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Nuclio : KubeFlow Serverless's component

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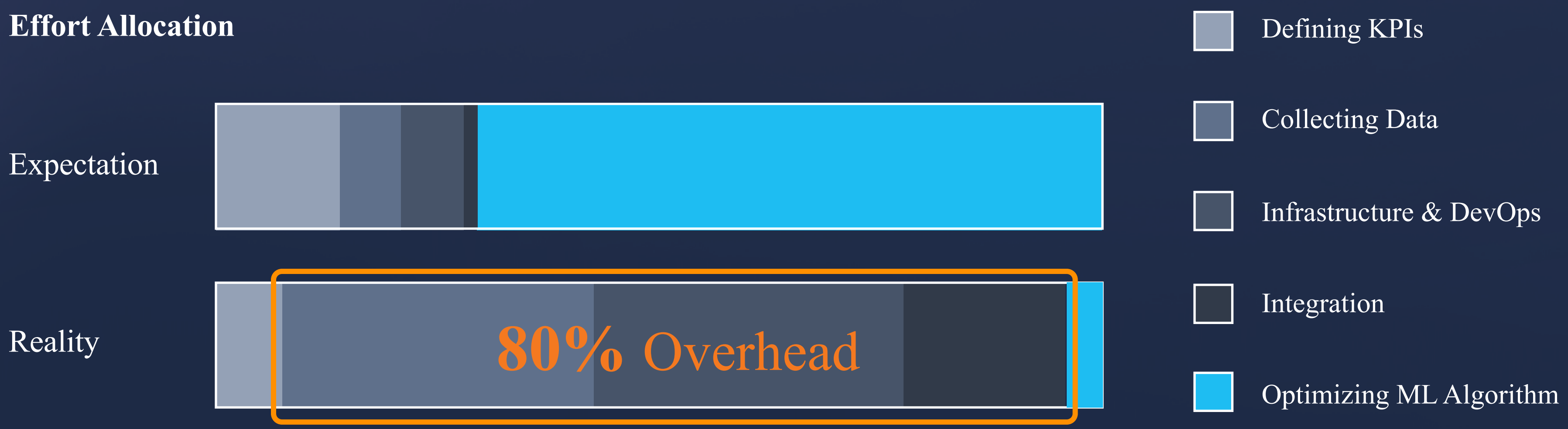
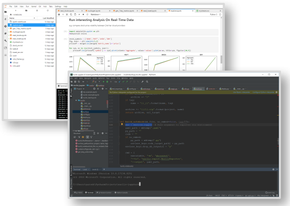
Data Science Teams Don't Do Data Science



