

# ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

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K Neighbors

# Informações gerais

**Total de registros:** 16635

**Total de cidades:** 5

**Total de condições climáticas:** 12

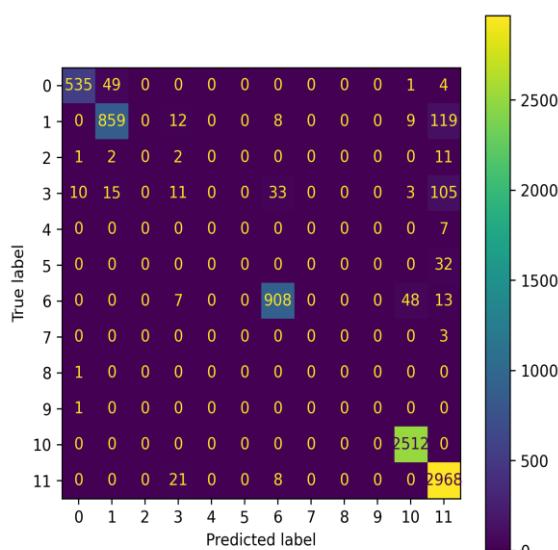
**Total de temperaturas:** 51

## Condições climáticas

### Regressão logística

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.98	0.91	0.94	589
<b>Chuvas esparsas</b>	0.93	0.85	0.89	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.21	0.06	0.1	177
<b>Neve</b>	0.0	0.0	0.0	7
<b>Neve baixa</b>	0.0	0.0	0.0	32
<b>Parcialmente nublado</b>	0.95	0.93	0.94	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	0.98	1.0	0.99	2512
<b>Tempo nublado</b>	0.91	0.99	0.95	2997

**Acurácia:** 93.69%



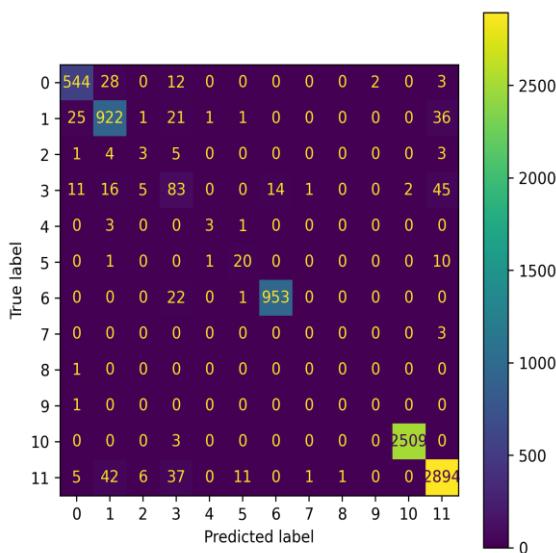
Matriz de confusão

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

### Árvore de decisão

Condição	Precision	Recall	F1-Score	Support
Chuva	0.93	0.92	0.92	589
Chuvas esparsas	0.91	0.92	0.91	1007
Chuviscos	0.2	0.19	0.19	16
Neblina	0.45	0.47	0.46	177
Neve	0.6	0.43	0.5	7
Neve baixa	0.59	0.62	0.61	32
Parcialmente nublado	0.99	0.98	0.98	976
Tempestade de areia	0.0	0.0	0.0	3
Tempestades	0.0	0.0	0.0	1
Tempestades isoladas	0.0	0.0	0.0	1
Tempo limpo	1.0	1.0	1.0	2512
Tempo nublado	0.97	0.97	0.97	2997

Acurácia: 95.35%



Matriz de confusão

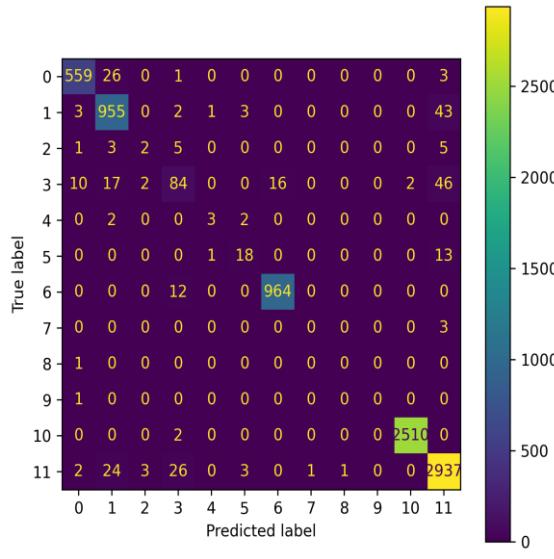
### Floresta aleatória

Condição	Precision	Recall	F1-Score	Support
Chuva	0.97	0.95	0.96	589
Chuvas esparsas	0.93	0.95	0.94	1007
Chuviscos	0.29	0.12	0.17	16
Neblina	0.64	0.47	0.54	177
Neve	0.6	0.43	0.5	7
Neve baixa	0.69	0.56	0.62	32
Parcialmente nublado	0.98	0.99	0.99	976
Tempestade de areia	0.0	0.0	0.0	3
Tempestades	0.0	0.0	0.0	1

