

# Configuration Manual

MSc Research Project  
MSc Cloud Computing

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MSc Project Submission Sheet



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**Programme:** MSc Cloud Computing

**Year:** 2024 - 2025

**Module:** MSc Research Project

**Lecturer:** Sai Emani

**Submission**

**Due Date:** 15-09-2025

**Project Title:** An Adaptive ML-Driven Layer-wise Caching and Pre-warming Approach for Cold Start Mitigation in Serverless Frameworks

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# Configuration Manual

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## 1 Framework

The adaptive framework built on the ML aims at predicting the challenging feature and using an advanced hybrid model that integrates both LSTM model temporal analysis and XGBoost future forecasting to help avoid cold starts in AWS lambda systems. This works in four comprehensive stages:

- Hybrid ML Model: LSTM + XGBoost
- Three Tier Cache System: Hot (Memory ) - Warm (EFS ) - Cold (S3 )
- Container-based Lambda functions

## 2 Development Environment

- # Core Requirements
  - Python 3.9+
  - AWS CLI 2.x
  - Docker 20.10+
  - Node.js 16+ (for AWS CDK)
- # Python Libraries
  - tensorflow==2.13.0
  - xgboost==2.0.3
  - scikit-learn==1.3.2
  - pandas==2.1.4
  - numpy==1.24.3
  - boto3==1.34.11
  - matplotlib==3.10.0
  - seaborn==0.13.2

## 3 AWS Configuration

```
# Configure AWS credentials (aws_setup_credentials.py)
import boto3
import configparser
from pathlib import Path

def setup_aws_academy_credentials():
    """Configure AWS Academy Lab Role credentials"""

    # Create .aws directory
    aws_dir = Path.home() / '.aws'
```

```

aws_dir.mkdir(exist_ok=True)

# Set credentials
credentials = """
[default]
aws_access_key_id=YOUR_ACCESS_KEY
aws_secret_access_key=YOUR_SECRET_KEY
aws_session_token=YOUR_SESSION_TOKEN
region=us-east-1
"""

# Write credentials file
creds_file = aws_dir / 'credentials'
creds_file.write_text(credentials)

# Verify connection
sts = boto3.client('sts')
identity = sts.get_caller_identity()
print(f"✓ Connected as: {identity['Arn']}")

```

Or use

```

aws configure #Terminal or Command Prompt

aws_access_key_id=YOUR_ACCESS_KEY
aws_secret_access_key=YOUR_SECRET_KEY

aws configure set aws_session_token YOUR_SESSION_TOKEN

```

## 4 Deployment

```

# Dockerfile for Lambda Container
FROM public.ecr.aws/lambda/python:3.10

# Install dependencies
COPY requirements.txt .
RUN pip install -r requirements.txt

# Copy application code
COPY lambda_function.py .
COPY src/ ./src/
COPY models/ ./models/

# Set handler
CMD ["lambda_function.lambda_handler"]

```

## 5 Testing

*#Train-Models*

```
python coldstart-predictor\train_models.py
```

*#Test-Predictor with Metrics Visualization*

```
python coldstart-predictor\tests\ test_predictor_v2.py
```

*#Test Coldstart-predictor Lambda deployment*

```
python coldstart-predictor\test_lambda_deployment.py
```