Source: Google Developers Launchpad

The need: Simpler Solutions, Better Data Integration

Develop/Experiment



Package

- Dependencies
- Parameters
- Run scripts
- Build

Scale-out

- Load-balance
- Data partitions
- Model distribution
- Hyper params

Tune

- Parallelism
- GPU support
- Query tuning
- Caching

Instrument

- Monitoring
- Logging
- Versioning
- Security

Automate

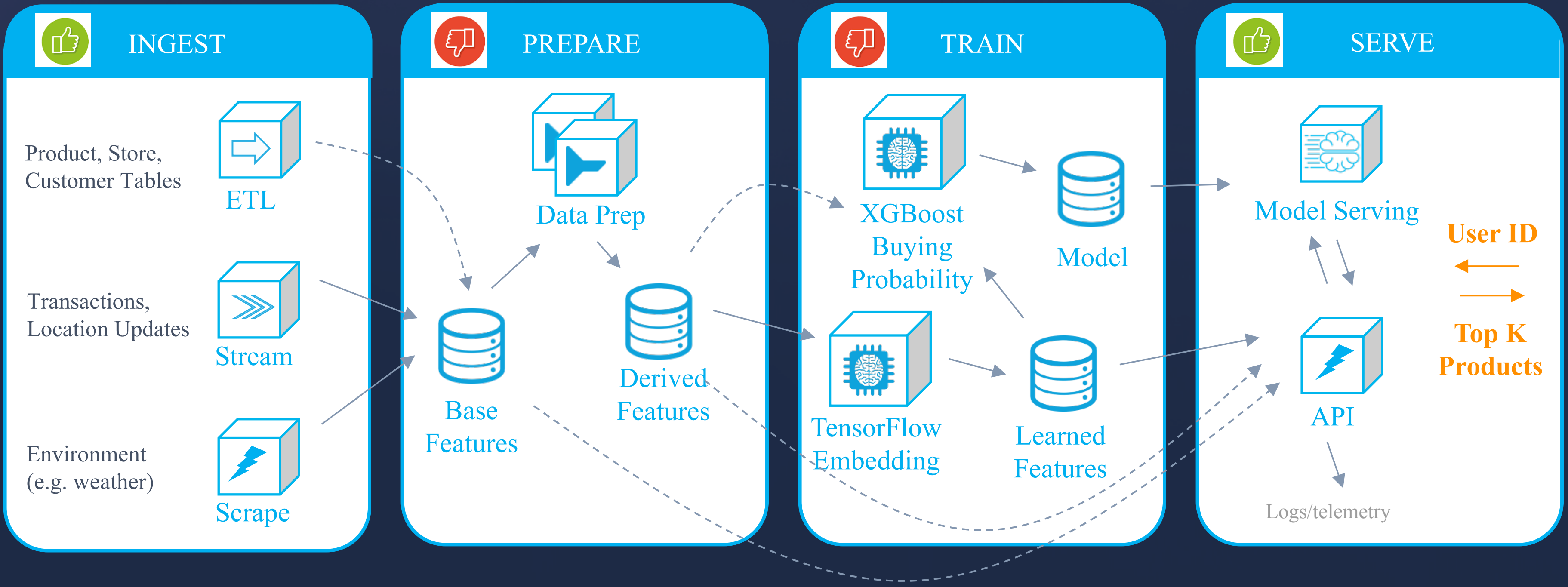
- CI/CD
- Workflows
- Rolling upgrades
- A/B testing

Weeks with one data scientist

Months with a large team of developers, scientists, data engineers and DevOps

Automate DevOps to Deploy Projects in One Week as Opposed to Months!

Example: Real-time Product Recommendations



ML Function

Feature/Model Store

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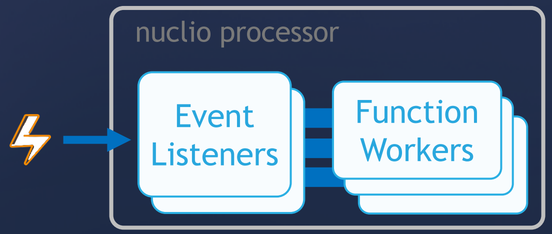
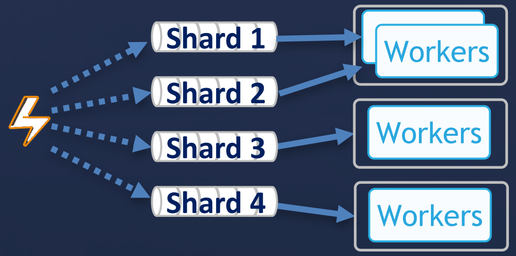
Nuclio: Taking Serverless to Data Intensive Apps

Extreme Performance



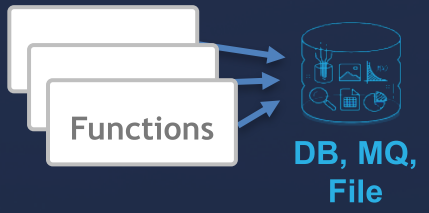
- Non-blocking, parallel
- Zero copy, buffer reuse
- Up to 400K events/sec/proc
- **GPU** optimizations

Advanced Data & AI Features



- Auto-rebalance, checkpoints
- Any source: Kafka, NATS, Kinesis, event-hub, iguazio, pub/sub, RabbitMQ, Cron, ..
- NVIDIA Rapids integration

Statefulness



- Data bindings
- Shared volumes
- Context cache

Natively integrated with Kubeflow and Jupyter Notebooks

Ingest: Using Nuclio to Accelerate ETL and Streaming

Simple code! Automated DevOps ! Any Source!