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	1.0	1.0	1.0	2512
<b>Tempo nublado</b>	0.96	0.98	0.97	2997

Acurácia: 96.56%



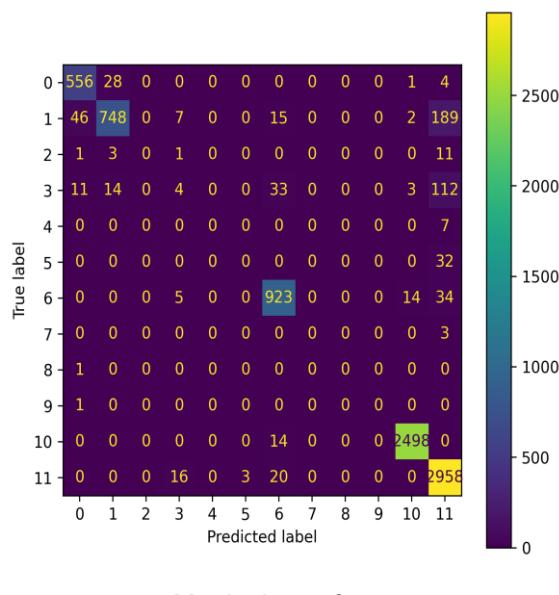
Matriz de confusão

## Multi-layer Perceptron (ADAM)

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.9	0.94	0.92	589
<b>Chuvas esparsas</b>	0.94	0.74	0.83	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.12	0.02	0.04	177
<b>Neve</b>	0.0	0.0	0.0	7
<b>Neve baixa</b>	0.0	0.0	0.0	32
<b>Parcialmente nublado</b>	0.92	0.95	0.93	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	0.99	0.99	0.99	2512
<b>Tempo nublado</b>	0.88	0.99	0.93	2997

Acurácia: 92.41%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



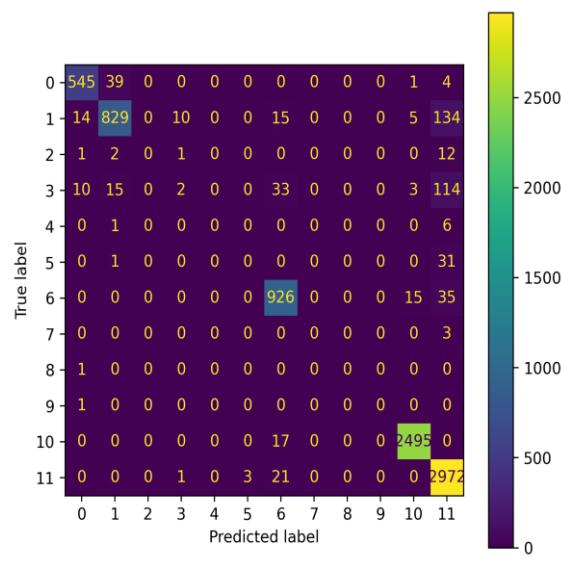
Matriz de confusão

## Multi-layer Perceptron (LBFGS)

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.95	0.93	0.94	589
<b>Chuvas esparsas</b>	0.93	0.82	0.88	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.14	0.01	0.02	177
<b>Neve</b>	0.0	0.0	0.0	7
<b>Neve baixa</b>	0.0	0.0	0.0	32
<b>Parcialmente nublado</b>	0.92	0.95	0.93	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	0.99	0.99	0.99	2512
<b>Tempo nublado</b>	0.9	0.99	0.94	2997

