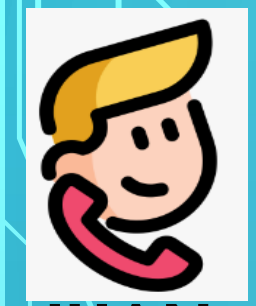
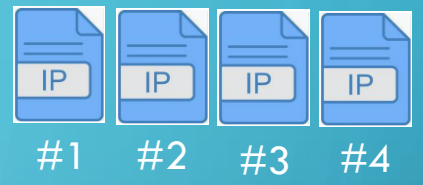
ESTIMACION DE LA CALIDAD DE AUDIO EN LLAMADAS TELEFÓNICAS (VoIP)

Llamada VOIP (Voice over IP)



JUAN



PEDRO

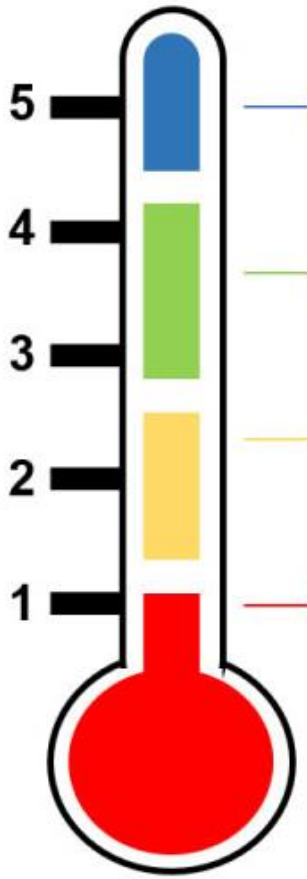
PROBLEMAS

1. Paket Loss
2. Latency
3. Jitter

Calidad de la llamada

MOS
(Mean Opinion Score)
ITU-T

call quality analysis ITU-T G.107



MOS metric	Quality	Description	Impact on viewers
5	Excellent	Perfect content	Highly satisfied
4	Good	With some distortion, but without inconvenience to the viewer	Some dissatisfied users
3	Regular	With distortions that cause inconvenience to the viewer	Many dissatisfied users
2	Poor	Low quality that produce a very annoying perception	Not recommended
1			

