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Using Some Mixture Probability Distributions in Predicting the Amounts of Pollution by Gas Emission in Basrah Governorate

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ABSTRACT

Mixture probability distributions are among the topics that have received great attention because of their role in reaching new distributions that have characteristics that are superior to traditional probability distributions, especially since there are data that have compound distributional characteristics when examined, and mixture distributions often contribute to improving the results of estimation and prediction. Therefore, this paper dealt with the problem of increasing gases emitted by factories, especially in oil installations, which is one of the main causes of environmental pollution, which negatively affects the health of citizens and the increase in diseases resulting from air pollution, including cancer. Therefore, the aim of preparing this paper was to predict the amounts of gases emitted by oil installations in Basrah Governorate, as the gas emissions data were modeled using mixed probability distribution models. These probability models were applied based on real data representing the gas emissions emitted by oil companies operating in Basrah Governorate for the period (Jan2010-Nov2020). Three probability distribution mixture were adopted, namely (Gamma-Gamma, Normal-Normal, Gamma-Lognormal). The comparison was made between them using the Kolmogorov-Smirnov goodness of fit test and the Criteria represented by (AIC, BIC, AIC_C), where the results determined the preference of the distribution model (N-N), after which the predictions of gas emissions associated with oil operations were found to be expected to increase in a short time.

1. Introduction

Probability distribution models have received wide attention in recent years because of their significant and prominent role in solving many problems, especially problems related to natural phenomena, as probability distributions have begun to take various forms that differ in their composition from traditional probability models, as the complexity and overlap facing data with the realization of the non-linear situation has made traditional distributional models useless in estimation processes as well as predicting the behaviour of the phenomenon. Therefore, there have been significant contributions to the development of probability distributions as a scalable environment through the adoption of the statistical and mathematical method in determining the appropriate form of distribution that results from mixturing and composition processes. This type of distribution has been called mixture distributions. In this type, new distributions appear that differ in their quality as well as the number of features. This contributes to improving the work of distributions while improving estimation and prediction processes. Therefore, there have been many contributions in this field. Many important problems have been discussed. In this paper, various distributions of mixture distribution have been presented for the purpose of comparing them and determining the best in addressing the phenomenon of gas emissions. Resulting from oil operations, where the province of Basrah is exposed to the risks of pollution continuously

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as a result of gas emissions emitted by oil operations, so the research problem lies in how to determine the appropriate distributions to predict this phenomenon through the adoption of a number of mixing and compound distributions. The importance of the study is also highlighted in how to determine the appropriate distribution of the phenomenon of gaseous springs. Under the above, some reference citations were presented that addressed or contributed to the development of models of probabilistic distributions, including: In (2019) Ogunwale and others proposed a new probabilistic distribution called Exponential-Gamma distribution with two parameters and its distributional characteristics were verified (D., A., & M., 2019).In (2020), AL-Moisheer and others were able to build a mixed bivariate reverse Weibull distribution assuming that the priority distribution parameters have a Bernoulli distribution (AL-Moisheer, Alotaibi, Alomani, & Rezk, 2020). In (2020), Afuecheta et al. proposed six complex probability distributions, namely half normal, Fréchet, Lomax, Burr III, inverse gamma and generalized gamma, where the probability density function was determined for each distribution while finding its probability characteristics and then combining these distributions with GARCH models and then adopting the simulation method in verifying the accuracy of the distributions (Afuecheta, Semeyutin, Chan, Nadaraja, & Pérez Ruiz, 2020). In (2020), Wei and others proposed multimodal distributions as a new category of probability distributions with great flexibility, as they outperformed the normal oblique alpha distributions and the natural oblique alpha beta distribution by studying the characteristics of the distribution and conducting the simulation. The results showed that the increase in the sample size makes the average value of the maximum probability estimators tend to the real value (Wei, Peng, & Zhou, 2020). In (2021), Al-Moisheer and others discussed a mixture of two distributions of Lindley mono-teacher theoretically and practically. All statistical characteristics of the mixing model were studied and the performance of the results evaluated through the study of simulation and the application of real data (Al-Moisheer, Daghestani, & Sultan, 2021). In (2022), Yakubu and others proposed a combination of probability distributions to analyse survival data by adopting two types of distributions, namely the Gamma-Gamma distribution and the Loglogistic-Gamma distribution, where the results of the two distributions showed that they are more consistent, stable and appropriate when estimating (Yakubu, Mohammed, & Imam, 2022). In (2022), Jana and Bera were able to estimate the parameters of the two-parameter inverse Whipple distributions, as the results showed the existence and uniqueness of the parameters of the scale and shape by adopting the Mle method(Jana & Bera, 2022). In (2023) Al-Omari and Dobbah proposed the distribution of gamma-Shanker resulting from the mixing of the two-dimensional gamma distribution and the one-parameter Shanker with the derivation of all statistical and mathematical characteristics important for the distribution and then applied to two real data sets represented by the tensile strength of the polyester fibres and the time of failure to explore the potential of the proposed model compared to some alternative models (Al-Omari & Dobbah, 2023). In (2023), Shanker recommended the Shanker distribution, which is an important distribution, which is a single-parameter age distribution with an increasing risk rate function, the theoretical and practical effects of a combination of two components of the Shanker model (2-CMSM). An important feature of the hazard rate function in the proposed model is that it has upward and downward-turned bathtub shapes (Abushal, Sindhu , Lone, Hassan, & Shafiq , 2023).