Acurácia: 93.40%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



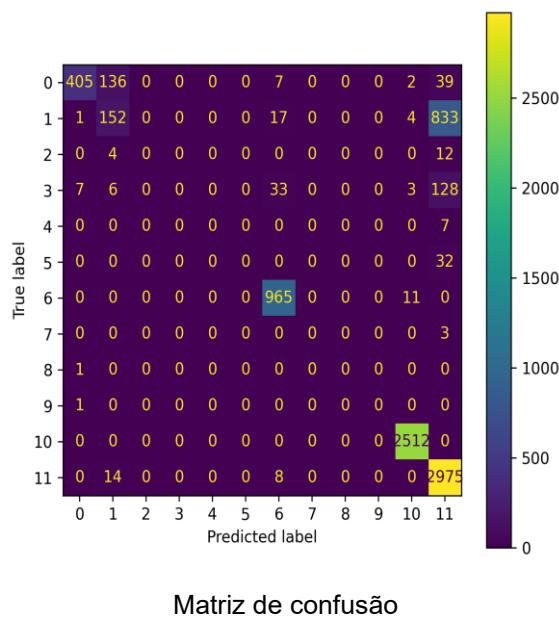
Matriz de confusão

## SVM - Support Vector Machine (RBF)

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.98	0.69	0.81	589
<b>Chuvas esparsas</b>	0.49	0.15	0.23	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.0	0.0	0.0	177
<b>Neve</b>	0.0	0.0	0.0	7
<b>Neve baixa</b>	0.0	0.0	0.0	32
<b>Parcialmente nublado</b>	0.94	0.99	0.96	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	0.99	1.0	1.0	2512
<b>Tempo nublado</b>	0.74	0.99	0.85	2997

Acurácia: 84.26%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



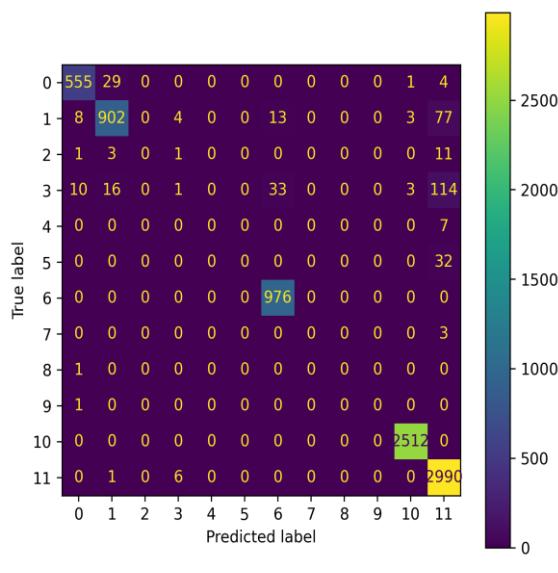
Matriz de confusão

### SVM - Support Vector Machine (Linear)

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.96	0.94	0.95	589
<b>Chuvas esparsas</b>	0.95	0.9	0.92	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.08	0.01	0.01	177
<b>Neve</b>	0.0	0.0	0.0	7
<b>Neve baixa</b>	0.0	0.0	0.0	32
<b>Parcialmente nublado</b>	0.95	1.0	0.98	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	1.0	1.0	1.0	2512
<b>Tempo nublado</b>	0.92	1.0	0.96	2997

Acurácia: 95.41%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



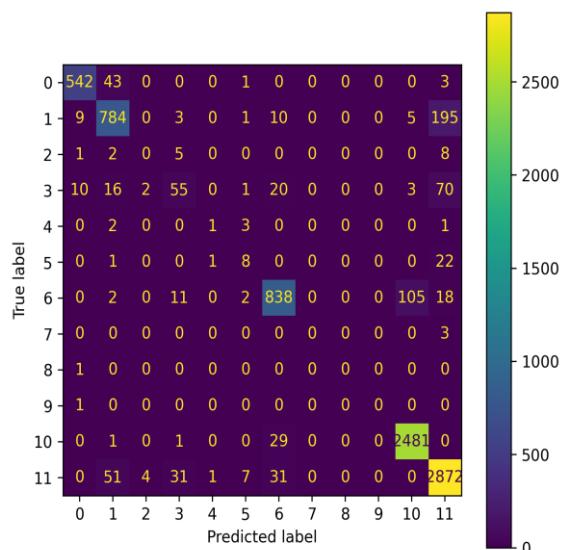
Matriz de confusão

## K Neighbors

Condição	Precision	Recall	F1-Score	Support
<b>Chuva</b>	0.96	0.92	0.94	589
<b>Chuvas esparsas</b>	0.87	0.78	0.82	1007
<b>Chuviscos</b>	0.0	0.0	0.0	16
<b>Neblina</b>	0.52	0.31	0.39	177
<b>Neve</b>	0.33	0.14	0.2	7
<b>Neve baixa</b>	0.35	0.25	0.29	32
<b>Parcialmente nublado</b>	0.9	0.86	0.88	976
<b>Tempestade de areia</b>	0.0	0.0	0.0	3
<b>Tempestades</b>	0.0	0.0	0.0	1
<b>Tempestades isoladas</b>	0.0	0.0	0.0	1
<b>Tempo limpo</b>	0.96	0.99	0.97	2512
<b>Tempo nublado</b>	0.9	0.96	0.93	2997