OBJETIVO

AI Anomaly Detections Voice Quality

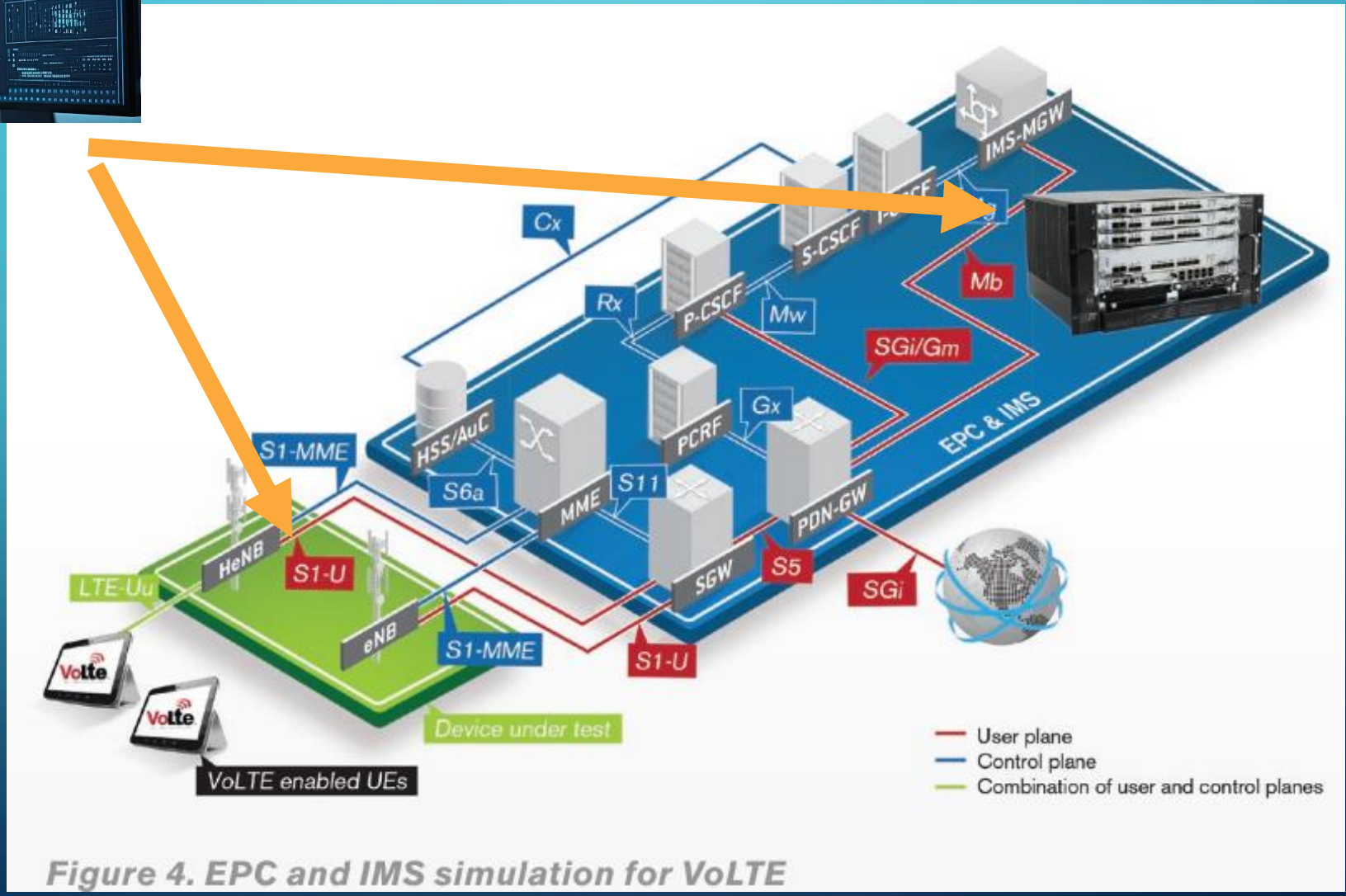


Figure 4. EPC and IMS simulation for VoLTE

Pasos de la implementación

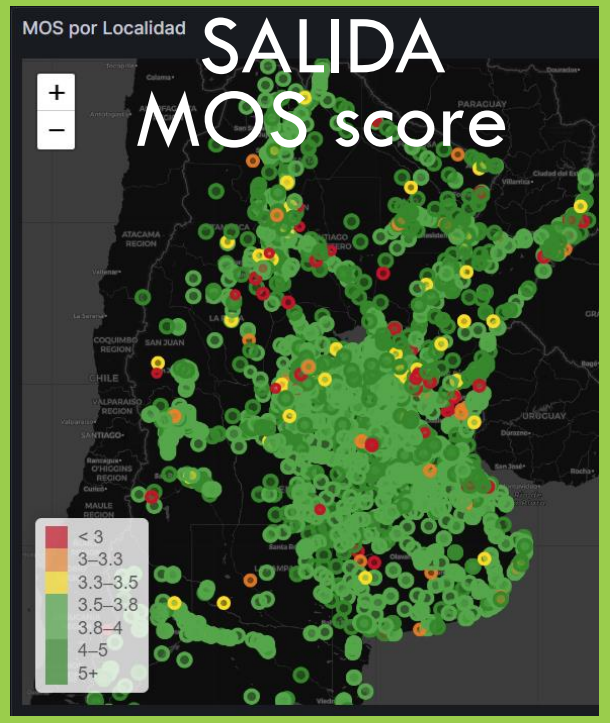
1. Entrenar un modelo. (predecir MOS)
2. Evaluar modelo.
3. Cargar modelo en la base ElasticSearch.
4. Monitorear con Grafana el MOS en real time.
5. Alertar ante desvíos.

