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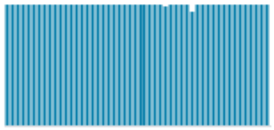
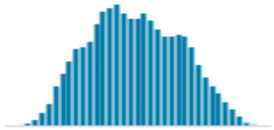
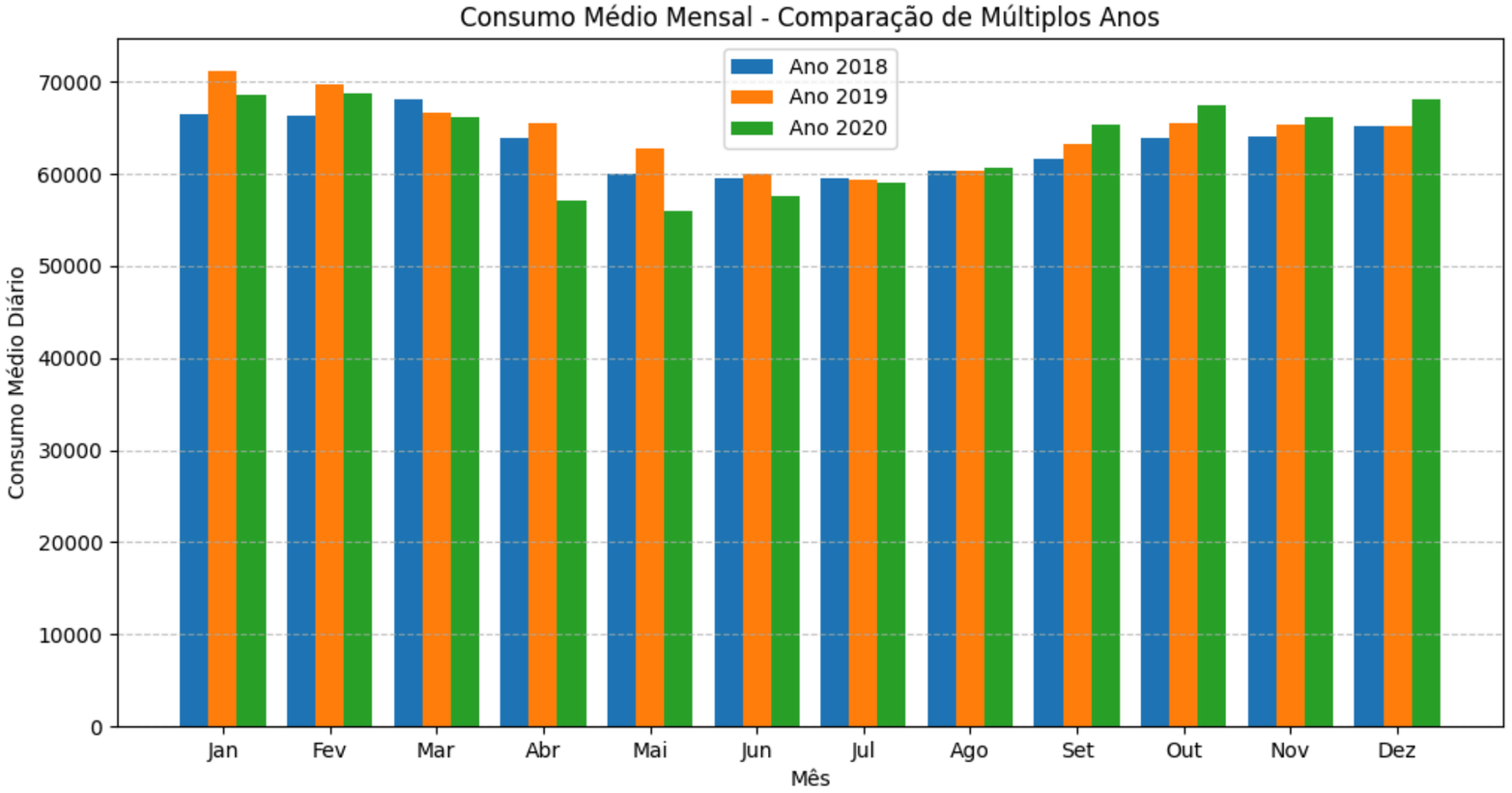
Análise do consumo de energia no Brasil

Base de dados

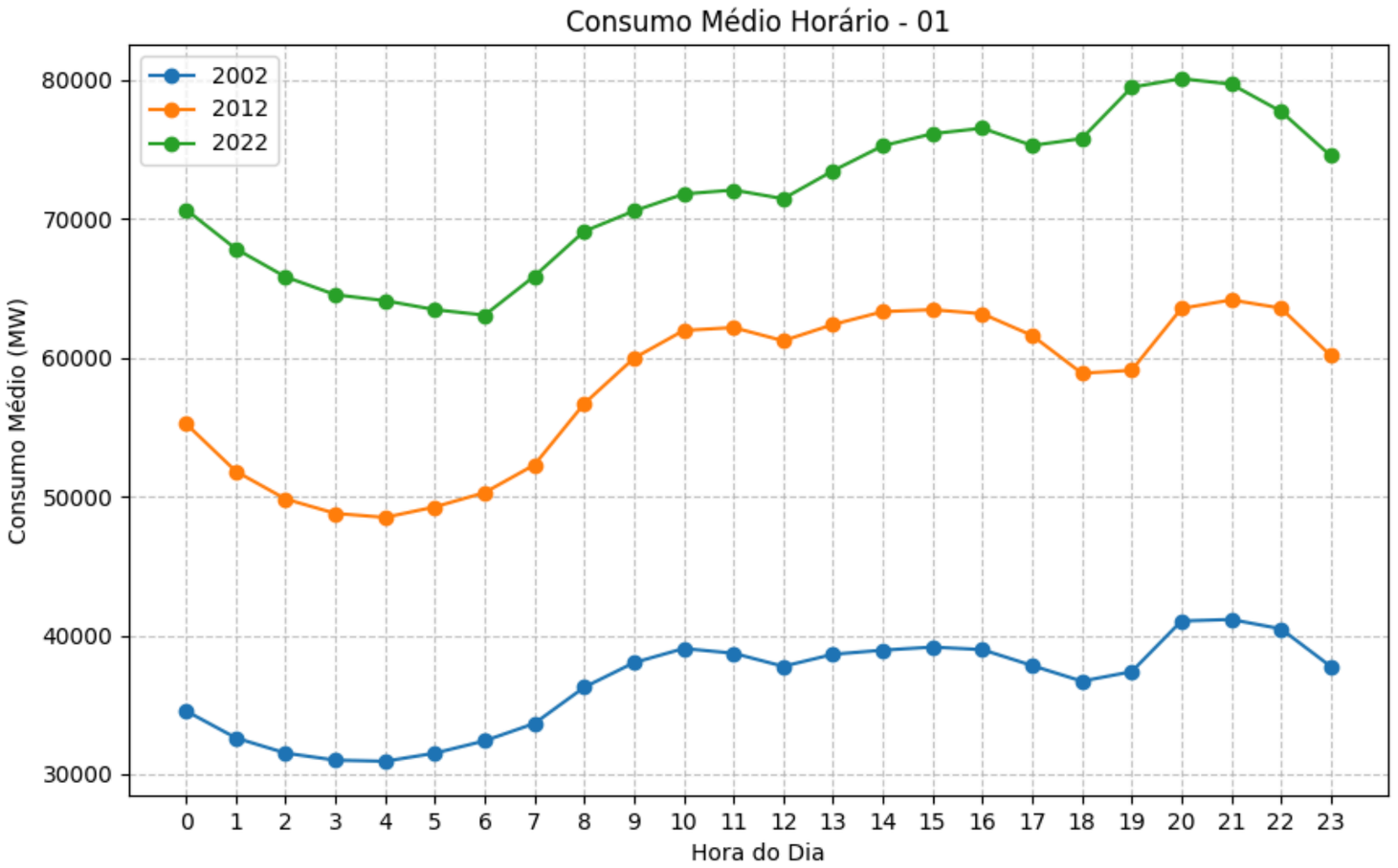
index Datetime	# hourly_demand Energy demand (MW)
 1999-12-31 2022-12-31	 0 90.1k
2000-01-01 00:00:00	34673.89999998
2000-01-01 01:00:00	33502.99999998
2000-01-01 02:00:00	32287.59999998
2000-01-01 03:00:00	31059.39999999
2000-01-01 04:00:00	30272.7
2000-01-01 05:00:00	29575.099999970003
2000-01-01 06:00:00	27731.59999997
2000-01-01 07:00:00	25917.89999998
2000-01-01 08:00:00	26285.29999999
2000-01-01 09:00:00	27146.79999999
2000-01-01 10:00:00	27964.89999998
2000-01-01 11:00:00	28215.7

