

paper01_eda

October 5, 2021

1 Proyecto Final: Análisis Exploratorio (EDA).

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1.1 Lectura de Archivos

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/patsy/constraint.py:13: DeprecationWarning: Using or importing the ABCs  
from 'collections' instead of from 'collections.abc' is deprecated since Python  
3.3, and in 3.9 it will stop working  
    from collections import Mapping  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/importlib/_bootstrap.py:219:  
RuntimeWarning: numpy.ufunc size changed, may indicate binary incompatibility.  
Expected 192 from C header, got 216 from PyObject  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/importlib/_bootstrap.py:219:  
RuntimeWarning: numpy.ufunc size changed, may indicate binary incompatibility.  
Expected 192 from C header, got 216 from PyObject  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/importlib/_bootstrap.py:219:  
RuntimeWarning: numpy.ufunc size changed, may indicate binary incompatibility.  
Expected 192 from C header, got 216 from PyObject  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/importlib/_bootstrap.py:219:  
RuntimeWarning: numpy.ufunc size changed, may indicate binary incompatibility.  
Expected 192 from C header, got 216 from PyObject  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/importlib/_bootstrap.py:219:  
RuntimeWarning: numpy.ufunc size changed, may indicate binary incompatibility.  
Expected 192 from C header, got 216 from PyObject  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during the transform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

Listing data files from: /home/jaa6766/Documents/jorge3a/itam/deeplearning/dlfinal/data/airdata

- Loading air-20210212-060408.json.gz
- Loading air-20210212-060529.json.gz
- Loading air-20210212-060534.json.gz
- Loading air-20210212-060545.json.gz
- Loading air-20210212-153737.json.gz
- Loading air-20210212-153808.json.gz
- Loading air-20210212-153921.json.gz
- Loading air-20210218-233000.json.gz
- Loading air-20210308-213952.json.gz
- Loading air-20210308-214511.json.gz
- Loading air-20210326-110304.json.gz
- Loading air-20210520-235254.json.gz
- Loading air-20210617-141714.json.gz

- Loading air-20210415-234052.json.gz
- Loading air-20210627-224727.json.gz
- Loading air-20210723-084450.json.gz
- Loading air-20210812-211858.json.gz
- Loading air-20210822-191723.json.gz
- Loading air-20210827-131714.json.gz
- Loading air-20210828-132805.json.gz
- Loading air-20210830-121252.json.gz

Done!

CPU times: user 2min 55s, sys: 5.54 s, total: 3min 1s

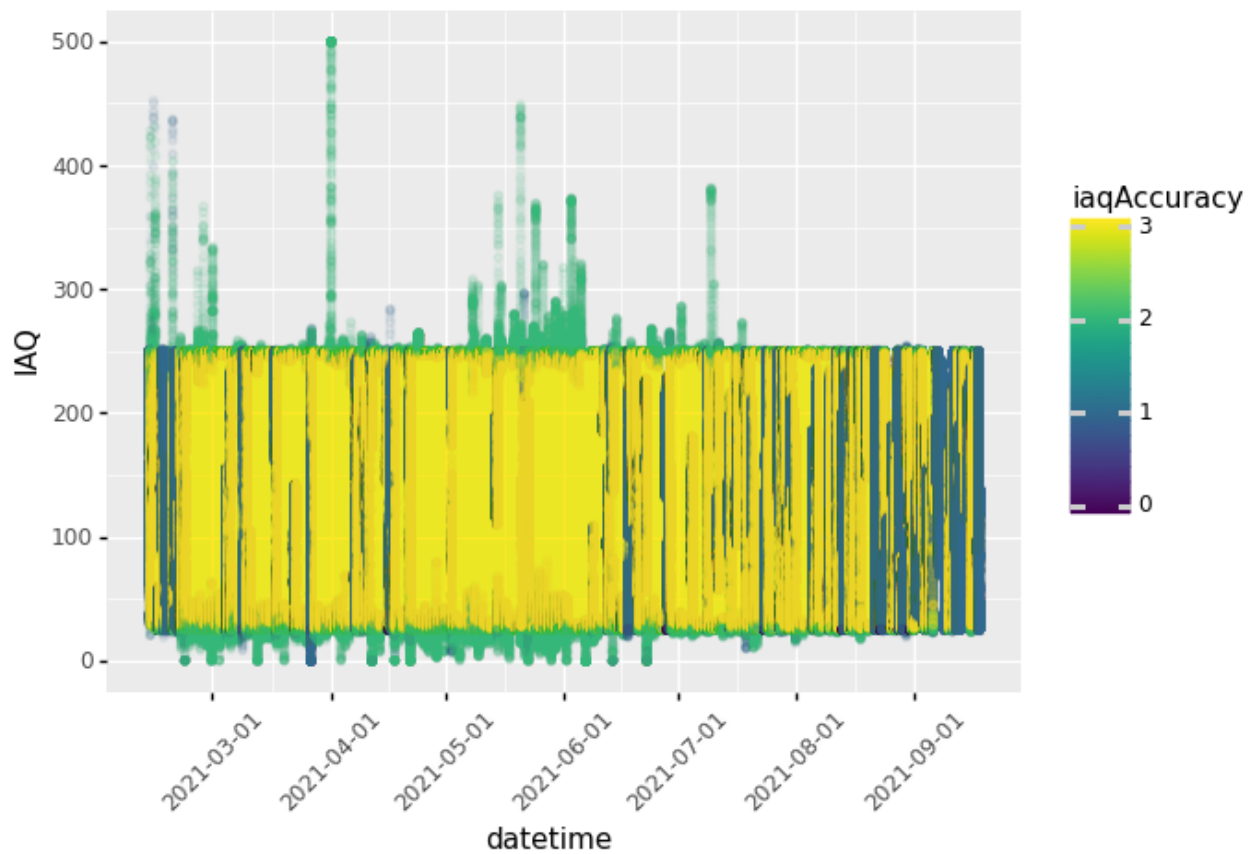
Wall time: 3min 1s

	temperature	pressure	humidity	gasResistance	IAQ	iaqAccuracy	\
0	21.54	777.41	43.93	151328	37.5		1
1	21.56	777.41	43.89	152702	35.6		1
2	21.53	777.41	43.97	151328	37.5		1
3	21.51	777.41	44.03	151464	38.5		1
4	21.51	777.41	44.05	152425	36.9		1

	datetime	year	month	day	hour	minute
0	2021-02-12 06:04:09.089621067	2021	2	12	6	4
1	2021-02-12 06:04:12.087778807	2021	2	12	6	4
2	2021-02-12 06:04:15.072475433	2021	2	12	6	4
3	2021-02-12 06:04:18.070170164	2021	2	12	6	4
4	2021-02-12 06:04:21.061994791	2021	2	12	6	4

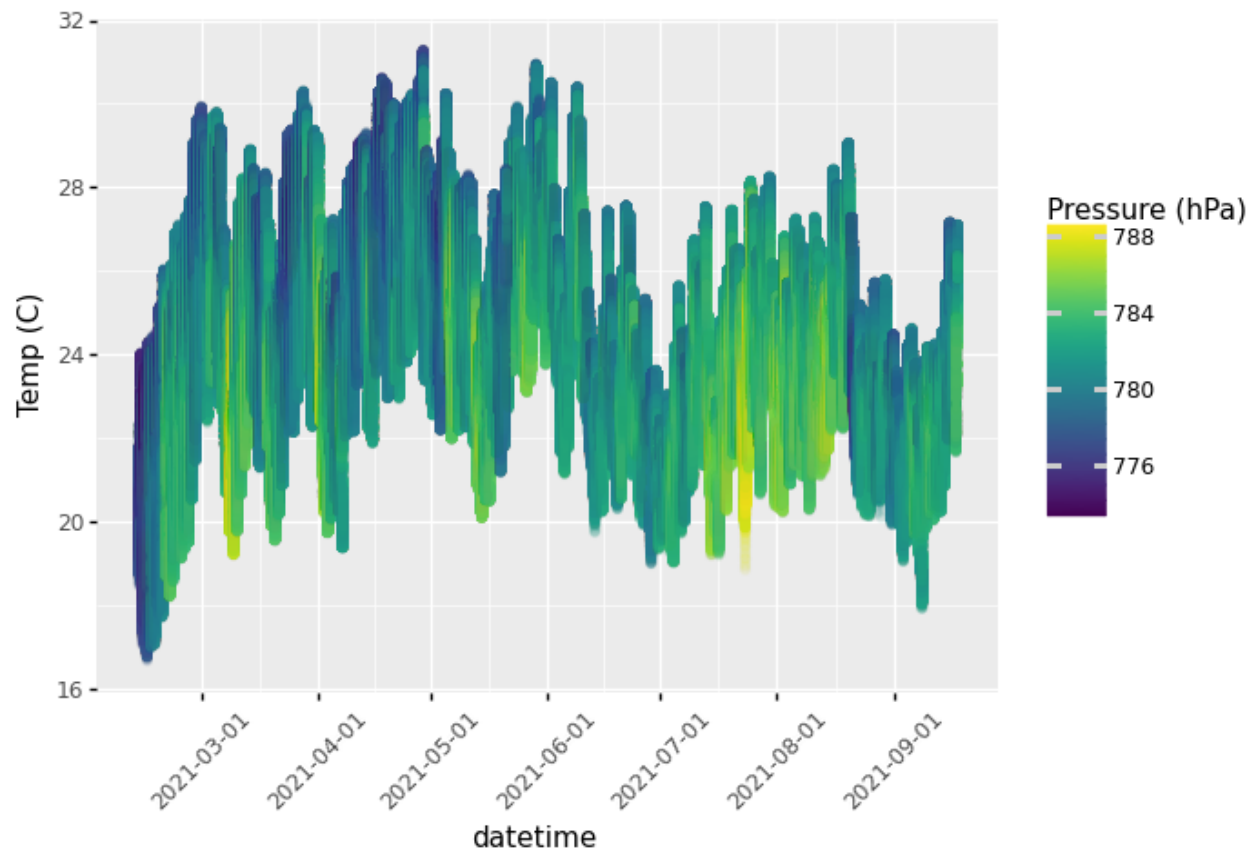
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during the transform in `preprocessing_exc_tuple` in IPython 7.17 and above.