(e.g. read JSON Stream + aggregate + dump to Parquet)

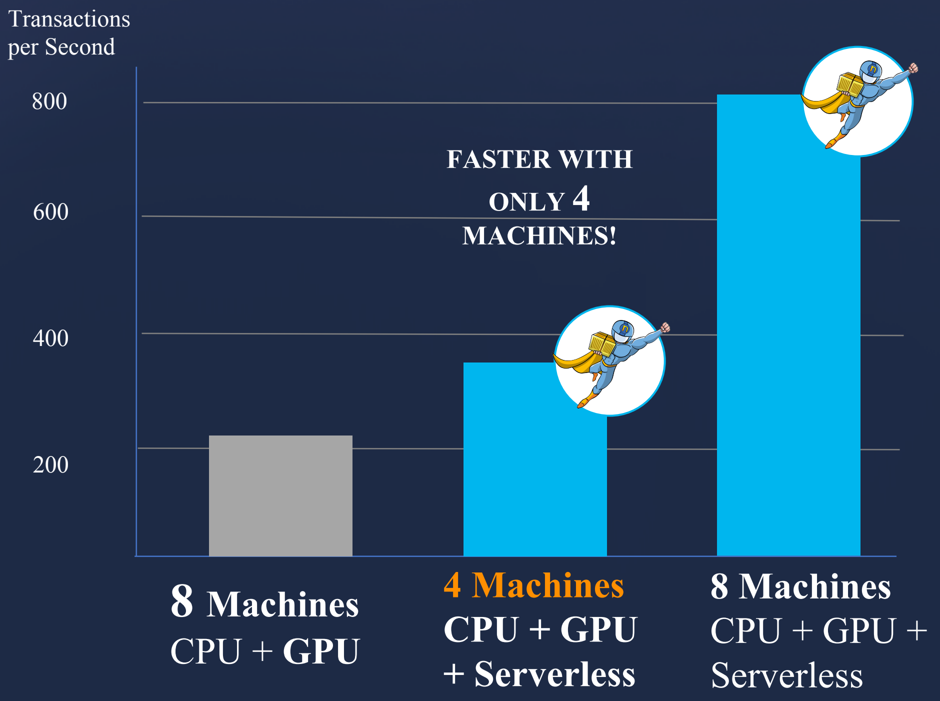
```python
def init_context(context):
    os.makedirs(sink, exist_ok=True)

def handler(context, event):
    add_log_to_batch(context, event.body)

    if len(batch) > batch_len:
        df = _batch_to_df(context)
        if not df.empty:
            df = df.groupby(['log_ip']).agg({'feconn':'mean',
                                             'beconn':'mean',
                                             'time_backend_response':'max',
                                             'time_backend_response':'mean',
                                             'time_queue':'mean',
                                             'time_duration': 'mean',
                                             'time_request': 'mean',
                                             'time_backend_connect':'mean'
                                            })
        df_to_parquet(df)
        reset_batch()
```

Serving: Using Nuclio for Real-time Model Serving

4X Faster model serving on GPU system



Single command from notebook to function

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Why Not Use Serverless for Training and Data Prep?

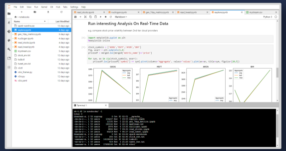
What about Training and data prep ?

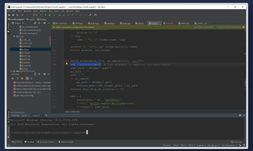
	Serverless Today	Data Prep and Training
Task lifespan	Millisecs to mins	Secs to hours
Scaling	Load-balancer	Partition, shuffle, reduce, Hyper-params, ring allreduce
State	Stateless	Stateful
Input	Event	Params, Datasets

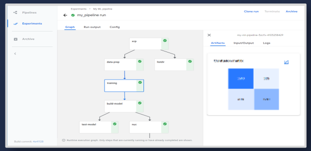
Serverless: resource elasticity and automated deployment and operations

