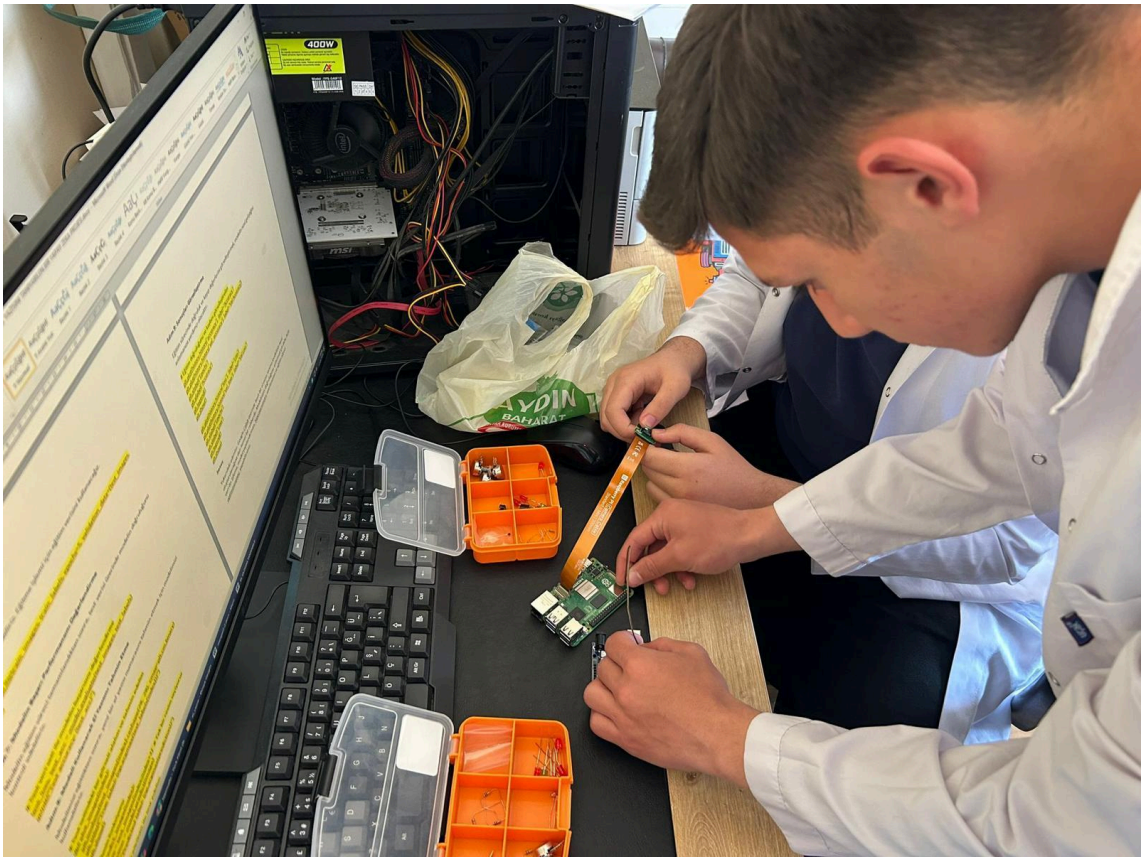


AI & SUSTAINABILITY IN VET EDUCATION

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Name of the Author/s: TR Team

Title of WP: WP3 – AI-SAVES@ProjectHub

Activity Reference: 3.2 – Project template for AI-SAVES@ProjectHub

Logo:



Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Table of Contents

Table of Contents **2**

1. Project Title 3

2. Project Category 3

3. Project Description 3

4. Keywords 4

5. Target Audience 4

6. Project Objectives 4

7. Project Timeline 4

8. Resources Provided 5

9. Tools and Technologies Used 5

10. Step-by-Step Implementation Plan 5

11. Evaluation Criteria 9

12. Languages Available 9

13. Contributors 9

14. Feedback and Continuous Improvement 10

Submission Notes **10**

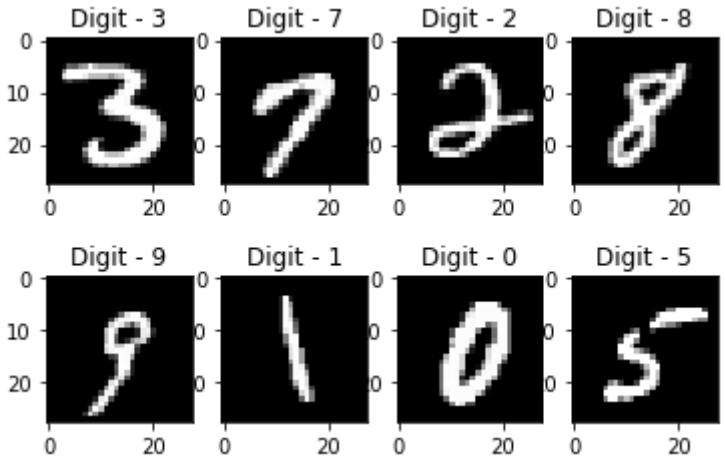
Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