(6285103, 12)



```
<ggplot: (8759878048277)>
```

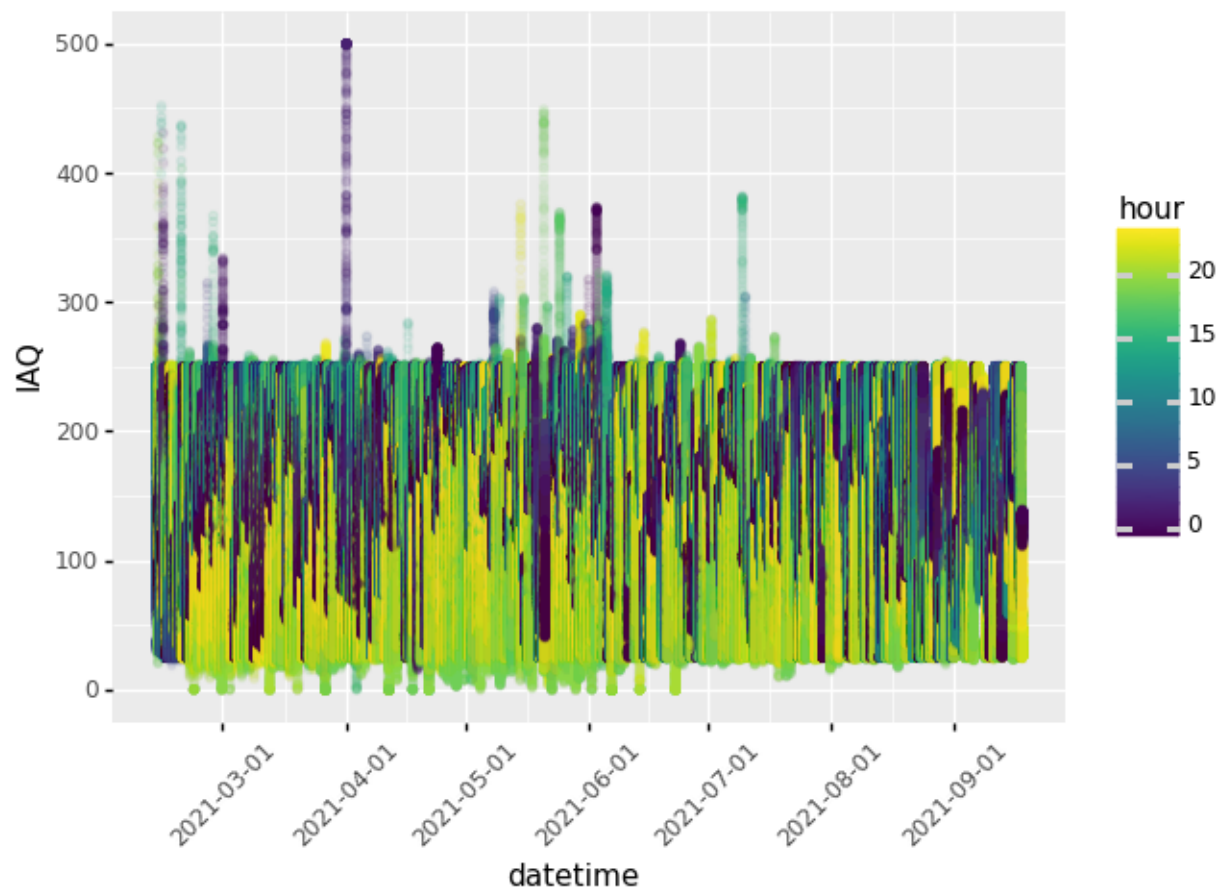
```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during the transform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```



<ggplot: (8759869828161)>

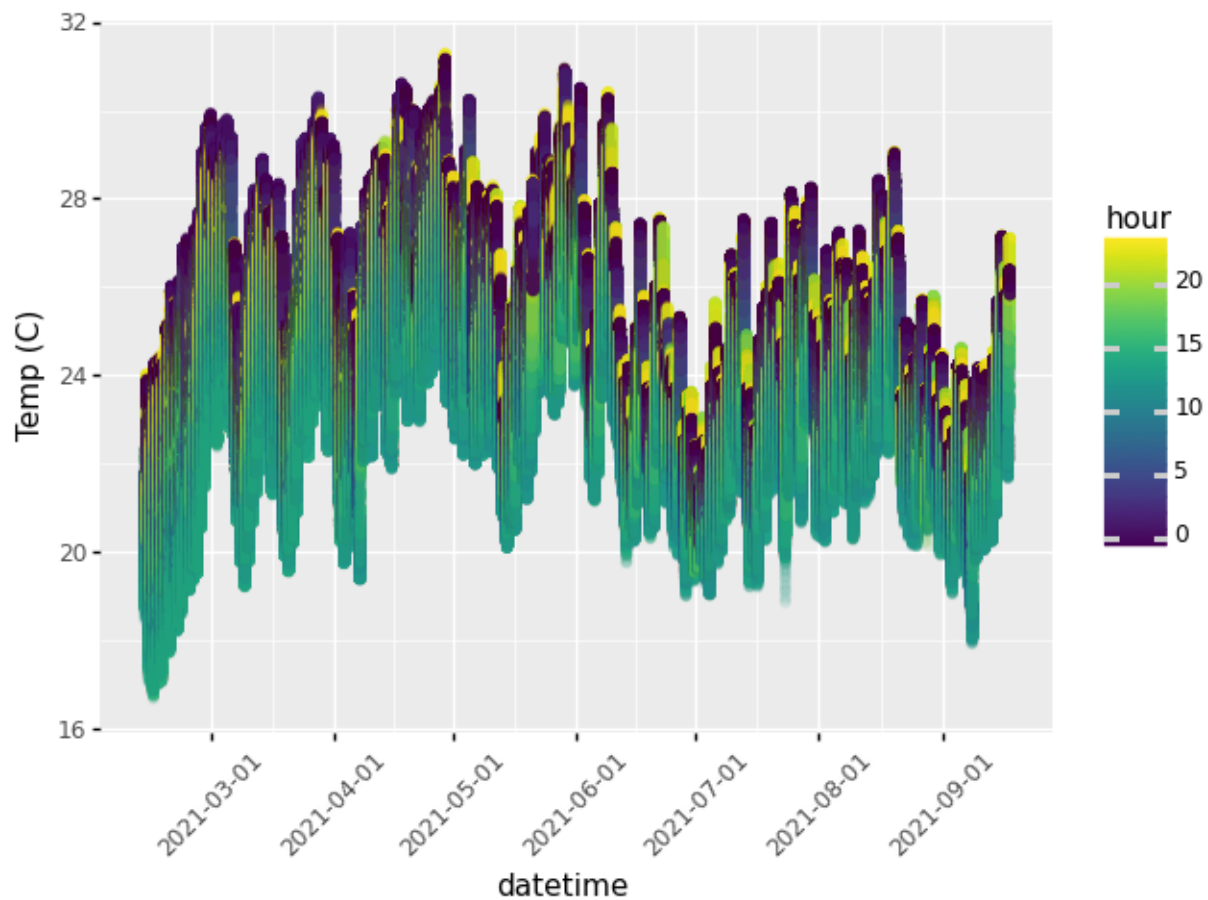
1.2 Graficando por Horas

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during the transform in `preprocessing_exc_tuple` in IPython 7.17 and above.



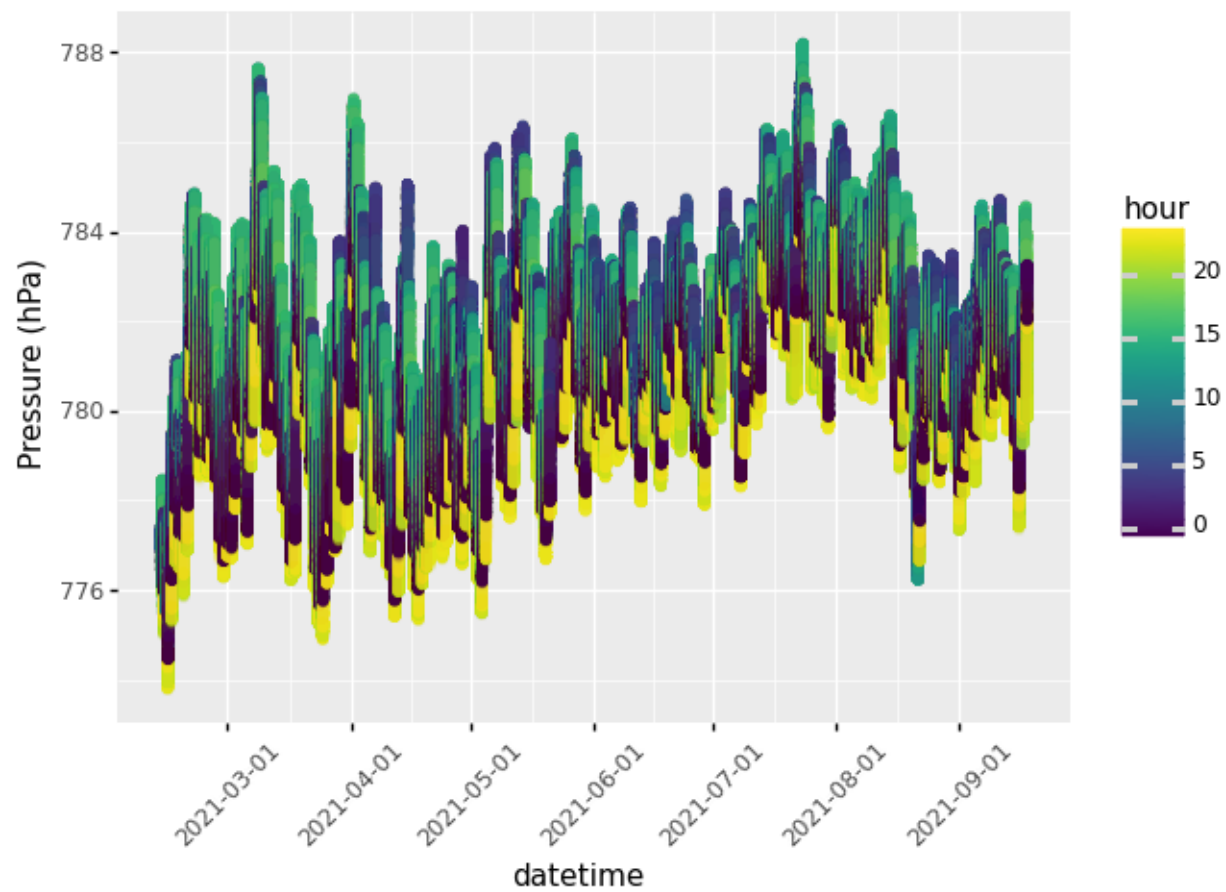
```
<ggplot: (8759792563449)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```



