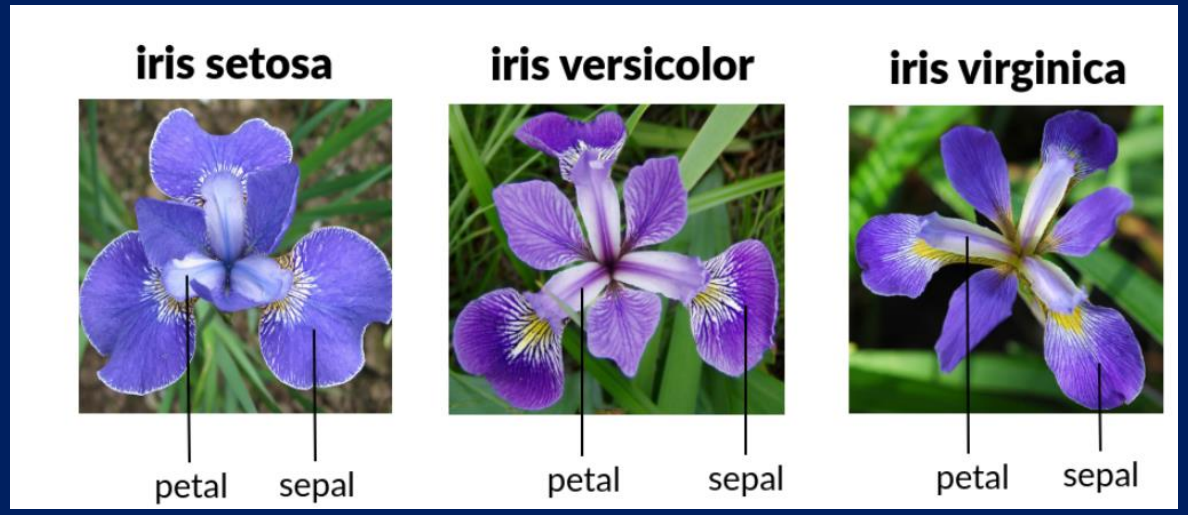
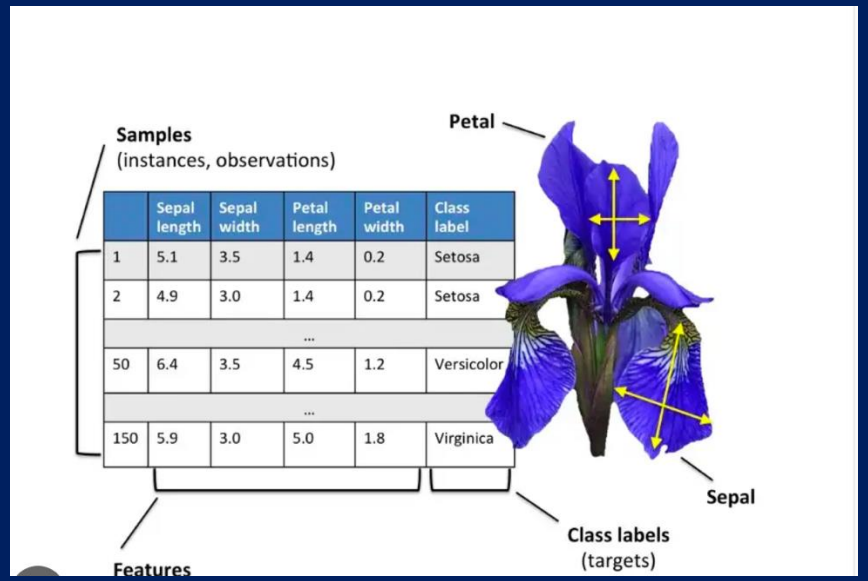
SOFTWARE DEVELOPMENT TOOLS AND ENVIRONMENTS





	Sepal length	Sepal width	Petal length	Petal width	Class label
1	5.1	3.5	1.4	0.2	Setosa
2	4.9	3.0	1.4	0.2	Setosa
...					
50	6.4	3.5	4.5	1.2	Versicolor
...					
150	5.9	3.0	5.0	1.8	Virginica

Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
1	5.1	3.5	1.4	0.2	Iris-setosa
2	4.9	3	1.4	0.2	Iris-setosa
3	4.7	3.2	1.3	0.2	Iris-setosa
4	4.6	3.1	1.5	0.2	Iris-setosa
5	5	3.6	1.4	0.2	Iris-setosa
6	5.4	3.9	1.7	0.4	Iris-setosa
7	4.6	3.4	1.4	0.3	Iris-setosa
8	5	3.4	1.5	0.2	Iris-setosa
9	4.4	2.9	1.4	0.2	Iris-setosa
10	4.9	3.1	1.5	0.1	Iris-setosa
11	5.4	3.7	1.5	0.2	Iris-setosa
12	4.8	3.4	1.6	0.2	Iris-setosa
13	4.8	3	1.4	0.1	Iris-setosa
14	4.3	3	1.1	0.1	Iris-setosa
15	5.8	4	1.2	0.2	Iris-setosa
16	5.7	4.4	1.5	0.4	Iris-setosa
17	5.4	3.9	1.3	0.4	Iris-setosa
18	5.1	3.5	1.4	0.3	Iris-setosa
19	5.7	3.8	1.7	0.3	Iris-setosa

feature extraction

Samples
(instances, observations)

	Sepal length	Sepal width	Petal length	Petal width	Class label
1	5.1	3.5	1.4	0.2	Setosa
2	4.9	3.0	1.4	0.2	Setosa
...					
50	6.4	3.5	4.5	1.2	Versicolor
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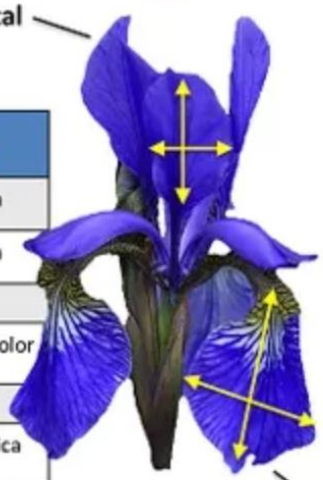
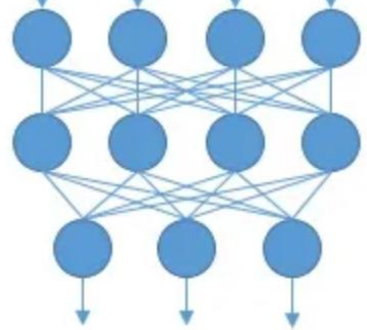
150	5.9	3.0	5.0	1.8	Virginica



Class labels
(targets)

