CDF $F_X(x) = P[X \le x]$	$F_{X_1,\ldots,X_n}(x_1,\ldots,x_n) = P[X_1 \le x_1,\ldots,X_n \le x_n]$
pdf $f_X(x) = \frac{d}{dx} F_X(x)$	$f_{X_1,\ldots,X_n}(x_1,\ldots,x_n) = \frac{d^n}{dx_1 \cdots dx_n} F_{X_1,\ldots,X_n}(x_1,\ldots,x_n)$

Conditioning on Events

Conditional CDF $F_X(x \mid A) = P[X \le x \mid A]$	$F_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A) = P[X_1 \le x_1,\ldots,X_n \le x_n \mid A]$
Conditional pdf (given an event) $f_X(x \mid A) = \frac{d}{dx} F_X(x \mid A)$	$f_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A) = \frac{d^n}{dx_1 \cdots dx_n} F_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A)$
Total Probability for CDF, if $\{A_i\}$ partition S $F_X(x) = \sum_i F_X(x \mid A_i) P(A_i)$	$F_{X_1,\ldots,X_n}(x_1,\ldots,x_n) = \sum_i F_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A_i) P(A_i)$
Total Probability for pdf, if $\{A_i\}$ partition S $f_X(x) = \sum_i f_X(x \mid A_i) P(A_i)$	$f_{X_1,\ldots,X_n}(x_1,\ldots,x_n) = \sum_i f_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A_i) P(A_i)$
Total Expectation, if $\{A_i\}$ partition S $E[g(X)] = \sum_i E[g(X) \mid A_i] P(A_i)$	$E[g(X_1,\ldots,X_n)] = \sum_i E[g(X_1,\ldots,X_n) \mid A_i] P(A_i)$

Point Conditioning and Events

Bayes rule for point conditioning $P(A \mid X = x) = f_X(x \mid A) P(A) / f_X(x)$	$P(A \mid X_1 = x_1,\ldots,X_n = x_n) = \frac{f_{X_1,\ldots,X_n}(x_1,\ldots,x_n \mid A) P(A)}{f_{X_1,\ldots,X_n}(x_1,\ldots,x_n)}$
Total Probability for event from pdf $P(A) = \int_{-\infty}^{\infty} P(A \mid X = x) f_X(x)\, dx$	$P(A) = \int_{-\infty}^{\infty} \cdots \int_{-\infty}^{\infty} P(A \mid X_1 = x_1,\ldots,X_n = x_n) f_{X_1,\ldots,X_n}(x_1,\ldots,x_n)\, dx_1 \cdots dx_n$

Two random variables

Bayes rule for two r.v.s	$f_{Y \mid X}(y \mid x) = f_{X \mid Y}(x \mid y) f_Y(y) / f_X(x)$
Total probability for two r.v.s	$f_Y(y) = \int_{-\infty}^{\infty} f_{Y \mid X}(y \mid x) f_X(x)\, dx = \int_{-\infty}^{\infty} f_{X,Y}(x,y)\, dx$
Total expectation for two r.v.s	$E[Y] = E[E[Y \mid X]] = \int_{-\infty}^{\infty} E[Y \mid X = x] f_X(x)\, dx$