Basic aggregate functions

TIME SERIES ANALYSIS IN SQL SERVER

SQL

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Key aggregation functions

Counts

COUNT()

COUNT_BIG()

COUNT(DISTINCT)

Other Aggregates

SUM()

MIN()

MAX()

What counts with COUNT()

Number of Rows

`COUNT(*)`

`COUNT(1)`

`COUNT(1/0)`

Non-NULL Values

`COUNT(d.YR)`

`COUNT(NULLIF(d.YR, 1990))`

Distinct counts

```sql
SELECT
    COUNT(DISTINCT c.CalendarYear) AS Years,
    COUNT(DISTINCT NULLIF(c.CalendarYear, 2010)) AS Y2
FROM dbo.Calendar c;
```

Years	Y2
50	49

Filtering aggregates with CASE

```sql
SELECT
    MAX(CASE WHEN ir.IncidentTypeID = 1
            THEN ir.IncidentDate
            ELSE NULL
        END) AS I1,
    MAX(CASE WHEN ir.IncidentTypeID = 2
            THEN ir.IncidentDate
            ELSE NULL
        END) AS I2,
FROM dbo.IncidentRollup ir;
```

I1	I2
2020-06-30	2020-06-29

Let's practice!

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Statistical aggregate functions

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Statistical aggregate functions

`AVG()`   Mean

`STDEV()`   Standard Deviation

`STDEVP()`   Population Standard Deviation
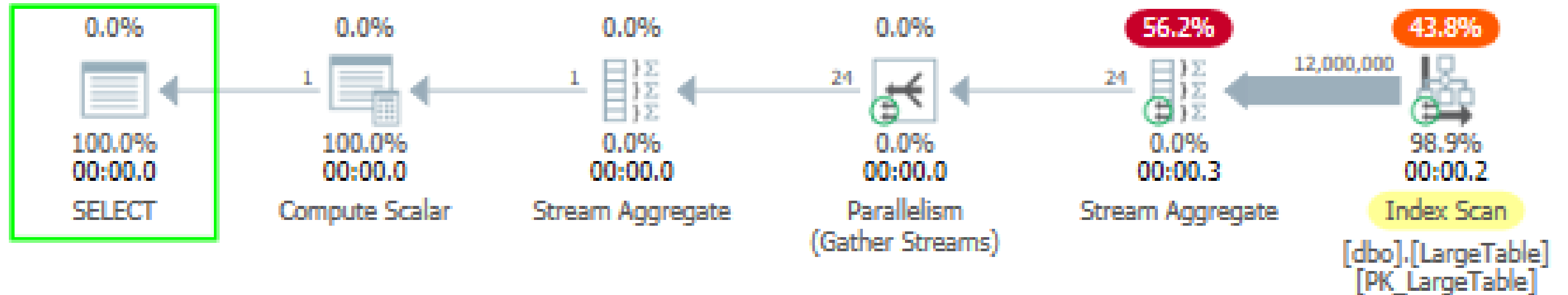
`VAR()`   Variance

`VARP()`   Population Variance
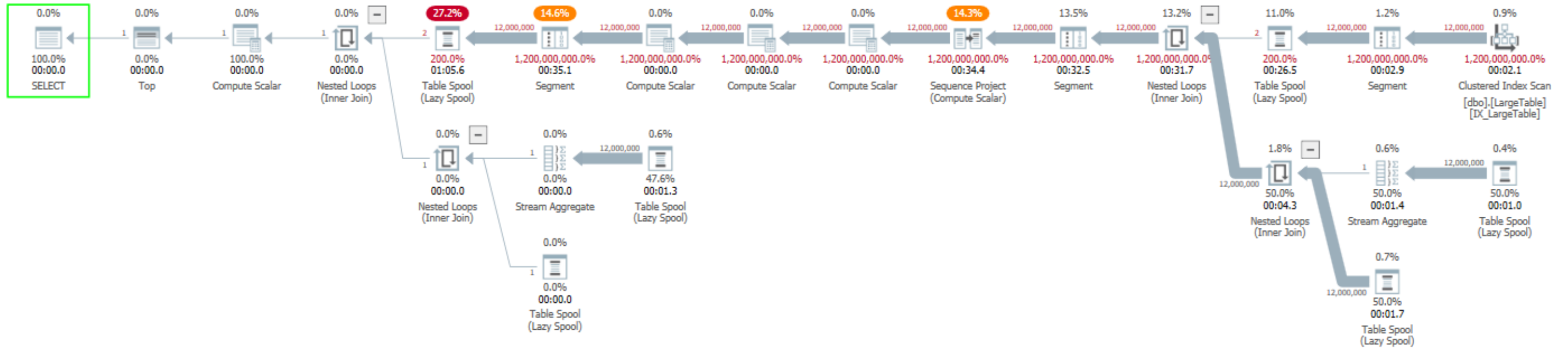
What about median?

```sql
SELECT TOP(1)
    PERCENTILE_CONT(0.5)
        WITHIN GROUP (ORDER BY l.SomeVal DESC)
        OVER () AS MedianIncidents
FROM dbo.LargeTable l;
```