Viavi csv

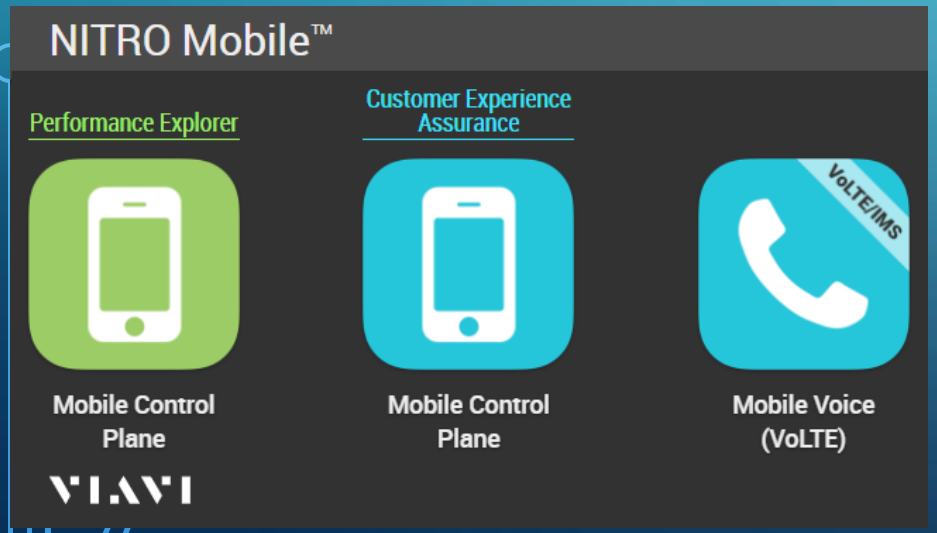
Entradas

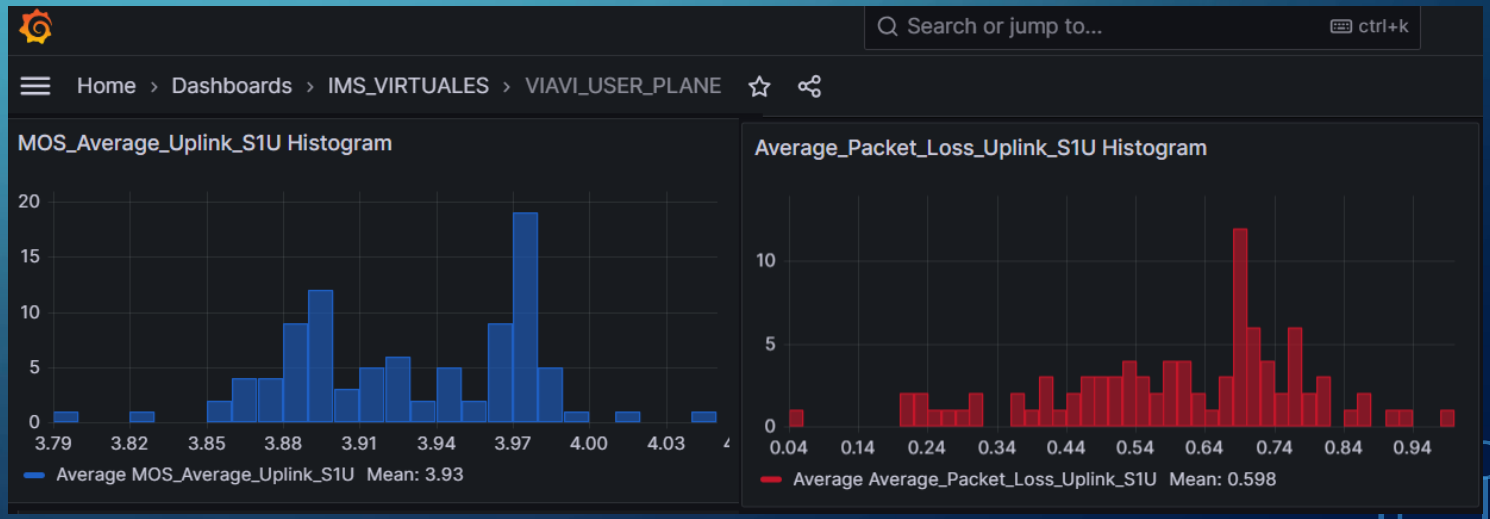
`Average_Jitter_Uplink_S1U`
`Average_Latency_Uplink_S1U`
`Average_One_Way_Audio_Uplink_S1U`
`Average_Packet_Loss_Uplink_S1U`

ESTIMACION IA



ENTRENAMIENTO





DATASET (csv by Viavi)

