



# Traffic & Weather

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# Tomtom Traffic API

- Input: Lat/Long coordinates
- Output:
  - Set of Lat/Long coordinates around input point, amount and location depend on road type
  - Road closure status
  - Current speed
  - Free flow speed
  - Current travel time
  - Free flow travel time
  - Road type
  - Confidence
  - API version



# Raw Json Traffic

Input:

<https://api.tomtom.com/traffic/services/4/flowSegmentData/absolute/10/json?key=mGYPguXgTmCokUu1XVqpe3kGhUc5cn3u&point=45.501139,-122.65425&unit=mph>

Output:

```
{
  "flowSegmentData": {
    "frc": "FRC4",
    "@version": "traffic-service-flow 1.0.109",
    "confidence": 1,
    "coordinates": {
      "coordinate": [
        {
          "latitude": 45.50273184261871,
          "longitude": -122.65424258603115,
        },
        {
          "latitude": 45.50248639843241,
          "longitude": -122.65423990382213,
        },
        {
          "latitude": 45.502400569085516,
          "longitude": -122.65423856271762,
        },
        {
          "latitude": 45.50231744197532,
          "longitude": -122.65423856271762,
        },
        {
          "latitude": 45.50211358910771,
          "longitude": -122.65423588050861,
        },
        {
          "latitude": 45.50177696589786,
          "longitude": -122.65423051609058,
        },
        {
          "latitude": 45.5016428447808,
          "longitude": -122.65422515167255,
        },
        {
          "latitude": 45.501518123017284,
          "longitude": -122.65422112835903,
        },
        {
          "latitude": 45.50122444124028,
          "longitude": -122.65422783388156,
        },
        {
          "latitude": 45.501118459282665,
          "longitude": -122.6542331982996,
        }
      ]
    },
    "roadClosure": false,
    "currentSpeed": 6,
    "freeFlowSpeed": 10,
    "currentTravelTime": 64,
    "freeFlowTravelTime": 40
  }
}
```

# Visual Crossing Weather API

- Input: City & State
- Output:
  - Date
  - Temp
  - Humidity
  - Rain\_inches
  - Chance of rain
  - Snow
  - Snow depth
  - Wind gust
  - Wind speed
  - Wind direction
  - Sea level pressure
  - Cloud cover
  - etc.



# Raw Json Weather


Input:

```
https://weather.visualcrossing.com/Visual  
CrossingWebServices/rest/services/timeli  
ne/Portland%2C%20Or?unitGroup=us&incl  
ude=hours&key=MB6Q595DGDRYZ7JAE2  
EM3E9NK&contentType=json
```

Output:


```
"hours" : [ {  
  "datetime" : "00:00:00",  
  "datetimeEpoch" : 1711350000,  
  "temp" : 48.6,  
  "feelslike" : 48.6,  
  "humidity" : 80.63,  
  "dew" : 42.9,  
  "precip" : 0.0,  
  "precipprob" : 0.0,  
  "snow" : 0.0,  
  "snowdepth" : 0.0,  
  "preciptype" : null,  
  "windgust" : 8.1,  
  "windspeed" : 2.6,  
  "winddir" : 304.0,  
  "pressure" : 1013.7,  
  "visibility" : 9.9,  
  "cloudcover" : 89.3
```



# First Normal Form

	 id int2(16,0...	coord_start_lat float8(53)	coord_start_long float8(53)	coord_end_lat float8(53)	coord_end_long float8(53)	road_closure bool
10	10	37.80899208001426	-122.36858778864438	37.78634573456624	-122.39323369318492	false
11	11	37.72505476410231	-122.44474595614076	37.73070513067648	-122.4319006234167	false
12	12	37.64418546040306	-122.4077239545006	37.62418468477725	-122.40260387265633	false
13	13	45.50273184261871	-122.65424258603115	45.501118459282665	-122.6542331982996	false
14	14	45.56317966775936	-122.55746953780655	45.59745610376687	-122.54839881157321	false
15	15	45.52723638670154	-122.68865995674466	45.52157080420472	-122.68743103278203	false

current_speed int2(16,0)	free_flow_speed int2(16,0)	current_travel_time int2(16,0)	free_flow_travel_time int2(16,0)	time_added timestamp(6)
12	59	631	126	2024-04-06 00:30:03.796801
67	67	44	44	2024-04-06 00:30:03.940229
70	70	73	73	2024-04-06 00:30:04.087777
7	9	58	43	2024-04-06 00:45:02.290931
44	63	218	153	2024-04-06 00:45:02.461962
19	57	74	25	2024-04-06 00:45:02.655475
11	58	667	127	2024-04-06 00:45:02.795898