But how bad is it?

This bad

The cost of median

	Median	Mean
Est. Cost	95.7%	4.3%
Duration	68.5s	0.37s
CPU	68.5s	8.1s
Reads	72,560,946	39,468
Writes	87,982	0

Let's practice!

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Downsampling and upsampling data

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Data in nature

```
SELECT
    SomeDate
FROM dbo.SomeTable
```

SomeDate
2019-08-11 06:14:29.990
2019-08-11 11:07:37.633
2019-08-11 14:08:00.337

Downsampling data

```sql
SELECT
    CAST(SomeDate AS DATE) AS SomeDate
FROM dbo.SomeTable
```

SomeDate
2019-08-11
2019-08-11
2019-08-11

Further downsampling

```sql
SELECT
    DATEADD(HOUR, DATEDIFF(HOUR, 0, SomeDate), 0) AS SomeDate
FROM dbo.SomeTable
```

`DATEDIFF(HOUR, 0, '2019-08-11 06:21:16')` = 1,048,470

`DATEADD(HOUR, 1048470, 0)` = 2019-08-11 06:00:00

SomeDate
2019-08-11 06:00:00.000
2019-08-11 11:00:00.000
2019-08-11 14:00:00.000

What about upsampling?

Downsampling

- Aggregate data

- Can usually sum or count results

- Provides a higher-level picture of the data

- Acceptable for most purposes

Upsampling

- Disaggregate data

- Need an allocation rule

- Provides artificial granularity

- Acceptable for data generation, calculated averages

Let's practice!

TIME SERIES ANALYSIS IN SQL SERVER

Grouping by ROLLUP, CUBE, and GROUPING SETS

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Hierarchical rollups with ROLLUP

```
SELECT
    t.Month,
    t.Day,
    SUM(t.Events) AS Events
FROM Table
GROUP BY
    t.Month,
    t.Day
WITH ROLLUP
ORDER BY
    t.Month,
    t.Day;
```

Month	Day	Events
NULL	NULL	100
1	NULL	60
1	1	3
1	2	4
...	...	...
2	NULL	40
2	1	8

Cartesian aggregation with CUBE

```sql
SELECT
    t.IncidentType,
    t.Office,
    SUM(t.Events) AS Events
FROM Table
GROUP BY
    t.IncidentType,
    t.Office
WITH CUBE
ORDER BY
    t.IncidentType,
    t.Office;
```

IncidentType	Office	Events
NULL	NULL	250
NULL	NY	70
NULL	CT	180
T1	NULL	55
T1	NY	30
T1	CT	25

Define grouping sets with GROUPING SETS

```sql
SELECT
    t.IncidentType,
    t.Office,
    SUM(t.Events) AS Events
FROM Table
GROUP BY GROUPING SETS
(
    (t.IncidentType, t.Office),
    ()
)
ORDER BY
    t.IncidentType,
    t.Office;
```

IncidentType	Office	Events
NULL	NULL	250
T1	NY	30
T1	CT	25
T2	NY	10
T2	CT	110
T3	NY	30
T3	CT	45

Let's practice!

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