- Séries temporais de demanda de energia no Brasil nos últimos 23 anos.
- Os dados foram obtidos do ONS, principal órgão responsável por gerir assuntos relacionados à energia elétrica no país.
- Contém 201.000 registros entre o ano de 2000 e 2022.

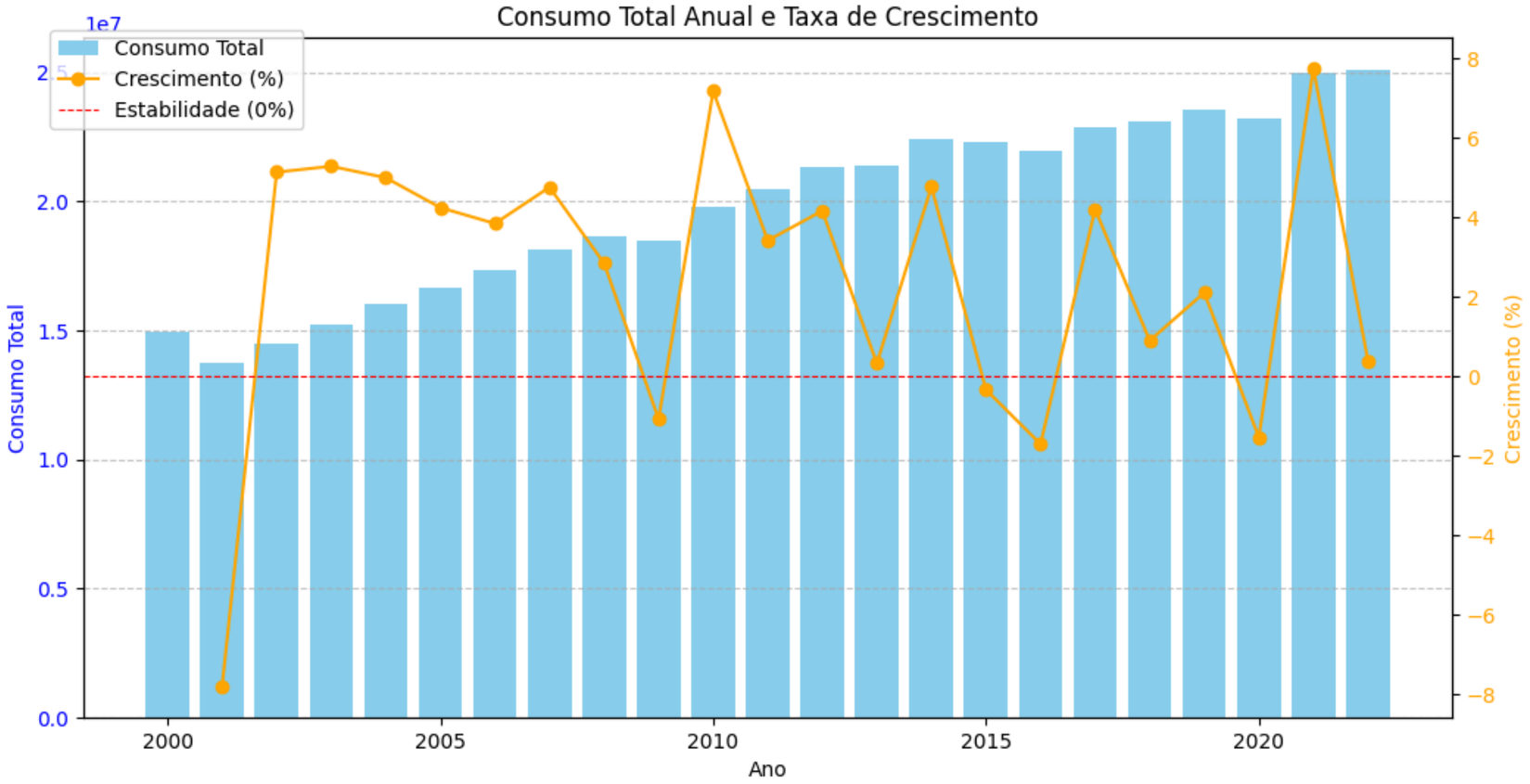
Consumo por mês



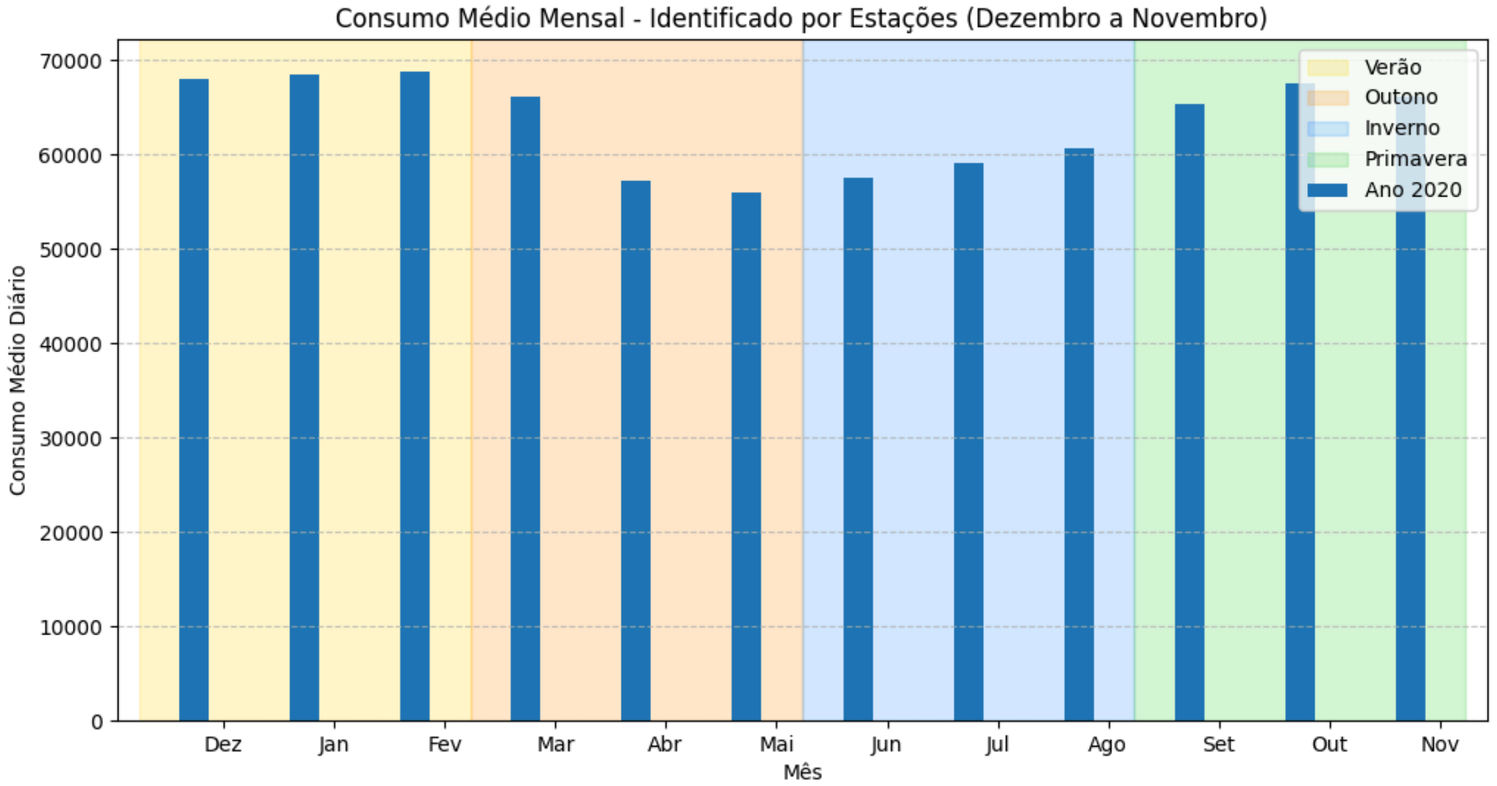
Consumo durante dia



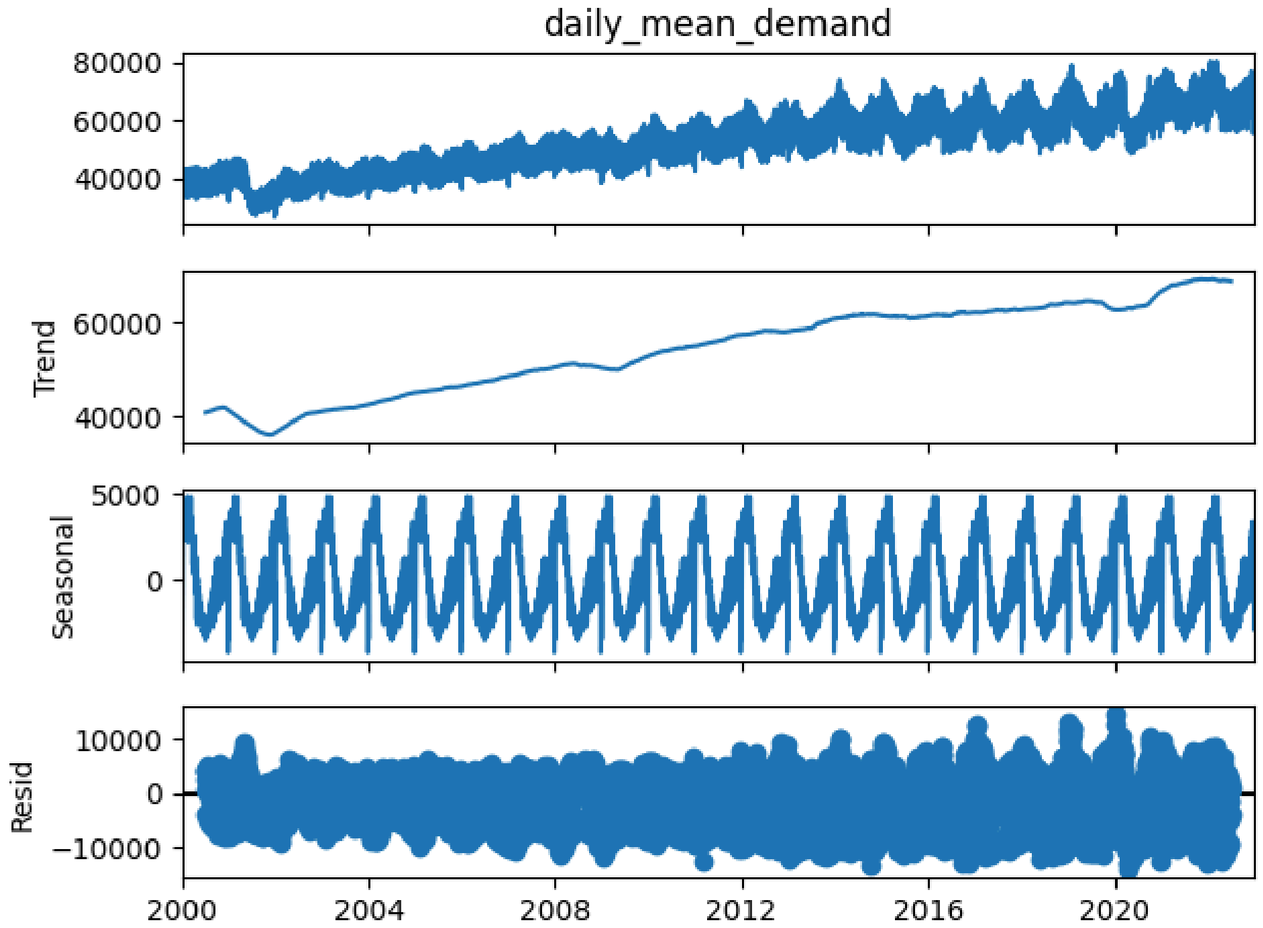
Consumo anual



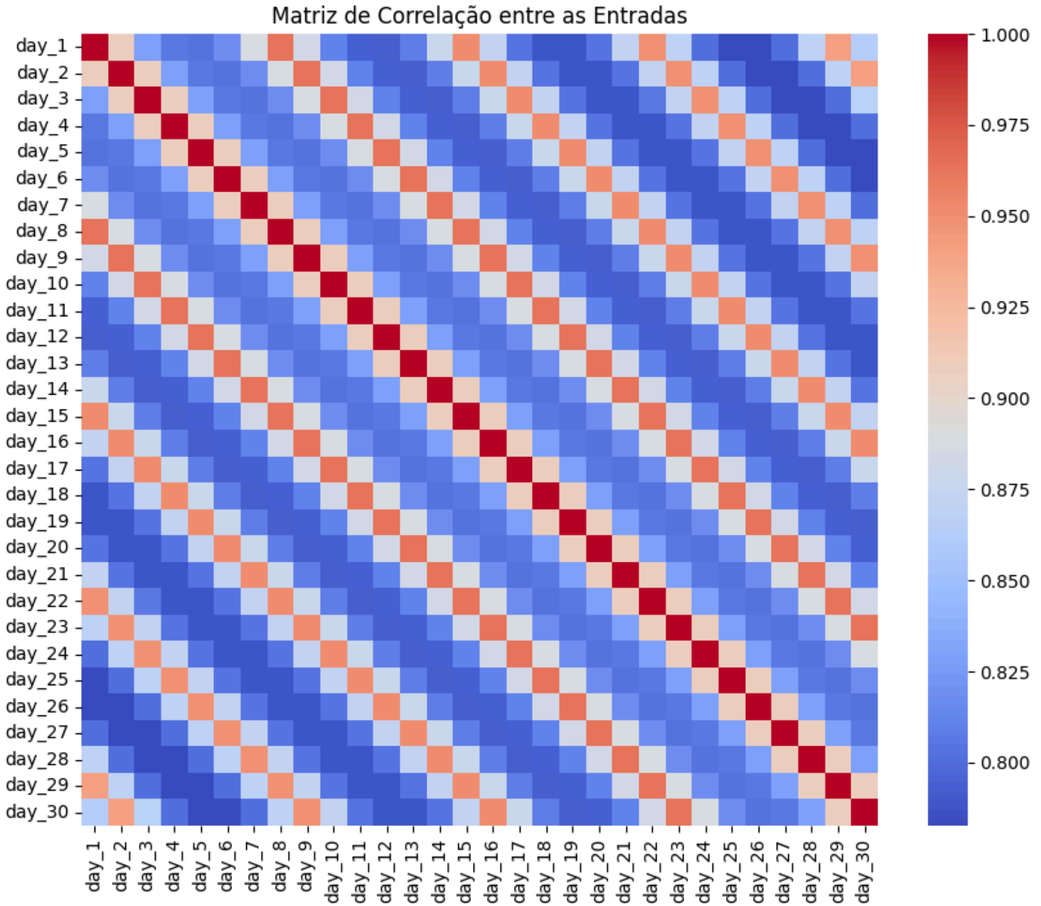
Consumo por estação

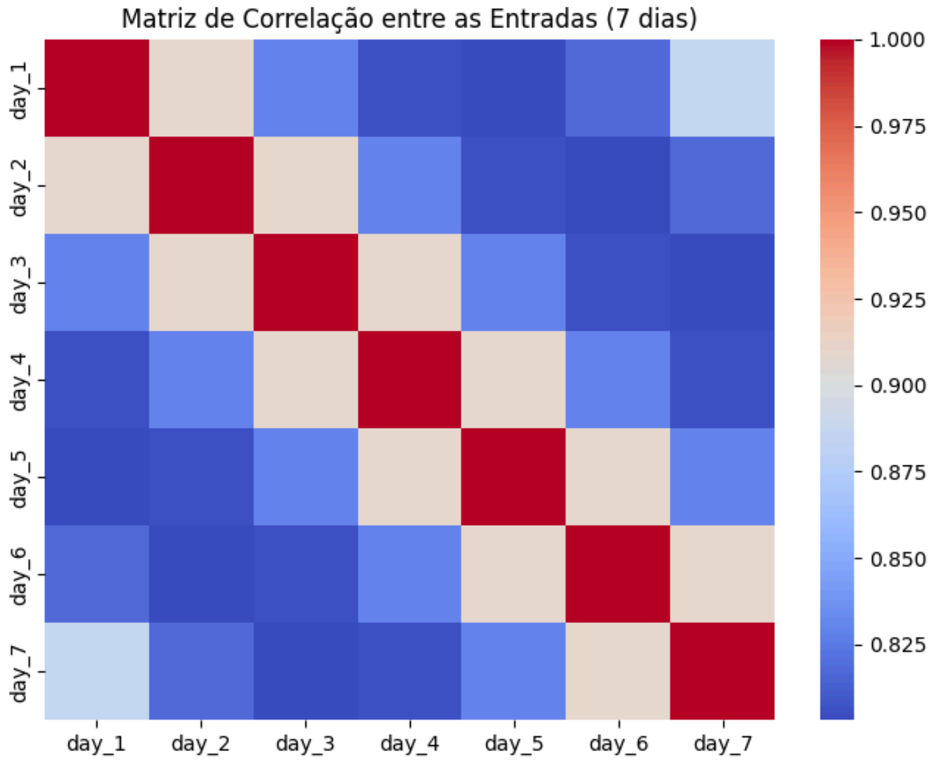


