
APPLICATIONS OF PROBABILITY THEORY AND MATHEMATICAL STATISTICS TO OTHER DISCIPLINES.

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Abstract: *This article presents the relationship between Probability Theory and Mathematical Logic and the application of Probability Theory to Mathematical Logic, Binomial Law of Probability Theory and Poisson's Law in economics, physics, biology, chemistry and medicine.*

Key words: *Poisson's law, distribution function, mathematical expectation, variance, moments, correlation coefficient, density function, regression equation.*

INTRODUCTION

The possibilities of probability theory and the science of mathematical statistics are very wide and rich. He boldly penetrates not only physics, astronomy, biology, economics, but also medicine, linguistics, environmental protection, and the study of various phenomena with his verification laws. Acceleration of socio-economic development of the country requires, in turn, complex mathematical calculations to create and launch new technologies.

The science of probability theory studies the forms of existing things in matter (distribution function, mathematical expectation, variance, moments, correlation coefficient, regression equation) in relation to quantitative relationships among other sciences. In the process of studying these quantitative relationships, he uses the methods of scientific research, the methods of intersubjective inductive description.

Studying the applications of probability theory to other subjects will increase students' learning efficiency, help them to get full and solid knowledge, and give better results.

As an example, the application of the binomial law of probability theory and Poisson's law to biology and medicine can be cited.

Example 1. There are 10,000 bacteria in a bucket of water. The probability of the presence of bacteria in a drop of water taken at random is 0.001. Find the distribution law of the number of bacteria in a randomly taken drop.

Solving. We use the Poisson formula.

$$P_n(k) = \frac{e^{-\lambda} \lambda^k}{k!}, \quad \lambda > 0; \quad k = 0, 1, 2, \dots$$

$$n = 10000; \quad p = 0,001$$

$$\lambda = np = 10000 \cdot 0,001 = 10$$

13. No bacteria in the drop $P_n(0) = \frac{10^0}{0!} e^{-10} = e^{-10} \quad k=0$

14. $P_n(k) = \frac{e^{-\lambda} \lambda^k}{k!}, \quad \lambda > 0; \quad k=1; \quad P_n(1) = \frac{e^{-10} \cdot 10}{1!} = 10 \cdot e^{-10}$ there is 1 in the drop.

15. $P_n(2) = \frac{e^{-10} \cdot 10^2}{2!} = \frac{1}{2} \cdot 10^2 \cdot e^{-10}$ there is 1 in the drop.

Example 2. The probability of spreading the virus in the air is 0.7. Find the probability of a virus appearing in 6 samples (experiment).

Solving. $p=0.7 \quad q=0.3 \quad P_n(m) = C_n^m p^m q^{n-m}$

a) $P_6(0) = C_6^0 (0,7)^0 (0,3)^6$

b) $P_6(1) = C_6^1 (0,7)^1 (0,3)^5$

.....

$$P_6(6) = C_6^6 (0,7)^6 (0,3)^0$$

The possibilities of the theory of probability and the science of mathematical statistics are very wide and rich. He is boldly entering not only physics, astronomy, biology, economics, but also medicine, linguistics, environmental protection, and the study of various phenomena with his verification laws. To accelerate the socio-economic development of the country, it will be necessary to apply the basic laws of probability theory to create and launch new technologies. Binomial law of probability theory is used in biology and chemistry Poisson's law is used in economics. For example, Example 1.

$Y_t - t$ – national income in

$J_t - t$ – net cost per year,

$C_t - t$ – annual consumption (for defense, education)

that is, the mathematical model of the economic balance

$$Y_t = J_t + C_t$$

given by the formula, the binomial relationship is found.

An example of two. There is a connection between the science of probability theory and mathematical logic, or the application of the science of probability theory to the science of mathematical logic. It is known that the probability of any event

$$0 \leq P(A) \leq 1$$

is known to be in the range; these marginal $\{0,1\}$ numbers give the probability of an improbable event and the probability of an inevitable event. And in mathematical logic, $\{0,1\}$ gives the concepts of "false" and "true" reasoning. Based on this, it is

possible to solve the problem in both ways using probability theory operations and their schemes, it is possible to apply probability theory.

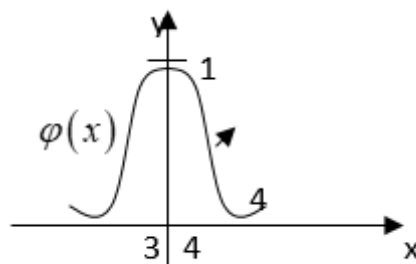
Example 3. Distribution function of a random variable distributed according to the normal law

$$\hat{O}(x) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^x e^{-\frac{(t-a)^2}{2\sigma^2}} dt$$

Its density function

$$\frac{d\hat{O}(x)}{dx} = \varphi(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(t-a)^2}{2\sigma^2}}$$

a - mathematical expectation, σ^2 - dispersion. There are applications of this density function in the shoe factory as follows $\varphi(x)$



such a graph is used. At the intersection of the coordinates, size 40 men's shoes, 41,42, ..., or 39,38,...., the length of the ordinate indicates the number of shoes (x - million).

Size 38 for women and size 36 for children are placed in the center.

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