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			²	3
			<i>t</i>	() .	3
			<i>F</i>	4
		1	§ 23	...	4
		1			4
§ 1.1	...	1	§ 31	4
§ 1.2	1		4
§ 1.3	2		5
			§ 32		5
		2		5
				6
		2		() ...	6
§ 2.1	2	§ 33	6
	2			
§ 2.2	3			6

§ 1.1

1.1.1

- $\text{cov}(X; Y) = E((X - E(X))(Y - E(Y)))$
- $\rho(X; Y) = \frac{\text{cov}(X; Y)}{\sqrt{D(X)}\sqrt{D(Y)}}$
- $\sigma_X = \sqrt{D(X)}$
- k $E(X^k)$
- k $E((X - E(X))^k)$

§ 1.2

1.2.1 (Chebyshev)

$$P(|X - E(X)| > \epsilon) \leq \frac{D(X)}{\epsilon^2}$$

1.2.1 () $\exists c; \delta > 0; \lim_{n \rightarrow \infty} P(|X_n - c| > \delta) = 0,$
 $f_{X_n} \rightarrow c, \quad X_n \xrightarrow{P} c$

1.2.2 (Chebyshev)

$f_{X_n} \rightarrow c$ () $D(X_i)$
 $c (D(X_i) < c),$

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i \xrightarrow{P} \frac{1}{n} \sum_{i=1}^n E(X_i)$$

1.2.3 () () f_{X_i}

$E(X_i) =$

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$$

§ 1.3

1.3.1 () f_{X_i}

$D(X_i) =$

$E(X_i) =$

$$\lim_{n \rightarrow \infty} P \left(\frac{\sum_{i=1}^n X_i}{n} \approx \bar{x} \right) = 1$$

$$\sum_{i=1}^n X_i \sim N(n\bar{x}, n\sigma^2) \quad \bar{X} \sim N\left(\bar{x}, \frac{\sigma^2}{n}\right)$$

§ 2.1

2.1.1 (X_1, X_2, \dots, X_n)

$$\bar{X} = \frac{1}{n} \sum_{i=1}^n X_i$$

$$S^2 = \frac{1}{n-1} \sum_{i=1}^n (X_i - \bar{X})^2$$

§ 22

2

$$\textbf{221} \quad f_{X_i} g_{i=1}^n \quad Y = \sum_{i=1}^n X_i^2 \quad n \quad Y \quad {}^2(n).$$

$$f(y) = \begin{cases} \frac{1}{2^{\frac{n}{2}} \sqrt{\frac{n}{2}}} y^{\frac{n}{2}-1} e^{-\frac{y}{2}}; & y > 0 \\ 0; & y \leq 0 \end{cases}$$

$$\textbf{221} \quad Y \quad {}^2(n)$$

$$\bullet E(Y) = n; D(Y) = 2n$$

$$\bullet \quad X \quad {}^2(m); Y \quad {}^2(n), X; Y \quad X + Y \quad {}^2(m + n)$$

t ()

$$\textbf{222} \quad X; Y \quad X \sim N(0; 1); Y \quad {}^2(n), \quad T = \frac{X}{\sqrt{Y/n}}$$

$$n \quad t \quad .$$

t

$$f(x) = \frac{1}{\sqrt{n}} \frac{\frac{n+1}{2}}{\sqrt{\frac{n}{2}}} \left(1 + \frac{x^2}{n} \right)^{-\frac{n+1}{2}}$$

$$t(n) \quad N(0; 1), \quad , \quad , \quad x = 0 \quad . \quad t(n) \quad N(0; 1) \quad , \quad t(n) \quad N(0; 1) \quad . \quad :$$

$$\lim_{n \rightarrow \infty} f(x) = \phi(x)$$

F

223

$X; Y \sim X^2(m); Y^2(n), \quad F = \frac{X/m}{Y/n} \sim F(m; n)$

$f(y) = \begin{cases} \frac{1}{2} \frac{\frac{m+n}{2}}{\frac{m}{2} \frac{n}{2}} \left(\frac{m}{n} \right)^{\frac{m}{2}} y^{\frac{m}{2}-1} \left(1 + \frac{m}{n} y \right)^{-\frac{m+n}{2}}; & y > 0 \\ 0; & y \leq 0 \end{cases}$

222

$F(m; n) \sim F \quad (P(F \in F(m; n)) = 1)$

$F(m; n) = \frac{1}{F_1}(n; m)$

§ 23

§ 31

$$k, \quad 1 \leq k \leq n, \quad A_k = E(X^k), \quad A_k = \frac{1}{n} \sum_{i=1}^n X_i^k, \quad A_k = (A_1; A_2; \dots; A_n)$$

$$\begin{aligned}
 & \sum_{(x_1; x_2; \dots; x_n)} P(X = x; \theta) = \sum_{(x_1; x_2; \dots; x_n)} f(x; \theta) \\
 & L(\theta) = \prod_{i=1}^n P(X_i = x_i; \theta); \quad L(\theta) = \prod_{i=1}^n f(x_i; \theta); \\
 & L(\hat{\theta}) = \max_{\theta} L(\theta)
 \end{aligned}$$

§ 32

$$\hat{\theta} = \hat{\theta}(X_1; X_2; \dots; X_n)$$

$$E \hat{\theta}(X_1; X_2; \dots; X_n) = \theta;$$

$$\hat{\theta} = \hat{\theta}(X_1; X_2; \dots; X_n)$$

$$\lim_{n \rightarrow \infty} E \hat{\theta}(X_1; X_2; \dots; X_n) = \theta;$$

$$\hat{\theta} = \hat{\theta}(X_1; X_2; \dots; X_n)$$

322 $\hat{\mathcal{L}}_1 \hat{\mathcal{L}}_2 \hat{\mathcal{L}}_1 \hat{\mathcal{L}}_2 D(\hat{\mathcal{L}}_1) \in D(\hat{\mathcal{L}}_2)$

(\quad)

323 $\hat{\mathcal{L}} = \hat{\mathcal{L}}(X_1; X_2; \dots; X_n) \qquad \delta'' > 0$

$$\lim_{n \rightarrow \infty} P(j^{\hat{\mathcal{L}}} \mid j > n) = 0;$$

$$\hat{\mathcal{L}} \qquad \hat{\mathcal{L}} \not\models \qquad \hat{\mathcal{L}}$$

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§ 33

331 $(X_1; X_2; \dots; X_n) \qquad X \qquad X \quad f(x, \dots); \mathcal{L}$
 $80 < \dots < 1 \qquad _ = _ (X_1; X_2; \dots; X_n) < _ (X_1; X_2; \dots; X_n) =$

–

$$P(_ \in _ \mid _) = 1 \qquad ; \mathcal{L} \quad ;$$

$$\begin{aligned} [_; _] \qquad 1 \qquad _; _ \qquad 1 \\ 1 \qquad (x_1; x_2; \dots; x_n) \\ [_ (x_1; x_2; \dots; x_n); _ (x_1; x_2; \dots; x_n)] \end{aligned}$$

$$m < n$$

$$\sum_{k=0}^n (-1)^k (n-k)^m C_n^k = 0$$