Acurácia: 91.14%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



Matriz de confusão

## Temperaturas

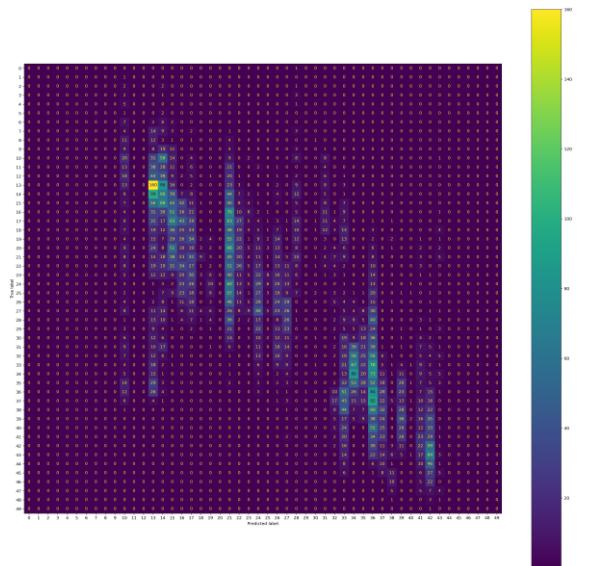
Rregressão logística

Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1
-9	0.0	0.0	0.0	1
-8	0.0	0.0	0.0	5
-7	0.0	0.0	0.0	6
-6	0.0	0.0	0.0	6
-5	0.0	0.0	0.0	3
-4	0.0	0.0	0.0	17
-3	0.0	0.0	0.0	36
-2	0.0	0.0	0.0	33
-1	0.0	0.0	0.0	55
0	0.08	0.13	0.1	155
1	0.0	0.0	0.0	124
2	0.0	0.0	0.0	149
3	0.2	0.49	0.29	325
4	0.11	0.22	0.15	302
5	0.09	0.15	0.12	296
6	0.08	0.09	0.09	281
7	0.09	0.09	0.09	332
8	0.0	0.0	0.0	256
9	0.08	0.02	0.03	258
10	0.0	0.0	0.0	283
11	0.05	0.15	0.08	297
12	0.12	0.09	0.1	296
13	0.07	0.02	0.03	237
14	0.1	0.12	0.11	234

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

15	0.09	0.01	0.02	237
16	0.09	0.11	0.1	222
17	0.12	0.1	0.11	249
18	0.01	0.0	0.01	202
19	0.0	0.0	0.0	153
20	0.11	0.01	0.01	167
21	0.0	0.0	0.0	218
22	0.02	0.01	0.01	245
23	0.05	0.08	0.06	263
24	0.22	0.32	0.26	266
25	0.13	0.1	0.12	273
26	0.09	0.27	0.13	307
27	0.09	0.08	0.09	264
28	0.02	0.0	0.01	223
29	0.17	0.19	0.18	187
30	0.0	0.0	0.0	181
31	0.12	0.14	0.13	161
32	0.14	0.38	0.21	155
33	0.06	0.02	0.03	146
34	0.0	0.0	0.0	82
35	0.0	0.0	0.0	64
36	0.0	0.0	0.0	38
37	0.0	0.0	0.0	21
38	0.0	0.0	0.0	5
39	0.0	0.0	0.0	1

Acurácia: 10.52%



Matriz de confusão

Árvore de decisão

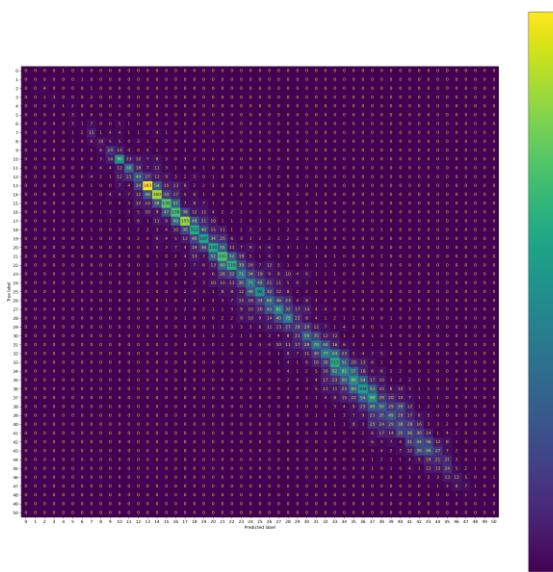
Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