## Third Normal Form Table 1 - Traffic

	 traffic_id int2(16,0)	road_closure bool	current_speed int2(16,0)	free_flow_speed int2(16,0)	current_travel_time int2(16,0)	free_flow_travel_time int2(16,0)
10	10	false	12	59	631	126
11	11	false	67	67	44	44
12	12	false	70	70	73	73
13	13	false	7	9	58	43
14	14	false	44	63	218	153
15	15	false	19	57	74	25

 road_id int2...	 time_id int2...
4	2
5	2
6	2
1	3
2	3
3	3


## Third Normal Form Table 2 - Roads

	 road_id int2...	city text	state text	input_coord_lat float8(53)	input_coord_long float8(53)	start_coord_lat float8(53)
1	1	Portland	Oregon	45.501139	-122.65425	45.50273184261871
2	2	Portland	Oregon	45.566597	-122.5554	45.56317966775936
3	3	Portland	Oregon	45.525326	-122.686877	45.52723638670154
4	4	San Francisco	California	37.797162	-122.378992	37.80899208001426
5	5	San Francisco	California	37.72683	-122.445304	37.72505476410231
6	6	San Francisco	California	37.642843	-122.40624	37.64418546040306

start_coord_long float8(53)	end_coord_lat float8(53)	end_coord_long float8(53)
-122.65424258603115	45.501118459282665	-122.6542331982996
-122.55746953780655	45.59745610376687	-122.54839881157321
-122.68865995674466	45.52157080420472	-122.68743103278203
-122.36858778864438	37.78634573456624	-122.39323369318492
-122.44474595614076	37.73070513067648	-122.4319006234167
-122.4077239545006	37.62418468477725	-122.40260387265633




## Third Normal Form Table 3 - Datetimes


	 <b>time_id</b> int4...	<b>time_added_gmt</b> timestamp(6)	<b>time_added_pst</b> timestamp(6)	<b>day_name</b> text	<b>hour</b> int2(16,0)	<b>minute</b> int2(16,0)
10	10	2024-04-06 02:30:02.165056	2024-04-05 19:30:02.165056	Friday	19	30
11	11	2024-04-06 02:45:02.14867	2024-04-05 19:45:02.14867	Friday	19	45
12	12	2024-04-06 03:00:03.064253	2024-04-05 20:00:03.064253	Friday	20	0
13	13	2024-04-06 03:15:02.153934	2024-04-05 20:15:02.153934	Friday	20	15
14	14	2024-04-06 03:30:02.261455	2024-04-05 20:30:02.261455	Friday	20	30
15	15	2024-04-06 03:45:02.37723	2024-04-05 20:45:02.37723	Friday	20	45