AI-SAVES@PROJECTHUB

---

1. Project Title: *Handwritten Digit Recognition with Artificial Intelligence*

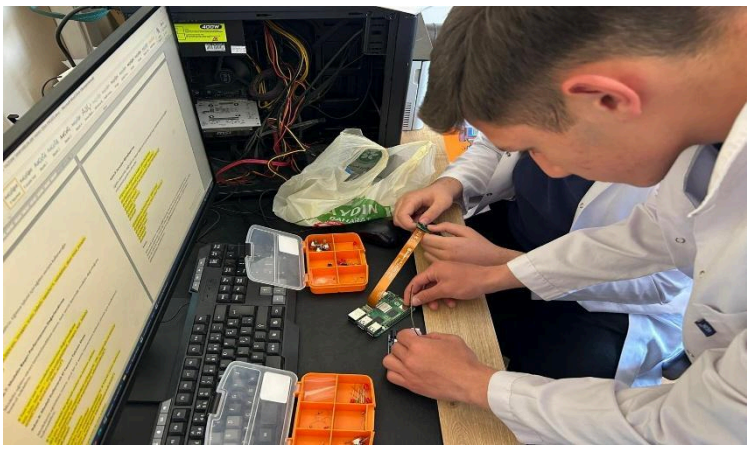


---

2. Project Category: *AI for Education*

---

3. Project Description: *This project aims to develop an artificial intelligence model capable of recognizing handwritten digits. Using deep learning techniques, a system is built to accurately identify digits in digital images.*



Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Co-funded by
the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

4. Keywords: *Artificial Intelligence, Deep Learning, CNN, MNIST, Handwriting Recognition*

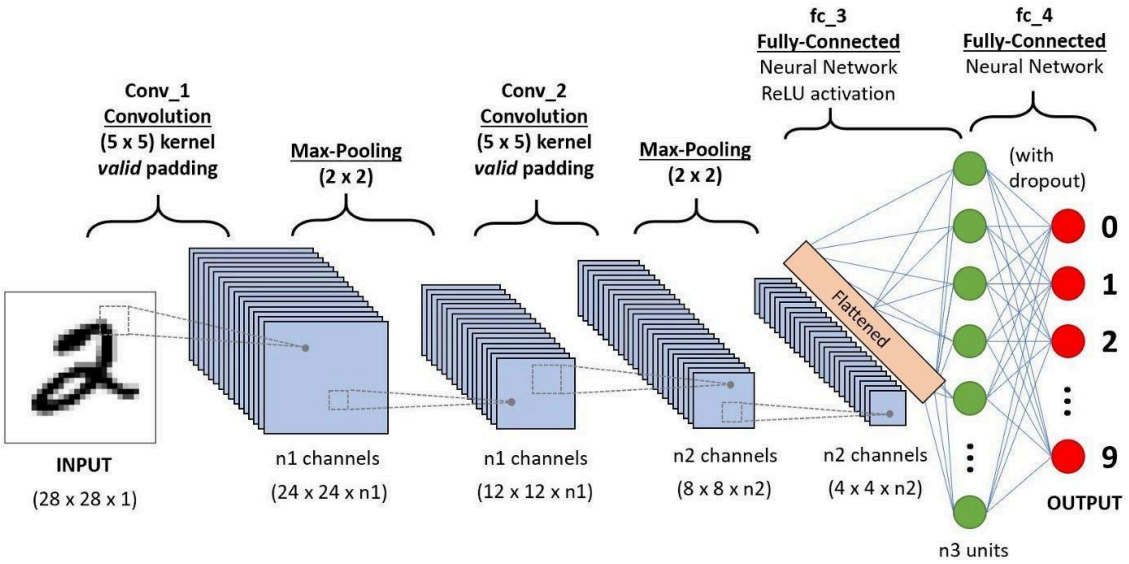
---

5. Target Audience: *Both Educators and Students*

---

6. Project Objectives:

- *Understand deep learning and CNN architectures.*
- *Learn the basics of image processing and classification.*
- *Apply data preprocessing and model training techniques.*
- *Explore the fundamentals of optical character recognition (OCR) systems.*



---

7. Project Timeline:

Start: February 2025
End: March 2025

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

8. Resources Provided:

- *MNIST dataset (handwritten digit images)*
- *Raspberry Pi and camera (AI-SAVES Kit)*
- *Python code samples*
- *Project presentation file*
- *Model training results and accuracy graphs*