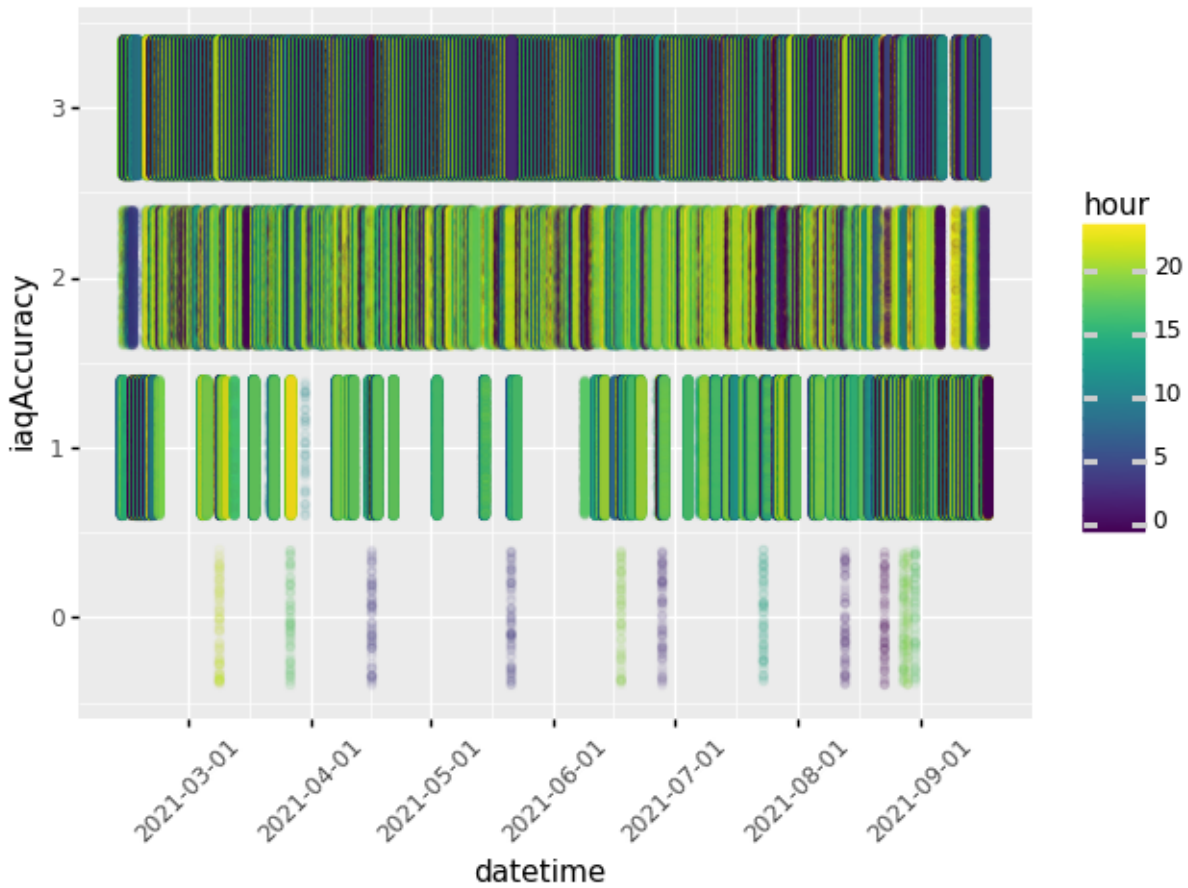
<ggplot: (8759792572893)>

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during the transform in `preprocessing_exc_tuple` in IPython 7.17 and above.



```
<ggplot: (8759792567581)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```



```
<ggplot: (8759792217949)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

1.3 SINAICA

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

Listing data files from: /home/jaa6766/Documents/jorge3a/itam/deeplearning/dlfinal/data/sinaica/...

Loading pickle prev data...

	Parámetro	Fecha	Valor	Unidad	Estacion
1	CO	2021-01-01 00:00:00	0.600	ppm	Camarones
1	NO	2021-01-01 00:00:00	0.006	ppm	Camarones
1	NO2	2021-01-01 00:00:00	0.029	ppm	Camarones
1	NOx	2021-01-01 00:00:00	0.034	ppm	Camarones
1	O3	2021-01-01 00:00:00	0.011	ppm	Camarones
425	NOx	2021-04-01 23:00:00	0.014	ppm	Tlalnepantla
701	O3	2021-04-01 23:00:00	0.029	ppm	Tlalnepantla
681	PM10	2021-04-01 23:00:00	55.000	µg/m³	Tlalnepantla


```
679      PM2.5 2021-04-01 23:00:00 22.000 µg/m³ Tlalnepantla
696      SO2 2021-04-01 23:00:00 0.002 ppm Tlalnepantla
```

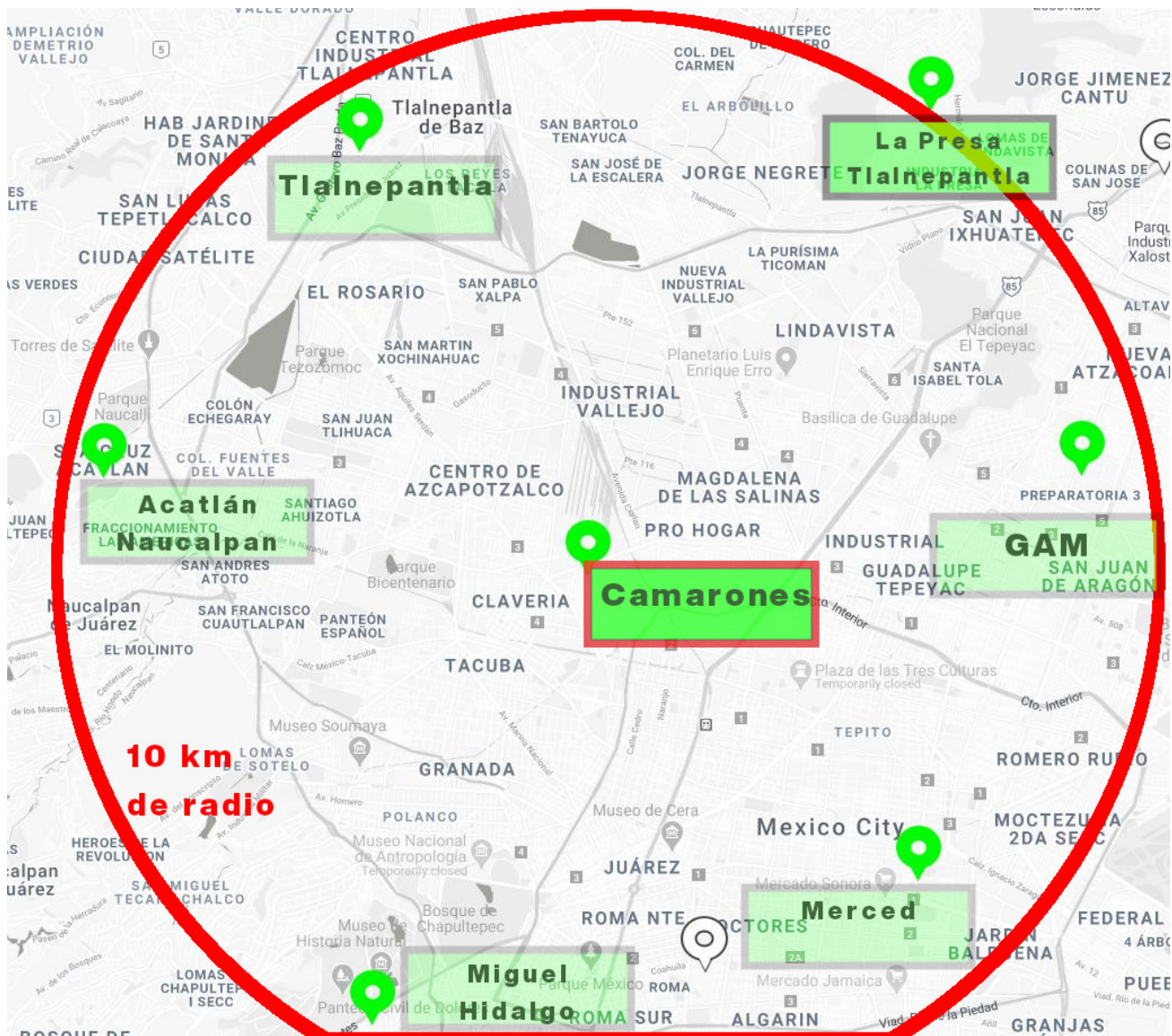
```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during the transform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

	Parámetro	Fecha	Valor	Unidad	Estacion
1	CO	2021-01-01 00:00:00	0.600	ppm	Camarones
1	NO	2021-01-01 00:00:00	0.006	ppm	Camarones
1	NO2	2021-01-01 00:00:00	0.029	ppm	Camarones
1	NOx	2021-01-01 00:00:00	0.034	ppm	Camarones
1	O3	2021-01-01 00:00:00	0.011	ppm	Camarones
..
425	NOx	2021-04-01 23:00:00	0.014	ppm	Tlalnepantla
701	O3	2021-04-01 23:00:00	0.029	ppm	Tlalnepantla
681	PM10	2021-04-01 23:00:00	55.000	µg/m³	Tlalnepantla
679	PM2.5	2021-04-01 23:00:00	22.000	µg/m³	Tlalnepantla
696	SO2	2021-04-01 23:00:00	0.002	ppm	Tlalnepantla