# First Normal Form - Weather

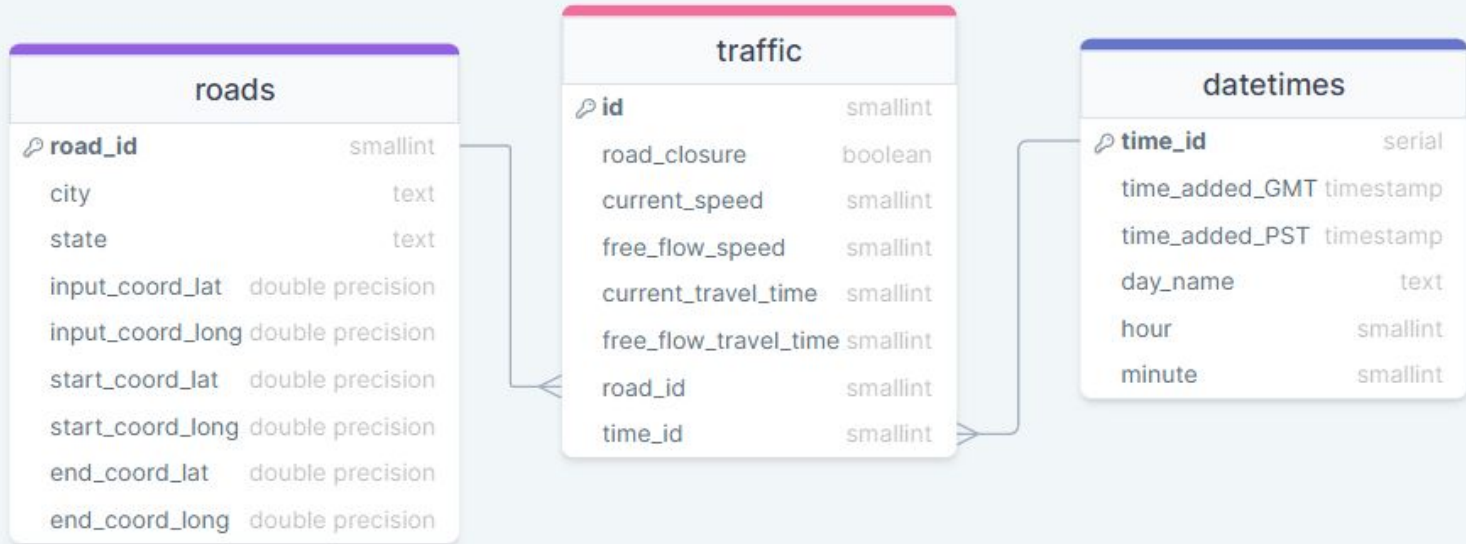
	date	time_pacific	temperature	humidity	rain_inches	chance_of_rain	precip_type	snow	snow_depth	wind_gust	wind_speed	wind_direction	sea_level_pressure	cloud_cover	visibility	solar_radiation	solar_energy	uv_index
1	2024-03-25 00:00:00	00:00:00	48.6	80.63	0	0	null	0	0	8.1	2.6	304	(NULL)	89.3	(NULL)	(NULL)	0	0
2	2024-03-25 01:00:00	01:00:00	47.9	83.72	0	0	null	0	0	8.1	0	0	(NULL)	100	(NULL)	(NULL)	0	0
3	2024-03-25 02:00:00	02:00:00	48.5	80.72	0	0	null	0	0	10.3	0.4	26	(NULL)	100	(NULL)	(NULL)	0	0
4	2024-03-25 03:00:00	03:00:00	48	81.34	0	0	null	0	0	9.2	1.9	229	(NULL)	100	(NULL)	(NULL)	0	0
5	2024-03-25 04:00:00	04:00:00	47.7	78.87	0	0	null	0	0	9.2	4.7	241	(NULL)	100	(NULL)	(NULL)	0	0
6	2024-03-25 05:00:00	05:00:00	47.7	77.48	0	0	null	0	0	10.3	3.5	233	(NULL)	100	(NULL)	(NULL)	0	0
7	2024-03-25 06:00:00	06:00:00	47.3	78.73	0	0	null	0	0	10.3	3.2	294	(NULL)	100	(NULL)	(NULL)	0	0
8	2024-03-25 07:00:00	07:00:00	47.6	78.31	0.003	100	rain	0	0	10.3	0	0	(NULL)	80.4	(NULL)	(NULL)	0	0
9	2024-03-25 08:00:00	08:00:00	47.6	78.31	0	0	null	0	0	10.3	2.2	115	(NULL)	100	(NULL)	(NULL)	0.1	0
10	2024-03-25 09:00:00	09:00:00	48.1	78.95	0.006	100	rain	0	0	11.4	2.2	115	(NULL)	100	(NULL)	(NULL)	0.1	0
11	2024-03-25 10:00:00	10:00:00	48.2	80.98	0	0	null	0	0	11.4	4.7	162	(NULL)	100	(NULL)	(NULL)	0.3	1
12	2024-03-25 11:00:00	11:00:00	48.6	79.7	0.013	100	rain	0	0	13.9	2.2	251	(NULL)	100	(NULL)	(NULL)	0.3	1
13	2024-03-25 12:00:00	12:00:00	49.7	79.42	0.013	100	rain	0	0	15	3.8	152	(NULL)	100	(NULL)	(NULL)	0.6	2
14	2024-03-25 13:00:00	13:00:00	51.7	72.61	0	0	null	0	0	15	6	179	(NULL)	100	(NULL)	(NULL)	0.1	0
15	2024-03-25 14:00:00	14:00:00	51.3	72.4	0	0	null	0	0	15	9.4	212	(NULL)	100	(NULL)	(NULL)	0.3	1
16	2024-03-25 15:00:00	15:00:00	52.1	75.34	0.018	100	rain	0	0	16.1	2.6	234	(NULL)	100	(NULL)	(NULL)	0.7	2
17	2024-03-25 16:00:00	16:00:00	52.7	74.97	0	0	null	0	0	13.9	5.4	70	(NULL)	94.8	(NULL)	(NULL)	0.6	2
18	2024-03-25 17:00:00	17:00:00	53	73.38	0.005	100	rain	0	0	11.4	6.8	109	(NULL)	100	(NULL)	(NULL)	0.3	1
19	2024-03-25 18:00:00	18:00:00	49.7	81.64	0.255	100	rain	0	0	10.3	5.1	78	(NULL)	100	(NULL)	(NULL)	0.1	0

