Lecture Notes for

Introduction to Probability and Statistics

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Probability and Statistics / 확률과 통계

강의노트 10

통계 - 확률분포 예제

78. Example 3.3.3.

Example 3.3.3. Suppose that we wish to compare a new drug to that of Example 3.3.1. Let X denote the number of heartbeats per minute obtained using the old drug and Y the number per minute obtained with the new drug. The hypothetical density of each of these variables is given in Table 3.6. Since each of the densities is symmetric, inspection shows that $\mu_X = \mu_Y = 70$. Each drug produces *on the average* the same number of heartbeats per minute. However, there is obviously a drastic difference between the two drugs that is not being detected by the mean. The old drug produces fairly consistent reactions in patients, with 90% differing from the mean by at most 2; very few (2%) have an extreme reaction to the drug. However, the new drug produces highly diverse responses. Only 10% of the patients have heart rates within 2 units of the mean, whereas 80% show an extreme reaction. If we examined only the mean, we would conclude that the two drugs had identical effects—but nothing could be further from the truth!

x	40	60	68	70	72	80	100
$f(x)$	.01	.04	.05	.80	.05	.04	.01

y	40	60	68	70	72	80	100
$f(y)$	.40	.05	.04	.02	.04	.05	.40

X : 기존 약으로 나온 결과

Y : 신약으로 나온 결과

1) μ_x 와 μ_y 를 구하면...

2) V(X), V(Y)를 구하면...

3) σ_x , σ_y 를 구하면...

79.

Theorem 3.3.3.

1. V(c) = 0, c 가 상수
2. $V(cX) = c^2 V(X)$
3. X 와 Y 가 독립이면, V(X+Y) = V(X) + V(Y)

a 와 b 가 상수일 때,

V(aX+b)

$= E[(aX+b)^2] - (E[(aX+b)])^2$

= ...

$= a^2 V(X)$

--->> 증명해볼 것