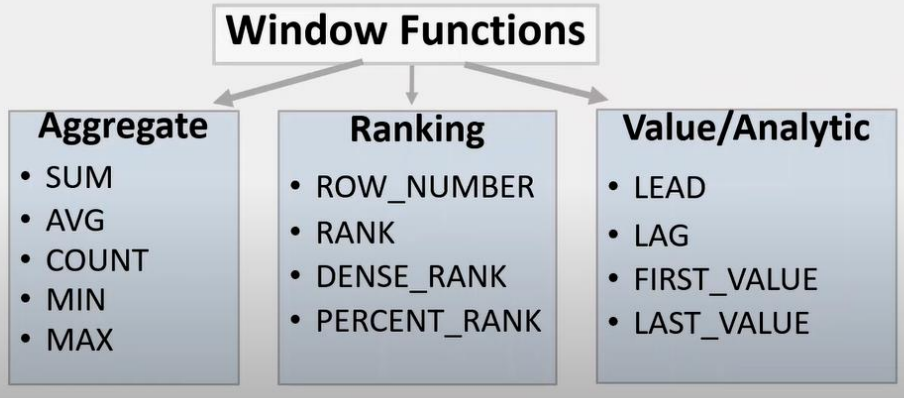
WINDOW FUNCTION TERMS

Let's look at some definitions:

- **Window function** applies aggregate, ranking and analytic functions over a particular window; for example, sum, avg, or row_number
- **Expression** is the name of the column that we want the window function operated on. This may not be necessary depending on what window function is used
- **OVER** is just to signify that this is a window function
- **PARTITION BY** divides the rows into partitions so we can specify which rows to use to compute the window function
- **ORDER BY** is used so that we can order the rows within each partition. This is optional and does not have to be specified
- **ROWS** can be used if we want to further limit the rows within our partition. This is optional and usually not used

WINDOW FUNCTION TYPES

There is no official division of the SQL window functions into categories but high level we can divide into three types



AGGREGATE FUNCTION Example

```
SELECT new_id, new_cat,
SUM(new_id) OVER( PARTITION BY new_cat ORDER BY new_id ) AS "Total",
AVG(new_id) OVER( PARTITION BY new_cat ORDER BY new_id ) AS "Average",
COUNT(new_id) OVER( PARTITION BY new_cat ORDER BY new_id ) AS "Count",
MIN(new_id) OVER( PARTITION BY new_cat ORDER BY new_id ) AS "Min",
MAX(new_id) OVER( PARTITION BY new_cat ORDER BY new_id ) AS "Max"
FROM test_data
```

new_id	new_cat	Total	Average	Count	Min	Max
100	Agni	300	150	2	100	200
200	Agni	300	150	2	100	200
500	Dharti	1200	600	2	500	700
700	Dharti	1200	600	2	500	700
200	Vayu	1000	333.33333	3	200	500
300	Vayu	1000	333.33333	3	200	500
500	Vayu	1000	333.33333	3	200	500

```
SELECT new_id, new_cat,
SUM(new_id) OVER( ORDER BY new_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Total",
AVG(new_id) OVER( ORDER BY new_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Average",
COUNT(new_id) OVER( ORDER BY new_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Count",
MIN(new_id) OVER( ORDER BY new_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Min",
MAX(new_id) OVER( ORDER BY new_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS "Max"
FROM test_data
```

new_id	new_cat	Total	Average	Count	Min	Max
100	Agni	2500	357.14286	7	100	700
200	Agni	2500	357.14286	7	100	700
200	Vayu	2500	357.14286	7	100	700
300	Vayu	2500	357.14286	7	100	700
500	Vayu	2500	357.14286	7	100	700
500	Dharti	2500	357.14286	7	100	700
700	Dharti	2500	357.14286	7	100	700

AGGREGATE FUNCTION Example

NOTE: Above we have used: "**ROWS** BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING" which will give a SINGLE output based on all INPUT Values/PARTITION (if used)

```
SELECT new_id,
ROW_NUMBER() OVER( ORDER BY new_id) AS "ROW_NUMBER",
RANK() OVER( ORDER BY new_id) AS "RANK",
DENSE_RANK() OVER( ORDER BY new_id) AS "DENSE_RANK“,
PERCENT_RANK() OVER( ORDER BY new_id) AS "PERCENT_RANK"
FROM test_data
```

new_id	ROW_NUMBER	RANK	DENSE_RANK	PERCENT_RANK
100	1	1	1	0
200	2	2	2	0.166
200	3	2	2	0.166
300	4	4	3	0.5
500	5	5	4	0.666
500	6	5	4	0.666
700	7	7	5	1

```
SELECT new_id,
FIRST_VALUE(new_id) OVER( ORDER BY new_id) AS "FIRST_VALUE",
LAST_VALUE(new_id) OVER( ORDER BY new_id) AS "LAST_VALUE",
LEAD(new_id) OVER( ORDER BY new_id) AS "LEAD",
LAG(new_id) OVER( ORDER BY new_id) AS "LAG"
FROM test_data
```

new_id	FIRST_VALUE	LAST_VALUE	LEAD	LAG
100	100	100	200	null
200	100	200	200	100
200	100	200	300	200
300	100	300	500	200
500	100	500	500	300
500	100	500	700	500
700	100	700	null	500

NOTE: If you just want the single last value from whole column, use: “**ROWS** BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING”

Quick Assignment: WINDOW FUNCTION

Offset the LEAD and LAG values by 2 in the output columns ?

INPUT

new_id
100
200
200
300
500
500
700

OUTPUT

new_id	LEAD	LAG
100	200	NULL
200	300	NULL
200	500	100
300	500	200
500	700	200
500	NULL	300
700	NULL	500

```
SELECT new_id,
LEAD(new_id, 2)  OVER( ORDER BY new_id) AS "LEAD_by2",
LAG(new_id, 2)  OVER( ORDER BY new_id) AS "LAG_by2"
FROM test_data
```

new_id	LEAD_by2	LAG_by2
100	200	null
200	300	null
200	500	100
300	500	200
500	700	200
500	null	300
700	null	500