Neutrosophic Sets and Systems

Volume 39 Article 8

1-4-2021

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*Neutrosophic Sets and Systems, Vol.* 39, 2021
*University of New Mexico*

# Neutrosophic Statistical Analysis of Income of YouTube Channels

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**Abstract:** The YouTube website is famous among all ages of people due to the verity of purposes. YouTube is also a good platform for earning; therefore, numbers of channels are operating through this website. The income of each channel is directly proportional to the number of views, likes, and subscribers. In this paper, three famous channels including Ducky Bahi TV, Hasi TV and Haqeeqat TV are chosen and their income is recorded. The analysis of these channels using neutrosophic statistics is given. From the analysis, it is concluded that on the average Haqeeqat TV is better in earning. On the other hand, Hasi TV is more consistent in earning as compared to other channels.

**Keywords:** Social media; YouTube; indeterminacy; income; statistics

## 1. Introduction

There is no life without the internet nowadays. The YouTube channel is very famous among children, young men, and even old men. This channel is a big source of knowledge and income. The different channels on YouTube provide information on political, games, and current affairs. This YouTube gives the opportunity to channels to earn money is based on the number of views, subscribers, and likes. The channel gets more income as the number of subscribers is increased. In nutshell, the income of the YouTube channel is directly proposal to the number of subscribers. This website is the 3rd position among the web sites of the world. Due to the attractive packages of YouTube, the people are launching their channels to entertain the audience. Due to the popularity of YouTube channels, several researchers studied different aspects of YouTube. Reference [1] presented a study on the influence of YouTube on the big cities. Reference [2] worked on the effect of YouTube on academic performance. Reference [3] studied its contents published in different journals. Reference [4] discussed the limitations of the channel. References [1] and [5] presented a statistical analysis for views and uploads of this website. [4] presented the statistical analysis of educational videos. Reference [6] presented the

analysis of childhood behavior. Reference [7] studied the effect of advertisements on the purchases. The existing literature assumes that the observations in the data obtained from YouTube should be determined, exact, and precise. In practice, the social media data is not always determined but in intervals. For example, the estimated income of each YouTube channel is in interval rather than the exact number. In such cases, the analysis is done using the fuzzy-based approach. References [8] and [9] presented the analysis techniques for the fuzzy data. References [10], [11] and [12] developed the statistical test for fuzzy data. More details about the fuzzy-based analysis can be seen in [13], [14] and [15].

[16] introduced the neutrosophic logic to deals with the measure of intermediacy. The neutrosophic logic is more efficient than the fuzzy logic, see [17]. The various applications of this logic can be viewed in [18], [19], [20], [21] and [22]. To deal with the neutrosophic data or data in the interval [23] introduced the neutrosophic statistics (NS). The NS is more efficient than classical statistics (CS). References [24] and [25] presented the methods to analyze the neutrosophic data. [26] and [27] proposed a test using NS.

According to [23], [28] and [29] (Smarandache 2014, 2016-2019), "while the Classical Statistics deals with *determinate data* and *determinate inference methods* only, Neutrosophic Statistics deals with *indeterminate data* and *indeterminate inference methods*, i.e. data that has any kind of indeterminacy (unclear, vague, partially unknown, contradictory, incomplete, etc.), and inference methods that degrees of indeterminacy as well (for example, instead of crisp arguments and values for the probability distributions, algorithms, functions etc. one may have inexact or ambiguous arguments and values). Neutrosophic Statistics was founded by Smarandache in 1998 and developed in 2014. The Neutrosophic Statistics is also a generalization of Interval Statistics, because of, among others, while Interval Statistics is based on Interval Analysis, Neutrosophic Statistics is based on Set Analysis (meaning all kind of sets, not only intervals). Neutrosophic Statistics is more elastic than Classical Statistics. If all data and inference methods are determinate, then Neutrosophic Statistics coincides with Classical Statistics. But, since in our world we have more indeterminate data than determinate data, therefore more neutrosophic statistical procedures are needed than classical ones."

The NS provides information about the measure of indeterminacy when the data is obtained under uncertainty. By exploring the literature, the NS was not applied to analyze the income of YouTube channels. In this paper, we will select three famous YouTube channels including Ducky Bahi TV, Hasi TV, and Haqeeqat TV. We will record the income of these channels and present the analysis using the idea of NS. From the analysis, it can be expected that the proposed NS analysis will be more informative than the analysis based CS.