Through the contributions presented, we can put the contribution of this paper through the adoption of a number of complex distributions that are consistent with the quality of the data and examine their distributional characteristics with the best data in the estimation and prediction processes. In addition, this paper contributed to the study of one of the environmental problems that directly affect all forms of life

2. Methodology

Probability distributions are a powerful statistical tool in the field of analysis and prediction in many phenomena, especially in the construction and modelling of the behaviour of environmental phenomena, including pollution resulting from gas emissions from oil installations. Today, we note the complexity in the behaviour of phenomena as a result of the high oscillation in their data, which in turn led to the modelling of these phenomena based on single and traditional probability distributions. This led many researchers to rely on compound distributions and the mixture generated from traditional distributions in modelling these phenomena because of their high flexibility in simulating the behaviour of phenomena. It should also be noted that mixed distributions have many applications, especially in heterogeneous data, including environmental data (Yakubu, Mohammed, & Imam, 2022) (R. & T., 2017).

2.1 Mixture Model

Let $x_1, x_2, \dots, x_n$ be a sample of independent random variables and x_i represent the survival time of the observed i, and assuming the probability density $f(x_i)$ function of x_i, then the mixture probability density function is defined by the equation(1), (Yakubu, Mohammed, & Imam, 2022):

$$f(t) = \sum_{i=1}^{n} \pi_i f_i(t;\theta) \qquad (1)$$

The $f_i(t;\theta)$ mixed probability density functions, the θ parameters of those mixed probability functions, the π_i ratios (weights) of mixing the probability density functions in which the $\sum_{i=1}^{n} \pi_i = 1$

As for the mixed cumulative distribution and survival functions, they are mathematically defined by the following two equations:

$$F(t) = \sum_{i=1}^{n} \pi_i F_i(t;\theta) \qquad (2)$$

$$S(t) = \sum_{i=1}^{n} \pi_i S_i(t;\theta)$$

2.2 Mixture Gamma-Gamma Distribution

The Gamma distribution is one of the well-known probability distributions in the study of life times, and the continuous random variable follows the two-parameter Gama distribution (α, β) if it has a probability density function and a cumulative distribution function defined by the equations (3), (Ekhosuehı, Nzeı , & Opone, 2020).

$$f(x;\alpha,\beta) = \frac{\beta^{\alpha}}{\Gamma\alpha} x^{\alpha-1} e^{-\beta x}\,; x > 0;\ \alpha,\beta > 0$$

$$F(x,\alpha,\beta) = \frac{\Gamma(\alpha, \beta x)}{\Gamma\beta}\,; x > 0;\ \alpha,\beta > 0 \qquad (3)$$

