РУХАНИ ЖАҢҒЫРУ

20 АСТАНА

ЕУРАЗИЯ ҰЛТТЫҚ УНИВЕРСИТЕТІ

Студенттер мен жас ғалымдардың
«ҒЫЛЫМ ЖӘНЕ БІЛІМ - 2018»
XIII Халықаралық ғылыми конференциясы

СБОРНИК МАТЕРИАЛОВ

XIII Международная научная конференция
студентов и молодых ученых
«НАУКА И ОБРАЗОВАНИЕ - 2018»

The XIII International Scientific Conference
for Students and Young Scientists
«SCIENCE AND EDUCATION - 2018»

12th April 2018, Astana

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
Л.Н. ГУМИЛЕВ АТЫНДАҒЫ ЕУРАЗИЯ ҰЛТТЫҚ УНИВЕРСИТЕТІ

Студенттер мен жас ғалымдардың
«Ғылым және білім - 2018»
атты XIII Халықаралық ғылыми конференциясының
БАЯНДАМАЛАР ЖИНАҒЫ

СБОРНИК МАТЕРИАЛОВ
XIII Международной научной конференции
студентов и молодых ученых
«Наука и образование - 2018»

PROCEEDINGS
of the XIII International Scientific Conference
for students and young scholars
«Science and education - 2018»

2018 жыл 12 сәуір

Астана

УДК 378

ББК 74.58
Ғ 96

Ғ 96

«Ғылым және білім – 2018» атты студенттер мен жас ғалымдардың XIII Халықаралық ғылыми конференциясы = XIII Международная научная конференция студентов и молодых ученых «Наука и образование - 2018» = The XIII International Scientific Conference for students and young scholars «Science and education - 2018». – Астана: http://www.enu.kz/ru/nauka/nauka-i-obrazovanie/, 2018. – 7513 стр. (қазақша, орысша, ағылшынша).

ISBN 978-9965-31-997-6

Жинаққа студенттердің, магистранттардың, докторанттардың және жас ғалымдардың жаратылыстану-техникалық және гуманитарлық ғылымдардың өзекті мәселелері бойынша баяндамалары енгізілген.

The proceedings are the papers of students, undergraduates, doctoral students and young researchers on topical issues of natural and technical sciences and humanities.

В сборник вошли доклады студентов, магистрантов, докторантов и молодых ученых по актуальным вопросам естественно-технических и гуманитарных наук.

УДК 378

ББК 74.58

ISBN 978-9965-31-997-6

болжаудың әдістері. // Вестник ЕНУ имени Л.Н. Гумилева. Серия естественно-технических наук. – 2012. - № 4 (89). – С. 6-14.
2. Iskakova A. The probabilistic model of distortions of radiation processes. Verlag/ publisher: LAP LAMBER Academic publishing ist ein Imprint der/ is a trademark of OmniScriptum GmbH & Co. KG Heinrich-Bocking –Str.6-8, 66121 Saarbrucken, Deutschland/ Germany, 2014. - 52 p.

THE SET OF UNBIASED ESTIMATORS FOR DISCRETE DISTRIBUTION OF SUMS OF RANDOM VARIABLES

Ospanali Yelnur
Elnur.o.a@mail.ru
Student of the second course Mechanical and Mathematical Faculty of L.N. Gumilev ENU
Scientific supervisor – Iskakova A.

Multivariate model, as a reflection of the current reality, are essential to the description of many phenomena and situations encountered in daily life. In recent years, there were developed a considerable amount of probabilistic models [1-2]. Nevertheless, there are still many unresolved problems, when possible to observe only the sum of the components, which can not be detected by observation [3-5]. To date, probabilistic models describing such situations were not considered. Extremely relevant example of application of such a model is the advertising industry, where it is necessary to link the distribution of consumer interests with appropriate advertisements in various sources. Similar problems are very common in meteorology and other fields. In this article we present statistical evaluation of the distribution of the sum of random values $L_1, \dots, L_d$, where $L_1, \dots, L_d$ are not observable and observable only their sum. Thus, the results of the proposed work can solve many of these problems.

Suppose that an urn contains balls and each ball in the urn marked some value L_α. Also assume that the number of possible L_α there is d.

Let the elements of the vector p = $(p_1, \dots, p_d)$ determine the probability of retrieving the ball boxes labeled respective values of $L_1, \dots, L_d$, and $\sum_{\alpha=1}^{d} p_\alpha = 1.$

Produces a sequence of extraction of n balls from the urn with the return, and it is not known exactly which balls were removed from the box. We only know the value of u, which represents the sum of the values of the n taken out of the urn balls. To study this situation requires the construction of a probability distribution u.

Assume that V_u is the number of possible combinations $r_{1v_u}L_1, \dots, r_{d\,v_u}L_d$, which together formed u, where $r_{1v_u}, \dots, r_{dv_u}$ determine the possible number of balls are removed, that bear the $L_1, \dots, L_d$. In other words, in [1] that is, the number of partitions V_u u on the part of $L_1, \dots, L_d$.

