Report - Forcasting signal strength in LoRaWan networks

Renata Rojas Guerra - Thiago Tavares Lopes

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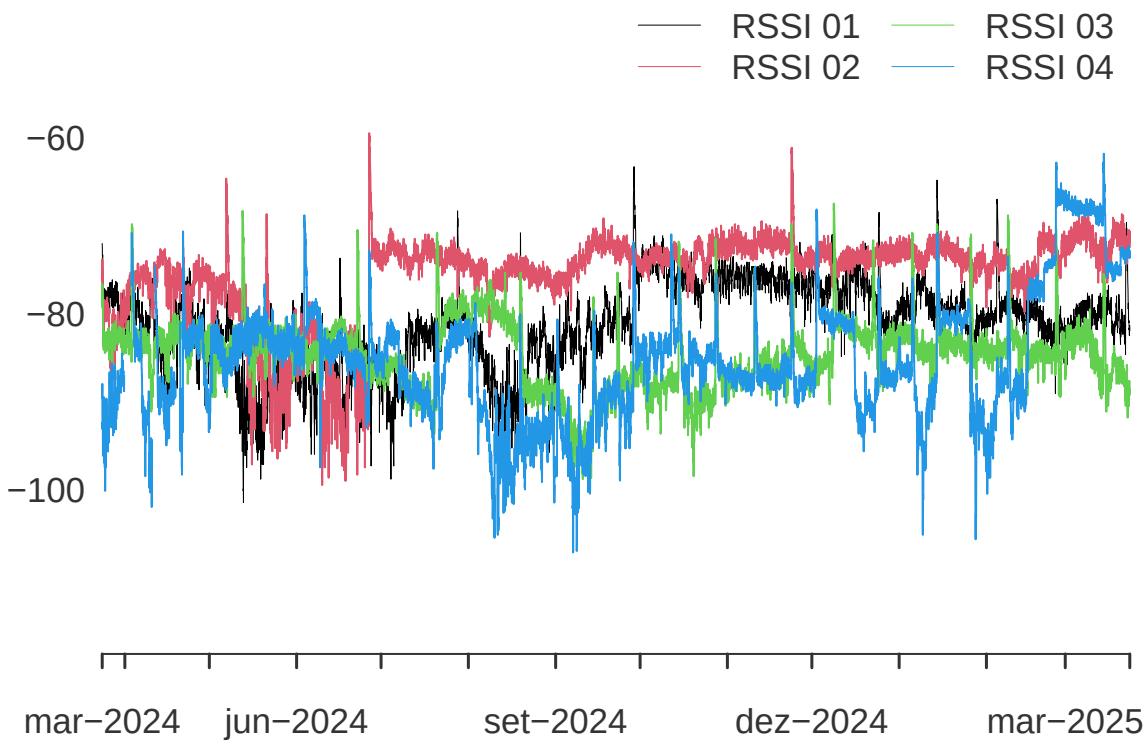
Table 1: Resume 1 — Part 1

Sensor	Variable	Min	Q1	Median	Mean	Q3	Max
TINOVI-01	humidity_mean	12.115	26.110	38.643	37.434	49.968	66.660
	lora_rssi_mean	-101.000	-83.333	-80.167	-80.662	-77.292	-62.833
	lora_snr_mean	3.750	8.917	9.125	9.106	9.333	10.100
	temperature_mean	0.758	7.774	15.286	14.954	21.397	35.405
TINOVI-02	humidity_mean	23.535	42.783	55.437	51.090	60.015	78.177
	lora_rssi_mean	-99.000	-75.833	-73.667	-75.199	-72.333	-59.000
	lora_snr_mean	3.900	8.750	8.958	8.947	9.167	10.000
	temperature_mean	0.818	7.816	15.302	14.539	20.865	30.445
TINOVI-03	humidity_mean	21.985	29.939	43.193	41.115	50.082	68.482
	lora_rssi_mean	-98.500	-86.800	-83.833	-84.286	-82.167	-67.000
	lora_snr_mean	5.800	8.616	8.833	8.805	9.042	9.833
	temperature_mean	1.922	8.118	15.828	15.177	21.964	31.157
TINOVI-04	humidity_mean	1.230	63.072	68.215	68.448	75.474	121.753
	lora_rssi_mean	-106.667	-89.167	-85.500	-84.902	-81.350	-61.333
	lora_snr_mean	0.917	8.250	8.500	8.434	8.750	10.250
	temperature_mean	1.552	7.705	15.020	14.223	20.561	31.083