Sazonalidade

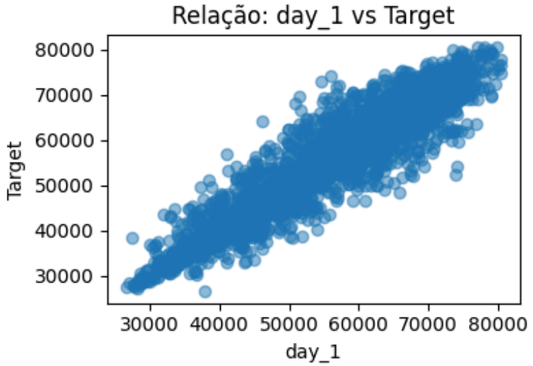


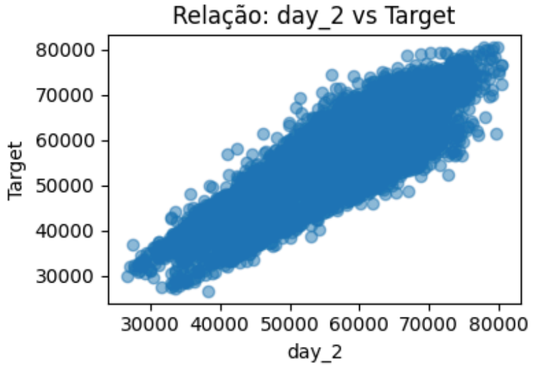
Matriz correlação

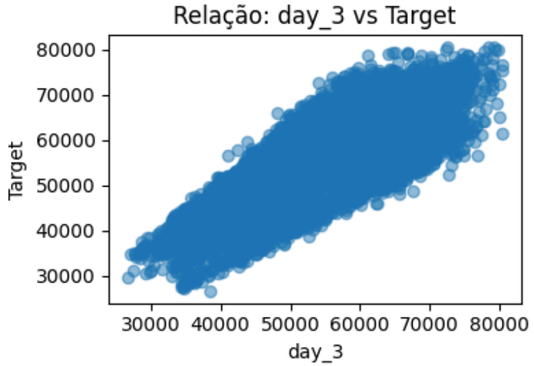


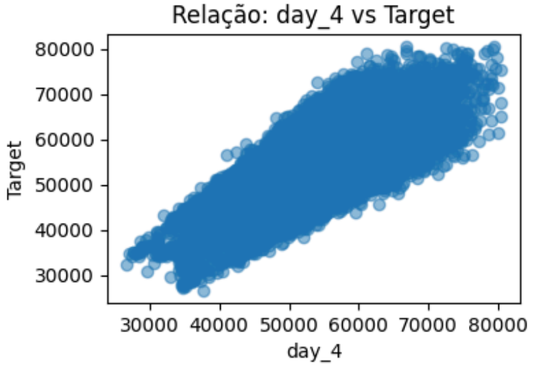


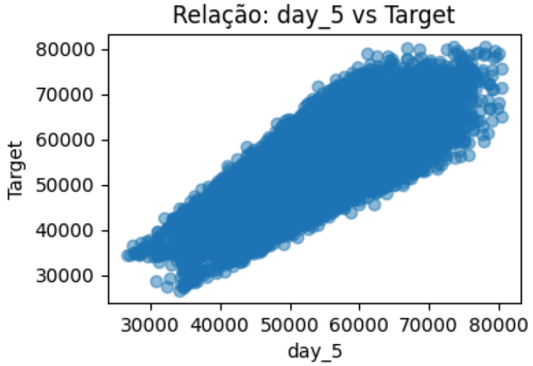
Dispersão total