## 6 Visualizations

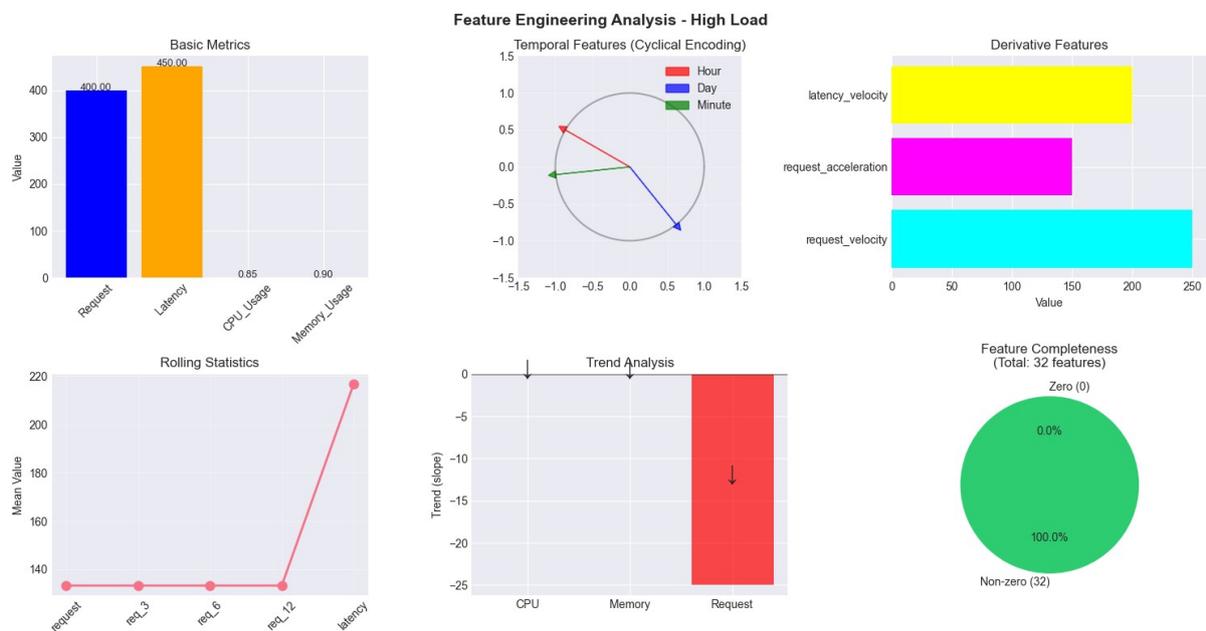


Figure 1: Features – high load condition

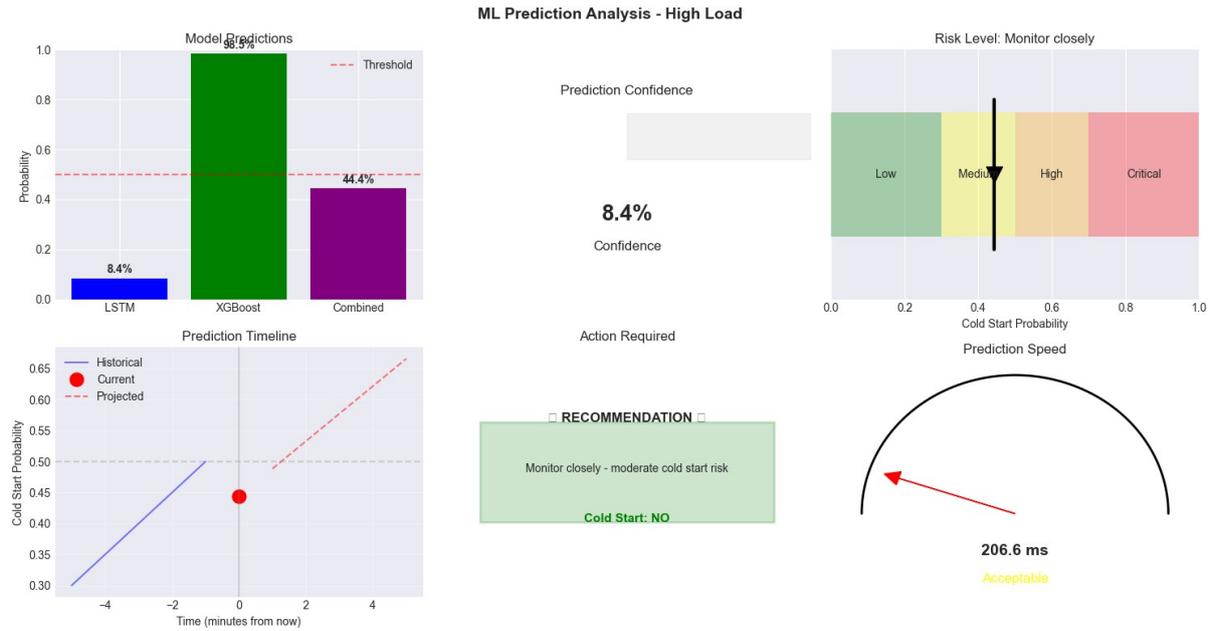


Figure 2: ML Prediction - High load condition



Figure 3: Cache Optimization