# 3rd Normal Form - Weather

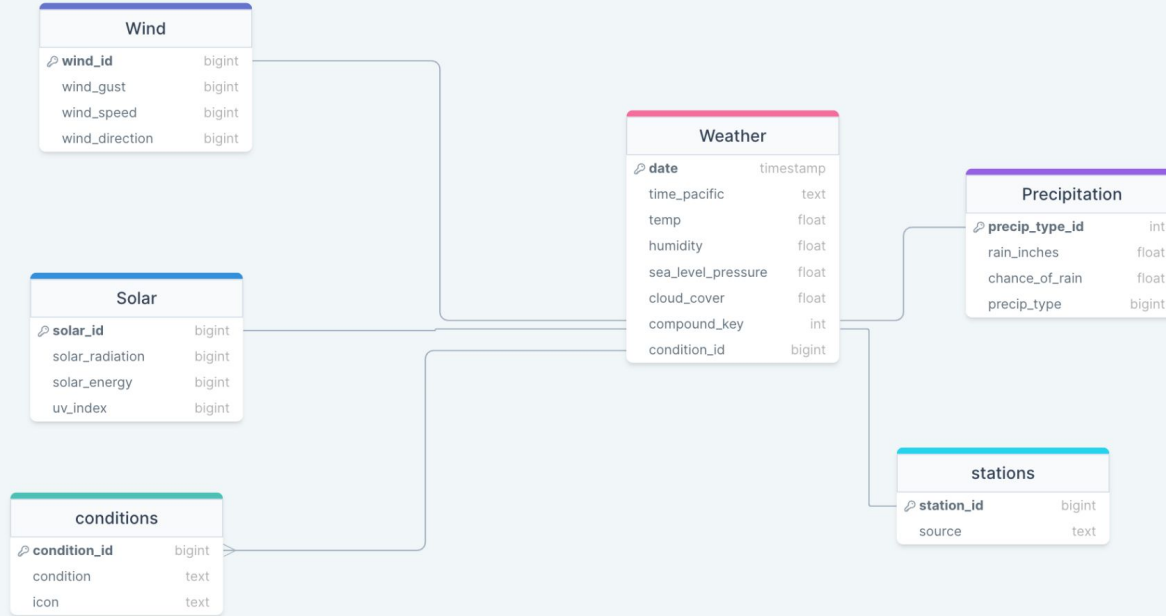
	 id int4(32,0)	wind_gust float8(53)	wind_speed float8(53)	wind_direction float8(53)
1	1	8.1	2.6	304
2	2	8.1	0	0
3	3	10.3	0.4	26
4	4	9.2	1.9	229
5	5	9.2	4.7	241
6	6	10.3	3.5	233
7	7	10.3	3.2	294
8	8	10.3	0	0
9	9	10.3	2.2	115
10	10	11.4	2.2	115
11	11	11.4	4.7	162
12	12	13.9	2.2	251
13	13	15	3.8	152
14	14	15	6	179
15	15	15	9.4	212
16	16	16.1	2.6	234
17	17	13.9	5.4	70
18	18	11.4	6.8	109
19	19	10.3	5.1	78
20	20	9.2	2.2	271
21	21	9.2	0.6	22
22	22	8.1	1.6	35

