Counting Statistics

Ibraheem Al-Yousef

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1 Introduction

Counting statistics is very important for physicists. And most importantly, for nuclear physicists where they count the number of events the nuclear may undergo. For example, in this experiment, we are going to use a Gieger-Miller tube and count the number of excited ions inside the tube, which gives us an idea about how radioactive the material is.

We will these equations:

$$N_i \sum_{j=1}^{J} m_j \tag{1}$$

The average of an n ensembles:

$$N_{av} = \sum_{i=1}^{n} \frac{N_i}{n} \tag{2}$$

2 Experimental Setup & Procedure

We first turn on the detector with an operating voltage of 420 V. Then we placed a cesium source 30 cm away from the detector.

Then, we took 500 readings. Each readingwas took within a time interval of 10 s.

3 Data & Analysis

3.1 Average and Standard Deviation

Trial #	N_i	σ	N_i - N_avg	(N_i - N_avg)/σ	Rounded
1.0	24.0	4.3	5.13	1.19	1.0
2.0	25.0	4.3	6.13	1.42	1.0
3.0	23.0	4.3	4.13	0.96	1.0
4.0	20.0	4.3	1.13	0.26	0.0
5.0	21.0	4.3	2.13	0.49	0.5
6.0	22.0	4.3	3.13	0.73	1.0
7.0	15.0	4.3	-3.87	-0.90	-1.0
8.0	18.0	4.3	-0.87	-0.20	0.0
9.0	12.0	4.3	-6.87	-1.59	-1.5
10.0	16.0	4.3	-2.87	-0.66	-0.5
Average	18.8697				
STD	4.3169				

Table 1. Experimental data which we extracted the average μ and the STD σ.

Here, we rounded off the last column to 0.5 to show the plot in terms of $\pm\ 0.5\sigma$

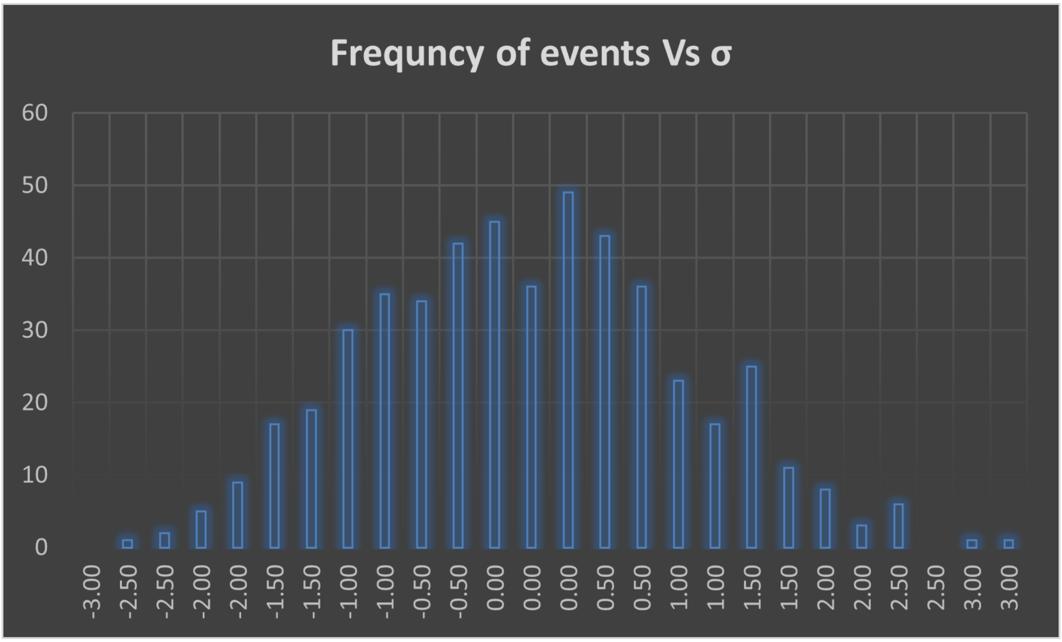

Figure 1. Frequency of occurance vs $\pm\ 0.5\sigma$

We can see here that most of the data lies within $\pm\ \sigma$. Moreover, we can also see that the data distribute itself in a shape similer to the normal distribution.

4 Conclusion

In this experiment we have seen how seen how can we use statistics to describe certain type of data. And by performing a counting experiment, we ended up seeing a normal distribution of our experimental data.