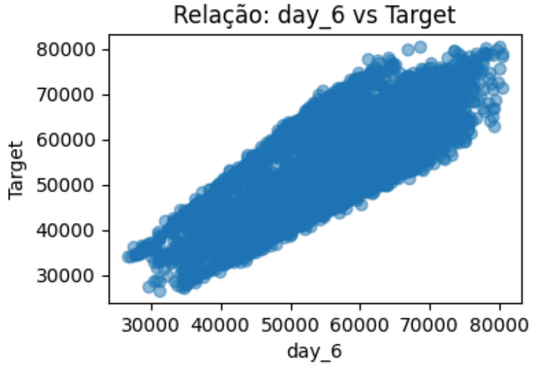


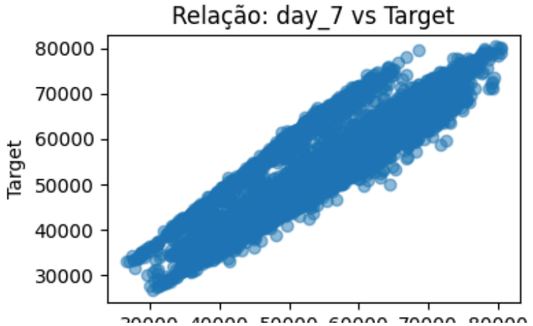




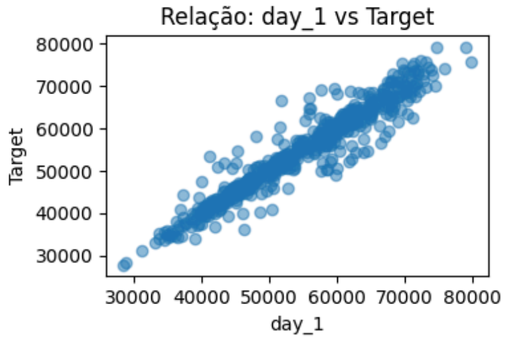


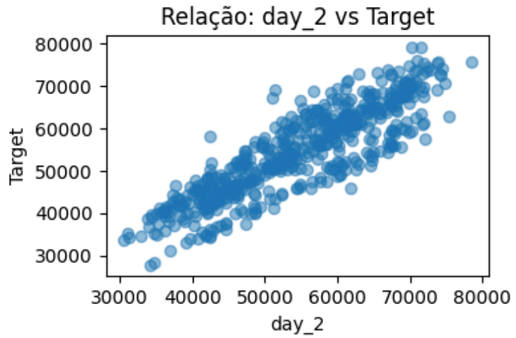


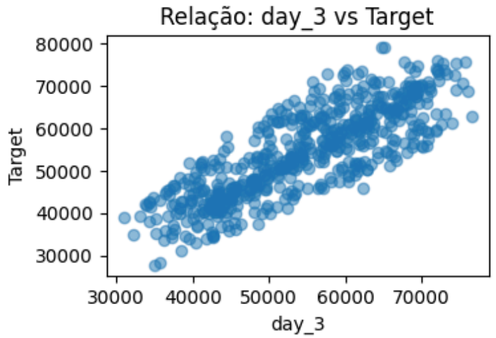


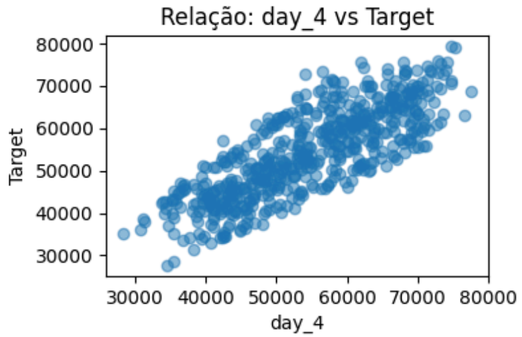


