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Link to Survey
[Link]

```
[8] import pandas as pd
    import matplotlib.pyplot as plt
    import seaborn as sns
    from scipy.stats import poisson
    import numpy as np
    from google.colab import drive
```

```
[12] from google.colab import drive
     drive.mount('/content/drive')
     file_path = '/content/drive/MyDrive/AI/Week_3/Worksheet3response.csv'
     df = pd.read_csv(file_path)
     df.head()
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

	Timestamp	Name	Email	Level	How often do you use AI tools?	In the past week, how many times did you use AI tools for writing assistance (e.g., grammar, structure)?	Do you use AI tools (e.g., ChatGPT, Grammarly, etc.) while the teacher is asking questions in class?	How often do you use AI tools while attending live online classes?	When preparing for exams, which AI tool do you prefer using the most?	Do you believe using AI tools improved your academic performance this week?	What is the primary reason you use AI tools for academic work?	How well do AI too provide answers th meet your needs expectation
0	7/31/2025 11:04:27	Nabin Pyakurel	nabinpyakurel332211@gmail.com	Bachelors	Often	10-15	No	Sometimes	Copilot	Yes	To understand or summarize reading material	
1	7/31/2025 11:09:10	Pujan Upadhyay	Np03cs4a230284@heraldcollege.edu.np	Bachelors	Often	5-10	Yes	Often	Copilot	Yes	To understand or summarize reading material	
2	7/31/2025 11:12:35	Shreya Shrestha	shresthashreya227@gmail.com	Bachelors	Always	5-10	Yes	Sometimes	Quillbot	Yes	To understand or summarize reading material	
3	7/31/2025 11:45:19	Subrat Regmi	subratregmi3@gmail.com	Bachelors	Sometimes	20+	Yes	Always	Chatgpt	Yes	To solve problems or answer homework questions	
4	7/31/2025 11:59:51	Pranjal Sedhai	pranjalsedhai@gmail.com	Bachelors	Always	20+	Yes	Always	Chatgpt	Yes	To generate ideas or brainstorm topics	

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
[21] rating_col = 'How well do AI tools provide answers that meet your needs or expectations?  '
     ratings = df[rating_col].dropna().astype(int)
```

```
[22] freq_table = ratings.value_counts().sort_index()
     empirical_pmf = freq_table / freq_table.sum()
```

```
     sample_mean = ratings.mean()
     sample_variance = ratings.var()
```

```
[17] x_vals = np.arange(ratings.min(), ratings.max() + 1)
     poisson_pmf = poisson.pmf(x_vals, mu=sample_mean)
```

```
[20] print("Sample Mean (λ):", sample_mean)
     print("Sample Variance:", sample_variance)
     print("\nFrequency Table:\n", freq_table)
     print("\nEmpirical PMF:\n", empirical_pmf)
```

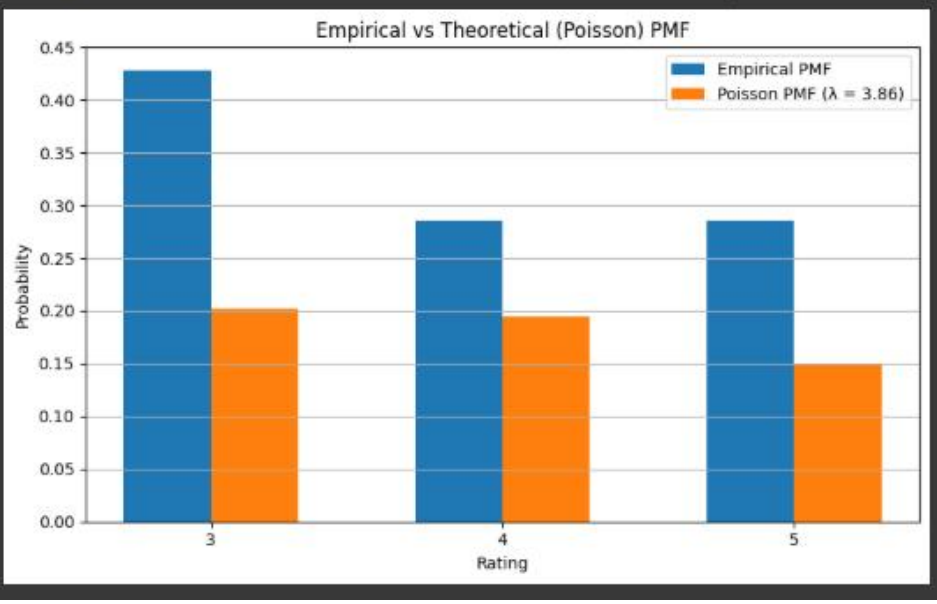
```
Sample Mean (λ): 3.857142857142857
Sample Variance: 0.7285714285714286

Frequency Table:
 How well do AI tools provide answers that meet your needs or expectations?
3    9
4    6
5    6
Name: count, dtype: int64

Empirical PMF:
 How well do AI tools provide answers that meet your needs or expectations?
3    0.428571
4    0.285714
5    0.285714
Name: count, dtype: float64
```