-9	0.0	0.0	0.0	1
-8	0.8	0.8	0.8	5
-7	0.6	0.5	0.55	6
-6	0.5	0.17	0.25	6
-5	0.3	1.0	0.46	3
-4	0.25	0.06	0.1	17
-3	0.37	0.42	0.39	36
-2	0.36	0.3	0.33	33
-1	0.4	0.44	0.42	55
0	0.58	0.58	0.58	155
1	0.51	0.48	0.5	124
2	0.31	0.33	0.32	149
3	0.59	0.56	0.58	325
4	0.48	0.53	0.5	302
5	0.49	0.46	0.47	296
6	0.42	0.46	0.44	281
7	0.54	0.47	0.5	332
8	0.39	0.44	0.41	256
9	0.42	0.41	0.42	258
10	0.42	0.39	0.4	283
11	0.38	0.44	0.41	297
12	0.45	0.4	0.42	296
13	0.31	0.3	0.3	237
14	0.3	0.3	0.3	234
15	0.37	0.39	0.38	237
16	0.27	0.27	0.27	222
17	0.36	0.33	0.34	249
18	0.33	0.37	0.35	202
19	0.2	0.18	0.19	153
20	0.32	0.35	0.34	167
21	0.36	0.32	0.34	218
22	0.34	0.31	0.32	245
23	0.35	0.43	0.39	263
24	0.31	0.3	0.31	266
25	0.31	0.32	0.31	273
26	0.36	0.34	0.35	307
27	0.31	0.34	0.33	264
28	0.24	0.22	0.23	223
29	0.29	0.26	0.28	187
30	0.21	0.21	0.21	181
31	0.23	0.22	0.23	161
32	0.29	0.28	0.29	155
33	0.32	0.32	0.32	146
34	0.26	0.26	0.26	82
35	0.29	0.38	0.33	64
36	0.35	0.32	0.33	38
37	0.44	0.33	0.38	21
38	0.4	0.4	0.4	5
39	1.0	1.0	1.0	1
42	0.0	0.0	0.0	0

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

Acurácia: 37.14%



Matriz de confusão

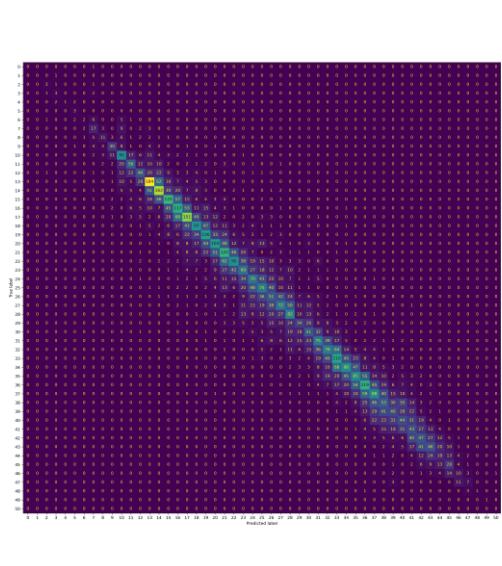
## Floresta aleatória

Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1
-9	0.0	0.0	0.0	1
-8	0.5	0.6	0.55	5
-7	0.43	0.5	0.46	6
-6	1.0	0.17	0.29	6
-5	0.38	1.0	0.55	3
-4	0.4	0.12	0.18	17
-3	0.41	0.47	0.44	36
-2	0.5	0.33	0.4	33
-1	0.57	0.55	0.56	55
0	0.53	0.59	0.56	155
1	0.46	0.45	0.46	124
2	0.39	0.32	0.35	149
3	0.57	0.57	0.57	325
4	0.49	0.54	0.51	302
5	0.46	0.42	0.44	296
6	0.37	0.42	0.39	281
7	0.45	0.45	0.45	332
8	0.4	0.38	0.39	256
9	0.38	0.41	0.4	258
10	0.39	0.37	0.38	283
11	0.35	0.4	0.38	297
12	0.4	0.32	0.36	296
13	0.29	0.29	0.29	237
14	0.29	0.3	0.29	234
15	0.29	0.32	0.3	237