The probability that the random variable U takes the value u, there

$$P(U = u) = \sum_{v_u}^{V_u} n! \prod_{\alpha=1}^{d} \frac{p_\alpha^{r_{\alpha v_u}}}{r_{\alpha v_u}!}. \qquad (1)$$

Theorem. A function that is defined in (1) is a probability distribution.

Let $\mathbf{X} = (X_1, ..., X_k)$ represents a sampling volume of distribution n (1) and $\mathbf{x} = (x_1, ..., x_k)$ is the observed value of $\mathbf{X}$, where the elements x_i $(i = 1, ..., k)$ represent the sum of the values of the n balls consistently taken out of the urn with replacement. For each $i = 1, ..., k$ we define the number of partitions of V_i $\underline{x_i}$ values at $L_1, \dots, L_d$.

Vectors $\mathbf{r}_{1i} = (r_{11i}, \dots, r_{d1i}), \dots, \mathbf{r}_{Vi} = (r_{1Vi}, \dots, r_{dVi})$, defining these partitions, when $v_i = 1, ..., V_i$, are solutions of the following system of equations

$$\begin{cases} \sum_{\alpha=1}^{d} \mathbf{L}_{\alpha} r_{\alpha_{v_i}} = \mathbf{x}_i, \\ \sum_{\alpha=1}^{d} r_{\alpha_{v_i}} = n. \end{cases} \quad (2)$$

Suppose that for each $j = 1, ..., \mu$, where $\mu = \prod_{i=1}^{k} V_i$, there exists a vector $\mathbf{z}_j=(z_{1j},..., z_{dj})$, defined as $\mathbf{z}_j = \sum_{i=1}^{k} \mathbf{r}_{v_i}$, and the indices in the right and left side of the linked-to-one correspondence, which is not unique.

Lemma. a) If any element of the implementation of the sample $\mathbf{x} =(x_1, ... , x_k)$ of the distribution (1) has more than one partition on a view of the portion, the solutions $\mathbf{z}_1, \dots , \mathbf{z}_{\mu}$, based on observation, not implementations are sufficient statistics .

b) If all the elements of the implementation of the sample $\mathbf{x} =(x_1, ... , x_k)$ of the distribution (1) have no more than one partition on a view of the portion, the solution $\mathbf{z}_1$, based on observation, and is the only implementation of a complete sufficient statistic.

The following theorem, presented in the paper [6-9], to determine the set of unbiased estimates for the probability distribution of the test.

Theorem. The elements of $W(\mathbf{u}, \mathbf{z})=\{W(\mathbf{u}, \mathbf{z}_1), \dots, W(\mathbf{u}, \mathbf{z}_{\mu})\}$ is an unbiased estimate of the probability P ($\mathbf{U} = \mathbf{u}$) of the distribution (1) that for $j = 1, ..., \mu$ is defined as

$$W(\mathbf{u}, \mathbf{z}_j) = \frac{\sum_{v_u=1}^{V_u} \prod_{\alpha=1}^{d} \binom{z_{\alpha_j}}{r_{\alpha_{v_u}}}}{\binom{nk}{n}}, \quad (3)$$

where V_u is the number of partitions of u on the part of $L_1,..., L_d$; for each partition $r_{1v_u},\dots, r_{dv_u}$ determine the possible number of balls are removed, that bear the $L_1, ..., L_d$; $k \geq 1$ and $z_{\alpha j} \geq r_{\alpha v_u}$, when $\alpha = 1, ..., d$, $v_u=1, \dots, V_u$.

The analysis of the research carried out in this work allows us to formulate the following main results.

1. A new probability distribution generated by the urn scheme with balls marked with rectangular is proposed and studied in the case when only their sums are observable.

2. Many unbiased estimates for the probability distribution of the proposed model and the variance of these estimates are obtained.

References

1. Mu, T., Chen, Z., Zhang, C., & Liang, R. (2016). Optimal design and performance metric of broadband full-Stokes polarimeters with immunity to Poisson and Gaussian noise. Optics express, 24(26), 29691-29704.
2. An, J., Seok, M. G., & Park, D. (2016). Automatic on-chip backup clock changer for protecting abnormal MCU operations in unsafe clock frequency. IEICE Electronics Express, 13(24), 20160808-20160808.
3. Ayman I. Construction of the most suitable unbiased estimate distortions of radiation processes from remote sensing data //Journal of Physics: Conference Series. – IOP Publishing, 2014. – T. 490. – №. 1. – P. 012113.
4. Ayman I. Statistical Research for Probabilistic Model of Distortions of Remote Sensing //Journal of Physics: Conference Series. – IOP Publishing, 2016. – T. 738. – №. 1. – P. 012004.
5. Iskakova A. S. Determination of the most suitable unbiased estimate for a weather forecast being correc //Sibirskii Zhurnal Industrial'noi Matematiki. – 2002. – T. 5. – №. 1. – P. 79-84.