Input and Output.

Inputs

1. **Cruise Control Data Samples (Anonymized)**

   - `timestamp` : When the sample was recorded

   - `segmentId` : Road segment identifier

   - `cruiseSetpointKmh` : Speed set by the driver

   - `vehicleSpeedKmh` : Actual speed (optional; for validation)

   - `trafficCondition` : e.g., `FreeFlow` , `Heavy` (optional)

   - `timeOfDayBucket` : e.g., `Morning` , `Night` (optional)

2. **Segment Metadata**

   - `mapSpeedLimitKmh` : Official speed limit for the segment

   - `timeDependentLimits` : Optional overrides (e.g., 30 km/h in school zones during 8–10 AM)

   - `Lat` : Latitude of the road segment

   - `Long` : Longitude of the road segment

3. **System Configuration**

   - Max age of valid samples (e.g., 30 days)

   - Sample threshold for using median (e.g., 8+ samples)

   - Outlier thresholds (e.g., >120% of map limit = discard)

📤 Outputs

1. **Cruise Profile per Segment**

   - `segmentId` : Road segment

   - `chosenSpeedKmh` : Computed optimal cruise speed

   - `reason` : Explanation (e.g., "median of 12 samples", "fallback to map limit")

   - `computedAt` : Timestamp of calculation

Test Data:

CruiseCast Segment Mock Data

Segment	Latitude	Longitude	Map Speed Limit (km/h)	Time-Dependent Limits	Chosen Speed (km/h)	Reason	Computed At
SEG1	48.7837	9.1829	30	20 km/h from 7:00 to 9:00 (Mon–Fri)	20	Most recent of 5 samples (capped)	7/20/2025, 9:11:11 AM
SEG2	48.7832	9.1815	50	40 km/h from 17:00 to 19:00	44	Most recent of 7 samples (capped)	7/20/2025, 9:11:11 AM
SEG3	48.7825	9.18	50	41 km/h from 12:00 to 14:00	42	Most recent of 7 samples	7/20/2025, 9:11:11 AM

Segment	Latitude	Longitude	Map Speed Limit (km/h)	Time-Dependent Limits	Chosen Speed (km/h)	Reason	Computed At
						(capped)	
SEG4	48.7815	9.179	60	51 km/h from 12:00 to 14:00	50	Most recent of 7 samples (capped)	7/20/2025, 9:11:11 AM
SEG5	48.7805	9.178	60	58 km/h from 12:00 to 14:00	52	Most recent of 6 samples (capped)	7/20/2025, 9:11:11 AM
SEG6	48.7795	9.177	80	44 km/h from 12:00 to 14:00	80	Median of 8 samples (capped)	7/20/2025, 9:11:11 AM
SEG7	48.7785	9.176	80	70 km/h from 22:00 to 6:00	80	Median of 8 samples (capped)	7/20/2025, 9:11:11 AM

Result Table

segment	map_speed_limit	effective_speed_limit	valid_sample_count	chosen_speed
SEG1	30	30	5	20
SEG2	50	50	7	44
SEG3	50	50	7	42
SEG4	60	60	7	50
SEG5	60	60	6	52
SEG6	80	80	8	80
SEG7	80	80	8	80

Correlation Matrix

	map_speed_limit	effective_speed_limit	valid_sample_count	chosen_speed
map_speed_limit	1.000	1.000	0.867	0.994
effective_speed_limit	1.000	1.000	0.867	0.994
valid_sample_count	0.867	0.867	1.000	0.877
chosen_speed	0.994	0.994	0.877	1.000

Insights:

- **Chosen speed** is almost perfectly correlated with the **(effective) map speed limit** (r≈0.99), indicating drivers tend to set cruise close to the legal limit when enough data exists.

- **Valid sample count** also correlates positively with both limits (r≈0.87) and chosen speed (r≈0.88), suggesting segments with more data tend to have higher speed limits and higher recommended speeds.