Requirements for Configuration Performance Learning for X264

Configuration Performance Learning Research

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1 Software Requirements

This project requires the following software components to run the machine learning models for predicting x264 configuration performance:

1.1 Python Environment

The implementation requires Python 3.6 or higher. We recommend using a virtual environment to manage dependencies.

```
# Create and activate a virtual environment
python -m venv x264_env
source x264_env/bin/activate  # On Windows: x264_env\Scripts\activate
```

1.2 Required Python Packages

The following Python packages are required to run the code. Install them using pip:

```
pip install numpy pandas scikit-learn lightgbm
```

Table 1: Required Python Package Versions

Package	Min Version	Purpose
numpy	1.19.0	Numerical operations and array handling
pandas	1.1.0	Dataset loading and preprocessing
scikit-learn	0.24.0	Linear Regression model and metrics
lightgbm	3.2.0	Gradient boosting implementation

1.3 Hardware Requirements

The experiments were conducted on a system with the following specifications:

- CPU: Intel Core i7 or equivalent (4+ cores recommended)
- RAM: Minimum 8GB (16GB recommended for large datasets)
- Disk Space: At least 1GB free space for datasets and result logs

While the models can run on less powerful hardware, training time may increase significantly.

2 Directory Structure

The codebase expects a specific directory structure to function properly:

```
config-performance-learning-x264/
          data_loader.py
          lightGBM.py
          lr.py
          datasets/
                x264/
                    blue_sky_1080p25.csv
                    Johnny_1280x720_60.csv
                    ... (other video datasets)
          log/
              YYYYMMDD/
                  lightgbm/
                  linear-regression/
```

The ‘datasets‘ directory contains subdirectories for each system (x264 in this case), with CSV files for each video. The ‘log‘ directory stores results organized by date and model type.

3 Dataset Format

Each dataset CSV file should have the following format:

- Rows represent different configurations of x264
- Columns represent configuration parameters
- The last column contains the performance metric (runtime in seconds)
- No header row (or will be automatically skipped if present)

The dataset used in this study is based on x264 version baee400 and includes 3,113 unique configurations across 25 parameters.

4 Environment Variables

No specific environment variables are required for this project.

5 Compilation

As this is a Python project, no compilation is needed. The scripts can be run directly using the Python interpreter.