Introducing Nuclio ML Functions

Access from your notebook, IDE, or KubeFlow







Kubeflow

Common APIs & Automation

Multiple Engines

Application & Notebook Templates

Builder | Controller | Runs & Artifacts DB

Real-time | Analytics | Training | Serving

Spark

+ KFS

Fast Persistent Data Layer (Files, DataFrames, K/V)

Built-in Artifacts & Runs Tracking

Elastic Scaling

Demo: Fast and Serverless KubeFlow Pipeline

All demos can be found in github: https://github.com/mlrun/demos

Thank You

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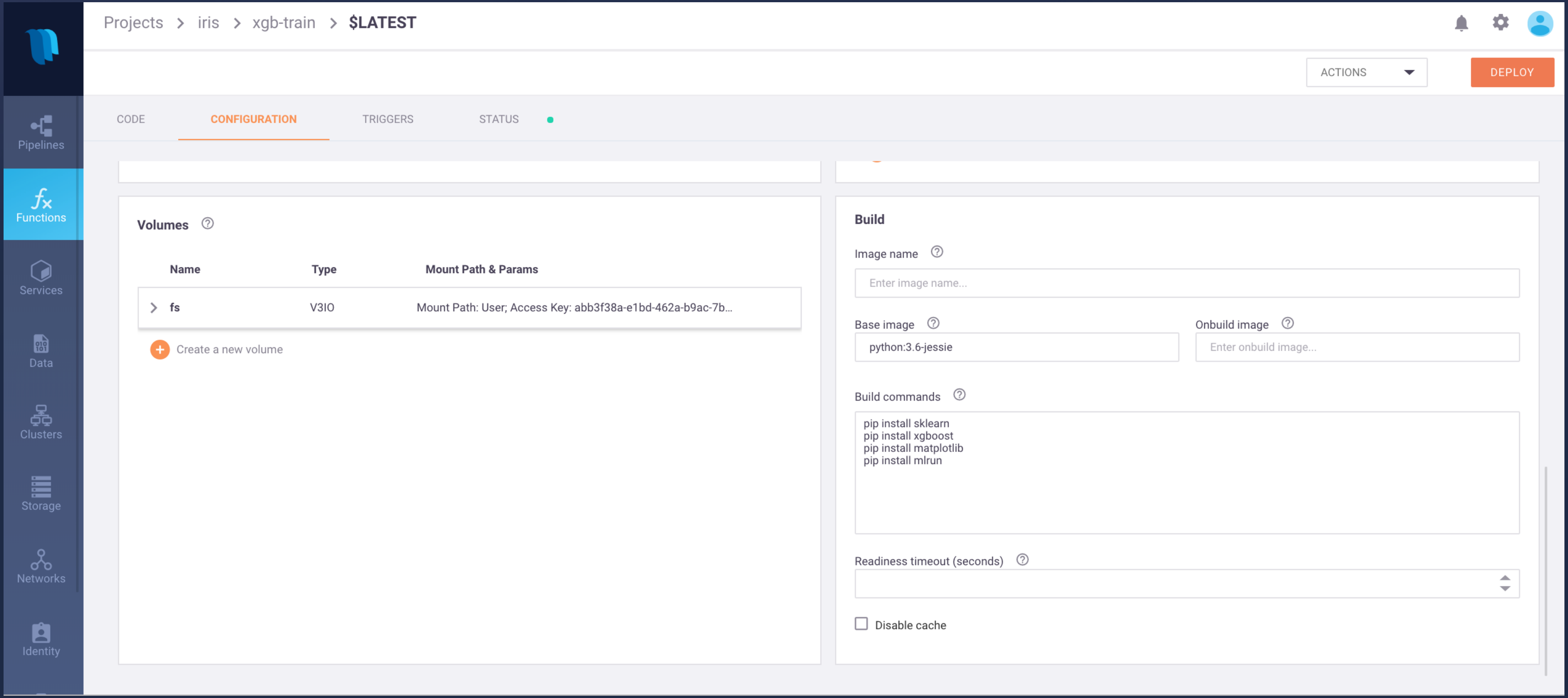
Iris Model Nuclio Function



