Week 7
Non-Linear Models

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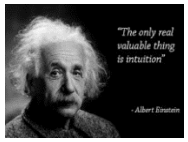
Non-Linearity Overview

LI(×) – Y and the X's are not linearly related



Non-Linearity: Intuition

- **Linear model** → the **truth** is **never linear**, but the linearity assumption is often **good enough**: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + etc.$
- In a linear model, the **effects** of the various variables are **additive**
- However, an inspection of **scatterplots** may reveal the effect may be **other** than **additive**, for example:
  - If the combined effect of two X variables is **multiplicative** rather than additive, it is said that the two variables have an **"interaction"** effect.
  - If the effect of one X variable on Y is **curvilinear**, then this effect is not linear, but may be quadratic, cubic, etc.
- We explore the following **non-linear models** in this section:
  - **Interaction** effects
  - **Polynomials** (quadratic, cubic, etc.)
  - **Step** and **Piecewise** functions (not the same as step models)
  - **Splines** and **Smoothing Splines**

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