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Notice for the PhD Viva Voce Examination

Ms Nancy M, Registration Number: 2073005, PhD Scholar at the Department of Statistics and Data Science, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Wednesday, 20 August 2025 at 10.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru – 560029, Karnataka, India.

Title of the Thesis	:	**Construction and Performance Evaluation of Regression Control Charts in the Context of Multicollinearity**
Discipline	:	**Statistics**
External Examiner - I	:	**Dr Yashavanth B S** Senior Scientist Agricultural Statistics Information & Communication Management Division ICAR-National Academy of Agricultural Research Management Hyderabad, Telangana
External Examiner - II	:	**Dr M Sivaram** Principle Scientist Southern Regional Station, ICAR-National Dairy Research Institute, Bengaluru Karnataka
Supervisor	:	**Dr Hemlata Joshi** Assistant Professor Department of Statistics and Data Science School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar (Academics)

Place: Bengaluru
Date: 14 August 2025

ABSTRACT

Graphical procedures to meet and monitor quality standards and the performance of targeted processes are determined by Statistical Quality Control. When various factors influence targeted quality, regression control charts are essential for identifying the assignable causes to monitor and improve the process. Regression control charts are used for process monitoring when a relationship exists between response and regressor variables. Additionally, further explanatory variables may be impacted by strong linear relationships among them, leading to unstable and unreliable coefficient estimates. By addressing multicollinearity issues in constructing regression control charts (multiple and logistic), this research proposes a schema chart and robust boundary limits. Regression and residual-based process-bound charts are constructed using ridge, principal component, and r-k class estimators integrated with Shewhart, EWMA, and M-EWMA charts to mitigate the impact of influential observations.

Further, it has been demonstrated that the proposed charts are helpful in the performance and long-term variability in actual situations such as Shewhart and EWMA regression control charts with initial and monitoring phases constructed to track the process of building an effective structure using ridge and (r-k) class estimators in reliability monitoring of financial health of India by facilitating policymakers for making decisions contributing to more governing progress as an enhancing instrument in fiscal policies. Pearson's, Deviance and Ordinary residuals-based control charts for logistic regression are manifested in sleep wellness disorder. A unique control chart related to per hectare consumption of fertilizers in India is studied to figure out the residual-based M-EWMA chart using ridge and (r-k) class estimators to increase the sensitivity of small variations in detecting shifts at early stages of both phases and control the multivariate processes. To evaluate the performance of the charts, the key metric, AvgRL is used critically to determine the sensitivity of control charts. Hence, regression control charts in the presence of multicollinearity can act as a preventative measure to identify possible issues in better monitoring the performance of process control based on in and out-of-bound states for decision-making.

Keywords: *Regression Control Charts, Residual Control Charts, Boundary Limits, Multicollinearity, Statistical Process Control.*

Publications:

1. **Nancy, M.,** Joshi, H., & Dhandra, B. V. (2023). "Regression Control Charts-A Survey". *Journal of Pharmaceutical Negative Results* 14(3), pp. 1078-1086.
2. **Nancy, M.,** Joshi, H. (2024). "Tracking Sigmoid Regression with Multicollinearity in Phase I: An Approach Incorporating Control Charts." *Lecture Notes in Networks and Systems* 1051, pp. 244-255.
3. **Nancy, M.,** Joshi, H. (2024). "Residual-Based Statistical Process Control Charts in the Presence of Multicollinearity: An EWMA Framework with (r-k) Estimator". *Lecture Notes in Networks and Systems*, 1095, pp. 327-340.
4. **Nancy, M.,** Joshi, H. "Residual-Based MEWMA Control Charts in the Presence of Multicollinearity". *Songklanakarin Journal of Science and Technology.* (Under review).
5. **Nancy, M.,** Joshi, H. "Construction of Regression Control Chart with (r-k) class Estimator in Two Phases." *Pakistan Journal of Statistics.* (Under review)