SDAIA
الهيئة السعودية للبيانات والذكاء الاصطناعي
Saudi Data & AI Authority

# FRESH AND ROTTEN CLASSIFICATION

Deep learning

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# AGENDA

- Fresh and Rotten Dataset
- The Dataset Variables
- New Features
- neural network And Performance
- Hyperparameter tuning on the neural network models
- network models and strategies
- Conclusion

# Fresh and Rotten Dataset

- **Is a collection of high-quality images for training and evaluating classification models.**
- **Each item in the dataset is represented by multiple images capturing fresh and rotten/stale states.**
- **Tran : 23619 rows , 3 columns**
- **Test : 6738 rows, 3 columns**
- **problem statement : focuses on distinguishing between fresh and rotten/stale produce.**

# The Dataset Variables

- 7Classes from 0 to 6
- (Apple - Banana - Cucumber - Okra - Orange - Potato  - Tomato)
- fresh : 1
- rotten: 0

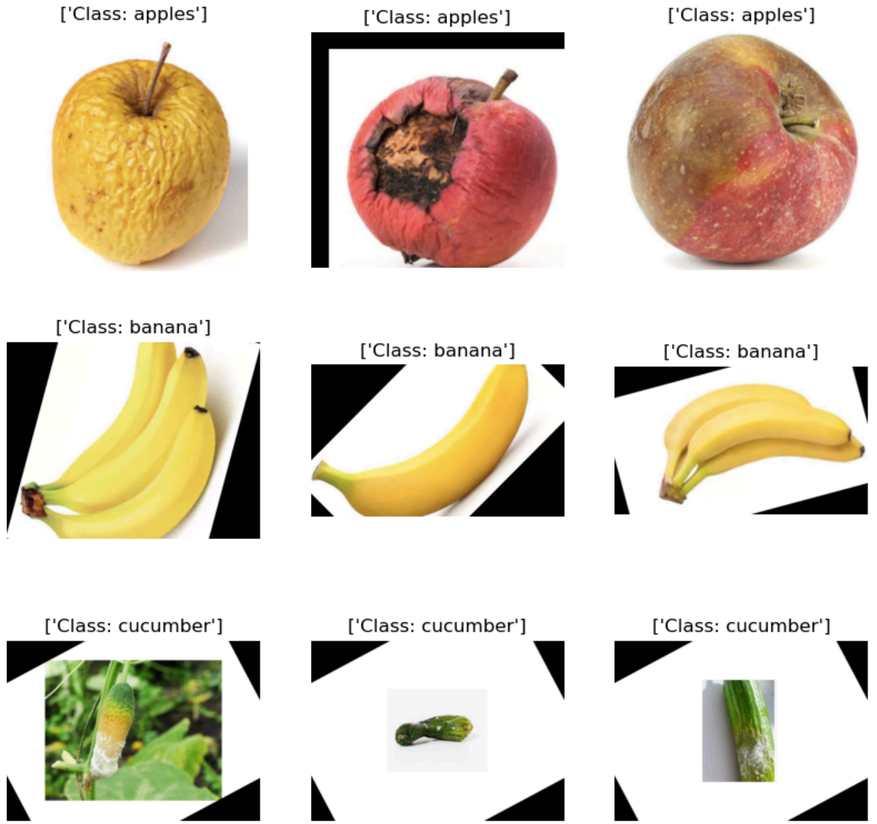
| | filename | fruit | fresh |
|---|---|---|---|
| 1550 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 |
| 13176 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | oranges | 0 |
| 7003 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 |
| 9808 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | banana | 1 |
| 1220 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 |
| ... | ... | ... | ... |
| 5940 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 |
| 16888 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | apples | 0 |
| 11490 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | potato | 0 |

| | filename | fruit | fresh | fruit_label |
|---|---|---|---|---|
| 1550 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 | 1 |
| 13176 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | oranges | 0 | 4 |
| 7003 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 | 6 |
| 9808 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | banana | 1 | 1 |
| 1220 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 | 1 |
| ... | ... | ... | ... | ... |
| 5940 | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 | 6 |
| 16888 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | apples | 0 | 0 |
| 11490 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | potato | 0 | 5 |
| 13179 | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | oranges | 0 | 4 |

# NEW FEATURES

]