The α shape parameter, the β scale parameter, $\Gamma\alpha$ is the Gamma function, which is defined as follows:

$$\Gamma z = \int_0^{\infty} t^{z-1}\, dt$$

$\Gamma(z,x) = \int_0^{x} t^{z-1}\, dt$ the lower gamma function; $\gamma(z,x) = \int_x^{\infty} t^{z-1}\, dt$ the upper gamma function whose sum is equal to the gamma function:

$$\Gamma z = \Gamma(z,x) + \gamma(z,x) = (z-1)!$$

Assuming $f_1(x), f_2(x)$ the probability density functions and the cumulative distribution $F_1(x), F_2(x)$ functions and the survival function of the Gamma distribution of random variable X respectively, then the probability density function of the Gamma-Gamma mixture distribution with the equation (4) is defined.

$$f_{gmgm}(x) = \pi\, f_{gm}(x;\ \alpha_1, \beta_1) + (1 - \pi) f_{gm}(x;\ \alpha_2, \beta_2) \qquad (4)$$

$$F_{gmgm}(x) = \pi\, F_{gm}(x;\ \alpha_1, \beta_1) + (1 - \pi) F_{gm}(x;\ \alpha_2, \beta_2) \qquad (5)$$

$$S_{gmgm}(x) = \pi\, S_{gm}(x;\ \alpha_1, \beta_1) + (1 - \pi) S_{gm}(x;\ \alpha_2, \beta_2) \qquad (6)$$

Where $\alpha_1, \beta_1, \alpha_2, \beta_2$ the shape and scale parameters of the gamma distributions of the random variable are, respectively.

2.3 Mixture Normal-Normal Distribution

The normal distribution is one of the continuous probability distributions, and it is characterized by being the most important probability distributions in statistics and probabilities because most phenomena in working life behave as normal distribution, and the random variable is a normal distribution if it has two probability density functions defined by the equation (7) (Pishro-Nik, 2014).

$$f(x;\mu,\sigma^2)=\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{(x-\mu)^2}{2\sigma^2}} \quad (7)$$

$$-\infty < x < \infty, -\infty < \mu < \infty, \sigma^2 > 0$$

The location μ parameter and the scale σ^2parameter.

Assuming $f_1(x), f_2(x)$ the probability density functions of the normal distribution of random variable X respectively, then the probability density function of the normal distribution mixed with the equation (8) is defined.

$$f_{NorNor}(x)=\pi\, f(x;\ \mu_1,\sigma_1^2)+(1-\pi)f(x;\ \mu_2,\sigma_2^2) \qquad (8)$$

Where $0 < \pi < 1$ $\mu_1,\sigma_1^2,\mu_2,\sigma_2^2$ the shape and scale parameters of the gamma distributions of the random variable are, respectively

2.4 Mixture Gamma-Log Normal Distribution

Let $f_1(x), f_2(x)$ the probability density functions of the Log-Normal distribution and the Gamma distribution of the random variable X respectively, then the probability density function of the Log-Normal distribution is known as Gamma- Log-Normal mixture with the equation (9) (Torrent, 1978).

$$f_{gamlogNor}(x)=\pi\, f(x;\ \alpha,\beta)+(1-\pi)f(x;\ \mu,\sigma^2) \qquad (9)$$

The $f(x;\ \alpha,\beta)$ Gamma distribution function, as defined by the equation (3) with the two parametersα,β, $f(x;\ \mu,\sigma^2)$ is the Log-Normal distribution function and the mathematically defined by the equation (10) below, with the two parametersμ: Location parameter and σ^2: scale parameter.

$$f(x;\mu,\sigma^2)=\frac{1}{x\sqrt{2\pi\sigma^2}}e^{-\frac{(\ln x-\mu)^2}{2\sigma^2}}\ ; x > 0, -\infty < \mu < \infty, \sigma^2 > 0 \quad (10)$$

3. Practical Aspect and discussion

Probability distributions are one of the basic statistical methods in the process of predicting many life phenomena, to reach appropriate statistical mathematical models to diagnose, estimate, analyze and interpret these phenomena based on the accurate indicators and estimates reached, which are the basis for developing possible treatments in the future.