	 id int4(32,0)	solar_radiation float8(53)	solar_energy float8(53)	uv_index float8(53)
1	1	(NULL)	0	0
2	2	(NULL)	0	0
3	3	(NULL)	0	0
4	4	(NULL)	0	0
5	5	(NULL)	0	0
6	6	(NULL)	0	0
7	7	(NULL)	0	0
8	8	(NULL)	0	0
9	9	(NULL)	0.1	0
10	10	(NULL)	0.1	0
11	11	(NULL)	0.3	1
12	12	(NULL)	0.3	1
13	13	(NULL)	0.6	2
14	14	(NULL)	0.1	0
15	15	(NULL)	0.3	1
16	16	(NULL)	0.7	2
17	17	(NULL)	0.6	2
18	18	(NULL)	0.3	1
19	19	(NULL)	0.1	0
20	20	(NULL)	0	0
21	21	(NULL)	0	0

# ER Diagram Traffic



# ER Diagram Weather



<https://apiservingproj-production.up.railway.app/traffic/0>

```
{
  "traffic_id": 3,
  "road_id": 3,
  "city": "Portland",
  "current_speed": 19,
  "free_flow_speed": 58,
  "speed_pct_of_capacity": 32.76,
  "current_travel_time": 74,
  "free_flow_travel_time": 24,
  "additional_travel_time_due_to_traffic": 50,
  "time_pst": "2024-04-05T17:22:02.300745"
},
{
  "traffic_id": 4,
  "road_id": 4,
  "city": "San Francisco",
  "current_speed": 12,
  "free_flow_speed": 58,
  "speed_pct_of_capacity": 20.69,
  "current_travel_time": 631,
  "free_flow_travel_time": 127,
  "additional_travel_time_due_to_traffic": 504,
  "time_pst": "2024-04-05T17:22:02.300745"
},
{
  "traffic_id": 5,
  "road_id": 5,
  "city": "San Francisco",
  "current_speed": 67,
  "free_flow_speed": 67,
  "speed_pct_of_capacity": 100,
```

<https://apiservingproj-production.up.railway.app/traffic/0?city=Portland>

```
{
  "traffic_id": 9,
  "road_id": 3,
  "city": "Portland",
  "current_speed": 22,
  "free_flow_speed": 57,
  "speed_pct_of_capacity": 38.6,
  "current_travel_time": 64,
  "free_flow_travel_time": 25,
  "additional_travel_time_due_to_traffic": 39,
  "time_pst": "2024-04-05T17:30:03.262713"
},
{
  "traffic_id": 13,
  "road_id": 1,
  "city": "Portland",
  "current_speed": 7,
  "free_flow_speed": 9,
  "speed_pct_of_capacity": 77.78,
  "current_travel_time": 58,
  "free_flow_travel_time": 43,
  "additional_travel_time_due_to_traffic": 15,
  "time_pst": "2024-04-05T17:45:02.290931"
},
{
  "traffic_id": 14,
  "road_id": 2,
  "city": "Portland",
  "current speed": 44,
```

<https://apiservingproj-production.up.railway.app/avghourtraffic/0>

```
{
  "hour": 3,
  "average_speed": 54.667,
  "average_free_flow_speed": 54.667,
  "pct_free_flow_capacity": 100
},
{
  "hour": 4,
  "average_speed": 54.667,
  "average_free_flow_speed": 54.667,
  "pct_free_flow_capacity": 100
},
{
  "hour": 5,
  "average_speed": 54.404,
  "average_free_flow_speed": 54.659,
  "pct_free_flow_capacity": 98.529
},
{
  "hour": 6,
  "average_speed": 52.096,
  "average free flow speed": 54.608,
```

<https://apiservingproj-production.up.railway.app/avghourtraffic/0?hour=5>

```
[
  {
    "hour": 5,
    "average_speed": 54.43,
    "average_free_flow_speed": 54.661,
    "pct_free_flow_capacity": 98.698
  }
]
```



<https://apiservingproj-production.up.railway.app/avgdaytraffic/0>

```
[
  {
    "day_name": "Thursday",
    "average_speed": 50.274,
    "average_free_flow_speed": 54.582,
    "pct_free_flow_capacity": 79.774
  },
  {
    "day_name": "Wednesday",
    "average_speed": 49.919,
    "average_free_flow_speed": 54.558,
    "pct_free_flow_capacity": 79.861
  },
  {
    "day_name": "Friday",
    "average_speed": 50.447,
    "average_free_flow_speed": 54.579,
    "pct_free_flow_capacity": 81.507
  },
  {
    "day_name": "Tuesday"
```