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

16	0.22	0.23	0.22	222
17	0.34	0.29	0.31	249
18	0.31	0.41	0.35	202
19	0.29	0.22	0.25	153
20	0.31	0.31	0.31	167
21	0.34	0.34	0.34	218
22	0.34	0.31	0.33	245
23	0.34	0.42	0.38	263
24	0.38	0.34	0.36	266
25	0.33	0.31	0.32	273
26	0.38	0.39	0.38	307
27	0.32	0.33	0.33	264
28	0.25	0.24	0.24	223
29	0.24	0.21	0.23	187
30	0.25	0.24	0.25	181
31	0.23	0.27	0.25	161
32	0.28	0.3	0.29	155
33	0.34	0.32	0.33	146
34	0.26	0.23	0.24	82
35	0.39	0.44	0.41	64
36	0.32	0.26	0.29	38
37	0.44	0.33	0.38	21
38	1.0	0.2	0.33	5
39	1.0	1.0	1.0	1
42	0.0	0.0	0.0	0

Acurácia: 36.22%



Matriz de confusão

Multi-layer Perceptron (ADAM)

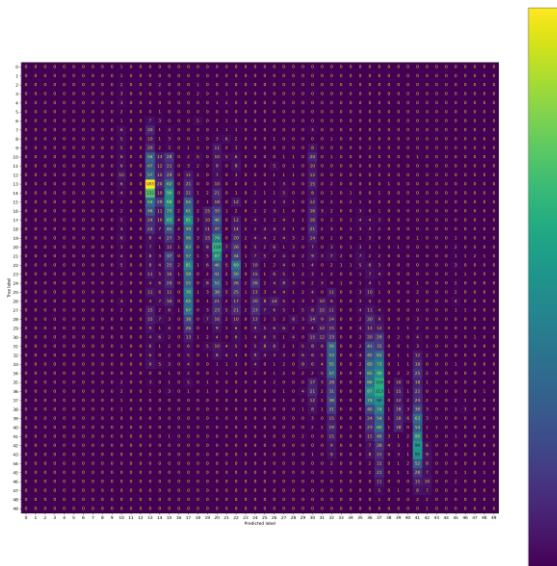
Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

-9	0.0	0.0	0.0	1
-8	0.0	0.0	0.0	5
-7	0.0	0.0	0.0	6
-6	0.0	0.0	0.0	6
-5	0.0	0.0	0.0	3
-4	0.0	0.0	0.0	17
-3	0.0	0.0	0.0	36
-2	0.0	0.0	0.0	33
-1	0.0	0.0	0.0	55
0	0.06	0.04	0.05	155
1	0.0	0.0	0.0	124
2	0.0	0.0	0.0	149
3	0.22	0.56	0.32	325
4	0.05	0.03	0.04	302
5	0.12	0.3	0.17	296
6	0.12	0.01	0.01	281
7	0.09	0.27	0.14	332
8	0.06	0.01	0.01	256
9	0.14	0.06	0.08	258
10	0.16	0.42	0.23	283
11	0.05	0.01	0.02	297
12	0.18	0.23	0.2	296
13	0.0	0.0	0.0	237
14	0.14	0.11	0.12	234
15	0.04	0.01	0.02	237
16	0.14	0.06	0.09	222
17	0.06	0.02	0.03	249
18	0.23	0.04	0.07	202
19	0.06	0.02	0.03	153
20	0.05	0.09	0.06	167
21	0.06	0.03	0.04	218
22	0.1	0.22	0.14	245
23	0.0	0.0	0.0	263
24	0.0	0.0	0.0	266
25	0.0	0.0	0.0	273
26	0.13	0.28	0.18	307
27	0.09	0.35	0.15	264
28	0.08	0.0	0.01	223
29	0.17	0.1	0.12	187
30	0.0	0.0	0.0	181
31	0.12	0.5	0.19	161
32	0.09	0.04	0.05	155
33	0.0	0.0	0.0	146
34	0.0	0.0	0.0	82
35	0.04	0.02	0.02	64
36	0.0	0.0	0.0	38
37	0.0	0.0	0.0	21
38	0.0	0.0	0.0	5
39	0.0	0.0	0.0	1

**Acurácia:** 12.08%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



Matriz de confusão

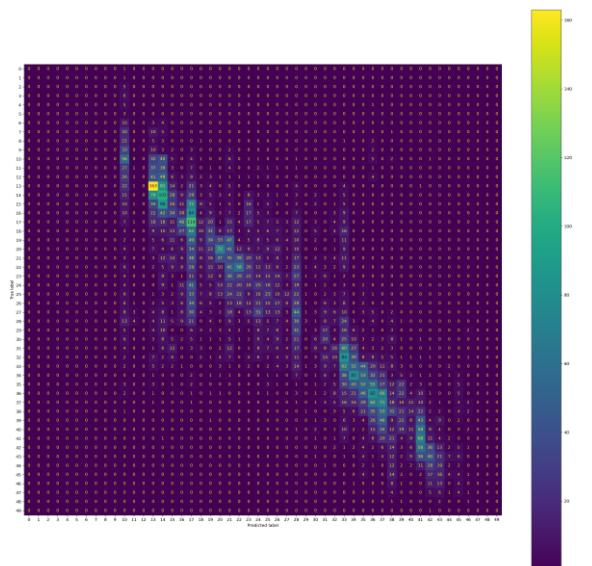
### Multi-layer Perceptron (LBFGS)

Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1
-9	0.0	0.0	0.0	1
-8	0.0	0.0	0.0	5
-7	0.0	0.0	0.0	6
-6	0.0	0.0	0.0	6
-5	0.0	0.0	0.0	3
-4	0.0	0.0	0.0	17
-3	0.0	0.0	0.0	36
-2	0.0	0.0	0.0	33
-1	0.0	0.0	0.0	55
0	0.15	0.36	0.22	155
1	0.07	0.01	0.01	124
2	0.0	0.0	0.0	149
3	0.32	0.5	0.39	325
4	0.18	0.34	0.23	302
5	0.12	0.09	0.1	296
6	0.1	0.07	0.08	281
7	0.15	0.34	0.21	332
8	0.09	0.04	0.05	256
9	0.16	0.13	0.15	258
10	0.32	0.25	0.29	283
11	0.09	0.12	0.1	297
12	0.26	0.2	0.22	296
13	0.1	0.09	0.1	237
14	0.12	0.11	0.11	234
15	0.13	0.1	0.11	237
16	0.11	0.08	0.09	222
17	0.04	0.01	0.02	249

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18	0.08	0.15	0.1	202
19	0.09	0.01	0.01	153
20	0.1	0.04	0.05	167
21	0.06	0.04	0.05	218
22	0.09	0.04	0.06	245
23	0.12	0.24	0.16	263
24	0.26	0.31	0.28	266
25	0.18	0.19	0.18	273
26	0.22	0.27	0.24	307
27	0.19	0.27	0.22	264
28	0.14	0.14	0.14	223
29	0.15	0.12	0.13	187
30	0.14	0.06	0.08	181
31	0.21	0.42	0.28	161
32	0.21	0.23	0.22	155
33	0.19	0.14	0.16	146
34	0.1	0.02	0.04	82
35	0.09	0.06	0.07	64
36	0.0	0.0	0.0	38
37	0.0	0.0	0.0	21
38	0.0	0.0	0.0	5
39	0.0	0.0	0.0	1

Acurácia: 16.59%



Matriz de confusão

SVM - Support Vector Machine (RBF)

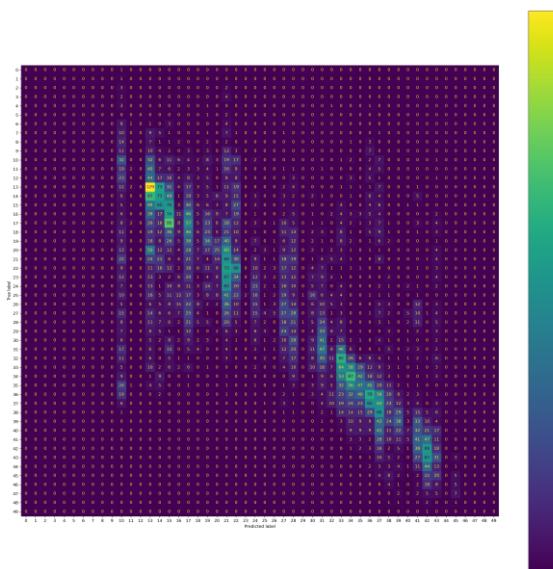
Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1
-9	0.0	0.0	0.0	1
-8	0.0	0.0	0.0	5
-7	0.0	0.0	0.0	6

