Summary of Lecture 1

- Models: family of densities, cdfs or distributions indexed by $\theta \in \Theta$.
- Parametric: $\Theta \subset \mathbb{R}^k$ for some k.
- Non-parametric Θ infinite dimensional
- Semiparametric $\theta = (\phi, \psi)$ with ϕ finite dimensional and ψ infinite dimensional.
- X has density f means

$$P(X \in A) = \int_A f(x)\, dx$$

- If X, Y has density $f(x, y)$ we call it *joint* density and
  - X has density (called *marginal* density)

$$f_X(x) = \int f(x, y) dy.$$

  - Conditional = joint / marginal. Conditional density of Y given X is

$$f_{Y|X}(y|x) = \frac{f(x, y)}{f_X(x)}$$

Summary of Lecture 1

- If X has density f and $Y = g(X)$ then

$$\mathrm{E}(Y) = \mathrm{E}(g(X)) = \int g(x) f(x)\, dx.$$

- If X, Y has joint density $f(x, y)$ then

$$\mathrm{E}(h(Y)|X = x) = \int h(y) f_{Y|X}(y|x)\, dy.$$

and

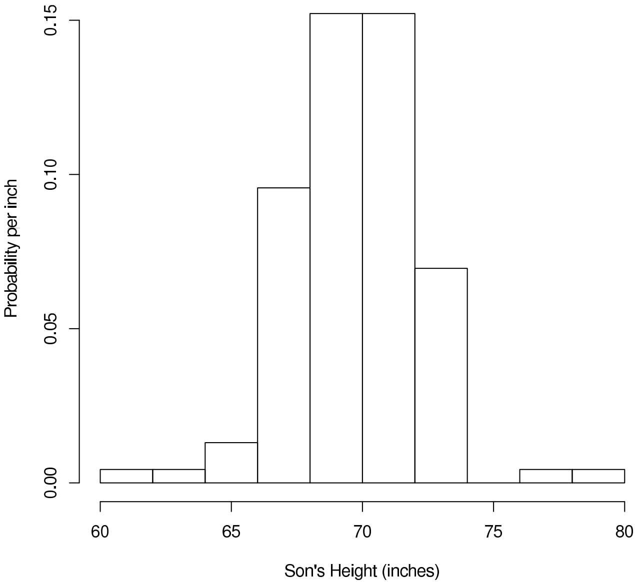
$$\mathrm{E}(h(Y)|X) = \int h(y) f_{Y|X}(y|X)\, dy.$$

- Second is first formula evaluated at random point – at X.

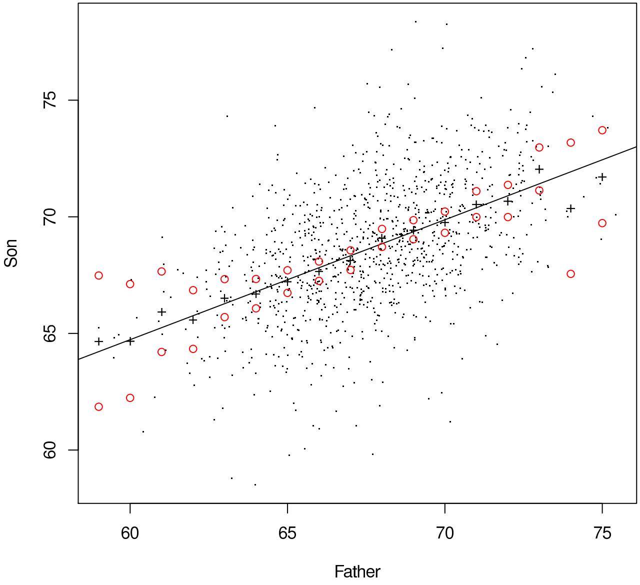
Summary of Lecture 1

Link to some `R` code.

Conditional distribution of son's heights



Regression of Son on Father



Course coverage in text

- Chapter 6, sections 1, 2.
- Review of Chapter 1.4, 1.5, 1.6; 2.1 to 2.9; 3.1, 3.2, 3.5.