Table 2: Resume 2 — Part 2

Sensor	Variable	Min	Q1	Median	Mean	Q3	Max
MILESIGHT-01	humidity_mean	21.750	71.667	93.083	84.326	100.000	100.000
	lora_rssi_mean	-103.800	-86.000	-80.167	-81.316	-77.000	-69.667
	lora_snr_mean	4.083	8.750	9.042	8.996	9.333	10.250
	temperature_mean	-5.617	6.967	14.527	14.899	21.943	37.667
MILESIGHT-02	humidity_mean	21.917	71.750	91.750	83.935	100.000	100.000
	lora_rssi_mean	-99.500	-84.833	-81.833	-82.320	-79.333	-71.000
	lora_snr_mean	5.750	8.750	9.042	9.023	9.333	10.375
	temperature_mean	-5.433	7.100	14.683	14.945	21.900	39.967
TINOVI-05	humidity_mean	18.922	37.279	57.425	52.122	64.555	89.388
	lora_rssi_mean	-95.000	-83.600	-81.333	-80.931	-78.167	-65.167
	lora_snr_mean	7.292	8.958	9.125	9.128	9.333	10.083
	temperature_mean	1.372	7.605	14.923	14.209	20.542	29.728
TINOVI-06	humidity_mean	27.278	39.751	55.850	54.007	64.051	91.190
	lora_rssi_mean	-107.833	-94.333	-90.833	-89.053	-81.167	-69.500
	lora_snr_mean	-0.750	7.792	8.333	8.095	8.667	9.650
	temperature_mean	2.578	8.080	15.170	14.594	20.462	27.607

3 Results



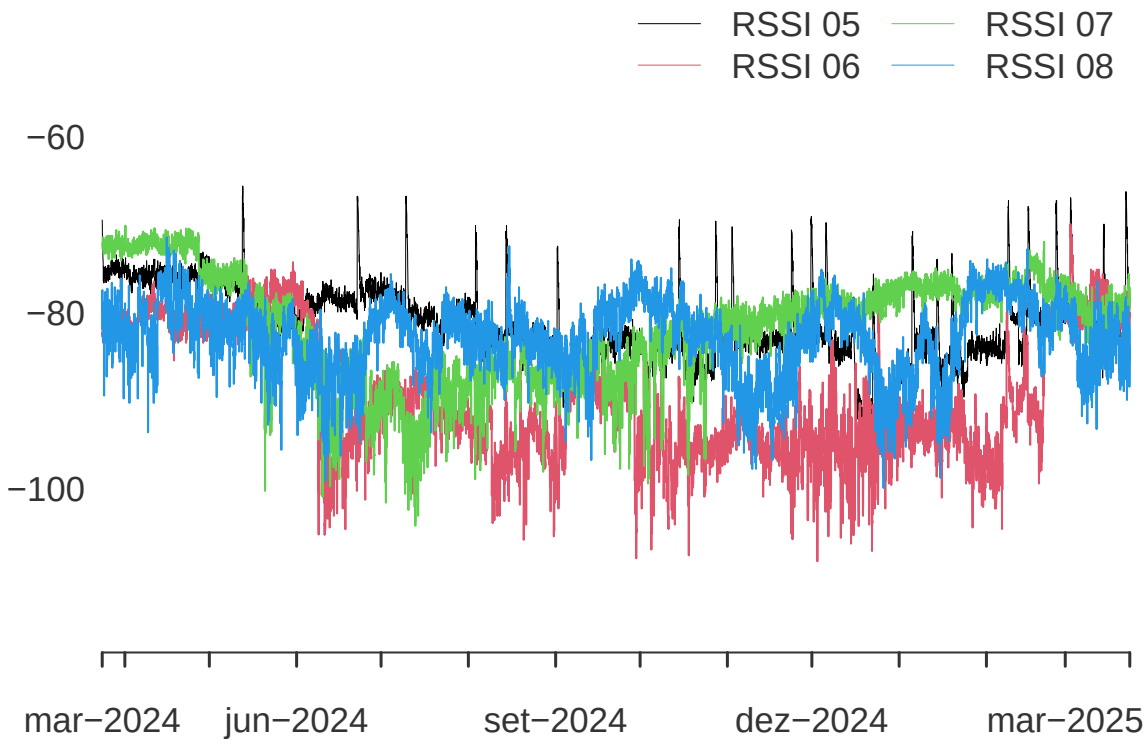

RSSI 05
RSSI 06
RSSI 07
RSSI 08
−60
−80
−100
mar−2024
jun−2024
set−2024
dez−2024
mar−2025

Table 3:

sensor	p	d	q	x1	x2	x3	x4
RSSI_01	1	1	2	T	RH		
RSSI_02	3	1	2	T	RH		
RSSI_03	2	1	1	RH			
RSSI_04	5	1	1	T	RH		
RSSI_05	5	1	1	T	RH		
RSSI_06	5	1	2	RH			
RSSI_07	1	1	2	T			
RSSI_08	3	1	1	T			

Table 4:

Sensor	Metric	ARIMA-TEMP+HUM	ARIMA-TEMP	ARIMA-HUM	ARIMA
RSSI_01	MAE	0.7652257	0.7651758	0.7686058	0.7689148
RSSI_01	MAPE	0.9629845	0.9626440	0.9672849	0.9673682
RSSI_01	RMSE	1.0534891	1.0533649	1.0562389	1.0555528
RSSI_01	COR	0.9002274	0.9002686	0.8996759	0.8998266
RSSI_02	MAE	0.6553707	0.6564086	0.6545148	0.6558902
RSSI_02	MAPE	0.9004603	0.9019343	0.8993346	0.9012520
RSSI_02	RMSE	0.8149727	0.8183093	0.8145643	0.8179126
RSSI_02	COR	0.9093617	0.9085111	0.9094078	0.9085814
RSSI_03	MAE	0.8176889	0.8172113	0.8176985	0.8173663
RSSI_03	MAPE	0.9821781	0.9816016	0.9821893	0.9817816
RSSI_03	RMSE	1.1757858	1.1751375	1.1757810	1.1752276
RSSI_03	COR	0.9128411	0.9129844	0.9128423	0.9129737
RSSI_04	MAE	0.6856021	0.6857798	0.6863827	0.6867395
RSSI_04	MAPE	0.8546917	0.8549352	0.8556393	0.8560968
RSSI_04	RMSE	1.0950609	1.0962053	1.0952284	1.0968393
RSSI_04	COR	0.9927400	0.9927242	0.9927385	0.9927163
RSSI_05	MAE	0.7313907	0.7316490	0.7323244	0.7324093
RSSI_05	MAPE	0.9069064	0.9072763	0.9080481	0.9081986
RSSI_05	RMSE	1.1506012	1.1510927	1.1509197	1.1512954
RSSI_05	COR	0.9520147	0.9519719	0.9519861	0.9519536
RSSI_06	MAE	0.9856722	0.9873228	0.9861111	0.9876293
RSSI_06	MAPE	1.1138262	1.1157275	1.1144475	1.1161660
RSSI_06	RMSE	1.3731101	1.3760568	1.3734402	1.3761711
RSSI_06	COR	0.9834225	0.9833510	0.9834146	0.9833483
RSSI_07	MAE	0.7384961	0.7391818	0.7417886	0.7445362
RSSI_07	MAPE	0.9478599	0.9487002	0.9519469	0.9554312
RSSI_07	RMSE	0.9784195	0.9804507	0.9852922	0.9875973
RSSI_07	COR	0.8845917	0.8841355	0.8829889	0.8823219
RSSI_08	MAE	1.1702243	1.1699662	1.1730390	1.1782543
RSSI_08	MAPE	1.4225516	1.4222048	1.4262281	1.4325535
RSSI_08	RMSE	1.5837723	1.5836119	1.5859816	1.5902019
RSSI_08	COR	0.9316452	0.9316642	0.9314225	0.9310428

Table 5:

Sensor	Metric	ARIMA-TEMP+HUM	ARIMA-TEMP	ARIMA-HUM
RSSI_01	MAE	0.4797762	0.4862653	0.0401813
RSSI_01	MAPE	0.4531587	0.4883540	0.0086128
RSSI_01	RMSE	0.1955111	0.2072773	-0.0650001
RSSI_01	COR	0.0445428	0.0491202	-0.0167467
RSSI_02	MAE	0.0792058	-0.0790349	0.2096942
RSSI_02	MAPE	0.0878396	-0.0757116	0.2127464
RSSI_02	RMSE	0.3594298	-0.0485077	0.4093625
RSSI_02	COR	0.0858791	-0.0077363	0.0909549
RSSI_03	MAE	-0.0394728	0.0189588	-0.0406457
RSSI_03	MAPE	-0.0403916	0.0183277	-0.0415359
RSSI_03	RMSE	-0.0474996	0.0076596	-0.0470905
RSSI_03	COR	-0.0145225	0.0011707	-0.0143958
RSSI_04	MAE	0.1656239	0.1397499	0.0519613
RSSI_04	MAPE	0.1641284	0.1356861	0.0534405
RSSI_04	RMSE	0.1621375	0.0578005	0.1468616
RSSI_04	COR	0.0023853	0.0007906	0.0022297
RSSI_05	MAE	0.1390632	0.1037972	0.0115861
RSSI_05	MAPE	0.1422752	0.1015512	0.0165641
RSSI_05	RMSE	0.0602946	0.0176069	0.0326262
RSSI_05	COR	0.0064172	0.0019264	0.0034140
RSSI_06	MAE	0.1981709	0.0310415	0.1537283
RSSI_06	MAPE	0.2096297	0.0392848	0.1539610
RSSI_06	RMSE	0.2224274	0.0083041	0.1984411
RSSI_06	COR	0.0075440	0.0002686	0.0067408
RSSI_07	MAE	0.8112630	0.7191652	0.3690331
RSSI_07	MAPE	0.7924491	0.7044991	0.3646917
RSSI_07	RMSE	0.9293031	0.7236307	0.2334032
RSSI_07	COR	0.2572540	0.2055515	0.0756005
RSSI_08	MAE	0.6815133	0.7034196	0.4426298
RSSI_08	MAPE	0.6981866	0.7223938	0.4415437
RSSI_08	RMSE	0.4043249	0.4144106	0.2653927
RSSI_08	COR	0.0646946	0.0667384	0.0407774