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

-6	0.0	0.0	0.0	6
-5	0.0	0.0	0.0	3
-4	0.0	0.0	0.0	17
-3	0.0	0.0	0.0	36
-2	0.0	0.0	0.0	33
-1	0.0	0.0	0.0	55
0	0.08	0.21	0.12	155
1	0.22	0.02	0.03	124
2	0.0	0.0	0.0	149
3	0.18	0.4	0.25	325
4	0.18	0.24	0.21	302
5	0.13	0.24	0.17	296
6	0.09	0.04	0.06	281
7	0.12	0.17	0.14	332
8	0.07	0.02	0.03	256
9	0.16	0.13	0.15	258
10	0.2	0.09	0.12	283
11	0.1	0.23	0.14	297
12	0.18	0.22	0.2	296
13	0.0	0.0	0.0	237
14	0.15	0.09	0.11	234
15	0.04	0.0	0.01	237
16	0.13	0.01	0.02	222
17	0.1	0.11	0.1	249
18	0.07	0.1	0.09	202
19	0.0	0.0	0.0	153
20	0.08	0.05	0.06	167
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24	0.25	0.33	0.28	266
25	0.2	0.17	0.19	273
26	0.24	0.25	0.24	307
27	0.14	0.24	0.17	264
28	0.11	0.08	0.09	223
29	0.27	0.2	0.23	187
30	0.16	0.04	0.06	181
31	0.15	0.25	0.19	161
32	0.22	0.45	0.29	155
33	0.16	0.21	0.18	146
34	0.0	0.0	0.0	82
35	0.21	0.08	0.11	64
36	0.0	0.0	0.0	38
37	0.0	0.0	0.0	21
38	0.0	0.0	0.0	5
39	0.0	0.0	0.0	1

**Acurácia:** 15.16%

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING



Matriz de confusão

### SVM - Support Vector Machine (Linear)

Condição	Precision	Recall	F1-Score	Support
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Acurácia: 0

Imagen não disponível

Matriz de confusão

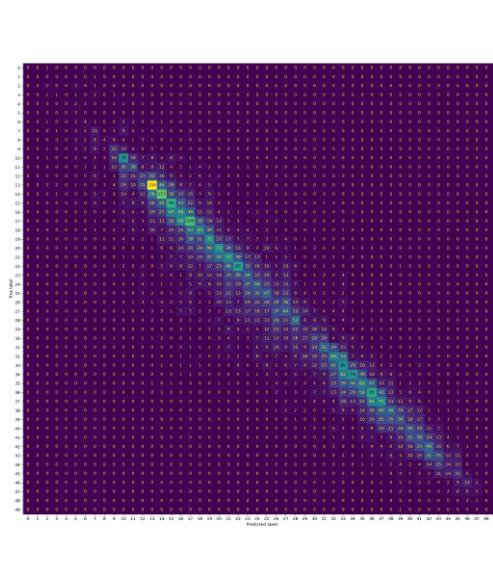
### K Neighbors

Condição	Precision	Recall	F1-Score	Support
-10	0.0	0.0	0.0	1
-9	0.0	0.0	0.0	1
-8	0.2	0.4	0.27	5
-7	0.2	0.17	0.18	6
-6	0.0	0.0	0.0	6
-5	0.12	1.0	0.22	3
-4	0.33	0.24	0.28	17
-3	0.2	0.31	0.24	36
-2	0.29	0.12	0.17	33
-1	0.31	0.4	0.35	55
0	0.37	0.5	0.42	155
1	0.3	0.29	0.3	124
2	0.21	0.18	0.2	149
3	0.44	0.47	0.46	325
4	0.35	0.39	0.37	302
5	0.29	0.33	0.31	296
6	0.21	0.24	0.23	281
7	0.29	0.33	0.31	332

## ANÁLISE PREDITIVA DE DADOS METEOROLÓGICOS USANDO MACHINE LEARNING

8	0.25	0.25	0.25	256
9	0.23	0.28	0.25	258
10	0.26	0.26	0.26	283
11	0.24	0.25	0.24	297
12	0.32	0.29	0.31	296
13	0.18	0.19	0.18	237
14	0.2	0.19	0.19	234
15	0.2	0.2	0.2	237
16	0.13	0.13	0.13	222
17	0.2	0.18	0.19	249
18	0.26	0.26	0.26	202
19	0.12	0.09	0.11	153
20	0.17	0.16	0.16	167
21	0.27	0.23	0.25	218
22	0.27	0.27	0.27	245
23	0.23	0.3	0.26	263
24	0.34	0.29	0.32	266
25	0.26	0.23	0.24	273
26	0.31	0.31	0.31	307
27	0.29	0.28	0.29	264
28	0.26	0.22	0.24	223
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30	0.25	0.22	0.23	181
31	0.23	0.24	0.23	161
32	0.33	0.32	0.32	155
33	0.31	0.24	0.27	146
34	0.24	0.17	0.2	82
35	0.29	0.33	0.31	64
36	0.48	0.37	0.42	38
37	0.33	0.24	0.28	21
38	0.0	0.0	0.0	5
39	0.0	0.0	0.0	1

Acurácia: 26.58%



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Matriz de confusão