Today, pollution is one of the threats to the environment, which has serious repercussions on human, animal and plant life. In the applied aspect, the paper focused on studying the trends of pollution by gas emission issued by oil companies operating in the oil sector field of Basrah Governorate for the period (Jan2010-Nov2020), relying on three mixture distributions (normal - normal, Gamma - Gamma, Gamma-Log normal) and estimating the parameters of those distributions using the maximum likelihood method (MLE) and finding the Kolmogorov-Smirnov (K-S) test and the criteria of the goodness of fit (AIC, BIC, AIC_C) to determine the suitability of data to these distributions and to compare them, and the table (1) shows the estimates of the parameters of the distributions.

Table (1): Mixture Distribution Parameter Estimates (Normal - Normal, Gamma-Gamma, Gamma-Log Normal)

Dist.	P	μ_1	σ_1^2	μ_2	σ_2^2
N-N	0.263	72.955	.783	.556	263
Dist.	P	α_1	β_1	α_2	β_2
G-G	0.286	.652	.002	766.	020
Dist.	P	α	β	μ	σ^2
G-L	0.291	549	386	470	252.

Table (2): Descriptive Statistics of the Study Sample

Mean	429
Variance	96574.8
Skewness	0.460603
Kurtosis	2.27596
Median	385
Standard Deviation	.765

Table (2) also shows the K-S test and the criteria for goodness of fit to the mixture distributions, as it is clear from the results of the K-S test that all three distributions are suitable for modelling gaseous emissions data because the level of significance of the test (p-value) is greater than (0.05), while the criteria for goodness of fit showed the preference of the (normal-normal) distribution over the two distributions (Gamma-Gamma, Gamma-Log normal) in representing the data because it has the lowest standards, and the figure (1) enhances this

Table (3): K-S Test and goodness of fit

Dist.	K-S		AIC	AICc	BIC
	Statistic	P- value			
N-N	0.047762	0.909831	1818	1818	1827
G-G	0.041828	0.907604	1820	1820	1828
G-L	0.050157	0.877289	1824	1818	1832.

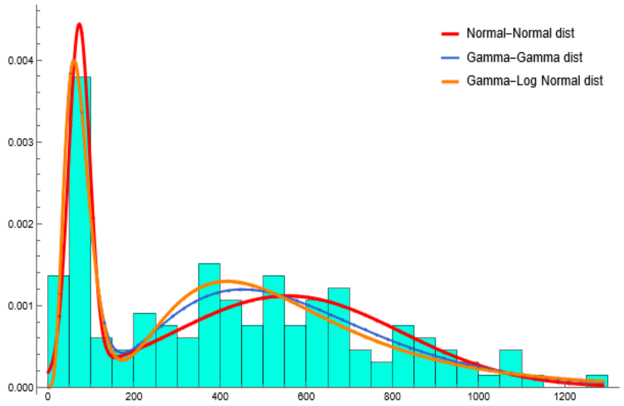

Figure (1): Histogram and Probability Density Functions Curves of the Three Gaseous Emission Distributions

Now, after completing the estimation of the three distributions using the gas emissions data and testing their suitability and trade-off between them, we are working to predict the expected probability of the occurrence of gas emissions, over a period of time t measured in months, based on the mixture (N - N) distribution because it is the best distribution, and according to the following equation ():

$$Prob = 1 - [1 - F(x)]^t \qquad (11)$$

The probability of the occurrence of gaseous emissions, F(x) the cumulative distribution function of the mixture (N -N) distribution, x the gaseous emissions.
Accordingly, the expected probability of occurrence of gaseous emissions for the time period (t) that takes the values (2, 4, 6, 8, 10, 12, 24, 48, 96 and 120) months was found.

Table (4): Expected probability of gas emission for a period of time (t) months

x \ t	2	4	6	8	10	12	24	48	96	120
19.29	0.04	0.07	0.11	0.14	0.18	0.21	0.37	0.60	0.84	0.98
21.93	0.04	0.08	0.12	0.15	0.19	0.22	0.39	0.63	0.87	0.98
26.71	0.05	0.09	0.14	0.18	0.22	0.26	0.45	0.69	0.91	0.99
32.92	0.06	0.12	0.17	0.22	0.27	0.32	0.53	0.78	0.95	1.00
34.33	0.06	0.13	0.18	0.24	0.29	0.33	0.55	0.80	0.96	1.00
40.45	0.08	0.16	0.23	0.30	0.36	0.41	0.65	0.88	0.99	1.00
41.9	0.09	0.17	0.25	0.31	0.38	0.43	0.68	0.90	0.99	1.00
48.73	0.12	0.23	0.32	0.41	0.48	0.54	0.79	0.96	1.00	1.00