## 2. Method

Suppose that $X_N = X_L + X_U I_N; I_N \epsilon [I_L, I_U]$ be a neutrosophic random variable which represents the income of YouTube channels, where $X_L$ is the lower-income and $X_U I_N$ is the upper-income level and $I_N \epsilon [I_L, I_U]$ be the indeterminacy interval. By following [24], the neutrosophic average $\bar{X}_N \epsilon [\bar{X}_L, \bar{X}_U]$ income can be calculated as

$$\bar{X}_N = \bar{X}_L + \bar{X}_U I_N;\ I_N \epsilon [I_L, I_U] \quad (1)$$

where $\bar{X}_L = \frac{1}{n_N}\sum_{i=1}^{n_N} X_{iL}$, $\bar{X}_U = \frac{1}{n_N}\sum_{i=1}^{n_N} X_{iU}$ and $n_N \epsilon [n_L, n_U]$ be a neutrosophic random sample. The neutrosophic sum of square (NSS) can be computed as follows

$$\sum_{i=1}^{n_N}(X_i - \bar{X}_{iN})^2 = \sum_{i=1}^{n_N}\begin{bmatrix} \min\begin{pmatrix}(a_i + b_i I_L)(\bar{a} + \bar{b} I_L), (a_i + b_i I_L)(\bar{a} + \bar{b} I_U) \\ (a_i + b_i I_U)(\bar{a} + \bar{b} I_L), (a_i + b_i I_U)(\bar{a} + \bar{b} I_U)\end{pmatrix} \\ \max\begin{pmatrix}(a_i + b_i I_L)(\bar{a} + \bar{b} I_L), (a_i + b_i I_L)(\bar{a} + \bar{b} I_U) \\ (a_i + b_i I_U)(\bar{a} + \bar{b} I_L), (a_i + b_i I_U)(\bar{a} + \bar{b} I_U)\end{pmatrix}\end{bmatrix}, I \epsilon [I_L, I_U] \quad (2)$$

where $a_i = X_L$ and $b_i = X_U$. The neutrosophic sample variance can be computed by

$$S_N^2 = \frac{\sum_{i=1}^{n_N}(X_i - \bar{X}_{iN})^2}{n_N}; S_N^2 \epsilon [S_L^2, S_U^2] \quad (3)$$

The neutrosophic coefficient of variation (NCV) measures the consistency of the YouTube channels. The smaller value of NCV means, the performance of the YouTube channel is more consistent than the other channels. The NCV can be computed by

$$CV_N = \frac{\sqrt{S_N^2}}{\bar{X}_N} \times 100;\ CV_N \epsilon [CV_L, CV_U] \quad (4)$$

## 3. Data Collection

As we know, thousands of channels are operating through YouTube websites that can be selected to study various aspects. Here, we will select only the three famous channels including Ducky Bahi TV, Hasi TV, and Haqeeqat TV. The available latest data about the estimated income of two weeks is selected to discuss the analysis under Neutrosophy. The same approach can be applied for any number of days and channels. It can be noted that the estimated income of these channels has the lower limit and upper limit. The income data is expressed in intervals rather than the exact income value. For example, on the date 29-6-2020, the estimated income for Haqeeqat TV is 25$ to 406$. The income data of these channels are shown in Table 1.

Table 1: The income of three channels

| Date | Ducky Bahi TV | Hasi TV | Haqeeqat TV |
|---|---|---|---|
| 2020-06-16 | [102,1600] | [28,452]] | [348,5600] |
| 2020-06-17 | [86,1400] | [32,505] | [407,6500] |
| 2020-06-18 | [83,1300] | [30,477] | [414,6600] |
| 2020-06-19 | [75,1200] | [25,392] | [419,6700] |
| 2020-06-20 | [65,1000] | [35,567] | [395,6300]` |
| 2020-06-21 | [63,1000] | [36,571] | [367,5900] |
| 2020-06-22 | [66,1100] | [43,692] | [362,5800] |
| 2020-06-23 | [61,972] | [46,730] | [357,5700] |
| 2020-06-24 | [57,917] | [48,774 | [337,5400] |
| 2020-06-25 | [56,893] | [41,661] | [347,5600] |
| 2020-06-26 | [58,928] | [40,643] | [386,6200] |
| 2020-06-27 | [57,905] | [43,685,] | [380,6100] |
| 2020-06-28 | [209,3300] | [44,705] | [371,5900] |

| | | | |
|---|---|---|---|
| 2020-06-29 | [140,2200] | [35,566] | [25,406] |

We note that the estimated income of the channel is expressed in the interval. For the interval data, the application of classical statistics is not suitable and informative. The use of classical statistics does not give us information about the measure of indeterminacy associated with these income intervals. Therefore, according to the nature of the income data of these channels, the analysis under neutrosophic statistics can be effective, suitable, and informative.

## 4. Neutrosophic Statistical Analysis

In this section, the application of neutrosophic statistics is given using the income data of three channels is given in Table 1. To see that which channel is better on the average in income, the values of neutrosophic averages $\bar{X}_N \epsilon [\bar{X}_L, \bar{X}_U]$ are computed and presented in Table 2. To study the variation in income, the values of neutrosophic standard deviation $S_N \epsilon [S_L, S_U]$ are also presented in Table 2. To see which channel is more consistent, the values of $CV_N \epsilon [CV_L, CV_U]$ are computed and given in Table 2.