Features



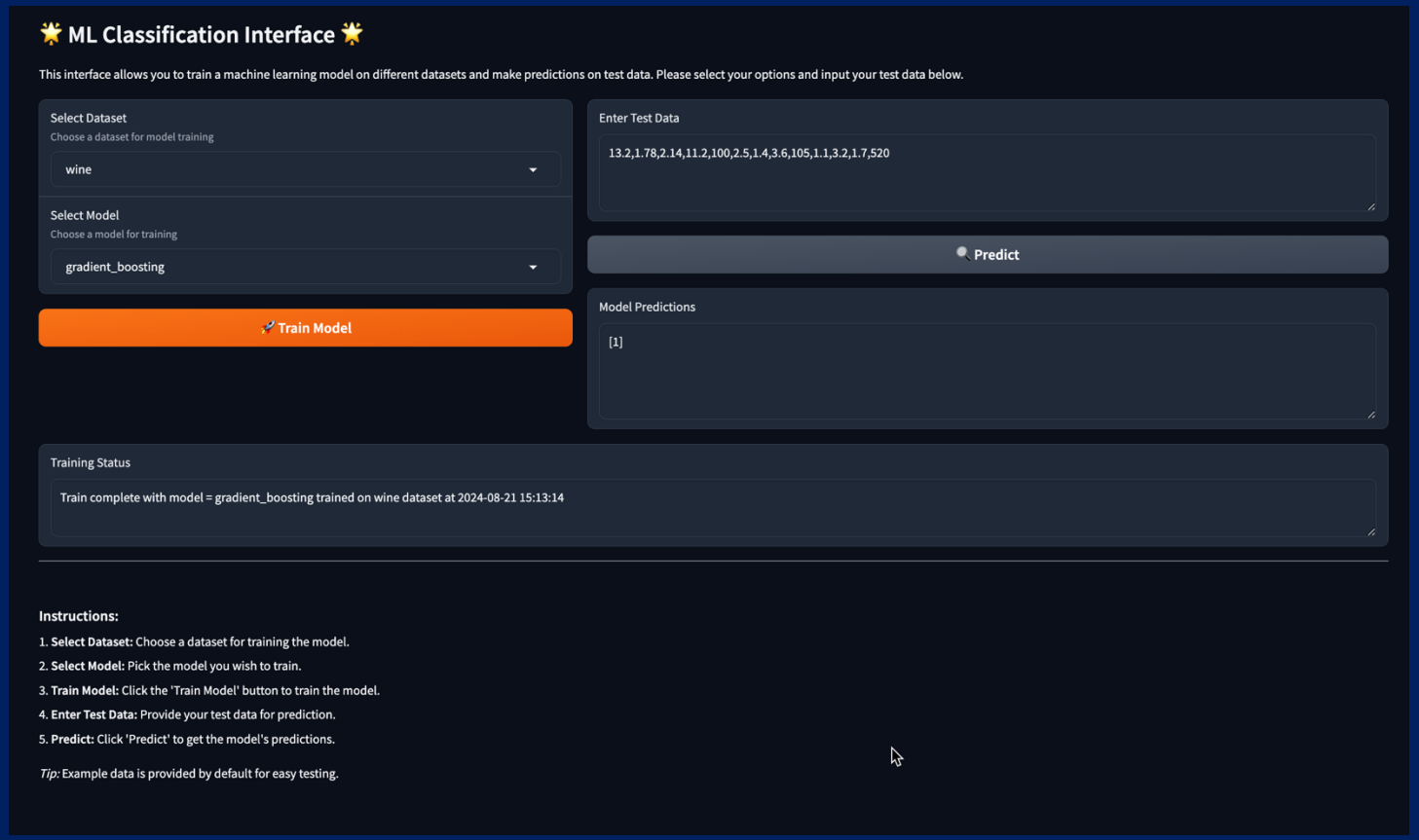
setosa versicolor virginia

Neural Nets

- *Name:* **Red Wine Quality Data Set**
- *Source:* UCI Machine Learning Repository
- *Input variables:*
  1 - fixed acidity
  2 - volatile acidity
  3 - citric acid
  4 - residual sugar
  5 - chlorides
  6 - free sulfur dioxide
  7 - total sulfur dioxide
  8 - density
  9 - pH
  10 - sulphates
  11 - alcohol
- *Output variable:* quality (score between 0 and 10)
- *Data Set Characteristics:* Multivariate
- *Number of Observations:* 1599
- *Number of Attributes/Variables:* 12
- *Missing Values:* N/A

Source: P. Cortez, A. Cerdeira, F. Almeida, T. Matos and J. Reis.
Modeling wine preferences by data mining from physicochemical properties. In Decision Support Systems, Elsevier, 47(4):547-553, 2009.

	fixed acidity	volatile acidity	citric acid	residual sugar	chlorides	free sulfur dioxide	total sulfur dioxide	density	pH	sulphates	alcohol	quality
0	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	5
1	7.8	0.88	0.00	2.6	0.098	25.0	67.0	0.9968	3.20	0.68	9.8	5
2	7.8	0.76	0.04	2.3	0.092	15.0	54.0	0.9970	3.26	0.65	9.8	5
3	11.2	0.28	0.56	1.9	0.075	17.0	60.0	0.9980	3.16	0.58	9.8	6
4	7.4	0.70	0.00	1.9	0.076	11.0	34.0	0.9978	3.51	0.56	9.4	5



