$$F(x) = \int_{-\infty}^{x} p(t)dt \tag{1}$$

$$F_n(x) = \frac{1}{n}\sum_{i=1}^{n} I(X_i \leq x) \tag{2}$$

$$p(x) \approx \frac{F(x+h) - F(x-h)}{2h} \tag{3}$$

$$p_n(x) = \frac{F_n(x+h) - F_n(x-h)}{2h} \tag{4}$$

$$= \frac{1}{nh}\sum_{i=1}^{n} K_0\left(\frac{X_i - x}{h}\right) \tag{5}$$

$$K_0(u) = \frac{1}{2}I(|u| < 1) \tag{6}$$

$$p_n(x) = \frac{1}{nh}\sum_{i=1}^{n} K\left(\frac{X_i - x}{h}\right) \tag{7}$$

rectangular	$\frac{1}{2}I(\|u\| \leq 1)$
triangular	$(1 - \|u\|)I(\|u\| \leq 1)$
Epanechnikov	$\frac{3}{4}(1 - u^2)I(\|u\| \leq 1)$
Gaussian	$\frac{1}{\sqrt{2\pi}}exp(-u^2/2)$

$$\sum(\beta, L) = \left\{f : T \to \mathbf{R}, |f^{(\ell)}(x) - f^{(\ell)}(x')| < L|x - x'|^{\beta-\ell}\right\} \tag{8}$$

$$\mathcal{P}(\beta, L) = \left\{p : p \geq 0, \int p(x)dx = 1, p \in \sum(\beta, L)\right\} \tag{9}$$

$$p \in \mathcal{P} \tag{10}$$

$$\frac{\partial}{\partial h} = 0 \tag{11}$$