<https://apiservingproj-production.up.railway.app/avgdaytraffic/0?day=Monday>

```
{
  "day_name": "Monday",
  "average_speed": 52.537,
  "average_free_flow_speed": 54.623,
  "pct_free_flow_capacity": 88.021
}
```

[https://apiserv-production.up.railway.app/weather\\_stuff/0](https://apiserv-production.up.railway.app/weather_stuff/0)

```
[
  {
    "temperature": 48.6,
    "date_time": "\\00:00:00\\",
    "timestamp_pacific": "2024-03-25T00:00:00",
    "humidity": 80.63,
    "rain_inches": 0,
    "chance_of_rain": 0,
    "precip_type": "[\\\"rain\\\"]",
    "snow": 0,
    "snow_depth": 0,
    "wind_gust": 8.1,
    "wind_speed": 2.6,
    "wind_direction": 304,
    "sea_level_pressure": null,
    "cloud_cover": 89.3,
    "visibility": null,
    "solar_radiation": null,
    "solar_energy": 0,
    "uv_index": 0,
    "severe_risk": 10,
    "conditions": "Partially cloudy",
    "icon": "\\\"partly-cloudy-night\\\"",
    "source": "[\\\"F8831\\\", \\\"72698524242\\\", \\\"KVU0\\\", \\\"72698024229\\\", \\\"KPD\\\", \\\"72698694261\\\", \\\"72791894298\\\"]",
    "wind_id": null,
    "condition_id": null,
    "precip_type_id": null,
    "station_id": null,
    "solar_id": null,
    "id": 49
  },
]
```

<https://apiserv-production.up.railway.app/mtbh/0>

```
[  
  {  
    "max_temp": 48.6,  
    "hour": 0  
  },  
  {  
    "max_temp": 47.9,  
    "hour": 1  
  },  
  {  
    "max_temp": 48.5,  
    "hour": 2  
  },  
  {  
    "max_temp": 48,  
    "hour": 3  
  },  
  {  
    "max_temp": 47.7,  
    "hour": 4  
  },  
  {  
    "max_temp": 47.7,  
    "hour": 5  
  },  
  {  
    "max_temp": 47.3,  
    "hour": 6  
  },  
  {  
    "max_temp": 47.6,  
    "hour": 7  
  },  
]
```

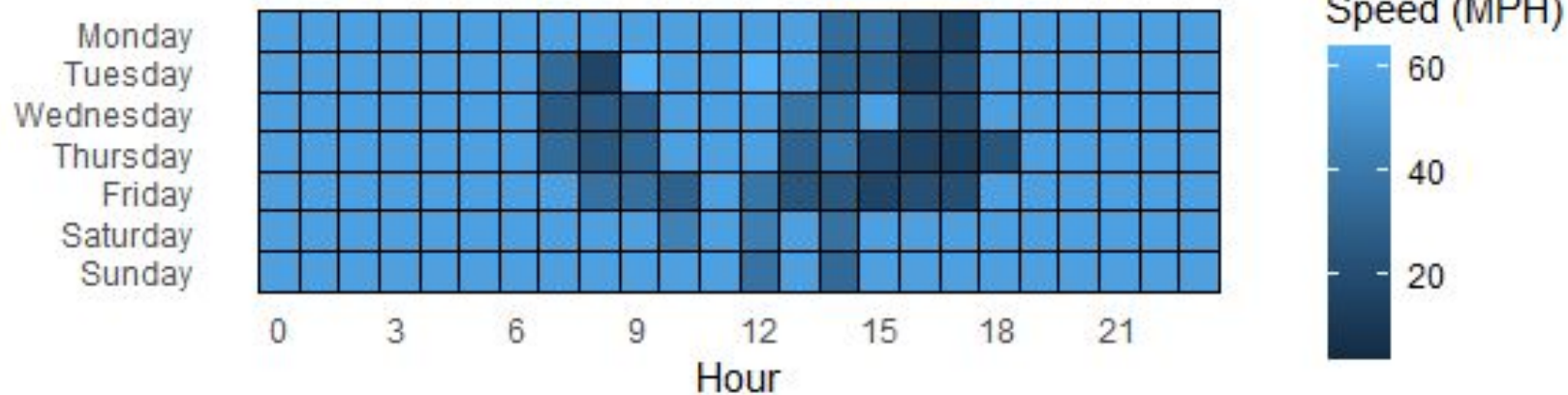
<https://apiserv-production.up.railway.app/mtbh/0?hour=4>

```
[  
  {  
    "max_temp": 47.7,  
    "hour": 4  
  }  
]
```

