Postgraduate Seminar Series

Venue: Graduate Seminar Room
Date & Time: May 4, 2024 at 3:00 PM

Speaker Information

Hasan Muhammad Kafi (Std No. 0421054002) is a part time Ph.D. student in the department of CSE, BUET. He completed his undergraduate studies from CUET in 2010. His research interest lies in the fields of Data Science, Machine Learning, and applications of Deep-Learning in Agriculture and Medical diagnosis. He is currently doing his postgraduate thesis under the supervision of Dr. Mohammed Eunus Ali. He will be speaking about his ongoing research in this talk.

Automatic and Real-Time Identification of Rice Diseases, Pests, and Nutritional Deficiencies: Challenges and Guidelines

Rice cultivation plays a pivotal role in ensuring food security and fostering socio-economic development in Bangladesh. While the utilization of modern technologies and techniques helps boost rice production, three main factors—diseases, pests, and nutritional deficiencies—account for a significant amount of rice yield loss each year. Conventional approaches for diagnosing diseases, pests, and nutritional deficiencies require a high degree of experience and expertise. In this scenario, numerous researchers have been striving to develop an autonomous system for detecting diseases, pests, and nutritional deficiencies in rice by utilizing machine learning and deep learning approaches. However, these systems may fail to replicate satisfactory performance and efficiency with real-world datasets due to challenges such as wide-shot or long-shot images, lighting variations, unwanted backgrounds, symptom variations, focus issues, lesion size and count, and so on. Additionally, many of the existing systems are evaluated with small-sized datasets and rely heavily on expert knowledge, often proving inadequate in addressing the complexities of real-world agricultural environments. To overcome these challenges, we presented a novel and robust rice diseases, pests, and nutritional deficiencies recognition system using deep learning algorithms through an automatic data filtering approach. The purpose of the proposed brand-new automatic data filtering approach is to filter out undesired data and expedite data preprocessing tasks, reducing the need for manual intervention, and minimizing errors, particularly when dealing with large datasets. Another substantial contribution of our work lies in constructing a novel and large real-time rice diseases, pests, and nutritional deficiencies dataset, addressing the data deficiency problem in this discipline. This dataset comprises comprehensive information, including seven common rice diseases, two prevalent pests, and two nutritional deficiencies, all sourced from actual field conditions. It accounts for diverse background conditions, lighting conditions, weather conditions, soil conditions, symptom variations, and other factors, ensuring its relevance to real-world scenarios. Moreover, we employed a data balancing technique to overcome the issues of data imbalance. Finally, we employed a variety of deep-learning algorithms for feature extraction and classification. Through extensive experimentation, we evaluated the proposed system with the newly created original version, filtered version, and filtered-balanced version of the dataset, which produced the maximum accuracy scores of 95.44%, 95.71%, and 98.41%, respectively. We believe that the proposed deep-learning-based automatic filtering framework and our dataset can make a substantial contribution to the field of rice diseases, pests, and nutritional deficiencies identification.