ENTRADA

```
df.describe()
```

	Average_Jitter_Uplink_S1U (ms)	Average_Latency_Uplink_S1U (ms)	Average_One_Way_Audio_Uplink_S1U	Average_Packet_Loss_Uplink_S1U (%)	MOS_Average_Uplink_S1U
count	55096.000000	55096.000000	55096.000000	55096.000000	55096.000000
mean	10.720333	49.468343	16.120190	0.657283	4.010397
std	9.792482	5.166832	25.142074	1.674674	0.181058
min	0.460000	6.120000	0.000000	0.000000	1.140000
25%	7.590000	50.000000	0.000000	0.040000	3.960000
50%	9.090000	50.000000	4.000000	0.160000	4.050000
75%	10.800000	50.000000	23.000000	[illegible]	4.110000
max					4.240000

Jitter

Latency

One way audio

Packet Loss

MOS. UL S1U
Valor a predecir

Sentido UPLINK

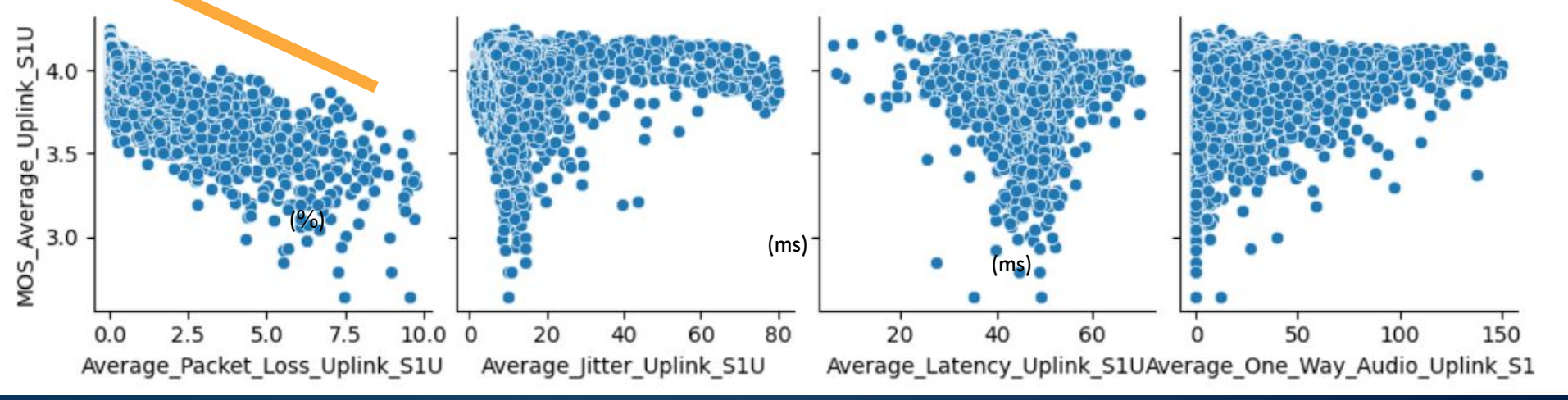
Packet Loss

Jitter

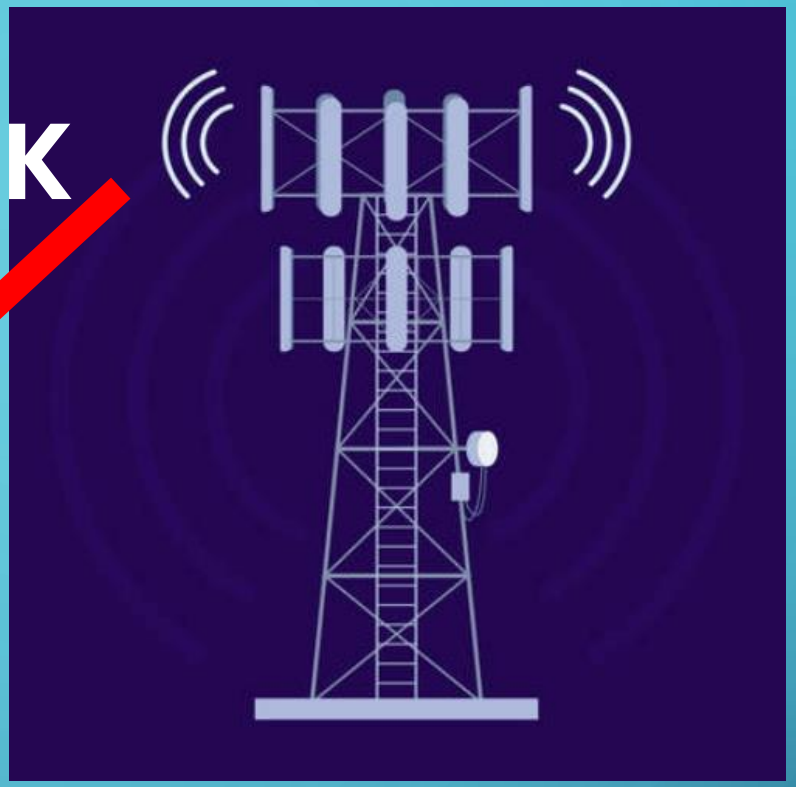
Latency

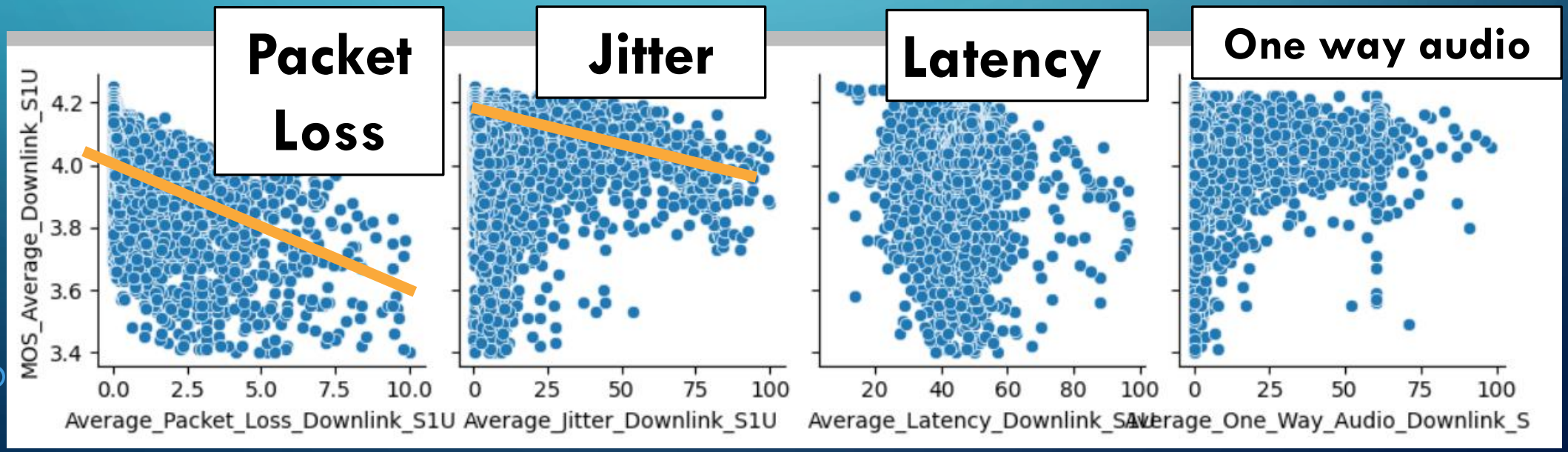
One way audio

```
sns.pairplot(
                x                                    t_Loss_Uplink_S1U","Average_Jitter_Uplink_S1U", "Average_Latency_Uplink_S1U", "Average_One_Way_Au
                y_vars=["MOS_Average_Uplink_S1U"]);
```