```
[88034 rows x 5 columns]
```

1.3.1 Visualización de las Estaciones Cercanas

Encontramos que las siguientes son algunas de las estaciones cercanas a “Camarones” que está próxima a nuestro sensor:

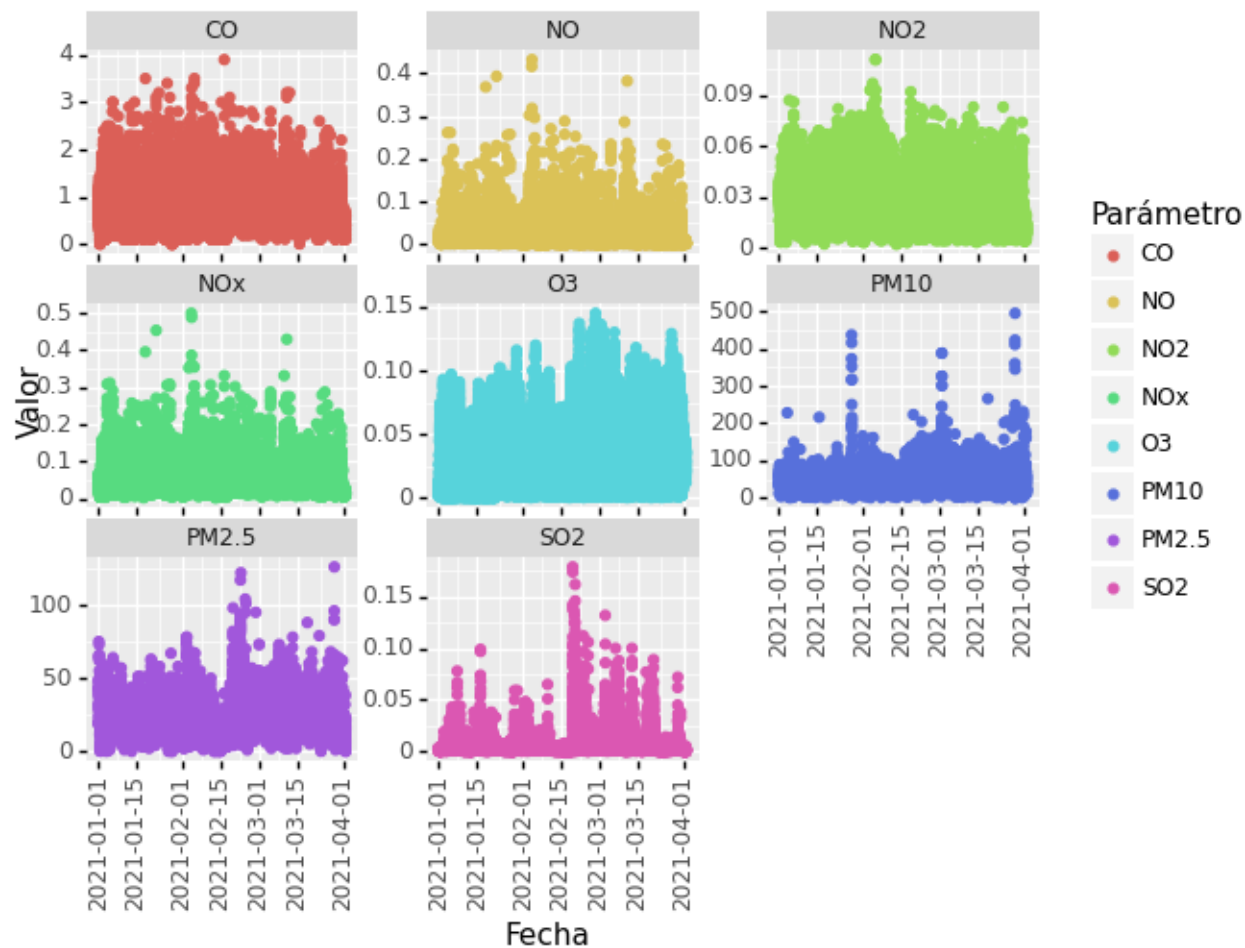


```

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.

```

Visualización general de las Variables de Contaminantes

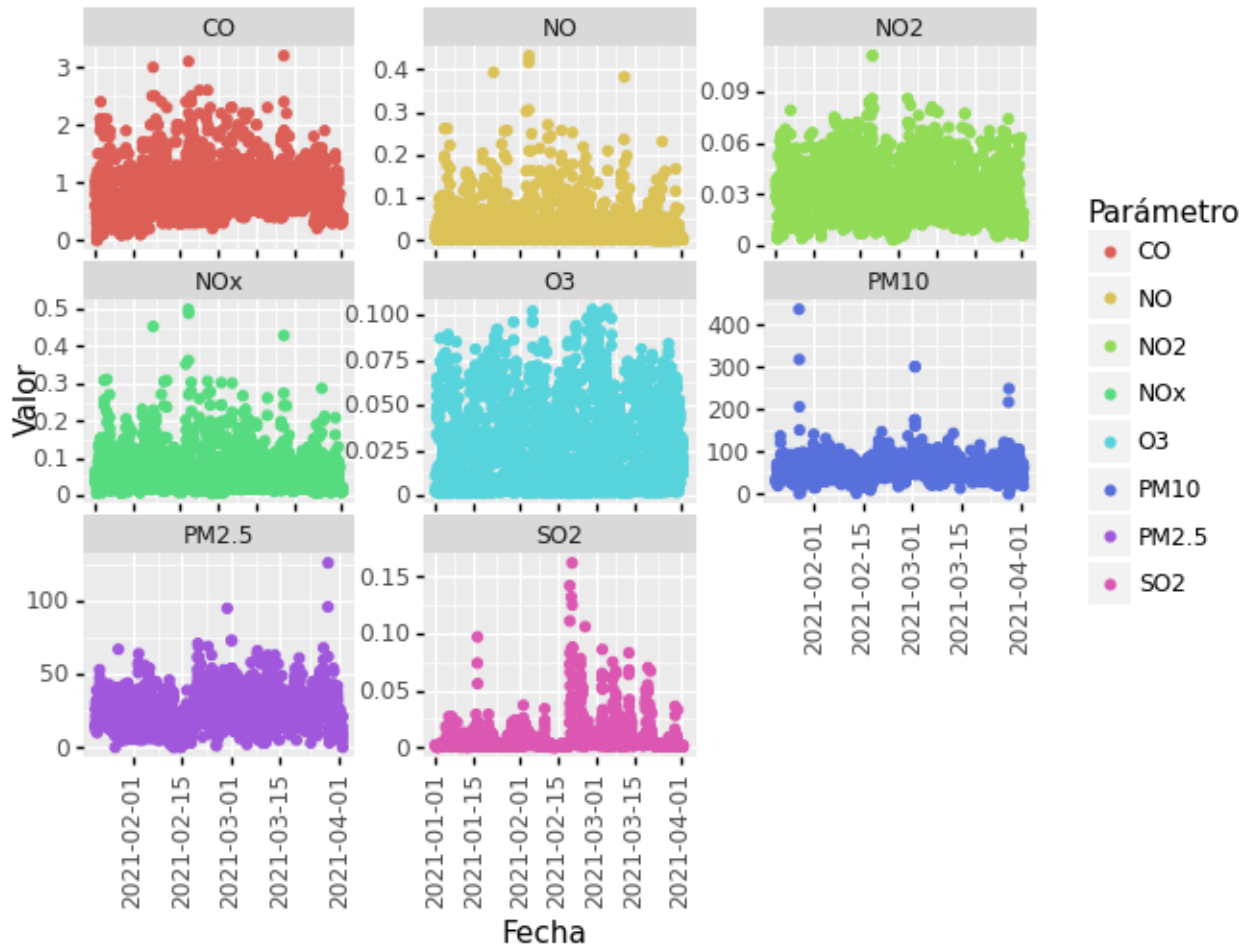


<ggplot: (8759791742085)>

1.3.2 Estación de Monitoreo Camarones

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

Estación Camarones



```
<ggplot: (8759877268541)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

1.4 Datos del Sensor

Se obtienen los promedios para que sean alineables con el monitoreo del aire de la Ciudad de México.

	temperature	pressure	humidity	gasResistance	IAQ	iaqAccuracy	\
0	21.54	777.41	43.93	151328	37.5	1	
1	21.56	777.41	43.89	152702	35.6	1	
2	21.53	777.41	43.97	151328	37.5	1	
3	21.51	777.41	44.03	151464	38.5	1	
4	21.51	777.41	44.05	152425	36.9	1	

	datetime	year	month	day	hour	minute
0	2021-02-12 06:04:09.089621067	2021	2	12	6	4
1	2021-02-12 06:04:12.087778807	2021	2	12	6	4
2	2021-02-12 06:04:15.072475433	2021	2	12	6	4
3	2021-02-12 06:04:18.070170164	2021	2	12	6	4

4 2021-02-12 06:04:21.061994791 2021 2 12 6 4

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.  
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/dplython/dplython.py:196: DeprecationWarning: 'dfilter' is deprecated.  
Please use 'sift' instead.
```

	temperature	pressure	humidity	gasResistance	IAQ	iaqAccuracy \
490473	28.06	780.7	30.37	175863	198.1	3
490474	28.05	780.7	30.38	176417	197.7	3
490475	28.05	780.7	30.41	175313	198.0	3

	datetime	year	month	day	hour	minute
490473	2021-03-01 06:00:01.807887316	2021	3	1	6	0
490474	2021-03-01 06:00:04.803511858	2021	3	1	6	0
490475	2021-03-01 06:00:07.798833609	2021	3	1	6	0

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

CPU times: user 31.8 s, sys: 7.06 s, total: 38.9 s

Wall time: 38.9 s

	year	month	day	hour	temperature	pressure	humidity \
0	2021	2	12	6	21.557391	777.271496	44.289745
1	2021	2	12	7	21.153699	777.077872	43.183375
2	2021	2	12	8	20.653242	776.620657	42.604564
3	2021	2	12	9	20.406470	776.213214	42.223995
4	2021	2	12	10	20.051380	776.202968	42.269584
...
5223	2021	9	17	21	26.476714	780.191339	50.048186
5224	2021	9	17	22	26.849135	780.496165	50.588394
5225	2021	9	17	23	26.281820	782.067298	54.032219
5226	2021	9	18	0	26.222995	782.853860	55.496814
5227	2021	9	18	1	25.928134	782.818660	56.467943

	gasResistance	IAQ	iaqAccuracy
0	1.439648e+05	90.755292	1
1	1.497397e+05	81.831588	1
2	1.537118e+05	86.220615	1
3	1.491061e+05	138.266030	1
4	1.428894e+05	198.164339	1
...
5223	1.043343e+06	37.047504	1
5224	1.050633e+06	38.850749	1
5225	9.918547e+05	81.164589	1
5226	9.266802e+05	128.776123	1
5227	9.204316e+05	134.620335	1

[5228 rows x 10 columns]

Estadísticas de los valores de las lecturas

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
```

not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during thetransform in `preprocessing_exc_tuple` in IPython 7.17 and above.

	year	month	day	hour	temperature \
count	5228.0	5228.000000	5228.000000	5228.000000	5228.000000
mean	2021.0	5.509946	15.633512	11.506121	24.349677
std	0.0	2.093404	8.655932	6.921888	2.489229
min	2021.0	2.000000	1.000000	0.000000	17.282542
25%	2021.0	4.000000	8.000000	6.000000	22.518177
50%	2021.0	6.000000	16.000000	12.000000	24.198175
75%	2021.0	7.000000	23.000000	18.000000	26.116874
max	2021.0	9.000000	31.000000	23.000000	31.066215

	pressure	humidity	gasResistance	IAQ	iaqAccuracy
count	5228.000000	5228.000000	5.228000e+03	5228.000000	5228.000000
mean	781.624137	43.442600	6.950943e+05	157.429759	2.551071
std	2.187106	12.554327	3.111298e+05	69.918421	0.817749
min	774.004780	8.750125	9.540458e+04	22.751331	1.000000
25%	780.216749	32.662378	5.044701e+05	98.951158	3.000000
50%	781.726205	43.999339	6.915713e+05	171.485025	3.000000
75%	783.156527	54.322785	8.638399e+05	219.580799	3.000000
max	787.963968	70.166841	2.716493e+06	255.292928	3.000000

1.5 Datos del Monitoreo Ambiental

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during thetransform in `preprocessing_exc_tuple` in IPython 7.17 and above.