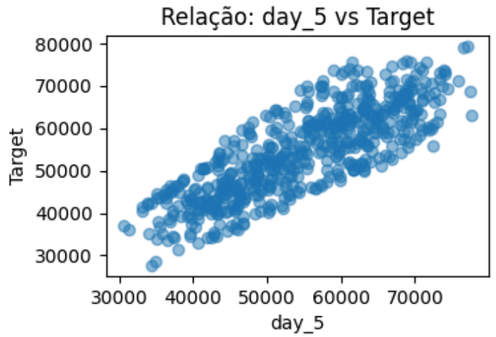
Dispersão total

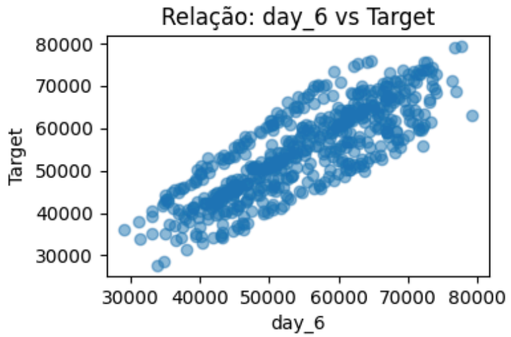


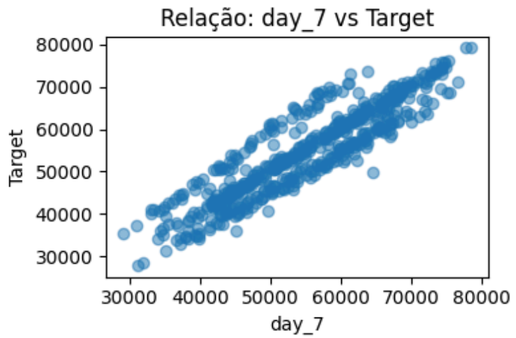












Relação entre entrada/saída

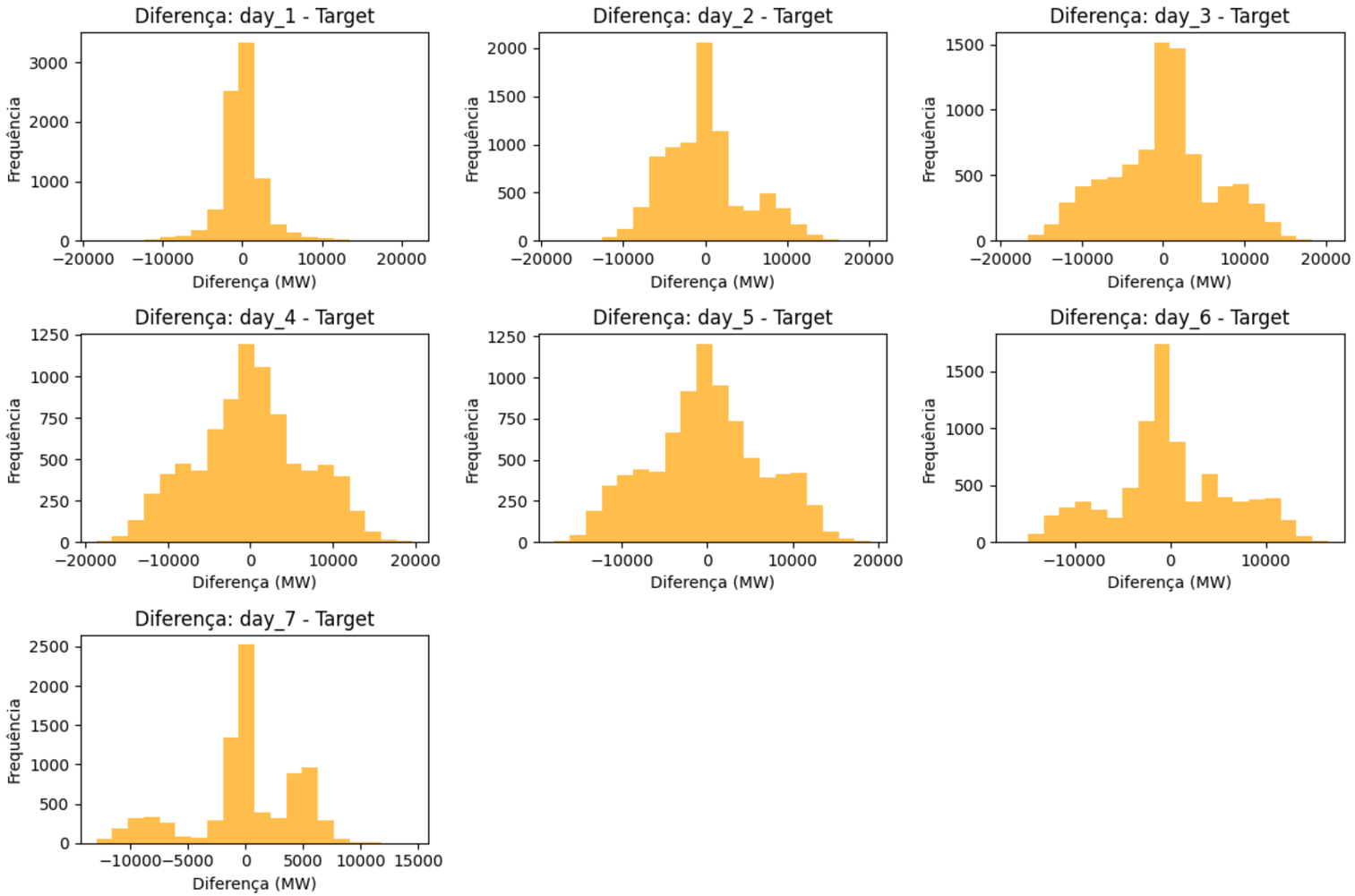
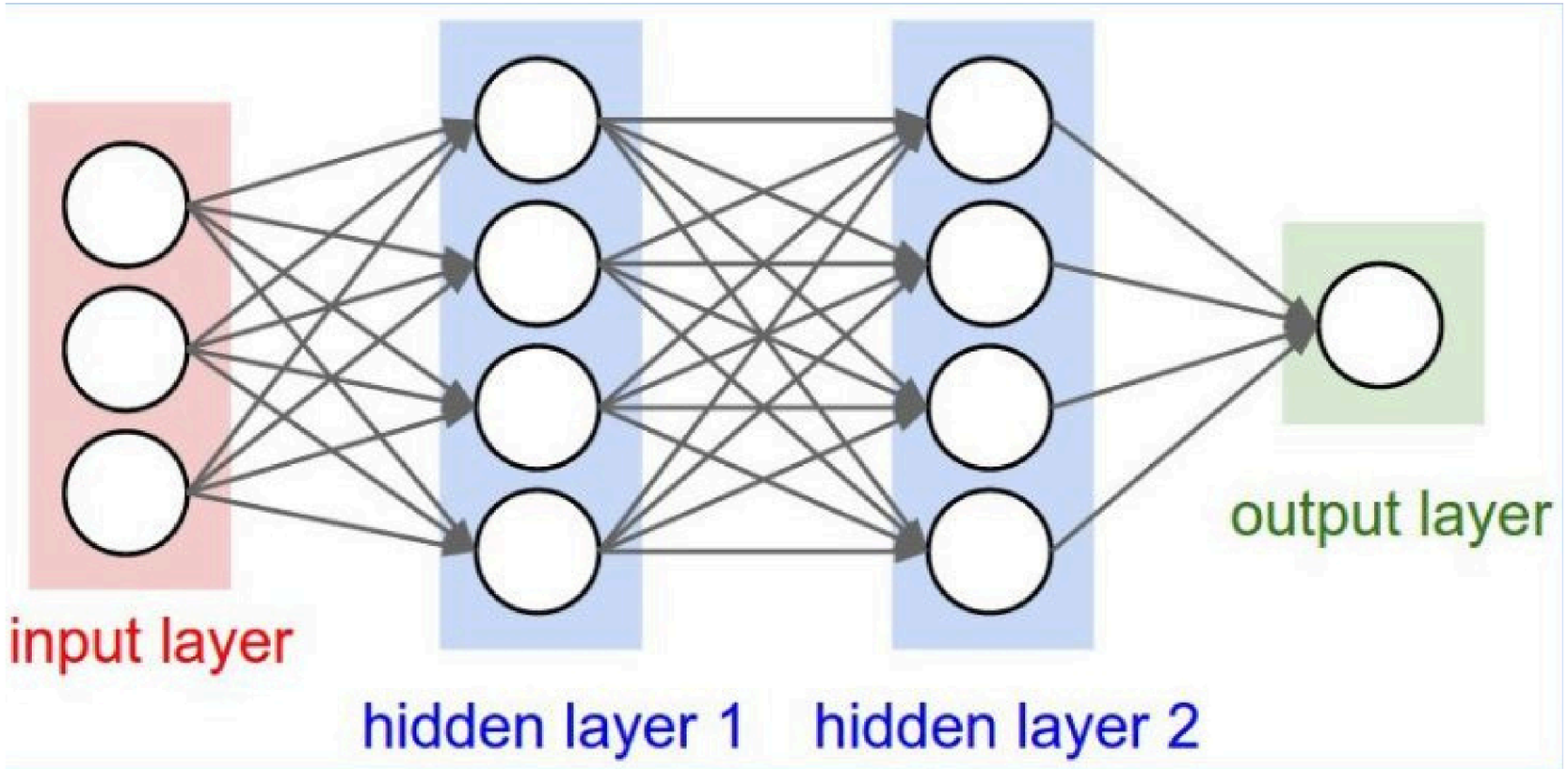