Sentido DOWNLINK

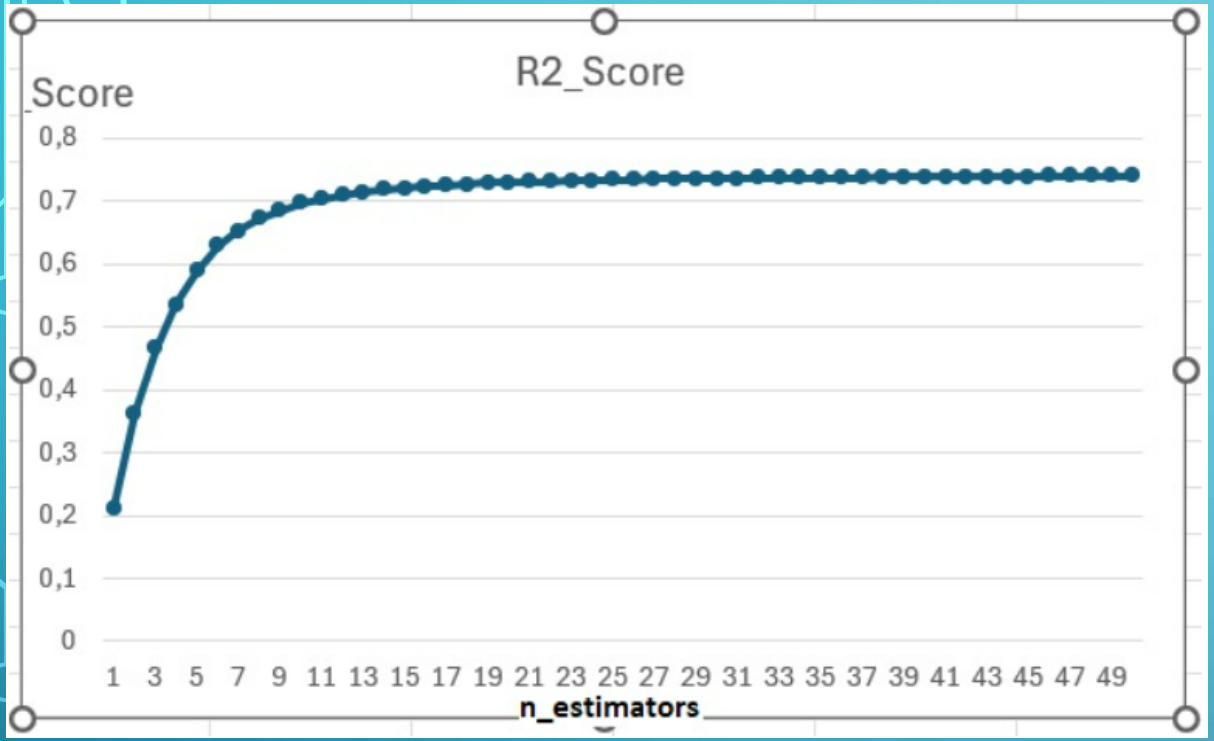


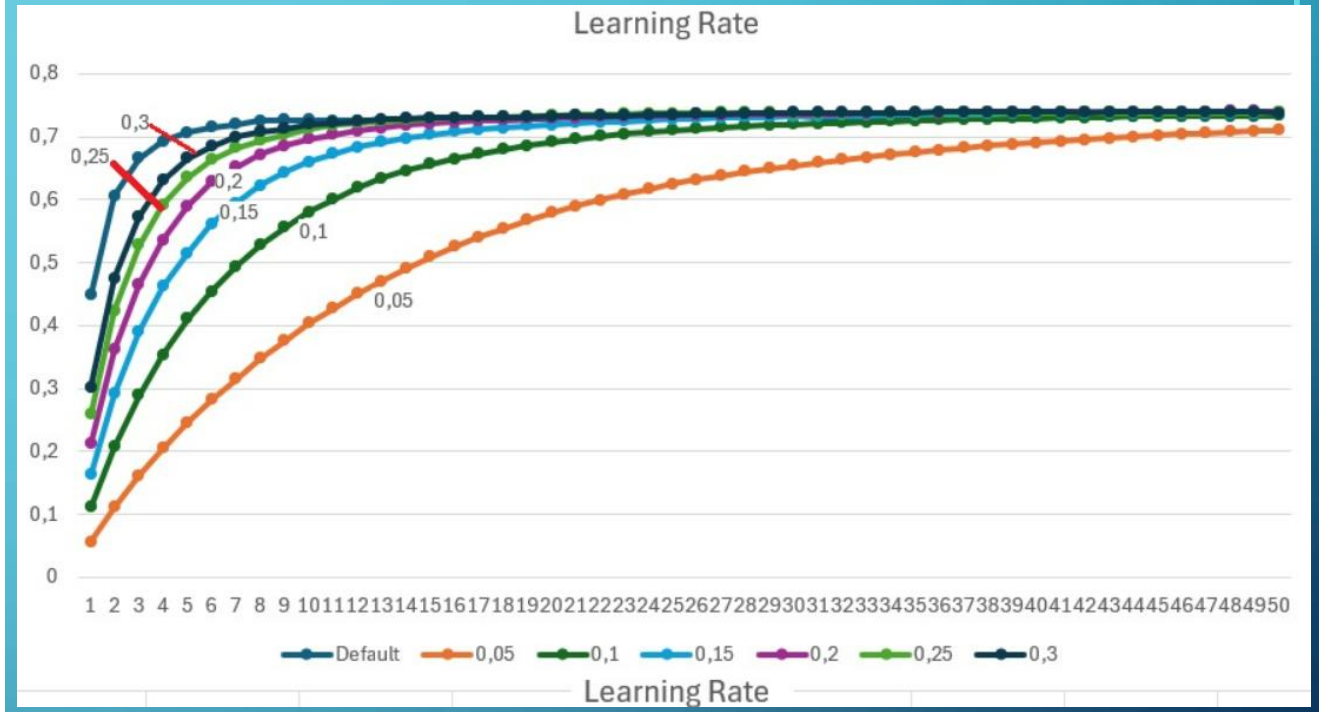


Modelos testeados

1. Regresión Lineal (Score 0,65)
2. DecisionTreeRegressor (Score 0,68)
3. BaggingRegressor (Score 0,68)
4. RandomForestRegressor (Score 0,73)
5. ExtraTreesRegressor (Score 0,729)