	Parámetro	Fecha	Valor	Unidad	Estacion
1	CO	2021-01-01 00:00:00	0.600	ppm	Camarones
1	NO	2021-01-01 00:00:00	0.006	ppm	Camarones
1	NO2	2021-01-01 00:00:00	0.029	ppm	Camarones
1	NOx	2021-01-01 00:00:00	0.034	ppm	Camarones
1	O3	2021-01-01 00:00:00	0.011	ppm	Camarones
..
425	NOx	2021-04-01 23:00:00	0.014	ppm	Tlalnepantla
701	O3	2021-04-01 23:00:00	0.029	ppm	Tlalnepantla
681	PM10	2021-04-01 23:00:00	55.000	µg/m³	Tlalnepantla
679	PM2.5	2021-04-01 23:00:00	22.000	µg/m³	Tlalnepantla
696	S02	2021-04-01 23:00:00	0.002	ppm	Tlalnepantla

[88034 rows x 5 columns]

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during thetransform in `preprocessing_exc_tuple` in IPython 7.17 and above.

	Fecha	Camarones_CO	Camarones_NO	Camarones_NO2 \
0	2021-01-01 00:00:00	0.6	0.006	0.029
1	2021-01-01 01:00:00	1.0	0.021	0.038
2	2021-01-01 02:00:00	0.8	0.013	0.035
3	2021-01-01 03:00:00	1.0	0.031	0.034
4	2021-01-01 04:00:00	0.6	0.005	0.029
...

2166	2021-04-01	19:00:00	0.4	0.003	0.011
2167	2021-04-01	20:00:00	0.4	0.002	0.011
2168	2021-04-01	21:00:00	0.4	0.002	0.013
2169	2021-04-01	22:00:00	0.4	0.002	0.019
2170	2021-04-01	23:00:00	0.4	0.001	0.014

	Camarones_NOx	Camarones_O3	Camarones_PM10	Camarones_PM2.5	\
0	0.034	0.011	NaN	NaN	
1	0.059	0.002	NaN	NaN	
2	0.049	0.003	NaN	NaN	
3	0.065	0.002	NaN	NaN	
4	0.034	0.005	NaN	NaN	
...	
2166	0.013	0.016	69.0	7.0	
2167	0.012	0.018	71.0	9.0	
2168	0.015	0.016	37.0	9.0	
2169	0.021	0.012	19.0	0.0	
2170	0.015	0.021	61.0	21.0	

	Camarones_SO2	FES Acatlán_CO	...	Miguel Hidalgo_O3	\
0	0.002	0.4	...	0.009	
1	0.002	0.6	...	0.006	
2	0.001	0.9	...	0.003	
3	0.001	0.8	...	0.004	
4	0.001	1.0	...	0.006	
...	
2166	0.001	0.3	...	0.023	
2167	0.001	0.2	...	0.024	
2168	0.001	0.2	...	0.023	
2169	0.001	0.1	...	0.027	
2170	0.001	0.2	...	0.033	

	Miguel Hidalgo_SO2	Tlalnepantla_CO	Tlalnepantla_NO	Tlalnepantla_NO2	\
0	0.003	0.6	NaN	0.030	
1	0.003	0.6	NaN	0.026	
2	0.002	0.7	NaN	0.032	
3	0.002	0.7	NaN	0.033	
4	0.002	0.7	NaN	0.032	
...	
2166	0.000	0.3	0.009	0.017	
2167	0.000	0.4	0.004	0.015	
2168	0.000	0.3	0.002	0.014	
2169	0.000	0.3	0.002	0.011	
2170	0.001	0.3	0.001	0.014	

	Tlalnepantla_NOx	Tlalnepantla_O3	Tlalnepantla_PM10	\
0	0.034	0.012	37.0	
1	0.029	0.013	42.0	
2	0.036	0.006	58.0	
3	0.039	0.004	59.0	
4	0.038	0.004	64.0	
...	
2166	0.025	0.017	52.0	
2167	0.019	0.020	22.0	
2168	0.017	0.021	21.0	
2169	0.013	0.022	11.0	
2170	0.014	0.029	55.0	

Tlalnepantla_PM2.5 Tlalnepantla_SO2

0	19.0	0.002
1	29.0	0.003
2	43.0	0.002
3	41.0	0.002
4	46.0	0.002
...
2166	24.0	0.003
2167	10.0	0.005
2168	14.0	0.002
2169	7.0	0.001
2170	22.0	0.002

[2171 rows x 45 columns]

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during thetransform in `preprocessing_exc_tuple` in IPython 7.17 and above.

	Estacion	count	mean \
Camarones_CO	Camarones_CO	2050.0	0.771805
Camarones_NO	Camarones_NO	2042.0	0.025181
Camarones_NO2	Camarones_NO2	2042.0	0.031787
Camarones_NOx	Camarones_NOx	2042.0	0.056961
Camarones_O3	Camarones_O3	2042.0	0.025693
Camarones_PM10	Camarones_PM10	1616.0	58.066213
Camarones_PM2.5	Camarones_PM2.5	1604.0	25.158978
Camarones_SO2	Camarones_SO2	2042.0	0.006598
FES Acatlán_CO	FES Acatlán_CO	2020.0	0.634901
FES Acatlán_NO	FES Acatlán_NO	1304.0	0.014301
FES Acatlán_NO2	FES Acatlán_NO2	2015.0	0.025607
FES Acatlán_NOx	FES Acatlán_NOx	2019.0	0.041234
FES Acatlán_O3	FES Acatlán_O3	2015.0	0.033841
FES Acatlán_PM10	FES Acatlán_PM10	1991.0	47.245605
FES Acatlán_SO2	FES Acatlán_SO2	2015.0	0.006546
Gustavo A. Madero_NO2	Gustavo A. Madero_NO2	2085.0	0.025859
Gustavo A. Madero_O3	Gustavo A. Madero_O3	2076.0	0.031555
Gustavo A. Madero_PM10	Gustavo A. Madero_PM10	2035.0	52.755283
Gustavo A. Madero_PM2.5	Gustavo A. Madero_PM2.5	2026.0	23.785291
La Presa_CO	La Presa_CO	2034.0	0.933628
La Presa_O3	La Presa_O3	1863.0	0.029086
La Presa_SO2	La Presa_SO2	2017.0	0.005163
Merced_CO	Merced_CO	2087.0	1.151749
Merced_NO	Merced_NO	1381.0	0.021361
Merced_NO2	Merced_NO2	2070.0	0.032723
Merced_NOx	Merced_NOx	2070.0	0.056423
Merced_O3	Merced_O3	2076.0	0.028389
Merced_PM10	Merced_PM10	2142.0	54.485061
Merced_PM2.5	Merced_PM2.5	2137.0	26.730463
Merced_SO2	Merced_SO2	2094.0	0.006420
Miguel Hidalgo_CO	Miguel Hidalgo_CO	2090.0	0.544785
Miguel Hidalgo_NO	Miguel Hidalgo_NO	2077.0	0.021710
Miguel Hidalgo_NO2	Miguel Hidalgo_NO2	2078.0	0.029400
Miguel Hidalgo_NOx	Miguel Hidalgo_NOx	2078.0	0.051113
Miguel Hidalgo_O3	Miguel Hidalgo_O3	2082.0	0.033624
Miguel Hidalgo_SO2	Miguel Hidalgo_SO2	2081.0	0.005228
Tlalnepantla_CO	Tlalnepantla_CO	2023.0	0.740287
Tlalnepantla_NO	Tlalnepantla_NO	1039.0	0.020687
Tlalnepantla_NO2	Tlalnepantla_NO2	1751.0	0.031346

Tlalnepantla_NOx	Tlalnepantla_NOx	1752.0	0.052864
Tlalnepantla_O3	Tlalnepantla_O3	2077.0	0.027766
Tlalnepantla_PM10	Tlalnepantla_PM10	1989.0	48.649573
Tlalnepantla_PM2.5	Tlalnepantla_PM2.5	1973.0	22.273188
Tlalnepantla_SO2	Tlalnepantla_SO2	2066.0	0.008569
Fecha	Fecha	NaN	NaN

