Comparing Centers of Several Independent Groups (2024 Spring EN5423 – week14)

Your student id # _____

Quiz

In a study conducted to analyze the effectiveness of different times of day on a specific treatment for patients, researchers collected data from seven patients. Each patient received the treatment three times a day: in the morning, at noon, and in the evening. The researchers aimed to determine if there was a significant difference in the treatment outcomes based on the time of day the treatment was administered. Use the Friedman test.

Data

The researchers measured the effectiveness of the treatment at three different times of day for each patient, resulting in the following data:

Patient	Morning	Noon	Evening
1	34	45	36
2	33	36	31
3	41	35	44
4	39	43	42
5	44	42	41
6	37	42	45
7	49	46	40

Step 1: Rank the Data

For each patient, rank the scores for morning, noon, and evening. If there are ties, assign the average rank.

Patient	Morning	Noon	Evening	Morning Rank	Noon Rank	Evening Rank
1	34	45	36	[ ]	[ ]	[ ]
2	33	36	31	[ ]	[ ]	[ ]
3	41	35	44	[ ]	[ ]	[ ]
4	39	43	42	[ ]	[ ]	[ ]
5	44	42	41	[ ]	[ ]	[ ]
6	37	42	45	[ ]	[ ]	[ ]
7	49	46	40	[ ]	[ ]	[ ]

Step 2: Sum the Ranks for Each Treatment

Calculate the sum of the ranks for each time period (morning, noon, evening).

Treatment	Sum of Ranks
Morning	[ ]
Noon	[ ]

Evening [ ]

Step 3: Calculate the Test Statistic

Use the following formula for the Friedman test statistic Q:

$$Q = \frac{12}{nk(k+1)} \sum_{j=1}^{k} R_j^2 - 3n(k+1)$$

where:

- n is the number of patients
- k is the number of treatments
- R_j is the sum of ranks for treatment j

Q = [ ]

Step 4: Determine the Critical Value

• Find the critical value for the Friedman test with k−1 degrees of freedom.

• Use the chi-square distribution table to find the critical value for a chosen significance level (e.g., 0.05).

• For df and α=0.05, the critical value from the chi-square table is approximately [ ].

	Significance level (α)							
Degrees of freedom (*df*)	.99	.975	.95	.9	.1	.05	.025	.01
1	-------	0.001	0.004	0.016	2.706	3.841	5.024	6.635
2	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210
3	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345

Step 5: Compare the Test Statistic to the Critical Value

Compare the calculated Q value to the critical value:

- If Q is greater than the critical value, reject the null hypothesis.
- If Q is less than or equal to the critical value, fail to reject the null hypothesis.

In this case, Q = [ ] is less than [ ], so we [ ] the null hypothesis.

Conclusion