---

9. Tools and Technologies Used:

- *Google Colab (cloud-based development environment)*
- *Python programming language*
- *TensorFlow & Keras libraries*
- *MNIST dataset*

---

10. Step-by-Step Implementation Plan:

1. Set up the Google Colab environment for coding and model training.
2. Load the MNIST dataset containing grayscale images of handwritten digits (28x28 pixels).
3. Normalize the image data by scaling pixel values to the range of 0–1.
4. Build a Convolutional Neural Network (CNN) model with three convolutional layers and max-pooling.
5. Train the model using the training dataset and validate accuracy with the test dataset.
6. Visualize training results (loss and accuracy graphs) to evaluate model performance.
7. Prepare a final presentation including model architecture, test accuracy, and sample predictions.

Python Code Example (Basic Structure):

```
# TensorFlow ve diğer gerekli kütüphaneleri yükleyin
import tensorflow as tf
from tensorflow.keras import layers, models
from tensorflow.keras.preprocessing import image
import matplotlib.pyplot as plt
import numpy as np
```

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

```
from google.colab import drive
```

```
# Google Drive'ı bağla
drive.mount('/content/drive')
```

```
# MNIST veri setini yükleyin
(train_images, train_labels), (test_images, test_labels) =
tf.keras.datasets.mnist.load_data()

# Veri boyutlarını kontrol edelim
print(f"Train images shape: {train_images.shape}")
print(f"Test images shape: {test_images.shape}")



# Verileri normalize etme
train_images = train_images / 255.0
test_images = test_images / 255.0

# Görselleri yeniden şekillendirelim (28x28x1)
train_images = train_images.reshape((train_images.shape[0], 28, 28,
1))
test_images = test_images.reshape((test_images.shape[0], 28, 28,
1))

# Etiketleri kategorik hale getirelim (one-hot encoding)
train_labels = tf.keras.utils.to_categorical(train_labels, 10)
test_labels = tf.keras.utils.to_categorical(test_labels, 10)
```

```
# Modeli kurma
model = models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(28,
28, 1)),
    layers.MaxPooling2D((2, 2)),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D((2, 2)),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.Flatten(),
    layers.Dense(64, activation='relu'),
    layers.Dense(10, activation='softmax')
])

# Modeli derleme
model.compile(optimizer='adam',
              loss='categorical_crossentropy',
              metrics=['accuracy'])

# Model özetini alalım
model.summary()
```

```
# Modeli eğitme
```

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

```
history = model.fit(train_images, train_labels, epochs=5,
validation_data=(test_images, test_labels))
```

```
# Görseli yükleme ve işleme
img_path = '/content/drive/MyDrive/mnist_digit_recognition/1.png'
 # Buraya görselin yolunu girin
img = image.load_img(img_path, target_size=(28, 28),
color_mode='grayscale')  # Görseli 28x28 boyutuna çevir


# Görseli numpy array'e dönüştürme
img_array = image.img_to_array(img)
img_array = np.expand_dims(img_array, axis=0)  # Tek bir örnek
olarak şekil değiştir

# Görseli normalize et
img_array = 1 - (img_array / 255.0)

# Tahmin fonksiyonu
def predict_image(image_array):
    prediction = model.predict(image_array)
    print(f"Predicted label: {np.argmax(prediction)}")


# Görseli çizdir
    plt.imshow(img_array[0].reshape(28, 28), cmap=plt.cm.binary)  #
Görseli çizdir (reshape 28x28 boyutunda)

    plt.show()

# Tahmin et ve görseli çiz
predict_image(img_array)
```

```
model.save('/content/drive/MyDrive/mnist1.h5')
```

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

11. Evaluation Criteria:

- Model accuracy on test data
- Quality of project presentation
- Participants' learning outcomes in deep learning
- Feedback through evaluation surveys

---

12. Languages Available:

- English

---

13. Contributors:

Türkiye– Project Team 2

- **Zülfiye Okumuş (Project Lead)** – Lead educator responsible for project development and coordination.
- **Damla Yılmaz (Technical Expert)** – Provided expertise in AI programming and robotics.
- **Muhammet Köprü (Curriculum Designer)** – Developed lesson plans for AI-based handwriting recognition.
- **K. Burak Sipahi (Instructional Material Developer) –** Prepared supporting documents and coding materials used in the project**.**

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

17. Feedback and Continuous Improvement:

- Feedback forms will be collected from participants.
- A final review session will be conducted.
- Future improvements will be planned based on feedback received.

Submission Notes:

Please ensure that all required documents and resources are attached to your submission. The AI-SAVES@ProjectHub review team will evaluate the submission based on the provided information. Once approved, the project will be published on the hub, and partners will be notified.

Co-funded by the European Union

This project has been funded with support from the European Commission. This communication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.