	std	min	25%	50%	75%	max	\
Camarones_CO	0.430131	0.000	0.500	0.700	1.0000	3.200	
Camarones_NO	0.045487	0.000	0.002	0.006	0.0260	0.432	
Camarones_NO2	0.015682	0.003	0.020	0.031	0.0420	0.111	
Camarones_NOx	0.054418	0.004	0.022	0.039	0.0710	0.499	
Camarones_O3	0.024107	0.001	0.004	0.018	0.0420	0.103	
Camarones_PM10	26.906212	0.000	41.000	55.000	71.0000	437.000	
Camarones_PM2.5	12.946419	0.000	16.000	24.000	33.0000	126.000	
Camarones_SO2	0.013053	0.000	0.002	0.003	0.0050	0.162	
FES Acatlán_CO	0.370808	0.100	0.400	0.500	0.8000	2.900	
FES Acatlán_NO	0.024926	0.000	0.002	0.004	0.0130	0.215	
FES Acatlán_NO2	0.014263	0.002	0.015	0.023	0.0330	0.092	
FES Acatlán_NOx	0.035480	0.002	0.018	0.028	0.0520	0.260	
FES Acatlán_O3	0.026037	0.003	0.013	0.027	0.0480	0.137	
FES Acatlán_PM10	32.511497	0.000	27.000	41.000	61.0000	388.000	
FES Acatlán_SO2	0.010034	0.000	0.002	0.004	0.0070	0.136	
Gustavo A. Madero_NO2	0.014361	0.003	0.013	0.026	0.0360	0.081	
Gustavo A. Madero_O3	0.029610	0.001	0.004	0.023	0.0510	0.128	
Gustavo A. Madero_PM10	27.911189	0.000	34.500	50.000	67.0000	495.000	
Gustavo A. Madero_PM2.5	13.182547	0.000	14.000	22.000	31.0000	117.000	
La Presa_CO	0.513861	0.100	0.600	0.800	1.1000	3.500	
La Presa_O3	0.025911	0.001	0.006	0.024	0.0455	0.118	
La Presa_SO2	0.009749	0.000	0.001	0.002	0.0050	0.118	
Merced_CO	0.413130	0.500	0.900	1.000	1.3000	3.900	
Merced_NO	0.034552	0.000	0.003	0.008	0.0220	0.318	
Merced_NO2	0.014052	0.005	0.022	0.032	0.0410	0.087	
Merced_NOx	0.044741	0.006	0.027	0.042	0.0710	0.386	
Merced_O3	0.029109	0.000	0.003	0.018	0.0460	0.140	
Merced_PM10	23.727621	0.000	39.000	53.000	67.0000	411.000	
Merced_PM2.5	12.805604	0.000	18.000	25.000	33.0000	122.000	
Merced_SO2	0.010345	0.000	0.002	0.003	0.0060	0.146	
Miguel Hidalgo_CO	0.343697	0.000	0.300	0.500	0.7000	2.600	
Miguel Hidalgo_NO	0.038798	0.000	0.002	0.005	0.0220	0.368	
Miguel Hidalgo_NO2	0.013166	0.004	0.019	0.028	0.0390	0.086	
Miguel Hidalgo_NOx	0.046729	0.005	0.022	0.034	0.0620	0.395	
Miguel Hidalgo_O3	0.028588	0.002	0.009	0.027	0.0500	0.145	
Miguel Hidalgo_SO2	0.008925	0.000	0.001	0.002	0.0050	0.099	
Tlalnepantla_CO	0.360615	0.100	0.500	0.600	0.9000	2.900	
Tlalnepantla_NO	0.031055	0.000	0.003	0.007	0.0220	0.219	
Tlalnepantla_NO2	0.014525	0.004	0.021	0.030	0.0390	0.097	
Tlalnepantla_NOx	0.040767	0.005	0.026	0.039	0.0660	0.274	
Tlalnepantla_O3	0.025335	0.000	0.007	0.020	0.0430	0.125	
Tlalnepantla_PM10	27.959538	0.000	33.000	45.000	59.0000	423.000	
Tlalnepantla_PM2.5	12.075484	0.000	14.000	21.000	29.0000	90.000	
Tlalnepantla_SO2	0.014821	0.001	0.002	0.004	0.0080	0.179	
Fecha	NaN	NaN	NaN	NaN	NaN	NaN	

	NAs
Camarones_CO	121.0
Camarones_NO	129.0
Camarones_NO2	129.0
Camarones_NOx	129.0

Camarones_O3	129.0
Camarones_PM10	555.0
Camarones_PM2.5	567.0
Camarones_SO2	129.0
FES Acatlán_CO	151.0
FES Acatlán_NO	867.0
FES Acatlán_NO2	156.0
FES Acatlán_NOx	152.0
FES Acatlán_O3	156.0
FES Acatlán_PM10	180.0
FES Acatlán_SO2	156.0
Gustavo A. Madero_NO2	86.0
Gustavo A. Madero_O3	95.0
Gustavo A. Madero_PM10	136.0
Gustavo A. Madero_PM2.5	145.0
La Presa_CO	137.0
La Presa_O3	308.0
La Presa_SO2	154.0
Merced_CO	84.0
Merced_NO	790.0
Merced_NO2	101.0
Merced_NOx	101.0
Merced_O3	95.0
Merced_PM10	29.0
Merced_PM2.5	34.0
Merced_SO2	77.0
Miguel Hidalgo_CO	81.0
Miguel Hidalgo_NO	94.0
Miguel Hidalgo_NO2	93.0
Miguel Hidalgo_NOx	93.0
Miguel Hidalgo_O3	89.0
Miguel Hidalgo_SO2	90.0
Tlalnepantla_CO	148.0
Tlalnepantla_NO	1132.0
Tlalnepantla_NO2	420.0
Tlalnepantla_NOx	419.0
Tlalnepantla_O3	94.0
Tlalnepantla_PM10	182.0
Tlalnepantla_PM2.5	198.0
Tlalnepantla_SO2	105.0
Fecha	0.0

```

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel_launcher.py:8: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

```

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy

		Estacion	NAs
0	Camarones_CO	Camarones_CO	121.0
1	Camarones_NO	Camarones_NO	129.0
2	Camarones_NO2	Camarones_NO2	129.0
3	Camarones_NOx	Camarones_NOx	129.0
4	Camarones_O3	Camarones_O3	129.0

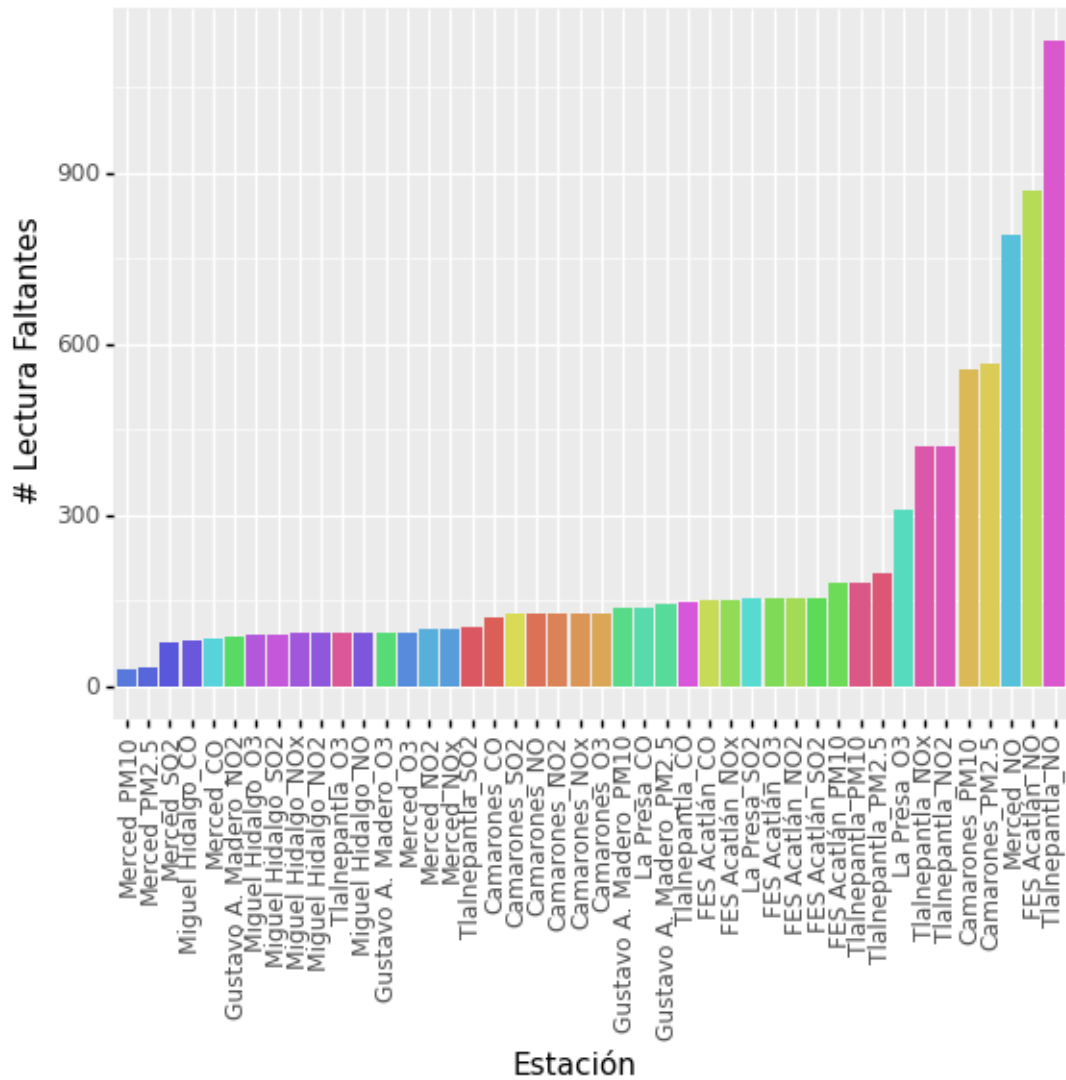
5	Camarones_PM10	Camarones_PM10	555.0
6	Camarones_PM2.5	Camarones_PM2.5	567.0
7	Camarones_SO2	Camarones_SO2	129.0
8	FES Acatlán_CO	FES Acatlán_CO	151.0
9	FES Acatlán_NO	FES Acatlán_NO	867.0
10	FES Acatlán_NO2	FES Acatlán_NO2	156.0
11	FES Acatlán_NOx	FES Acatlán_NOx	152.0
12	FES Acatlán_O3	FES Acatlán_O3	156.0
13	FES Acatlán_PM10	FES Acatlán_PM10	180.0
14	FES Acatlán_SO2	FES Acatlán_SO2	156.0
15	Gustavo A. Madero_NO2	Gustavo A. Madero_NO2	86.0
16	Gustavo A. Madero_O3	Gustavo A. Madero_O3	95.0
17	Gustavo A. Madero_PM10	Gustavo A. Madero_PM10	136.0
18	Gustavo A. Madero_PM2.5	Gustavo A. Madero_PM2.5	145.0
19	La Presa_CO	La Presa_CO	137.0
20	La Presa_O3	La Presa_O3	308.0
21	La Presa_SO2	La Presa_SO2	154.0
22	Merced_CO	Merced_CO	84.0
23	Merced_NO	Merced_NO	790.0
24	Merced_NO2	Merced_NO2	101.0
25	Merced_NOx	Merced_NOx	101.0
26	Merced_O3	Merced_O3	95.0
27	Merced_PM10	Merced_PM10	29.0
28	Merced_PM2.5	Merced_PM2.5	34.0
29	Merced_SO2	Merced_SO2	77.0
30	Miguel Hidalgo_CO	Miguel Hidalgo_CO	81.0
31	Miguel Hidalgo_NO	Miguel Hidalgo_NO	94.0
32	Miguel Hidalgo_NO2	Miguel Hidalgo_NO2	93.0
33	Miguel Hidalgo_NOx	Miguel Hidalgo_NOx	93.0
34	Miguel Hidalgo_O3	Miguel Hidalgo_O3	89.0
35	Miguel Hidalgo_SO2	Miguel Hidalgo_SO2	90.0
36	Tlalnepantla_CO	Tlalnepantla_CO	148.0
37	Tlalnepantla_NO	Tlalnepantla_NO	1132.0
38	Tlalnepantla_NO2	Tlalnepantla_NO2	420.0
39	Tlalnepantla_NOx	Tlalnepantla_NOx	419.0
40	Tlalnepantla_O3	Tlalnepantla_O3	94.0
41	Tlalnepantla_PM10	Tlalnepantla_PM10	182.0
42	Tlalnepantla_PM2.5	Tlalnepantla_PM2.5	198.0
43	Tlalnepantla_SO2	Tlalnepantla_SO2	105.0

```

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.