# How Does the Weather Impact Traffic Patterns?

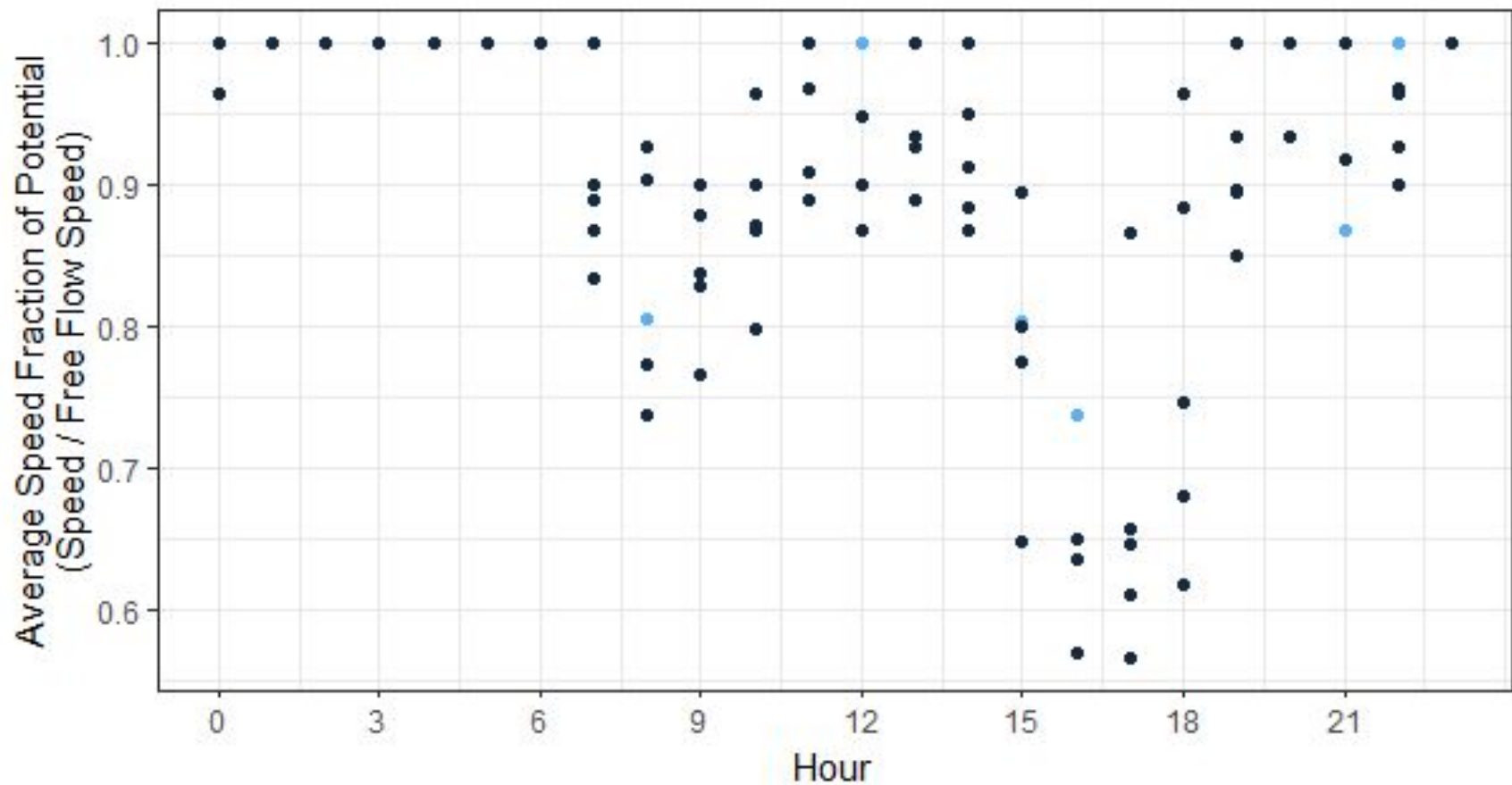


## Rush Hour Patterns are Fairly Consistant

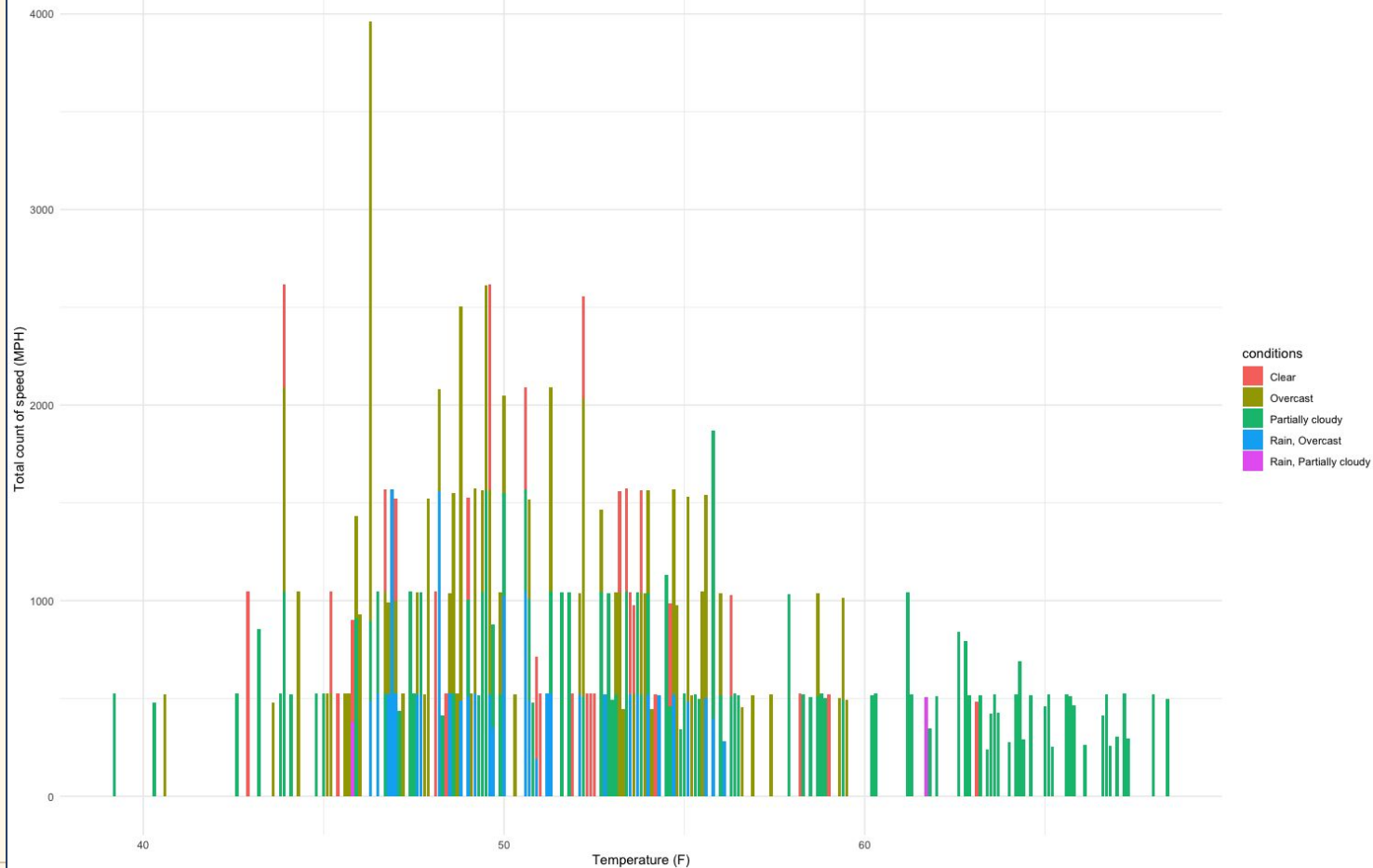


## How does the rain affect traffic?

Weekdays only, Rained=Blue



Conditions vs Speed



# Challenges

- Lost Data
- Not Enough Data for Proper Analysis
  - Ideally 6+ months
- Rushed Timeline
- API choice (not that much data)
- Double/Quadrupled data points

