



# Cotton water stress classification with CNN

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# Project background



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Cotton, accounting for approximately 25 percent of global fiber usage, is significant among textile fibers worldwide. As the foremost cotton exporter, the United States (US) ranks as the third-largest producer in this vital resource. The northwest plain region of Texas, known as Texas High Plains (THP), is the largest continuous cotton-producing region of Texas, which contributes to about 25% and 65% of the US and Texas cotton production, respectively.

However, the water resource is currently insufficient to provide full irrigation in the THP. The Lubbock area, for instance, is facing water limitation because of the significant decline of the water table in the Ogallala Aquifer. Considering the recurring water shortage in THP, finding effective methods to optimize irrigation water use is essential.





# Project objective

The study aimed to classify cotton water stress using Convolutional Neural Networks. The cotton image was collected by a UAV at Lubbock, Texas. A DJI Phantom 4 was utilized as the UAV platform for collecting high-resolution RGB images at an altitude of 90 meters.



## The cotton experimental field



4 Treatments □ 3 replication

(1=rainfed, 2=fully irrigated, 3=percent deficit, 4=time delay)



# Preprocessing

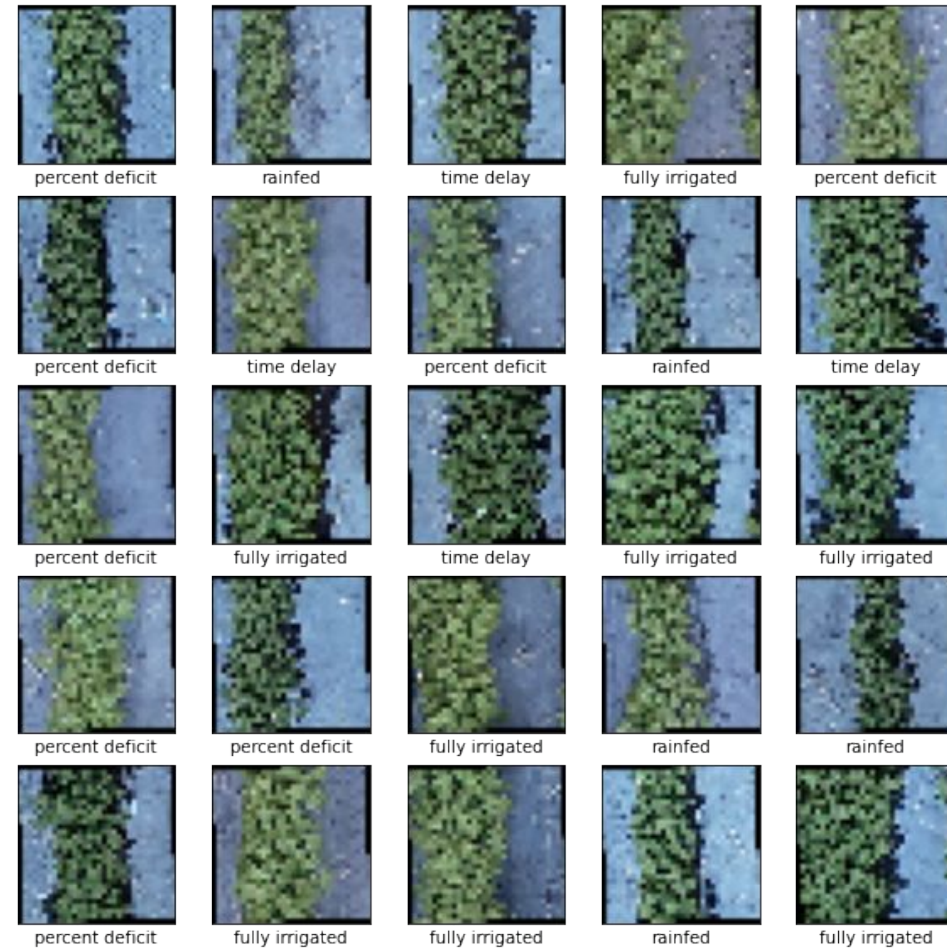


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## UAV RGB image



Image dataset for 9-20-2022 (5376, 64, 64, 3)



# Your task



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- You are given the dataset file named 'twri\_rgb\_6832\_cotton\_64x64\_9\_02.npy' and the label file, which has five classes.
- Please preprocess the dataset, remove the filler treatment and the corresponding images in the above dataset. The dataset and the label have the same image order.
- After the data preprocessing, you should have a dataset with shape (5376, 64, 64, 3) and a label data with size (5376, ).
- Build a CNN model to classify the dataset into four irrigation treatments. You can use any CNN models, such as the Resnet, YOLO, U-Net, etc. You can even customize a CNN model.
- Visualize your training and validation by
  - Curves, such as accuracy or loss.
  - Confusion matrix.
  - Others, etc.