```

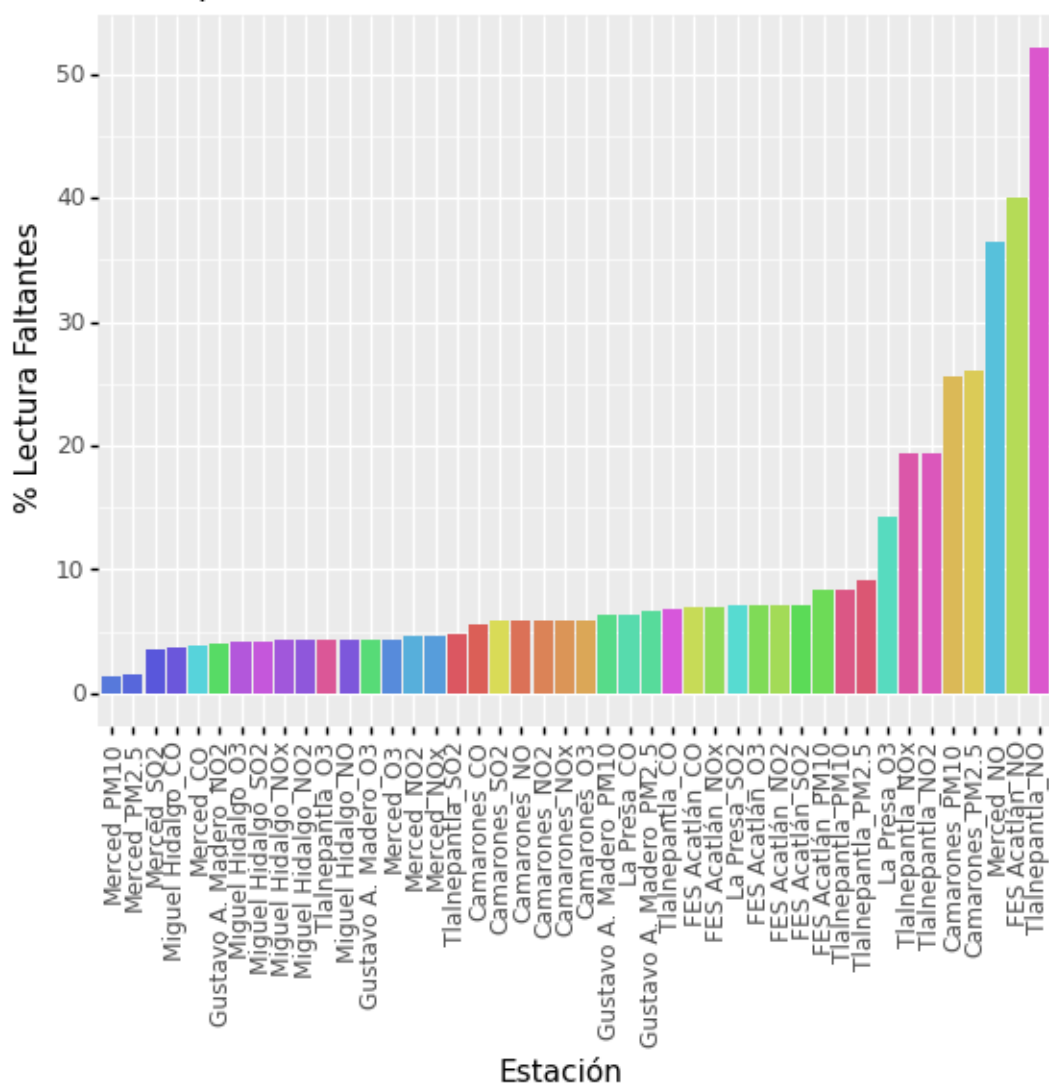
Histograma de Lecturas Faltantes por Contaminante-Estacion de Monitoreo



```
<ggplot: (8759875176429)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

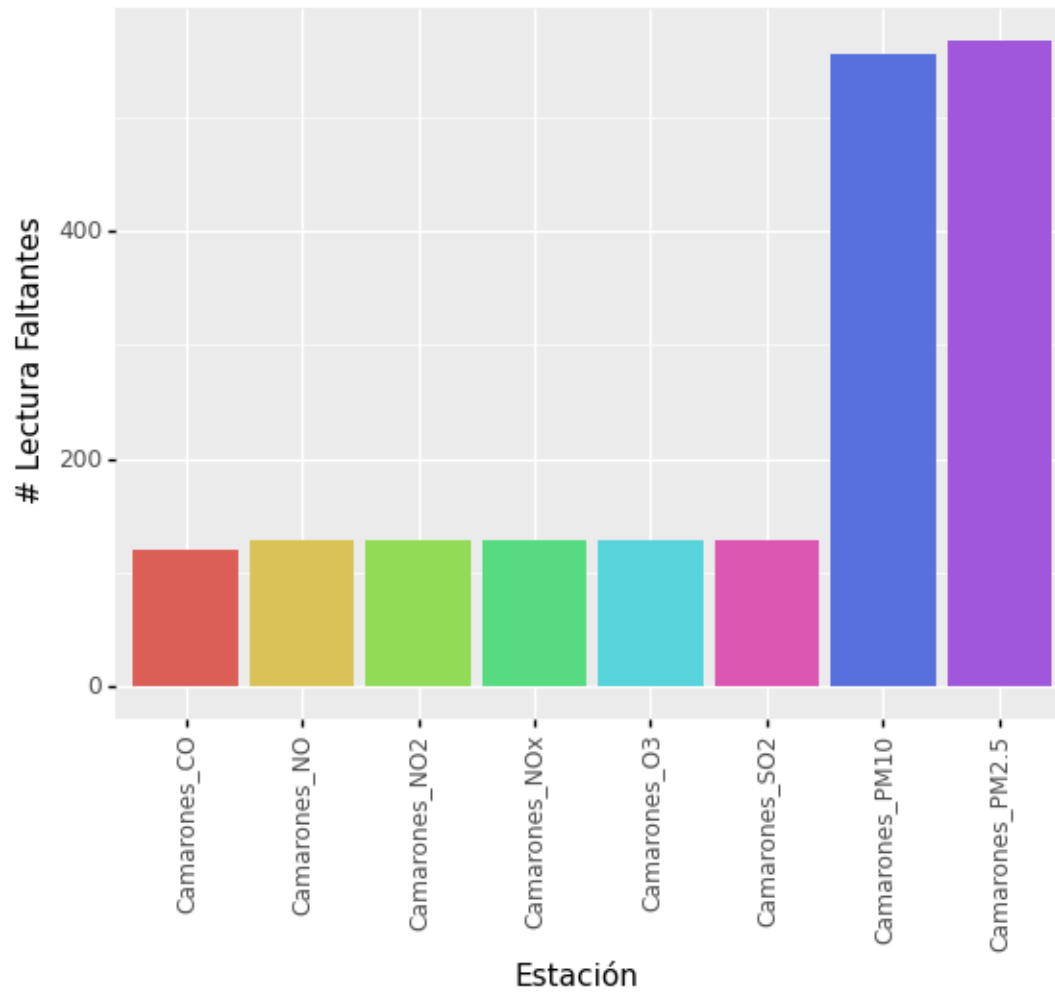
Porcentaje de Lecturas Faltantes
por Contaminante-Estacion de Monitoreo



```
<ggplot: (8759685738189)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

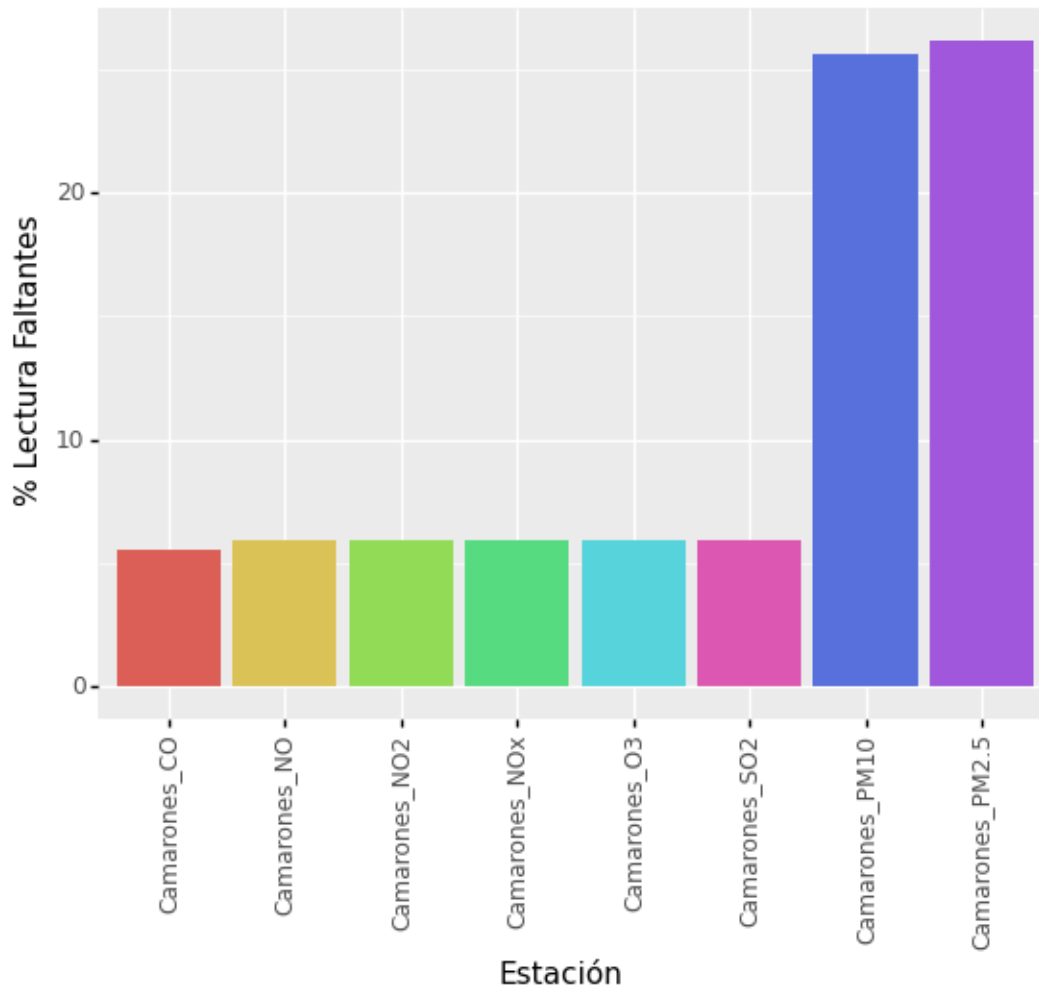
Histograma de Lecturas Faltantes por Contaminante en la Estación Camarones



```
<ggplot: (8759791694833)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

Porcentaje de Lecturas Faltantes por Contaminante en Camarones