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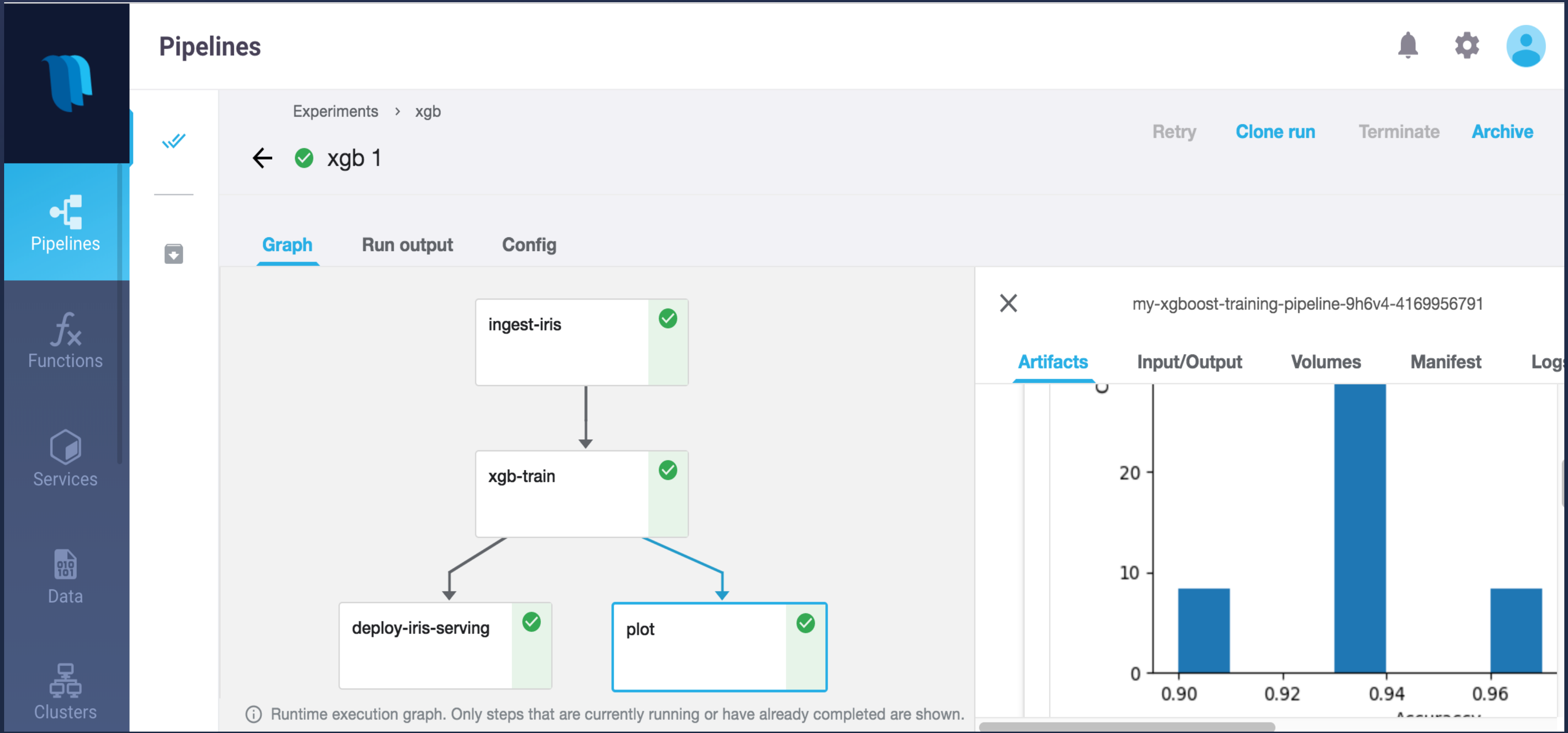
Iris Model Pipeline



Iris Model Serving

Projects > iris > iris-srv > $LATEST

CODE CONFIGURATION TRIGGERS STATUS

Code entry type: Source code (edit online)