Flow Diagram

```plaintext
+--------------------------+      +--------------------------+      +--------------------------+
|                          |      |                          |      |                          |
|     Gradio Frontend      +----->|      FastAPI Backend     +----->|     Model Training/      |
|                          |      |                          |      |    Inference             |
|     User Interface       |      |      Training and        |      |                          |
|                          |      |      Inference Logic     |      |                          |
|                          |      |                          |      |                          |
|  - Select Model          |      |  - Train Model           |      |  - Train Model           |
|  - Select Dataset        |      |  - Predict with          |      |  - Predict               |
|  - Enter Test Data       |      |    Test Data             |      |                          |
|  - Get Prediction        |<-----+  - Return               |<-----+  - Return               |
|                          |      |    Predictions           |      |    Predictions           |
+--------------------------+      +--------------------------+      +--------------------------+
```

```
ml-classification-docker-compose/
├── backend/
│   ├── Dockerfile
│   ├── main.py
│   └── requirements.txt
├── frontend/
│   ├── Dockerfile
│   ├── app.py
│   └── requirements.txt
├── docker-compose.yml
└── README.md  # Optional: Add a README file for project documentation
```

```yaml
version: '3.8'

services:
  backend:
    build: ./backend
    container_name: backend
    ports:
      - "8084:8000"
    volumes:
      - ./backend:/app

  frontend:
    build: ./frontend
    container_name: frontend
    ports:
      - "8085:7860"
    depends_on:
      - backend
    volumes:
      - ./frontend:/app
```

🌟 ML Classification Interface 🌟

This interface allows you to train a machine learning model on different datasets and make predictions on test data. Please select your options and input your test data below.

Select Dataset

Choose a dataset for model training

wine

Select Model

Choose a model for training

gradient_boosting

🚀 Train Model

Enter Test Data

13.2,1.78,2.14,11.2,100,2.5,1.4,3.6,105,1.1,3.2,1.7,520

🔍 Predict

Model Predictions

[1]

Training Status

Train complete with model = gradient_boosting trained on wine dataset at 2024-08-21 15:13:14

Instructions:

1. **Select Dataset:** Choose a dataset for training the model.
2. **Select Model:** Pick the model you wish to train.
3. **Train Model:** Click the 'Train Model' button to train the model.
4. **Enter Test Data:** Provide your test data for prediction.
5. **Predict:** Click 'Predict' to get the model's predictions.

Tip: Example data is provided by default for easy testing.

Back end

```python
@app.post("/train/")
async def train_model(request: TrainRequest):
    if request.dataset_name not in datasets:
        raise HTTPException(status_code=404, detail="Dataset not found")

    if request.model_name not in ["random_forest", "gradient_boosting"]:
        raise HTTPException(status_code=400, detail="Invalid model name")

    # Load dataset
    data = datasets[request.dataset_name]
    X = data.data
    y = data.target

    print(X.shape, y.shape)

    # Split dataset
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

    # Select model
    if request.model_name == "random_forest":
        model = RandomForestClassifier()
    elif request.model_name == "gradient_boosting":
        model = GradientBoostingClassifier()

    # Train model
    model.fit(X_train, y_train)

    # Save the model
    models[request.model_name] = model

    # Format current time as a string
    current_time = time.strftime("%Y-%m-%d %H:%M:%S", time.localtime())

    return {"message": f"Train complete with model = {request.model_name} trained on {request.dataset_name} dataset at {current_time}"}

@app.post("/predict/")
async def predict(request: PredictRequest):
    if request.model_name not in models:
        raise HTTPException(status_code=404, detail="Model not found")

    if request.model_name in models:
        model = models[request.model_name]
        # Predict using the provided test data
        predictions = model.predict(request.test_data)

        return {"predictions": predictions.tolist()}
    else:
        raise HTTPException(status_code=400, detail="Model not found")
```