**Link:**<https://assets.researchsquare.com/files/rs-574901/v1_covered_43e55d59-f117-4f0c-9541-991bb41eb69f.pdf?c=1702476500>

**Tittle:**Fruit Image Classication using Deep Learning

Relevance of Fruit Classification in Computer Vision and Image Recognition

The research paper explores the significance of fruit classification in the context of [computer vision](https://en.wikipedia.org/?curid=6596) and image classification. It emphasizes the importance of fruit classification in the fruit market for consumers to determine the variety and grading of fruits, as well as for ensuring fruit quality from a health perspective. The paper identifies the challenges facing current fruit classification systems in terms of accuracy and quantitative analysis and underscores the need for new proposals in fruit classification. [ 3 ]

**Utilizing Deep Learning for Fruit Image Classificatio**n

The study proposes a [deep learning](https://en.wikipedia.org/?curid=32472154)-based approach for fruit image classification and utilizes Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), and Long Short Term Memory (LSTM) models for the classification of fruits based on optimal and derived features. The [deep learning](https://en.wikipedia.org/?curid=32472154) models demonstrated effective accuracy and quantitative analysis results, and the proposed approach showed promising results in comparison to existing classification approaches. [

**Complexity and Limitations of Fruit Classification**

The paper highlights that fruit classification is a complex task due to the wide ranges and identical frames and aspects of fruits, making manual fruit classification time-consuming and challenging. Additionally, the authors discuss the [limitations](https://en.wikipedia.org/?curid=9401640) of existing classification systems, such as ambiguity in fruit images and the dependence on distinct features for fruit recognition. [ 3 ]

Proposed Framework for Fruit Image Classification

Furthermore, the proposed framework involves the use of Type-II Fuzzy based fruit image enhancement, teacher-learner based [optimization](https://en.wikipedia.org/?curid=52033) for fruit image [segmentation](https://en.wikipedia.org/?curid=505717), and the hybrid classifier (CNN-RNN) for developing coarse and fine category labels for fruit images. The paper also discusses the inclusion of LSTM to identify the latent semantic label dependency features sequentially. [ 34 ]

Experimental results and discussions highlight the success of the proposed [deep learning](https://en.wikipedia.org/?curid=32472154)-based classification approach in terms of accuracy, RMSE, and coefficient of correlation, outperforming existing classification techniques. The paper concludes by emphasizing the potential of the proposed approach for automatic fruit classification and the need for further research in this area, particularly in the context of fostering improvements in fruit quality and exporting processes. [ 3 ]

.