Runtime: Python 3.6

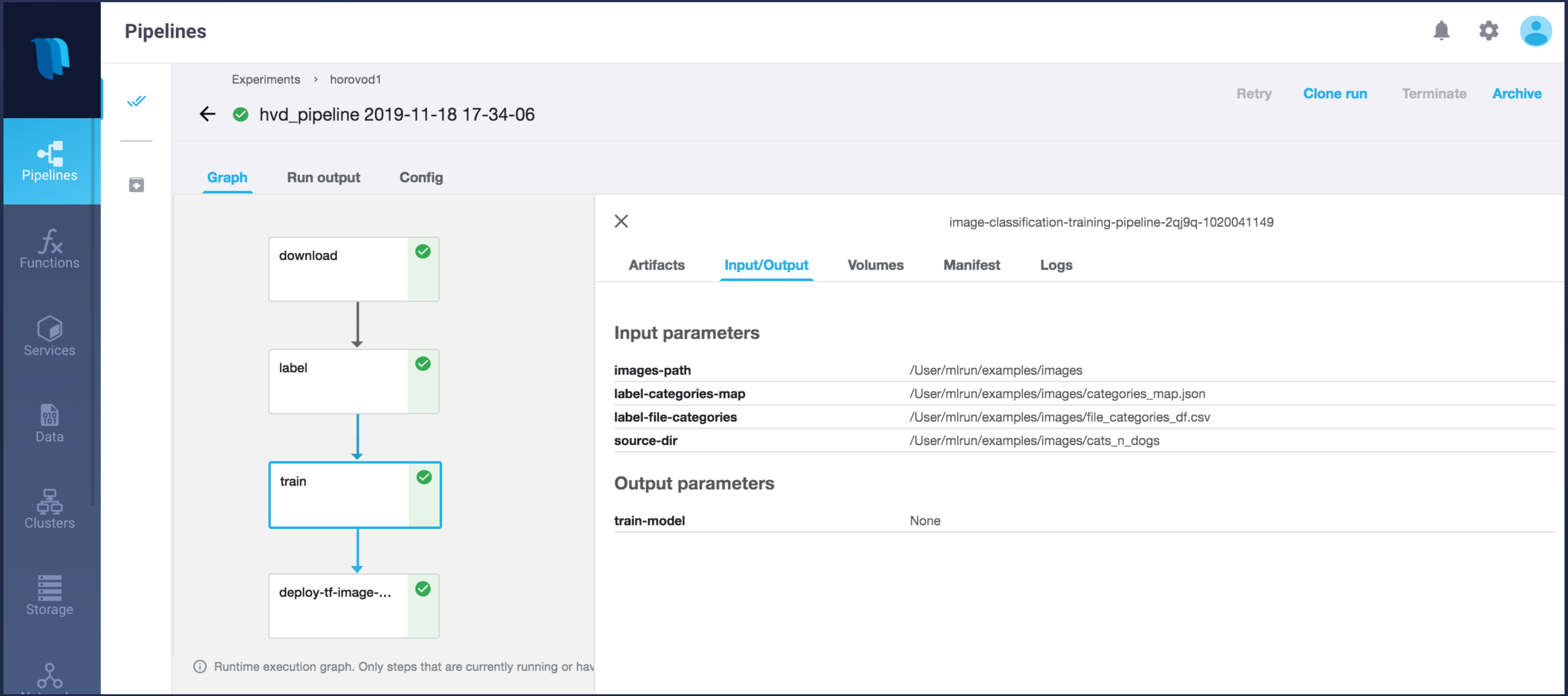
Handler: nuclio_serving:handler

Source code *

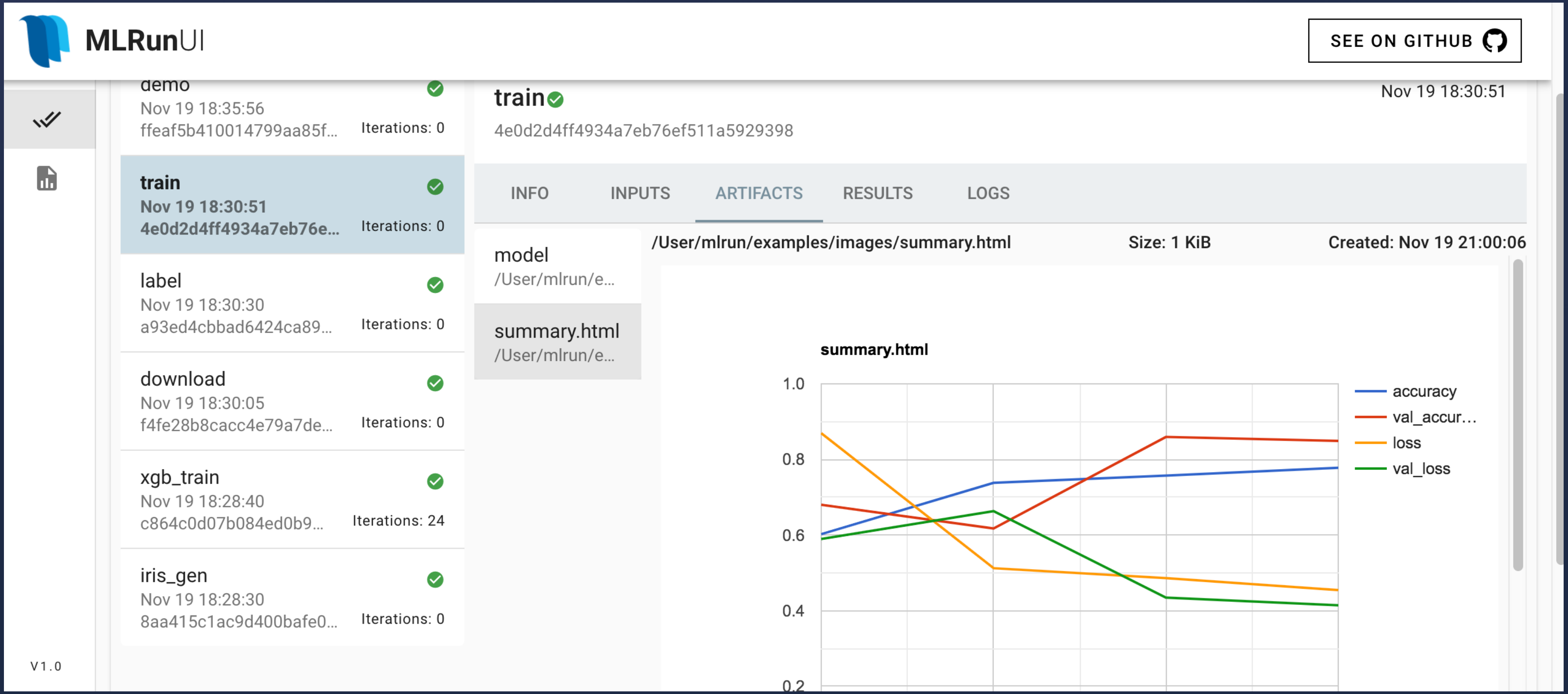
```python
BOOSTER_FILE = "model.bst"

class XGBoostModel(kfserving.KFModel):
    def __init__(self, name: str, model_dir: str, booster: xgb.XGBModel = None):
        super().__init__(name)
        self.name = name
        self.model_dir = model_dir
        if not booster is None:
            self._booster = booster
            self.ready = True

    def load(self):
        model_file = os.path.join(
            kfserving.Storage.download(self.model_dir), BOOSTER_FILE)
        self._booster = xgb.Booster(model_file=model_file)
        self.ready = True

    def predict(self, body: List) -> List:
        try:
            dmatrix = xgb.DMatrix(body)
            result: xgb.DMatrix = self._booster.predict(dmatrix)
            return result.tolist()
        except Exception as e:
            raise Exception("Failed to predict %s" % e)
```

Pipelines
Functions
Services
Data
Clusters
Storage
Networks
Identity

Distributed TenserFlow Pipeline



MLRun UI - Distributed TenserFlow Train Job



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