6. Xgboost (Score 0,69)
7. Lightgbm (Score 0,727)
8. Catboost (Score 0,74) << selecionado

Hiper parámetros tunnig





MODELO GANADOR CATBOOST Hiperparámetros
(Learning Rate = 0,2 & n_estimators = 50)

Explicabilidad del modelo

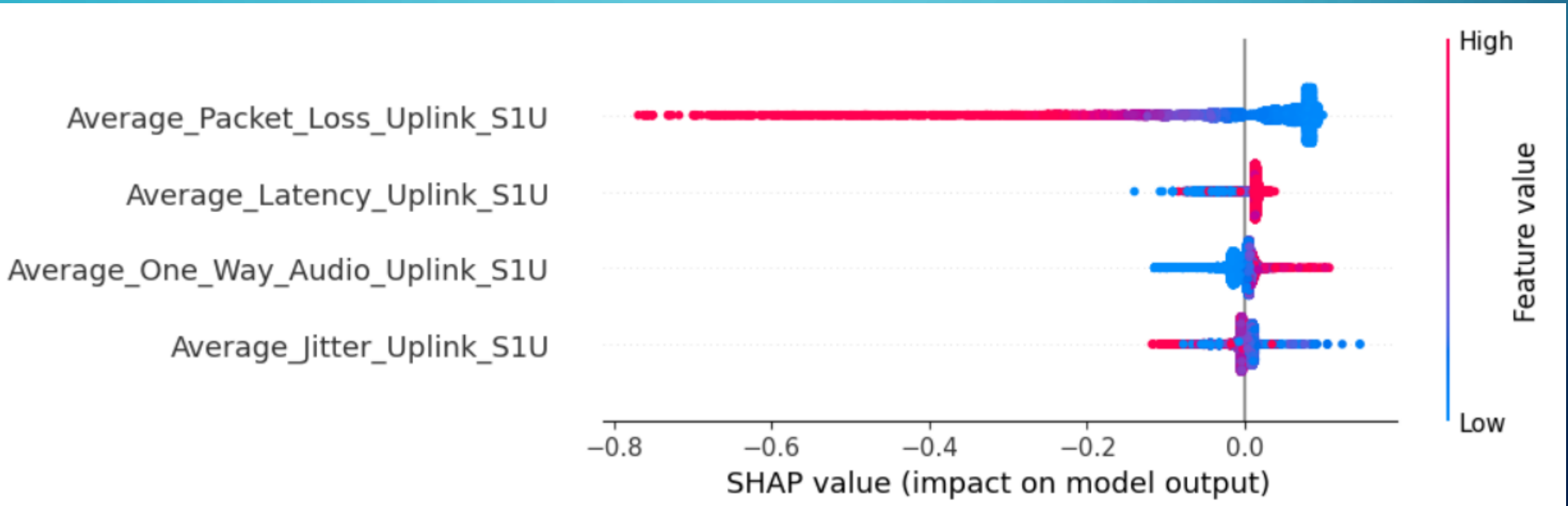


Gráfico final de la predicción