The output summarizes how respondents rated the effectiveness of AI tools in meeting their needs or expectations. The **average rating (sample mean)** is approximately **3.86**, suggesting a generally positive experience among users. The **sample variance** is around **0.73**, indicating that the responses are relatively consistent and not widely spread out. Most participants rated the tools between **3 and 5**, with the rating **3** being the most frequent, as shown in the frequency table. The **empirical probability mass function (PMF)** reveals that about **42.86%** of respondents gave a rating of **3**, while **28.57%** rated **4** and another **28.57%** rated **5**. This suggests that while a majority are moderately satisfied, there is still room for improvement in AI tools to better meet user expectations.

```
plt.figure(figsize=(8, 5))
plt.bar(x_vals - 0.15, empirical_pmf.reindex(x_vals, fill_value=0), width=0.3, label='Empirical PMF')
plt.bar(x_vals + 0.15, poisson_pmf, width=0.3, label='Poisson PMF (λ = {:.2f})'.format(sample_mean))
plt.title("Empirical vs Theoretical (Poisson) PMF")
plt.xlabel("Rating")
plt.ylabel("Probability")
plt.legend()
plt.xticks(x_vals)
plt.grid(axis='y')
plt.tight_layout()
plt.show()
```



This bar chart compares the **Empirical Probability Mass Function (PMF)** with the **Theoretical Poisson PMF** for the ratings of how well AI tools meet user expectations. The **x-axis** represents the ratings (3, 4, and 5), while the **y-axis** shows the probability of each rating occurring in the dataset. The blue bars display the **empirical PMF**, which is based on the actual frequency of responses collected from the survey. The orange bars represent the **Poisson PMF**, calculated using the sample mean ($\lambda \approx 3.86$) as the expected value. The comparison reveals that while the theoretical model follows a similar trend, the **empirical probabilities are generally higher**, especially for the rating of 3, which was the most frequently selected. This indicates that the real-world data shows a stronger preference for mid-level ratings compared to the theoretical distribution.

Interpretation of the Fit:

Based on the visualization, we can observe the following:

The empirical distribution shows that the most frequent rating is 3, followed by ratings of 4 and 5, which have similar frequencies.

The fitted Poisson distribution, with a lambda (λ) equal to the sample mean of approximately 3.86, predicts the highest probability for a rating of 4, with decreasing probabilities for ratings of 3 and 5.

Visually, the Poisson distribution does not appear to be a perfect fit for the empirical data. The empirical data is concentrated at ratings 3, 4, and 5, while the Poisson distribution spreads probability over a wider range of values and peaks at 4. This suggests that the assumption of the number of occurrences being independent and random events over a fixed interval might not be entirely appropriate for this rating data.

Reflection and Report:

My variable measured how well AI tools provide answers that meet user needs or expectations, which matters for understanding user satisfaction and identifying areas for improvement in AI tool development. A challenge faced was the limited sample size (21 responses), which may not be representative of a larger population. The theoretical Poisson model did not fit the data well, as the empirical distribution was concentrated on a few specific rating values, unlike the Poisson distribution which spreads probability over a wider range. If I repeated this experiment, I would aim for a larger and more diverse sample size and potentially explore different theoretical distributions that might better fit the data's characteristics.