Tabela de Dados

day_1	day_2	day_3	day_4	day_5	day_6	day_7	target
30736.53	31453.35	37466.74	39149.97	39961.88	40674.63	40604.99	36854.39
31453.35	37466.74	39149.97	39961.88	40674.63	40604.99	36854.39	33546.61
37466.74	39149.97	39961.88	40674.63	40604.99	36854.39	33546.61	40613.64
39149.97	39961.88	40674.63	40604.99	36854.39	33546.61	40613.64	41951.79
39961.88	40674.63	40604.99	36854.39	33546.61	40613.64	41951.79	42261.78

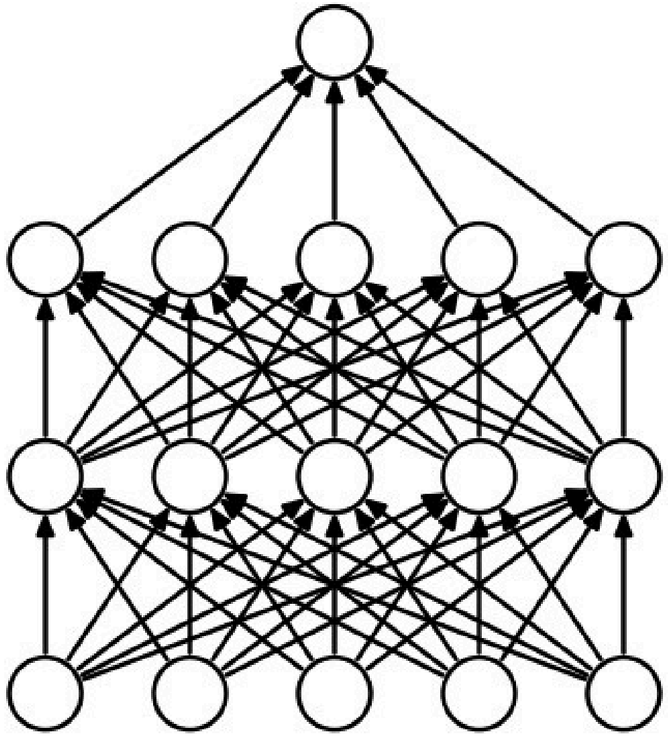
Tabela 2: Tabela de Demanda de Eletricidade

Estrutura da Rede Neural

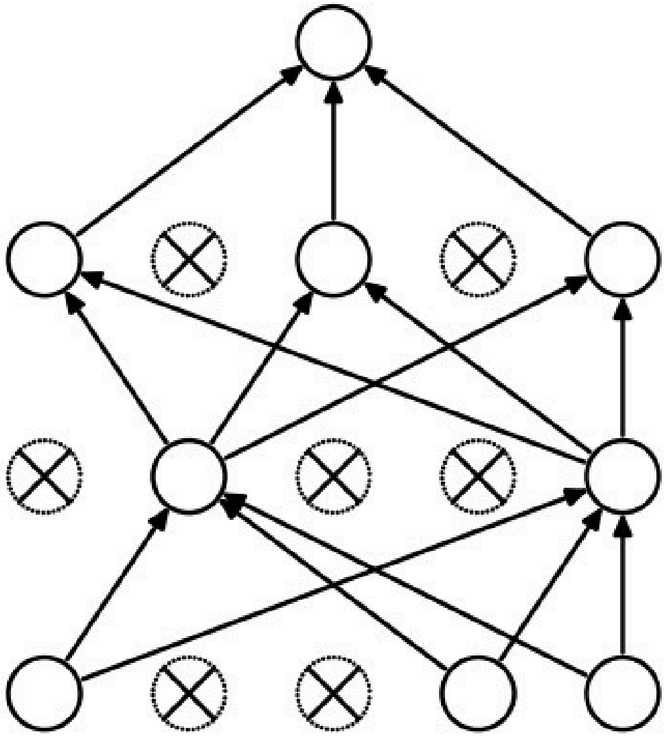


- Input Layer com 7 Entradas
- 2 Hidden Layers
- 2 Dropout Layers
- Output Layer com 1 saída