49.95	0.13	0.24	0.34	0.42	0.50	0.56	0.81	0.96	1.00	1.00
50.14	0.13	0.24	0.34	0.43	0.50	0.56	0.81	0.96	1.00	1.00
57.03	0.17	0.31	0.43	0.53	0.61	0.68	0.89	0.99	1.00	1.00
64.42	0.22	0.40	0.53	0.64	0.72	0.78	0.95	1.00	1.00	1.00
65.4	0.23	0.41	0.54	0.65	0.73	0.79	0.96	1.00	1.00	1.00
66.24	0.24	0.42	0.56	0.66	0.74	0.80	0.96	1.00	1.00	1.00
70.22	0.27	0.46	0.61	0.71	0.79	0.84	0.98	1.00	1.00	1.00
71.64	0.28	0.48	0.62	0.73	0.80	0.86	0.98	1.00	1.00	1.00
74.33	0.30	0.51	0.65	0.76	0.83	0.88	0.99	1.00	1.00	1.00
74.7	0.30	0.51	0.66	0.76	0.83	0.88	0.99	1.00	1.00	1.00
74.77	0.30	0.51	0.66	0.76	0.83	0.88	0.99	1.00	1.00	1.00
75.28	0.30	0.52	0.66	0.77	0.84	0.89	0.99	1.00	1.00	1.00
77.56	0.32	0.54	0.69	0.79	0.86	0.90	0.99	1.00	1.00	1.00
79.26	0.33	0.56	0.70	0.80	0.87	0.91	0.99	1.00	1.00	1.00
84.47	0.37	0.60	0.75	0.84	0.90	0.94	1.00	1.00	1.00	1.00
86.24	0.38	0.61	0.76	0.85	0.91	0.94	1.00	1.00	1.00	1.00
88.41	0.39	0.63	0.78	0.86	0.92	0.95	1.00	1.00	1.00	1.00
88.42	0.39	0.63	0.78	0.86	0.92	0.95	1.00	1.00	1.00	1.00
92.41	0.41	0.66	0.80	0.88	0.93	0.96	1.00	1.00	1.00	1.00
94.87	0.43	0.67	0.81	0.89	0.94	0.96	1.00	1.00	1.00	1.00
94.91	0.43	0.67	0.81	0.89	0.94	0.96	1.00	1.00	1.00	1.00
95.33	0.43	0.67	0.81	0.89	0.94	0.97	1.00	1.00	1.00	1.00
96.97	0.44	0.68	0.82	0.90	0.94	0.97	1.00	1.00	1.00	1.00
97.36	0.44	0.68	0.82	0.90	0.94	0.97	1.00	1.00	1.00	1.00
97.54	0.44	0.68	0.82	0.90	0.94	0.97	1.00	1.00	1.00	1.00
98.06	0.44	0.69	0.82	0.90	0.95	0.97	1.00	1.00	1.00	1.00
100.46	0.45	0.70	0.83	0.91	0.95	0.97	1.00	1.00	1.00	1.00
102.86	0.46	0.71	0.84	0.91	0.95	0.97	1.00	1.00	1.00	1.00
107.29	0.47	0.72	0.85	0.92	0.96	0.98	1.00	1.00	1.00	1.00
120.13	0.50	0.75	0.87	0.94	0.97	0.98	1.00	1.00	1.00	1.00
187.08	0.54	0.79	0.90	0.96	0.98	0.99	1.00	1.00	1.00	1.00
189.34	0.54	0.79	0.90	0.96	0.98	0.99	1.00	1.00	1.00	1.00

