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Decision Making Based on Probability Theory in Green Energy and Digital Systems

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Abstract: This in the article digital transformation and green energy solutions supreme education in institutions role probabilities theory based on mathematician models using is evaluated. Binomial distribution, opposite phenomenon , mathematics waiting and dispersion methods based on sunny days, digital systems reliability and energy reserve optimality is modeled . Research based on technician service show, energy resources saving and security increase according to clear recommendations working is released.

Key words: probabilities theory, binomial distribution, numerical system, solar days, technical service, mathematics waiting, energy safety.

Latest in years supreme education in institutions digital transformation processes acceleration, ecological stability provide and green energy sources current to grow important strategic to the direction Especially energy resources saving, technical service efficiency increase and systems reliability in providing probabilities theory mathematician from the methods use practical importance profession is doing. This in the article Andijan state technique at the institute installed sun panels and digital monitoring systems based on probabilities binomial distribution theory, opposite phenomenon , geometric distribution, mathematics waiting and dispersion such as methods used, energy safety, malfunction probabilities and technician of service optimality analysis is done . Obtained results through high accurate decision acceptance to do, to serve deadlines planning and alternative energy strategy create opportunities seeing is released.

ISSUE 1: **Sunny days based on green energy planning (Binomial distribution).** Andijan state technique Institute (ADTI) building sun panels installed. The building all electricity energy **sunny 100% coverage on days with cloudy** skies **in days of energy only 60% is covered**, the rest part and from the network is taken (costly).

Information:

Every one of the day sunny to be probability: $p = 0.6$,

Work Week: **6 days** $(n = 6)$,

Us interested in: **exactly 4 days** sunny to be probability $k = 4$

(Binomial distribution):

$$\boldsymbol{p(k) = C_n^k \cdot p^k \cdot (1-p)^{n-k}}.$$

Here:

$P(k)$— exactly $k$probability of an event occurring,

n — total number of days (6 working days),

k — number of sunny days (4 days),

p — the probability of each day being sunny (0.6),

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C_n^k –"n grouping of $k$elements.

Solution:

$$\boldsymbol{p(4) = C_6^4 \cdot 0.6^4 \cdot (1-0.6)^{6-4} = \frac{6!}{4!\,(6-4)!} \cdot 0.1296 \cdot 0.16}$$

$$p(4) = 0.31104$$

$p(4) = 0.31104 \rightarrow$ that is, **exactly 4 days a week in the ASTI building** sunny become, completely green energy with work probability 31.1%.

This is it. means that every per week institute **approximately** 3– 4 **It gets its electricity from the sun during the day.** The rest in days and partially to the network is related. Through this model **energy storage system, backup batteries or tariff policy** optimization possible.

ISSUE 2: Digital in systems error probability analysis to do (opposite) event via. In ADTI new digital monitoring system available: input-output cameras, temperature sensors and laboratory information transmitting Wi-Fi equipment. Technical service to the conclusion according to, every day malfunction face to give probability $p = 0.01$ (i.e. 1%).

Information:

Work Week: 6 days

On the moon work day: 4 weeks 24 days in total ($n = 24$),

Malfunction face not giving probability: $q = 1 - p = 0.99$.

Us interested in : one month inside at least 1 time malfunction to be probability

$$P(kamida\ 1\ nosozlik) = 1 - (1-p)^n.$$

Solution:

$$P = 1 - 0.99^{24} \approx 1 - 0.78849 = 0.21151.$$

$P = 0.2115$ → at least once a month in a digital system malfunction to be probability ~21.15%.

So this probability is 1 time in 5 months means. So in the system every month one times at least error output probability anyway attention to be taken Technical the service automation, prevention system current to do and "faults" in advance determination "system" is probability to reduce help gives .

ISSUE 3: Digital in systems malfunctions chain prophecy to do – geometric distribution and waiting through prevention strategy working exit.

Situation:

At ADTI installed digital monitoring system (input-output cameras, laboratory sensors, Wi-Fi transmitters) daily works. Technical to conclusions according to this in the system every one on the day malfunction face to give probability $p = 0.01$It is estimated that. In this case technician service to show clear planning , probable malfunctions chain in advance to know, and **malfunctions range waiting through preventive service cycle** create important.

Geometric distribution basics: *Geometric distribution – first success (or malfunction) to until was* ***days number*** *probability represents. Here failure as " success" is taken (in the model positive event as acceptance made).*

Formula:

$$P(X = k) = (1-p)^{k-1} \cdot p.$$

This in the formula:

- X — number of days before failure,

- $p = 0.01$— probability of failure every day,
- $P(X = k)$— malfunction $\boldsymbol{k}$ −probability of occurrence on the day.

Example 1: The failure occurred on day 5. to be probability

$$P(X = 5) = (1 - 0.01)^4 \cdot 0.01 = 0.009606.$$

So, the failure occurred on the 5th day. to give probability $\sim 0.96\%$ constitutes.

Mathematician waiting (waiting) malfunction day):

$$E[X] = \frac{1}{p} = \frac{1}{0.01} = 100 \text{ day}$$

That is, on average, once every 100 days. malfunction face This technique gives service 100 - day cycle in cycles planning the necessity shows.

Dispersion and standard deviation:

$$Var(X) = \frac{1 - p}{p^2} = \frac{0.99}{0.0001} = 9900,$$

$$\sigma = \sqrt{9900} \approx 99.5.$$

So, the failure is 100 days. around, but big in deviation This ($\pm 100\,kun!$)service may occur. in prevention **deviations reduction** the necessity shows.

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