```
<ggplot: (8759792099749)>
```

```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

		Estacion	NAs
0	Camarones_CO	Camarones_CO	121.0
1	Camarones_NO	Camarones_NO	129.0
2	Camarones_NO2	Camarones_NO2	129.0
3	Camarones_NOx	Camarones_NOx	129.0
4	Camarones_O3	Camarones_O3	129.0
5	Camarones_PM10	Camarones_PM10	555.0
6	Camarones_PM2.5	Camarones_PM2.5	567.0
7	Camarones_SO2	Camarones_SO2	129.0

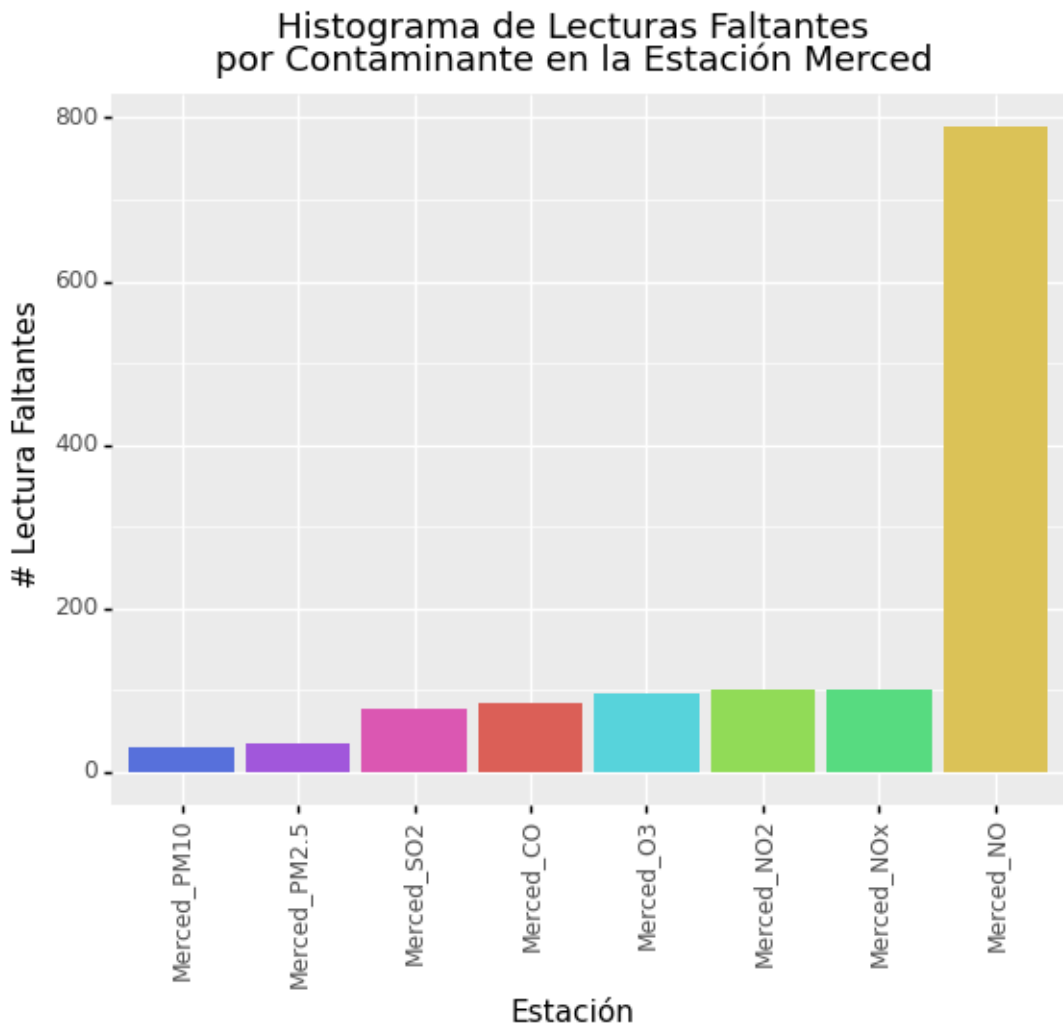
```
/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-  
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will  
not call `transform_cell` automatically in the future. Please pass the result to  
`transformed_cell` argument and any exception that happen during thetransform in  
`preprocessing_exc_tuple` in IPython 7.17 and above.
```

		Estacion	NAs
22	Merced_CO	Merced_CO	84.0
23	Merced_NO	Merced_NO	790.0
24	Merced_NO2	Merced_NO2	101.0
25	Merced_NOx	Merced_NOx	101.0
26	Merced_O3	Merced_O3	95.0
27	Merced_PM10	Merced_PM10	29.0
28	Merced_PM2.5	Merced_PM2.5	34.0
29	Merced_SO2	Merced_SO2	77.0

```

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.

```



```

<ggplot: (8759792245861)>

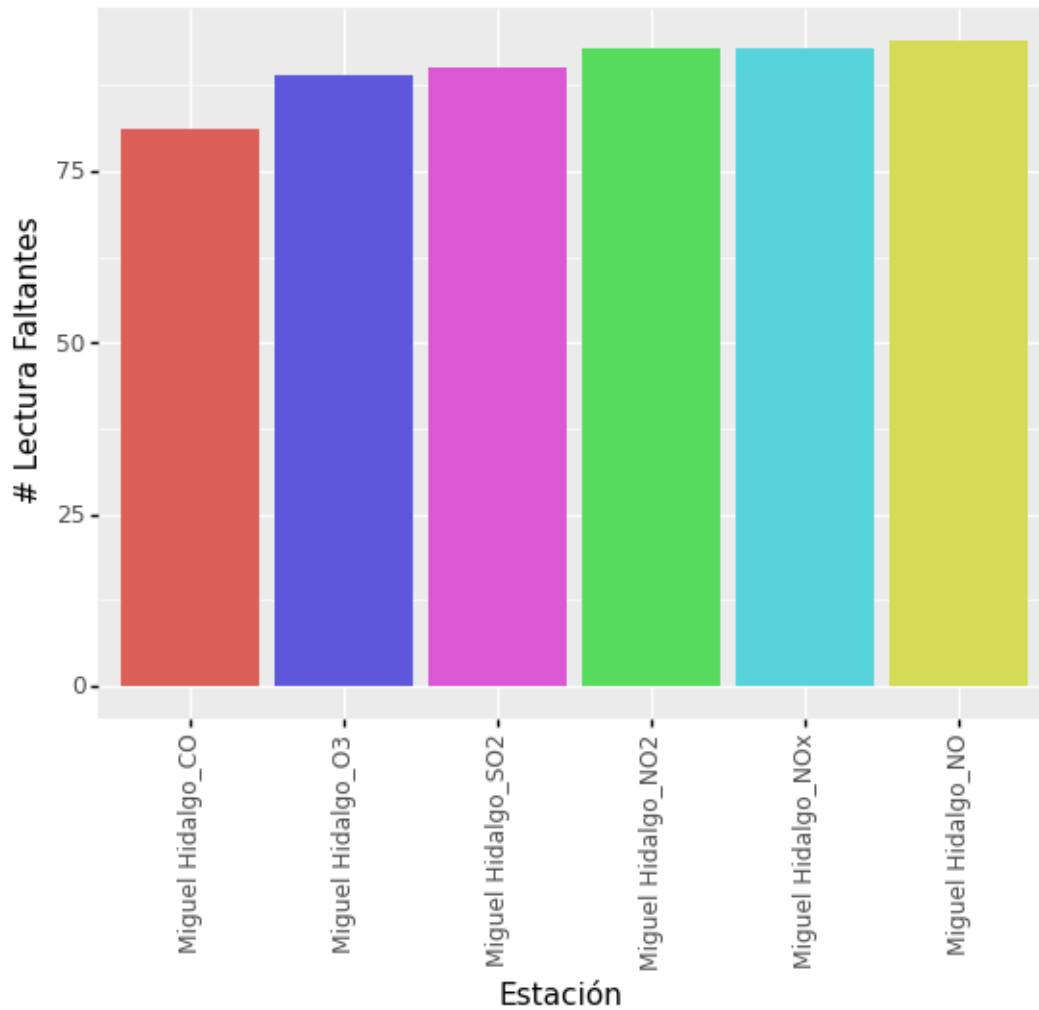
```

```

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-
packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will
not call `transform_cell` automatically in the future. Please pass the result to
`transformed_cell` argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.

```


Histograma de Lecturas Faltantes
por Contaminante en la Estación Miguel Hidalgo



<ggplot: (8759791713777)>

/home/jaa6766/.conda/envs/cuda/lib/python3.7/site-packages/ipykernel/ipkernel.py:287: DeprecationWarning: `should_run_async` will not call `transform_cell` automatically in the future. Please pass the result to `transformed_cell` argument and any exception that happen during the transform in `preprocessing_exc_tuple` in IPython 7.17 and above.

1.6 Bibliografía

- [Bosch BME680 Datasheet](#). 2021.
- Mancuso, Daniel. [Indoor Air Quality Monitor | Hackster.io](#). 2019.