PERFORMANCE EVALUATION EXERCISES

METHODOLOGY

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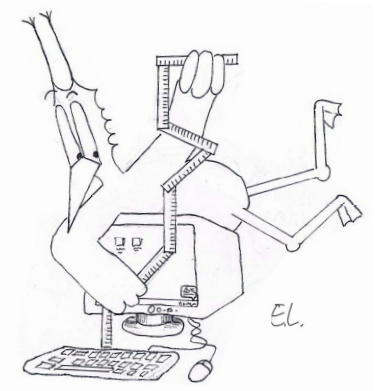

1. A nuisance factor is ...

   (a) ☐ An unanticipated experimental condition that corrupts the results

   (b) ☐ A condition in the system that affects the performance but that we are not interested in

   (c) ☐ An unpleasant part of the performance evaluation

2. A non-dominated metric means...

   (a) ☐ a metric vector for which no other vector is better

   (b) ☐ a metric value that is better than or equal to all others

   (c) ☐ a metric value that is better than all others

   (d) ☐ None of the above

3. In Borduria, there are two train companies: the incumbent operator (Sovrail) and a new company (Fastrack). The national bordurian consumer association developed an app and asked people to report whether trains are late or on time. Users also reported whether they travelled at the peak hour, off peak or during the week-end. Here are the results of the last campaign:

SOVRAIL	Late	On-time	Total (percent)
Peak hour	105397	105247	210644 (89.93)
Off peak	2805	6616	9421 (4.02)
Week-end	1369	12795	14164 (6.05)
Total (percent)	109571 (46.78)	124658 (53.22)	234229 (100.00)

FASTRACK	Late	On-Time	Total (percent)
Peak hour	182477	176468	358945 (56.68)
Off peak	64019	140990	205009 (32.37)
Week-end	7573	61794	69367 (10.95)
Total (percent)	254069 (40.12)	379252 (59.88)	633321 (100.00)

Which company performs better ? Is Simpson's paradox present here ?

4. We measure the performance of a radio link as a function of the modulation rate. Day/night is a nuisance factor.

Plan A	Nb of experiments	day	night
	1 Mb/s	20	10
	11 Mb/s	30	15
	55 Mb/s	60	30

Plan B	Nb of experiments	day	night
	1 Mb/s	20	20
	11 Mb/s	20	20
	55 Mb/s	20	20

Which experimental plan is a proper randomization of the day/night factor ?

(a) ☐ A

(b) ☐ B

(c) ☐ both

(d) ☐ None

5. The "scientific method" means ...

(a) ☐ Carefully screen all experimental conditions

(b) ☐ Beware of hidden factors

(c) ☐ Do not draw a conclusion until you have exhausted all attempts to invalidate it

(d) ☐ None of the above

6. The random variables X and Y take integer values in $\{0, 1, ..., M\}$. Which of the following statements are equivalent to "X and Y are independent" ? (m, n are integers).

(a) ☐ $\mathbb{P}(X = m \text{ and } Y = n) = \mathbb{P}(X = m)\mathbb{P}(Y = n)$ for all m, n

(b) ☐ $\mathbb{P}(X = m|Y = n) = \mathbb{P}(X = m)$ for all m, n such that $\mathbb{P}(Y = n) \neq 0$

(c) ☐ $\mathbb{P}(Y = n|X = m) = \mathbb{P}(Y = n)$ for all m, n such that $\mathbb{P}(X = m) \neq 0$

(d) ☐ $\mathbb{P}(X = m|Y = n)$, when defined, is independent of n for all m

(e) ☐ $\mathbb{P}(Y = n|X = m)$, when defined, is independent of m for all n

(f) ☐ $\mathbb{P}(X = m|Y = n)$, when defined, is independent of m for all n

(g) ☐ $\mathbb{P}(Y = n|X = m)$, when defined, is independent of n for all m

7. `genRandInt()` is a function that returns a random integer, distributed according to the Poisson distribution with mean m. Successive calls to this function produce independent results. A lazy performance analyst obtains a sequence of results as follows.

- $X_1 \leftarrow$ `genRandInt()`
- For $n \geq 2$, X_n is obtained as follows: flip a coin; if the result is TAIL then $X_n = X_{n-1}$ else $X_n \leftarrow$ `genRandInt()`

Is the sequence X_n independent ?

(a) ☐ No

(b) ☐ Yes

(c) ☐ It depends on m

8. Is the sequence X_n in the previous question identically distributed ?

(a) ☐ No

(b) ☐ Yes

(c) ☐ It depends on m

9. Can you find an instance of a pattern seen in class (or of another pattern) in a project that you were involved with ?