Dropout

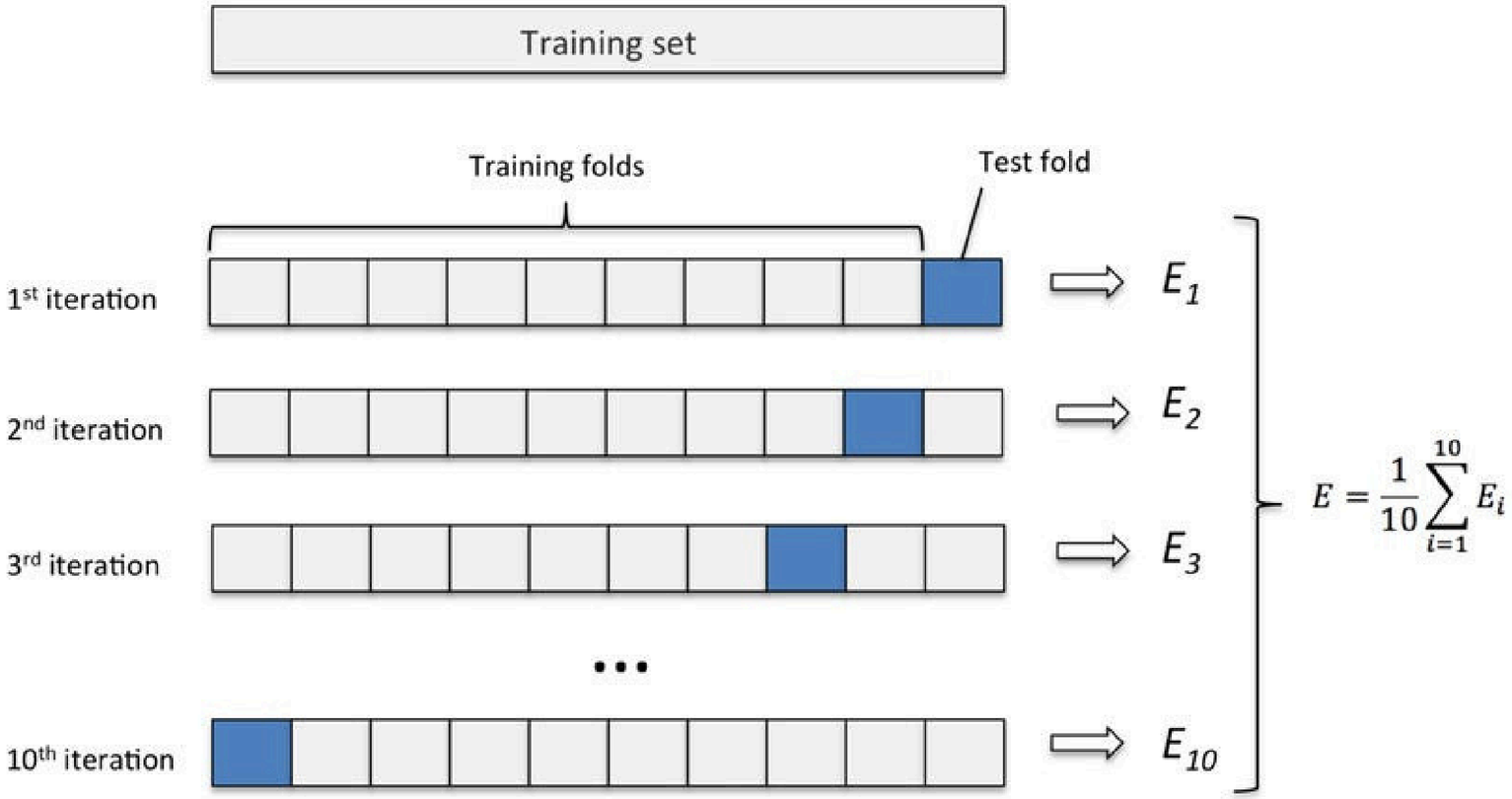


(a) Standard Neural Net



(b) After applying dropout.

Validação Cruzada (K-fold)



Melhor modelo treinado

- Otimizador: “adam”
- Neurônios por camada: 32
- Perda: “MSE”
- Inicializador: “normal”
- Dropout: 0
- Função de Ativação das camadas ocultas: Relu
- Épocas: 100

Previsão do Modelo Treinado

```
dados_para_prever = np.array([[31453.354167,  37466.737500, 39149.970833, 39961.879167,
                               40674.633333,  40604.995833, 36854.387500]])
```

```
Consumo previsto para o próximo dia: 31910.73
```

```
#Previsão do Modelo
np.abs((31910.73-33546.608333)/33546.608333) * 100
```

[20] ✓ 0.0s

```
np.float64(4.876434352949993)
```

```
#Comparando com a média
np.abs((38023.708333285715-33546.608333)/33546.608333) * 100
```

[18] ✓ 0.0s

```
np.float64(13.34590953530634)
```

```
#Comparando com a mediana
np.abs((39961.879167-33546.608333)/33546.608333) * 100
```

[19] ✓ 0.0s

```
np.float64(19.123455850793903)
```

- Erro do Modelo: 4.9%
- Erro da Média: 13.3%
- Erro da Mediana: 19.1%

Outros Modelos Treinados

optimizer	neurons	loss	kernel_initializer	dropout_rate	activation	epochs	mean_test_score	ank_test_score
adam	32	mse	random_uniform	0,3	relu	100	-5172,496841	1
adam	32	mse	normal	0,3	relu	100	-5497,332635	2
adam	32	mae	random_uniform	0,3	relu	100	-5601,906783	3
adam	16	mae	random_uniform	0,3	relu	100	-6355,792176	4
adam	32	mse	normal	0,3	relu	50	-6838,14096	5
sgd	32	mse	random_uniform	0,2	relu	50		92
sgd	4	mse	normal	0,3	relu	50		92
sgd	32	mse	normal	0,3	relu	50		92
sgd	32	mse	random_uniform	0,3	relu	100		92
sgd	4	mse	normal	0,2	relu	50		92

Obrigado!