

Train.py

```
(base) PS D:\LLM projects\MLOPS\LAB4-MLflow> python .\train.py

=====

Loading Iris Dataset

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Training samples: 120
Test samples: 30
Features: ['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)', 'petal width (cm)']
Classes: [np.str_('setosa'), np.str_('versicolor'), np.str_('virginica')]

Total Configurations: 12
RandomForest: 4 configs
SVC: 4 configs
LogisticRegression: 4 configs

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Training RandomForest with 4 hyperparameter sets

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Training RandomForest config 1...
2025/11/01 15:51:15 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 5965.08it/s]
✓ Accuracy: 0.9000 | F1: 0.8997
Training RandomForest config 2...
2025/11/01 15:51:24 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 4368.42it/s]
✓ Accuracy: 0.9667 | F1: 0.9666
Training RandomForest config 3...
2025/11/01 15:51:29 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 4593.98it/s]
✓ Accuracy: 0.9000 | F1: 0.8997
Training RandomForest config 4...
2025/11/01 15:51:34 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 5620.24it/s]
✓ Accuracy: 0.9667 | F1: 0.9666

=====

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2025/11/01 15:51:34 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 5620.24it/s]
✓ Accuracy: 0.9667 | F1: 0.9666

Summary for RandomForest:
Best Config: #2
Best Accuracy: 0.9667
Avg Accuracy: 0.9333
Std Accuracy: 0.0333

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Training SVC with 4 hyperparameter sets

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Training SVC config 1...
2025/11/01 15:51:39 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 4749.29it/s]
✓ Accuracy: 0.9667 | F1: 0.9666
Training SVC config 2...
2025/11/01 15:51:43 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 4687.87it/s]
✓ Accuracy: 0.9667 | F1: 0.9666
Training SVC config 3...
2025/11/01 15:51:47 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 6475.55it/s]
✓ Accuracy: 1.0000 | F1: 1.0000
Training SVC config 4...
2025/11/01 15:51:51 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
Downloading artifacts: 100%|██████████████████████████████████████████| 7/7 [00:00<00:00, 3952.63it/s]
✓ Accuracy: 1.0000 | F1: 1.0000

Summary for SVC:
Best Config: #3
Best Accuracy: 1.0000
Avg Accuracy: 0.9833
Std Accuracy: 0.0167
```

Training LogisticRegression with 4 hyperparameter-sets

```
2025/11/01 15:51:55 WARNING mlflow.models.model: `artifact_path` is deprecated. Please use `name` instead.
```

✓ Accuracy: 0.9667 | F1: 0.9666

```
2025/11/01 15:51:59 WARNING mlflow.models.model: 'artifact path' is deprecated. Please use 'name' instead.
```

✓ Accuracy: 0.9667 | F1: 0.9666

```
2025/11/01 15:52:03 WARNING mlflow.models.model: 'artifact_path' is deprecated. Please use 'name' instead.
```

✓ Accuracy: 1.0000 | F1: 1.0000

```
0:\miniconda3\Lib\site-packages\sklearn\linear_model\_sag.py:348: ConvergenceWarning: The max_iter was reached which means the coef_ did not converge
```

```
2025/11/01 15:52:10 WARNING mlflow.models.model: "artifact_path" is deprecated. Please use "name" instead.
```

✓ Accuracy: 1.0000 | F1: 1.0000

Best Config: #3
Best Accuracy: 1.0000
Avg Accuracy: 0.9833
Std Accuracy: 0.0167

	Model	Best Config	Test Accuracy	Test F1	Precision	Recall	Run ID
LogisticRegression	SVC	#3	1.0000	1.0000	1.0000	1.0000	c1e1c4c5
		#3	1.0000	1.0000	1.0000	1.0000	2966aab2
	RandomForest	#2	0.9667	0.9666	0.9697	0.9667	2627597f