Table 2: Neutrosophic Descriptive Statistics

| TV Channels | $\bar{X}_N$ | $S_N$ | $CV_N$ |
|---|---|---|---|
| Ducky Bahi TV | [84.14, 1336.78] | [41.18,686.77] | [48.94,51.38] |
| Hasi Tv | [37.57,601.42] | [6.82,117.60] | [18.15,19.55] |
| Haqeeqat TV | [351.07,5621.85] | [93.74,27022.69] | [26.70,480.67] |

From Table 2, it can be observed that Haqeeqat TV has higher values of income as compared to Hasi TV and Ducky Bahi TV. It means, Haqeeqat TV is better on average than the other channels. On the other hand, the value of $CV_N$ for Hasi TV is lower than the other channels. It means, Hasi TV performance in income-earning is consistent than the other channels. From this study, it can be concluded that although Haqeeqat TV is better on the average Hasi TV is more consistent than the other channels.

## 5. Comparative Study

To show that the neutrosophic statistical the analysis is more informative than classical statistics, the neutrosophic form and associated measure of indeterminacy for $\bar{X}_N \epsilon [\bar{X}_L, \bar{X}_U]$, $S_N \epsilon [S_L, S_U]$ and $CV_N \epsilon [CV_L, CV_U]$ are given in Table 3. For example, the neutrosophic form of $CV_N \epsilon [CV_L, CV_U]$ for Hasi TV is:

$CV_N = 18.15 + 19.55 I_N; I_N \epsilon [0, 0.07]$. The first value of this neutrosophic form presents the analysis from the classical statistics. The neutrosophic result reduces to classical statistics results when $I_N = 0$. The second part of the neutrosophic form presents the upper value of neutrosophic interval. From this neutrosophic form, it can be seen that the values of $CV_N$ is from 18.15% to 19.55% with the measure of intermediacy 0.07. From Table 3, it can be seen that measure of indeterminacy is smaller for Hasi TV. It means that the smaller the value $CV_N$ has smaller the value of the measure of indeterminacy.

Table 3: Neutrosophic forms with measure of indeterminacy

| TV Channels | $\bar{X}_N$ | $S_N$ | $CV_N$ |
|---|---|---|---|
| Ducky Bahi TV | $84.14 + 1336.78I_N; I_N\epsilon[0,0.94]$ | $41.18 + 686.77I_N; I_N\epsilon[0,0.94]$ | $48.94 + 51.38I_N; I_N\epsilon[0,0.08]$ |
| Hasi TV | $37.57 + 601.42I_N; I_N\epsilon[0,0.94]$ | $6.82 + 117.60I_N; I_N\epsilon[0,0.94]$ | $18.15 + 19.55I_N; I_N\epsilon[0,0.07]$ |
| Haqeeqat TV | $351.07 + 5621.85I_N; I_N\epsilon[0,0.94]$ | $93.74 + 27022.69I_N; I_N\epsilon[0,0.99]$ | $26.7 + 480.67I_N; I_N\epsilon[0,0.94]$ |

## 6. Concluding Remarks

The YouTube website was famous among all ages of people due to a verity of purposes. YouTube is also a good platform for earning; therefore, numbers of channels were operating through this website. The income of each channel was directly proportional to the number of views, likes, and subscribers. In this paper, three famous channels including Ducky Bahi TV, Hasi TV, and Haqeeqat TV were chosen and their income was recorded. The analysis of these channels using neutrosophic statistics was given. From the analysis, it was concluded that on the average Haqeeqat TV is better in earning. On the other hand, Hasi TV was more consistent in earning as compared to other channels. From the neutrosophic statistical analysis, it can be concluded that a channel having the smaller value of CV has a smaller value of the measure of indeterminacy. Using the same neutrosophic analysis, various aspects of channels can be studied as future research.

**Acknowledgements:** The authors are deeply thankful to the editor and reviewers for their valuable suggestions to improve the quality of the paper.

