

**CHRIST****(DEEMED TO BE UNIVERSITY)**
BANGALORE · INDIA

Notice for the PhD Viva-Voce Examination

Mr M Hussain Ali (Registration Number: 2071907), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Monday, 16 December 2024 at 11.30 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	Pharmaceutical Tablet Uniformity Prediction Using Spectroscopy-Based Data Fusion and Machine Learning Approaches
Discipline	:	Data Science
External Examiner - I	:	Dr Vivek Kumar Singh Professor and Head Department of Computer Science University of Delhi New Delhi - 110007
External Examiner - II	:	Dr Nickolas S Professor Department of Computer Applications National Institute of Technology Tiruchirappalli - 620015 Tamil Nadu
Supervisor	:	Dr Gobi R Associate Professor Department of Computer 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.

Place: Bengaluru
Date: 10 December 2024


Registrar

ABSTRACT

In the regulated pharmaceutical industry, Quality Control plays a vital role in demonstrating quality, safety and efficacy of drugs manufactured. The analytical test practices are time consuming, destructive, involves use of chemical reagents, and is costly. Quality by Design (QbD) and Process Analytical Technology (PAT) integration aims to overcome these challenges and achieve consistent quality through real-time testing and risk mitigation. Use of process analyzers such as Near-infrared (NIR) spectroscopy along multivariate statistical methods are commonly used techniques in PAT environment for both qualitative and quantitative measurements. Data Fusion approaches and use of advanced machine learning methodologies beyond statistical methods is can improve model accuracy and robustness.

This research introduces a systematic approach to implementing machine learning models using NIR in predicting the content uniformity of pharmaceutical tablets, as an alternative method to traditional chemical testing. The objective is to improve the model predictive performance by fusing the data obtained from NIR and its relevant manufacturing information. A comparison of Partial Least Squares regression models and machine learning Neural Network models is evaluated for the model predictability; followed by life cycle management of models.

Keywords: Near Infrared Spectroscopy, Data Fusion, Machine Learning, Neural Networks, Partial Least Squares, Pharmaceutical Manufacturing

Publications:

1. Ali H, et al. Machine Learning-Enabled NIR Spectroscopy. Part 2: Workflow for Selecting a Subset of Samples from Publicly Accessible Data. AAPS PharmSciTech. 2023; 24(1):34.
2. Ali H; et al. Machine Learning-Enabled NIR Spectroscopy. Part 3: Hyperparameter by Design (HyD) Based ANN-MLP Optimization, Model Generalizability, and Model Transferability. AAPS PharmSciTech. 2023; 24(8):254.
3. Muthudoss P, Ali H, et al. ML in Drug Delivery -- Current Scenario and Future Trends. In Advances in Drug Delivery Systems for Healthcare. IOP Publishing. 2024 Jan; 9-1 to 9-46. Online ISBN: 978-0-7503-5613-8.