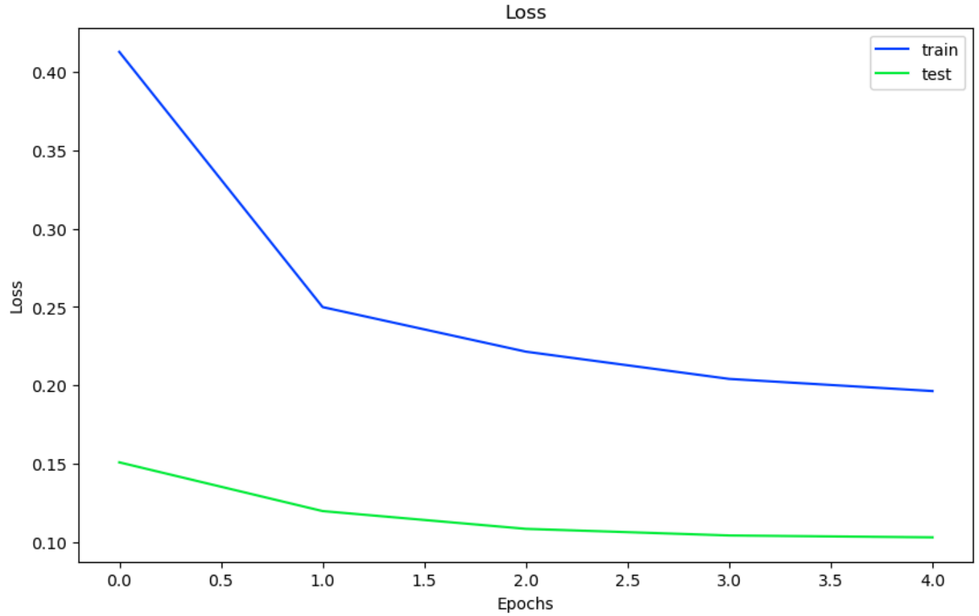
| | filename | fruit | fresh | fruit_label | combined |
|---|---|---|---|---|---|
| **1550** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 | 1 | banana_rotten |
| **13176** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | oranges | 0 | 4 | oranges_rotten |
| **7003** | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 | 6 | tomato_fresh |
| **9808** | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | banana | 1 | 1 | banana_fresh |
| **1220** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | banana | 0 | 1 | banana_rotten |
| **...** | ... | ... | ... | ... | ... |
| **5940** | /Users/abdu_salih/Desktop/py3/dataset/Train/ro... | tomato | 1 | 6 | tomato_fresh |
| **16888** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | apples | 0 | 0 | apples_rotten |
| **11490** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | potato | 0 | 5 | potato_rotten |
| **13179** | /Users/abdu_salih/Desktop/py3/dataset/Train/fr... | oranges | 0 | 4 | oranges_rotten |



# NEURAL NETWORK AND PERFORMANCE

- Test accuracy for simple model with Adam: 97.67%
- Test accuracy for multi_layer model with SGD: 95.87%
- Test accuracy for dropout model with RMSprop: 96.80%

| Model | Activation | Optimizer | Dropout | epochs | Accuracy | loss |
|---|---|---|---|---|---|---|
| Model1 | 'relu' 'softmax' | Adam | - | 5 | 0.9712 | 0.0975 |
| Model2 | 'relu' 'softmax' | SGD | - | 5 | 0.9513 | 0.1597 |
| Model3 | 'relu' 'softmax' | RMSprop | (0.5) | 5 | 0.9628 | 0.1369 |



# HYPERPARAMETER TUNING ON THE NEURAL NETWORK MODELS

- Hyperparameter tuning on the neural network models to optimize performance.
- top3_params = random_search_tuner.get_best_hyperparameters(num_trials=3)
  top3_params[0].values

```
{'n_layers': 2,
 'units_0': 480,
 'dropout': 1,
 'optimizer': 'rmsprop',
 'learning_rate': 0.00012165541012624621,
 'units_1': 320}
```

# NETWORK MODELS AND STRATEGIES

- Test Accuracy: 97.69%
- best_model.fit(x_train, y_train, epochs=2)
- test_loss, test_accuracy = best_model.evaluate(x_test, y_test)
- print(f"Test Accuracy: {test_accuracy * 100:.2f}%")

```
Epoch 1/2
1875/1875 ━━━━━━━━━━━━━━━━━━━━ 10s 5ms/step - accuracy: 0.9556 - loss: 0.1543
Epoch 2/2
1875/1875 ━━━━━━━━━━━━━━━━━━━━ 6s 3ms/step - accuracy: 0.9586 - loss: 0.1422
313/313 ━━━━━━━━━━━━━━━━━━━━ 0s 864us/step - accuracy: 0.9702 - loss: 0.0942
Test Accuracy: 97.69%
```

# CONCLUSION

- **Food quality inspection in production lines**
- **Smart refrigeration systems for freshness detection**
- **Enhanced product categorization and inventory management in retail and e-commerce**
- **Early spoilage detection in agriculture and farming**

# THANK YOU