Tarea2

August 21, 2025

[ ]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
df = pd.read_csv("Advertising.csv")
df.head()
```

[ ]:

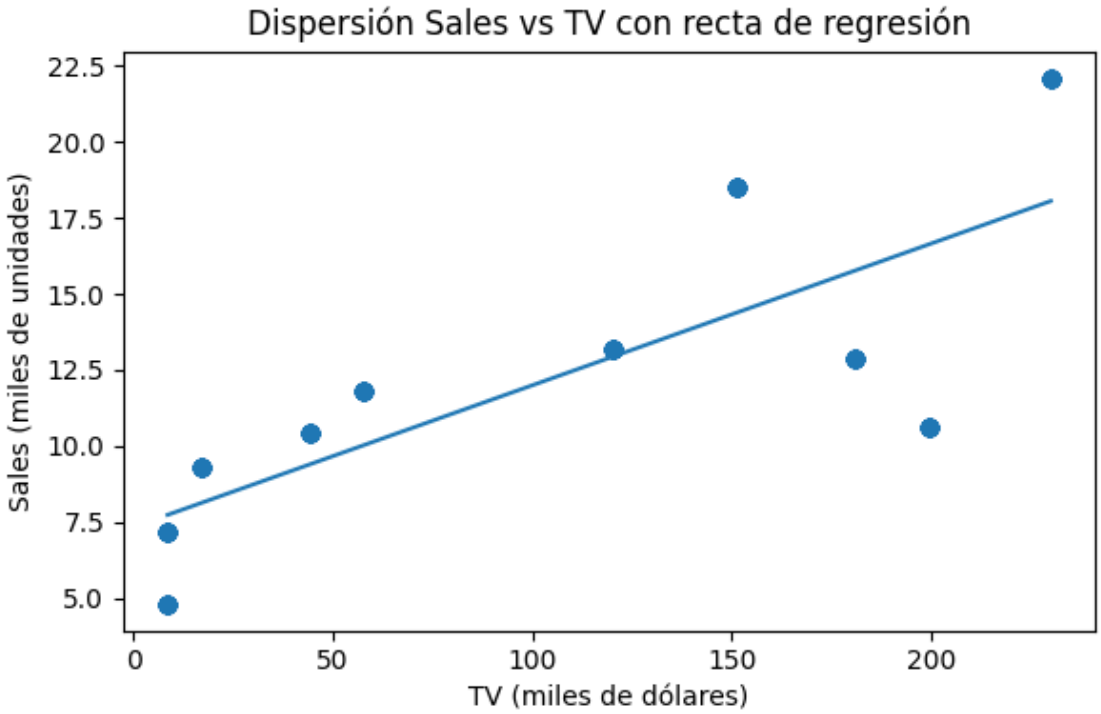
	TV	Radio	Newspaper	Sales
0	230.1	37.8	69.2	22.1
1	44.5	39.3	45.1	10.4
2	17.2	45.9	69.3	9.3
3	151.5	41.3	58.5	18.5
4	180.8	10.8	58.4	12.9

[2]:
```
# Variable independiente X (TV) y dependiente Y (Sales)
x = df["TV"].astype(float).values
y = df["Sales"].astype(float).values

n = len(x)
x_mean = x.mean()
y_mean = y.mean()

n, x_mean, y_mean
```

[2]:
```
(200, np.float64(101.89), np.float64(12.08))
```

[3]:
```
# Cálculo de la recta por fórmulas (sin statsmodels)
Sxx = np.sum((x - x_mean)**2)
Sxy = np.sum((x - x_mean)*(y - y_mean))
beta1 = Sxy / Sxx
beta0 = y_mean - beta1 * x_mean

# Gráfico
plt.figure(figsize=(6,4))
plt.scatter(x, y)
x_line = np.linspace(x.min(), x.max(), 100)
y_line = beta0 + beta1 * x_line
plt.plot(x_line, y_line)
plt.xlabel("TV (miles de dólares)")
```

```
plt.ylabel("Sales (miles de unidades)")
plt.title("Dispersión Sales vs TV con recta de regresión")
plt.tight_layout()
plt.show()
```



[4]:
```
# Cálculo manual equivalente
Syy = np.sum((y - y_mean)**2)
r = Sxy / np.sqrt(Sxx * Syy)
r
```

[4]:
```
np.float64(0.7769242755776288)
```

[5]:
```
beta0, beta1
```

[5]:
```
(np.float64(7.334018424710768), np.float64(0.04657946388545718))
```

[7]:
```
y_hat = beta0 + beta1 * x
resid = y - y_hat

SSE = np.sum(resid**2)           # Sum of Squared Errors
SST = np.sum((y - y_mean)**2)    # Total Sum of Squares
SSR = SST - SSE                  # Regression Sum of Squares
```