194.63	0.54	0.79	0.91	0.96	0.98	0.99	1.00	1.00	1.00	1.00
206.78	0.55	0.80	0.91	0.96	0.98	0.99	1.00	1.00	1.00	1.00
207.26	0.55	0.80	0.91	0.96	0.98	0.99	1.00	1.00	1.00	1.00
215.47	0.56	0.80	0.91	0.96	0.98	0.99	1.00	1.00	1.00	1.00
218.93	0.56	0.81	0.91	0.96	0.98	0.99	1.00	1.00	1.00	1.00
231.65	0.57	0.81	0.92	0.97	0.98	0.99	1.00	1.00	1.00	1.00
249.27	0.58	0.82	0.93	0.97	0.99	0.99	1.00	1.00	1.00	1.00
254.6	0.58	0.83	0.93	0.97	0.99	0.99	1.00	1.00	1.00	1.00
265.25	0.59	0.83	0.93	0.97	0.99	1.00	1.00	1.00	1.00	1.00
273.9	0.60	0.84	0.94	0.97	0.99	1.00	1.00	1.00	1.00	1.00
285.6	0.61	0.85	0.94	0.98	0.99	1.00	1.00	1.00	1.00	1.00
293.06	0.61	0.85	0.94	0.98	0.99	1.00	1.00	1.00	1.00	1.00
318.18	0.64	0.87	0.95	0.98	0.99	1.00	1.00	1.00	1.00	1.00
318.3	0.64	0.87	0.95	0.98	0.99	1.00	1.00	1.00	1.00	1.00
320.97	0.64	0.87	0.95	0.98	0.99	1.00	1.00	1.00	1.00	1.00
328.4	0.65	0.87	0.96	0.98	0.99	1.00	1.00	1.00	1.00	1.00
351.29	0.67	0.89	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00
354.64	0.67	0.89	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00
361.43	0.68	0.90	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
364.3	0.68	0.90	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
376.97	0.69	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
379.15	0.69	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
380.1	0.70	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
383.19	0.70	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
385.04	0.70	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
385.44	0.70	0.91	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00
412.94	0.73	0.93	0.98	0.99	1.00	1.00	1.00	1.00	1.00	1.00
421.28	0.74	0.93	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
423.1	0.74	0.93	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
432.2	0.75	0.94	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
435.73	0.75	0.94	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
445.95	0.76	0.94	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00

448.64	0.76	0.94	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
472.57	0.79	0.95	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
473.28	0.79	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
479.83	0.79	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
481.2	0.80	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
486.17	0.80	0.96	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
506.99	0.82	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
513.1	0.83	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
516.26	0.83	0.97	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
518.89	0.83	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
518.98	0.83	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
526.83	0.84	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
531.33	0.84	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
532.04	0.84	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
547.48	0.86	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
564.3	0.87	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
585.26	0.89	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
587.15	0.89	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
595.76	0.89	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
599.1	0.90	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
612.81	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
613.86	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
620.6	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
621.58	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
622.98	0.91	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
635.5	0.92	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
648.54	0.93	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
658.8	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
668.36	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
676.18	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
680.22	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
681.73	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

691.66	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
692.01	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
694.21	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
705.21	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
724.88	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
741.4	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
775.54	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
793.06	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
832.22	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
841.68	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
843.64	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
847.94	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
849.1	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
857.26	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
861.22	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
884.13	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
889.53	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
913.32	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
934.81	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
949.34	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
953.56	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
972.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1012.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1054.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1073.38	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1082.69	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1110.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1289.18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

It is clear from the table (4) that the expected probability of the occurrence of gaseous emissions increases with the increase in the amount of emissions in a short period of time, as we find that the probability of the occurrence of the amount of gaseous emissions (19.29) is equal to (0.98) at (120) months, while the probability of the quantities of gaseous emissions (913.32) and more is equal to (1) at the second month, and this indicates the danger of exacerbating the quantities of gaseous emissions generated by oil operations

4. Conclusions

From the above, we conclude that the best distribution was the mixture normal distribution (N-N) because it achieved the best results according to the criteria of goodness of fit and the Kolmogrov Smirnov test. The paper was also able to predict the expected probability of gas emissions during time periods (t). The results showed that the expected probability of gas emissions increases by increasing the amount of emissions in a short period.

Therefore, we recommend the concerned authorities the need to address the problem of gas emissions and reduce their dangerous environmental effects. We recommend finding new compound or mixture probability distributions in addressing environmental phenomena.

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