## References

1. Cheng, X., C. Dale, and J. Liu. *Statistics and social network of youtube videos*. in *2008 16th Interntional Workshop on Quality of Service*. 2008. IEEE.
2. Duverger, P. and E.M. Steffes, *Using YouTube Videos as a Primer to Affect Academic Content Retention.* Metropolitan Universities, 2012. **23**(2): p. 51-66.
3. Kunjambu, K. and P. Muniandy, *A content analysis in the studies of YouTube in selected journals.* Procedia-Social and Behavioral Sciences, 2013. **103**: p. 10-18.
4. Saurabh, S. and S. Gautam, *Modelling and statistical analysis of YouTube's educational videos: A channel Owner's perspective.* Computers & Education, 2019. **128**: p. 145-158.
5. Bärtl, M., *YouTube channels, uploads and views: A statistical analysis of the past 10 years.* Convergence, 2018. **24**(1): p. 16-32.
6. Dewi, S.K., S.M. Deliana, and H. Haryadi, *Impact of Youtube Kids Impressions on Early Childhood Prosocial Behavior*. Journal of Primary Education, 2019. **8**(3): p. 315-322.
7. Firat, D., *YouTube advertising value and its effects on purchase intention.* Journal of Global Business Insights, 2019. **4**(2): p. 141-155.
8. Grzegorzewski, P., *Testing statistical hypotheses with vague data.* fuzzy sets and systems, 2000. **112**(3): p. 501-510.
9. Jamkhaneh, E.B. and A.N. Ghara. *Testing statistical hypotheses for compare means with vague data*. in *International Mathematical Forum*. 2010. Citeseer.

10. Wu, H.-C., *Analysis of variance for fuzzy data.* International Journal of Systems Science, 2007. **38**(3): p. 235-246.
11. Grzegorzewski, P. and H. Szymanowski, *Goodness-of-fit tests for fuzzy data.* Information Sciences, 2014. **288**: p. 374-386.
12. Noughabi, H.A. and M. Akbari, *Testing Normality Based on Fuzzy Data.* International Journal of Intelligent Technologies & Applied Statistics, 2016. **9**(1).
13. Moradnezhadi, Y.M., *Determination of a some simple methods for outlier detection in maximum daily rainfall (case study: Baliglichay Watershed Basin–Ardebil Province–Iran).* Bull. Env. Pharmacol. Life Sci, 2014. **3**(3): p. 110-117.
14. Moewes, C., R. Mikut, and R. Kruse, *Fuzzy Control*, in *Springer Handbook of Computational Intelligence*2015, Springer. p. 269-283.
15. Choi, Y., H. Lee, and Z. Irani, *Big data-driven fuzzy cognitive map for prioritising IT service procurement in the public sector.* Annals of Operations Research, 2018. **270**(1-2): p. 75-104.
16. Smarandache, F., *Neutrosophy. Neutrosophic Probability, Set, and Logic, ProQuest Information & Learning.* Ann Arbor, Michigan, USA, 1998. **105**: p. 118-123.
17. Smarandache, F. and H.E. Khalid, *Neutrosophic precalculus and neutrosophic calculus*2015: Infinite Study.
18. Peng, X. and J. Dai, *Approaches to single-valued neutrosophic MADM based on MABAC, TOPSIS and new similarity measure with score function.* Neural Computing and Applications, 2018. **29**(10): p. 939-954.
19. Abdel-Baset, M., V. Chang, and A. Gamal, *Evaluation of the green supply chain management practices: A novel neutrosophic approach.* Computers in Industry, 2019. **108**: p. 210-220.
20. Abdel-Basset, M., et al., *Cosine similarity measures of bipolar neutrosophic set for diagnosis of bipolar disorder diseases.* Artificial Intelligence in Medicine, 2019. **101**: p. 101735.
21. Abdel-Basset, M., et al., *Utilising neutrosophic theory to solve transition difficulties of IoT-based enterprises.* Enterprise Information Systems, 2019: p. 1-21.
22. Nabeeh, N.A., et al., *An integrated neutrosophic-topsis approach and its application to personnel selection: A new trend in brain processing and analysis.* IEEE Access, 2019. **7**: p. 29734-29744.
23. Smarandache, F., *Introduction to neutrosophic statistics*2014: Infinite Study.
24. Chen, J., J. Ye, and S. Du, *Scale effect and anisotropy analyzed for neutrosophic numbers of rock joint roughness coefficient based on neutrosophic statistics.* Symmetry, 2017. **9**(10): p. 208.
25. Chen, J., et al., *Expressions of rock joint roughness coefficient using neutrosophic interval statistical numbers.* Symmetry, 2017. **9**(7): p. 123.
26. Aslam, M., *Introducing Kolmogorov–Smirnov Tests under Uncertainty: An Application to Radioactive Data.* ACS Omega, 2019.
27. Aslam, M., *Design of the Bartlett and Hartley tests for homogeneity of variances under indeterminacy environment.* Journal of Taibah University for Science, 2020. **14**(1): p. 6-10.
28. Smarandache, F., *Nidus idearum. Scilogs, I: De neutrosophia.* 2016.
29. Smarandache, F., *NIDUS IDEARUM. scilogs, VI: annotations on neutrosophy.* 2019.


Received: Sep 12, 2020. Accepted: Jan 4, 2021