

Department of Electrical and Computer Engineering
University of Massachusetts Dartmouth

ECE560: Computer Systems Performance Evaluation

Spring 2024

Homework #1

Name: _____

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**ECE560: Computer Systems Performance Evaluation
(Spring 2024)
Homework #1**

Assigned: January 29, Monday

Due: February 5, Monday, 12:30pm

Instructions:

1. Print your name on the cover page if you choose to use it or on the first page of you answer sheets.
2. Show all steps of your solution. Answers without justification would subject to a big penalty.
3. Relevant lecture: [Lecture #3](#)

Problem 1: Experimental Design and Analysis

In designing a computer system, the following four factors need to be studied:

- the number of processors (A),
- memory size (B),
- the number of cache levels (C),
- operating system (D).

The four factors and their level assignments are shown in the Table 1. The 2^4 design and the measured performance in MIPS are shown in Table 2 (Note that those figures are hypothesized, please do not make any conclusion about the performance between Linux and Windows 2000 based on them).

Table 1: Factors and Levels

Factor	Level (-1)	Level (1)
A: number of processors	1	2
B: memory size (MBytes)	256	512
C: cache level	1	2
D: operating system	Windows 2000	Red Hat Linux 6.2

Table 2: Measured System Performance in MIPS

		A(-1): 1 processor		A(1): 2 processors	
		B(-1): 256MB	B(1): 512MB	B(-1): 256MB	B(1): 512MB
C(-1): 1-level cache	D(-1): Win2000	43	69	97	143
	D(1): Linux	41	52	76	137
C(1): 2-level cache	D(-1): Win2000	60	80	138	200
	D(1): Linux	70	110	185	260

Use the Sign Table method to

- a. Find the mean performance of the system in MIPS.
- b. Determine which factor affects the system's performance the most? Which factor affects the system's performance the least? **Justify your answer.**
- c. Quantify the effects of interactions
 - between A and C,
 - between B and D,
 - between A, B, and D,
 - between A, C, and D.

Note: You need to show the sign table in your solution. If you write a program to implement the *Sign Table* method, please also attach your program as part of the answer.