# Weather Recognition

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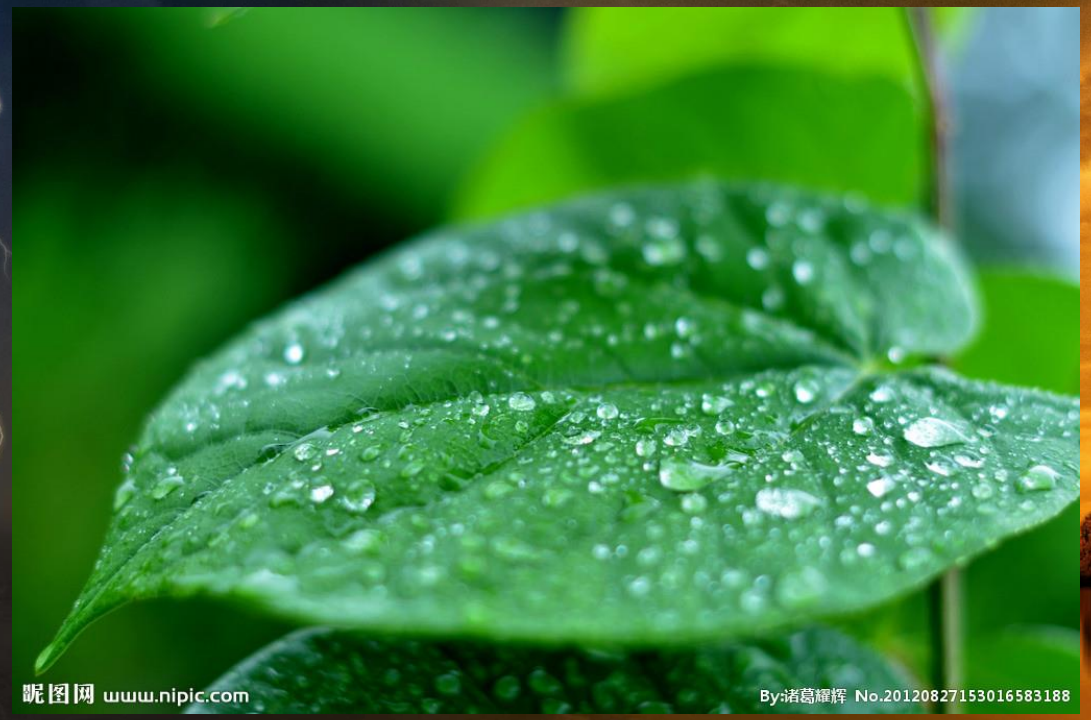
# Technology

- Python
- Libraries:
  - Tensorflow – building and training the neural network model
  - OpenCV – image processing
  - Scikit-Learn – data splittting
  - NumPy – handling arrays and numerical data
- Hardware
  - Used GPU for faster training

# Dataset

- Set consists of 11 different weather conditions
- Each image is resized to 180x180
- Testset is 20% of whole dataset
- Data augmentation

# Dew



# Fog/Smog

# Frost

# Glaze

# Hail

# Lightning

# Rain

# Rainbow

# Rime

# Sandstorm

# Snow

# Model

```
model.add(layers.Conv2D( filters: 32,  kernel_size: (5, 5), activation='relu', input_shape=(image_size_x, image_size_y, 3), kernel_regularizer=l2(0.0005)))
model.add(layers.MaxPooling2D( pool_size: (2, 2), padding='same'))
model.add(layers.Conv2D( filters: 32,  kernel_size: (3, 3), activation='relu'))
model.add(layers.MaxPooling2D( pool_size: (2, 2), padding='same'))
model.add(layers.Conv2D( filters: 64,  kernel_size: (3, 3), activation='relu'))
model.add(layers.MaxPooling2D( pool_size: (2, 2), padding='same'))
model.add(layers.Conv2D( filters: 128,  kernel_size: (3, 3), activation='relu'))
model.add(layers.MaxPooling2D( pool_size: (2, 2), padding='same'))
model.add(layers.Flatten())
model.add(layers.Dense( units: 11, activation='softmax'))

model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])

# Train the model using the augmented data
model.fit(datagen.flow(x_train, y_train, batch_size=32), epochs=150, validation_data=(x_valid, y_valid))
```

# Results progress

- Initial accuracy: ~40%
- Train-Test split: ~65%
- Adjusting Conv2D and MaxPooling: ~72%
- Data Augmentation: ~80%

# Latest results

```
Epoch 146/150
172/172 [==============================] - 29s 170ms/step - loss: 0.3530 - accuracy: 0.8785 - val_loss: 0.6521 - val_accuracy: 0.8222
Epoch 147/150
172/172 [==============================] - 29s 170ms/step - loss: 0.3601 - accuracy: 0.8694 - val_loss: 0.7297 - val_accuracy: 0.8076
Epoch 148/150
172/172 [==============================] - 30s 172ms/step - loss: 0.3673 - accuracy: 0.8706 - val_loss: 0.6679 - val_accuracy: 0.8047
Epoch 149/150
172/172 [==============================] - 29s 171ms/step - loss: 0.3360 - accuracy: 0.8841 - val_loss: 0.7338 - val_accuracy: 0.8120
Epoch 150/150
172/172 [==============================] - 29s 170ms/step - loss: 0.3769 - accuracy: 0.8686 - val_loss: 0.7025 - val_accuracy: 0.8222
2024-05-27 21:48:51.358068: W tensorflow/core/framework/cpu_allocator_impl.cc:82] Allocation of 533433600 exceeds 10% of free system memory.
43/43 [==============================] - 1s 11ms/step - loss: 0.7025 - accuracy: 0.8222
Loss: 0.7024612426757812
Accuracy: 0.8221574425697327
```

# Thank you for your attention

Sources:

- https://www.kaggle.com/datasets/jehanbhathena/weather-dataset
- https://pyimagesearch.com/2018/12/31/keras-conv2d-and-convolutional-layers/
- https://www.tensorflow.org/install/pip