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Project (II): Identifying component reliability impacts on system reliability from observational data

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Context

- Real data from the repair center of a power supply of a company (rescaled, removing all confidential information).
- When a product fails in the field, it is replaced and send back to use in the field.
- We observe:
 - series number: The same value means the same product.
 - product type: A/B, different type of component
 - model: V1E1, V1E2, V1E3, V2E1, V2E3
 - V and E are two key components.
 - The larger the number -> More up-to-date design
 - repair operation number: index of the repair operation
 - previous repair operation number:
 - If repaired before: the previous repair number
 - If the first repair: MFG

Context

- We observe:
 - time since previous repair: The time since the previous repair (in hours)
 - Censored: 0 – No, failure occurs, 1 – Right censored: No failure found.
 - age after repair: The age of the part after repair
 - If multiple repairs, the age will accumulate.
 - Component A-K
 - 0: The corresponding component does not fail
 - 1: The corresponding component fails.

Tasks

- Task 1: Estimate the reliability of the product from this dataset.
- Task 2: Impact of new design of component E
 - We would like to investigate the effect of changing the design of component E on its reliability.
 - In the “model” column, the number after “E” is the version of component E. So we have three versions 1-3.
 - We also observe that in general, the product with newer version of component “E” has older age. This is partly because, when a product fails and component “E” is the cause, it might be replaced by a newer version, while the other components are not changed.
 - Considering this fact, do we have strong evidence to believe that newer version of E improves its reliability?
- Task 3: The quality of maintenance
 - We would like to investigate if being repaired impacts the reliability of the product.
 - However, some confounders might exist:
 - Age of the product
 - Type and model of the product, etc.
 - Answer this question by developing a causal model.

Submission

- Source code + a report (pdf)
- The report should not exceed 5 pages.
- Deadline: 23:59, 14/02



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Thank you! Questions?