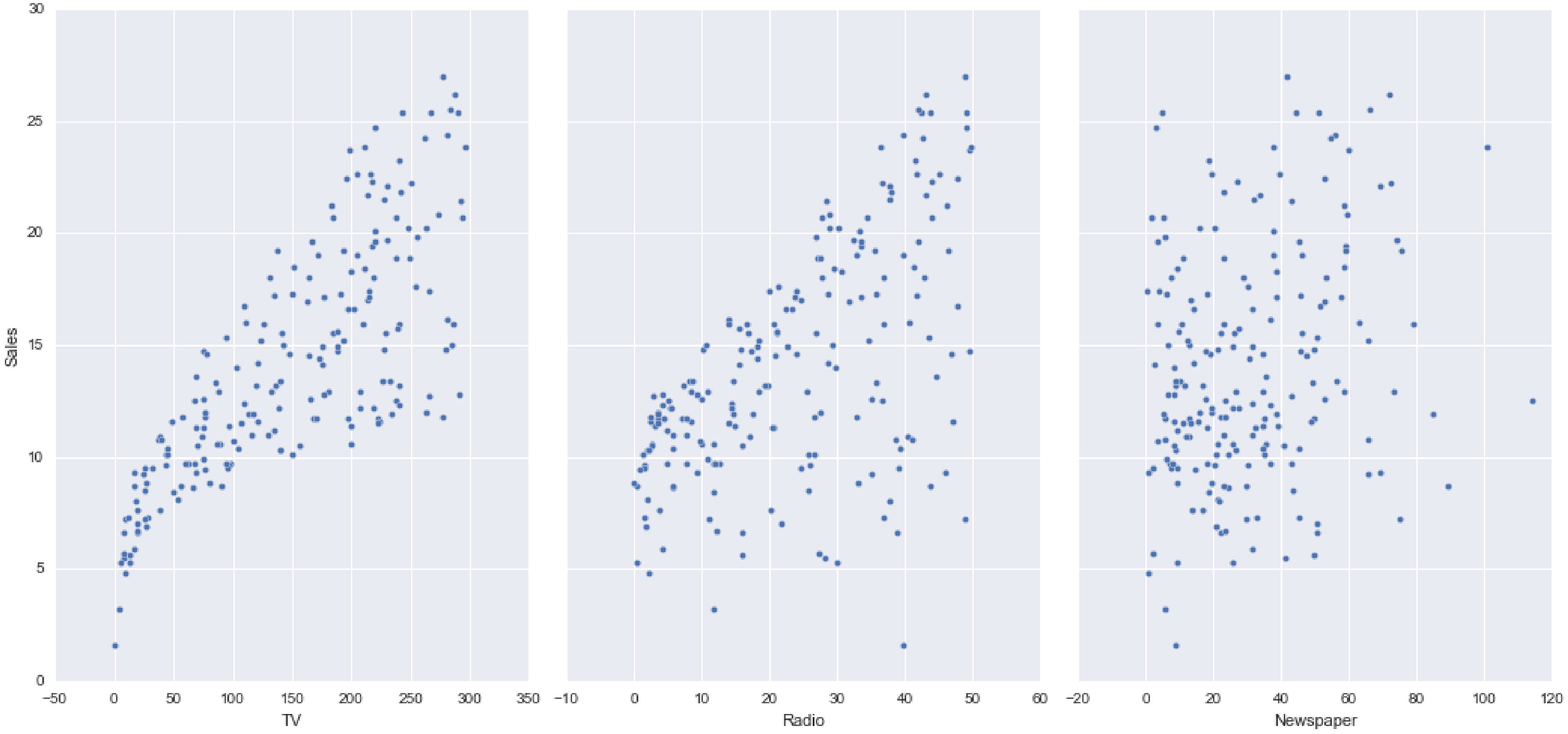
Highlights for regression problems

Data

	TV	Radio	Newspaper	Sales
1	230.1	37.8	69.2	22.1
2	44.5	39.3	45.1	10.4
3	17.2	45.9	69.3	9.3
4	151.5	41.3	58.5	18.5
5	180.8	10.8	58.4	12.9

Data Exploration - outlier



Feature Engineering

- Log / Squared scaling to get linear connection
- merge features by + / * -

Correlation: BP, Age, Weight, BSA, Dur, Pulse, Stress

	BP	Age	Weight	BSA	Dur	Pulse
Age	0.659					
Weight	0.950	0.407				
BSA	0.866	0.378	0.875			
Dur	0.293	0.344	0.201	0.131		
Pulse	0.721	0.619	0.659	0.465	0.402	
Stress	0.164	0.368	0.034	0.018	0.312	0.506

Detecting collinearity

Correlation matrix

Transforming features to fit non-linear relationships

Simple linear regression can easily be extended to include multiple features. This is called **multiple linear regression**:

$$y = \beta_0 + \beta_1 x_1 + \ldots + \beta_n x_n$$

Each x represents a different feature, and each feature has its own coefficient. In this case:

$$y = \beta_0 + \beta_1 \times TV + \beta_2 \times Radio + \beta_3 \times Newspaper$$

Diagnosing model fit

Model Evaluation Metrics for Regression

For classification problems, we have only used classification accuracy as our evaluation metric. What metrics can we used for regression problems?

Mean Absolute Error (MAE) is the mean of the absolute value of the errors:

$$\frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i|$$

Mean Squared Error (MSE) is the mean of the squared errors:

$$\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

Root Mean Squared Error (RMSE) is the square root of the mean of the squared errors:

$$\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}$$

Let's calculate these by hand, to get an intuitive sense for the results:

sources

https://www.ritchieng.com/machine-learning-evaluate-linear-regression-model/