```
R2 = SSR / SST
MSE = SSE / (n - 2)              # Error cuadrático medio (estimado con df =␣
 ↪n-2)

R2, MSE
```

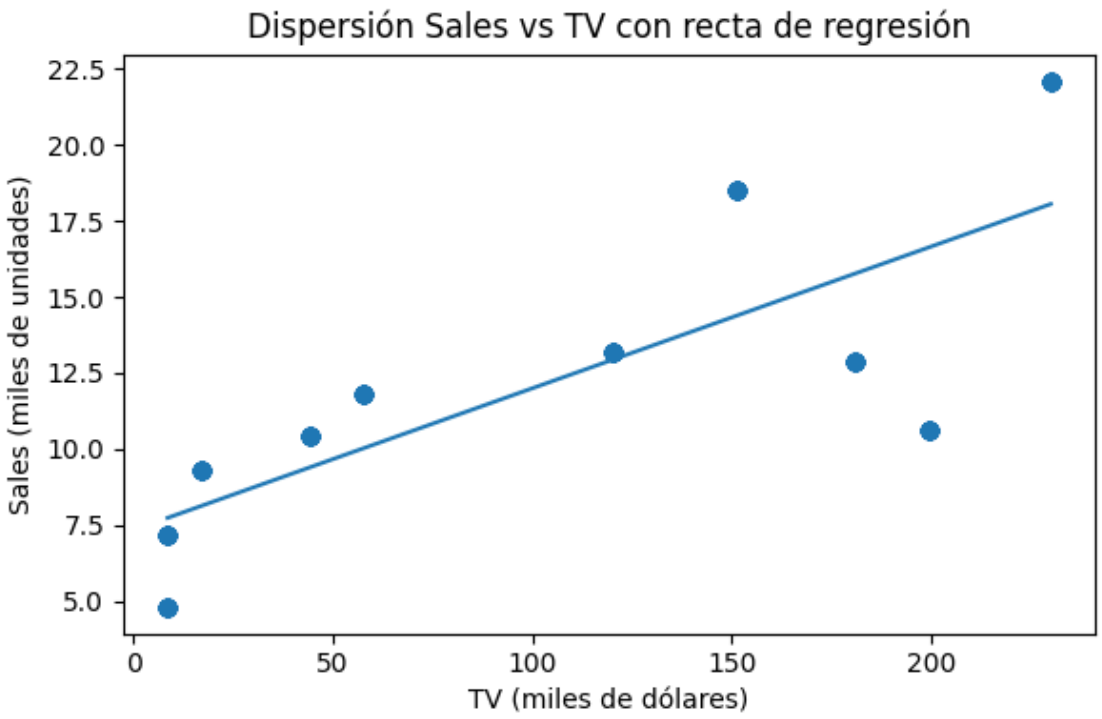
[7]:
```
(np.float64(0.6036113299818231), np.float64(9.3361943959756))
```

[8]:
```
df_reg = 1
df_res = n - 2
df_tot = n - 1

MSR = SSR / df_reg
MSE = SSE / df_res
F = MSR / MSE

anova = pd.DataFrame({
    "Fuente": ["Regresión", "Residual", "Total"],
    "df":     [df_reg, df_res, df_tot],
    "SS":     [SSR,     SSE,    SST],
    "MS":     [MSR,     MSE,    "" ],
    "F":      [F,       "",     "" ]
})
anova
```

[8]:

	Fuente	df	SS	MS	F
0	Regresión	1	2814.95351	2814.95351	301.509736
1	Residual	198	1848.56649	9.336194	
2	Total	199	4663.52000		

[9]:
```
plt.figure(figsize=(6,4))
plt.scatter(x, y)
plt.plot(x_line, y_line)
plt.xlabel("TV (miles de dólares)")
plt.ylabel("Sales (miles de unidades)")
plt.title("Dispersión Sales vs TV con recta de regresión")
plt.tight_layout()
plt.savefig("scatter_tv_sales.png", dpi=200)
```



[10]:
```
print(f"n = {n}")
print(f"Modelo: Sales = {beta0:.4f} + {beta1:.4f}·TV")
print(f"r = {r:.4f}")
print(f"R^2 = {R2:.4f}")
print(f"SST = {SST:.6f} | SSR = {SSR:.6f} | SSE = {SSE:.6f}")
print(f"MSE = {MSE:.6f}")
print(f"F = {F:.4f}")
```

```
n = 200
Modelo: Sales = 7.3340 + 0.0466·TV
r = 0.7769
R^2 = 0.6036
SST = 4663.520000 | SSR = 2814.953510 | SSE = 1848.566490
MSE = 9.336194
F = 301.5097
```