DETAILED COMPARISON - ALL CONFIGURATIONS

	Model	Config	Test Accuracy	Test F1	Run ID
	SVC	#3	1.0000	1.0000	c1e1c4c5
	SVC	#4	1.0000	1.0000	88d6de6e
LogisticRegression		#3	1.0000	1.0000	2966aabb
LogisticRegression		#4	1.0000	1.0000	4dd8b654
	RandomForest	#2	0.9667	0.9666	2627597f
	RandomForest	#4	0.9667	0.9666	5c6cb210
	SVC	#1	0.9667	0.9666	fa716131
	SVC	#2	0.9667	0.9666	939241a2
LogisticRegression		#1	0.9667	0.9666	db35375f
LogisticRegression		#2	0.9667	0.9666	f781ffbf
	RandomForest	#1	0.9000	0.8997	a2c853bf
	RandomForest	#3	0.9000	0.8997	4089fbf8

```
Model Type: SVC
Configuration: #3
Test Accuracy: 1.0000
Test F1 Score: 1.0000
Test Precision: 1.0000
Test Recall: 1.0000
Run ID: c1e1c4c5338a49b985facea41b309b5f
```

Successfully registered model 'iris_best_model'.

```
2025/11/01 15:52:13 WARNING mflow_tracking.model_registry.fluent: Run with id c1e1c45338a4b9885facea41b309b5f has no artifacts at artifact path 'model', registering model based on models:/m-def22ff9a5fc4de7a0f7b1b1e2fa4dfc1 instead
```

```
(base) PS D:\LLM projects\MLOPS\LAB4-MLflow> python .\train.py
Model Type: SVC
Configuration: #3
Registry Name: iris_best_model
Version: 1
Stage: Production
Accuracy: 1.0000
Run ID: c1e1c4c5338a49b985facea41b309b5f

=====
INFERENCE - Loading Production Model
=====
D:\LLM projects\MLOPS\LAB4-MLflow\train.py:606: FutureWarning: ``mlflow.tracking.client.MlflowClient.get_latest_versions`` is deprecated
since 2.9.0. Model registry stages will be removed in a future major release. To learn more about the deprecation of model registry sta
ges, see our migration guide here: https://mlflow.org/docs/latest/model-registry.html#migrating-from-stages
  versions = client.get_latest_versions(MODEL_REGISTRY_NAME, stages=[stage])
Model Name: iris_best_model
Version: 1
Stage: Production

Results:
  Accuracy: 1.0000
  F1 Score: 1.0000

Sample Predictions:
=====
✓ Sample 1: True=setosa      | Pred=setosa      | Conf=0.957
✓ Sample 2: True=virginica  | Pred=virginica   | Conf=0.637
✓ Sample 3: True=versicolor | Pred=versicolor  | Conf=0.885
✓ Sample 4: True=versicolor | Pred=versicolor  | Conf=0.905
✓ Sample 5: True=setosa     | Pred=setosa      | Conf=0.958
✓ Sample 6: True=versicolor | Pred=versicolor  | Conf=0.895
✓ Sample 7: True=setosa     | Pred=setosa      | Conf=0.957
✓ Sample 8: True=setosa     | Pred=setosa      | Conf=0.949
✓ Sample 9: True=virginica  | Pred=virginica   | Conf=0.923
✓ Sample 10: True=versicolor | Pred=versicolor  | Conf=0.804
```

Inference.py

```
● (base) PS D:\LLM projects\MLOPS\LAB4-MLflow> python .\inference.py
Loading model: iris_best_model from Production stage...
✓ Model loaded successfully

Input:
  Sepal Length: 5.1
  Sepal Width: 3.5
  Petal Length: 1.4
  Petal Width: 0.2

Predicted Class: setosa

Class Probabilities:
  setosa      : 0.9670 (96.70%)
  versicolor  : 0.0172 (1.72%)
  virginica   : 0.0158 (1.58%)
○ (base) PS D:\LLM projects\MLOPS\LAB4-MLflow>
```