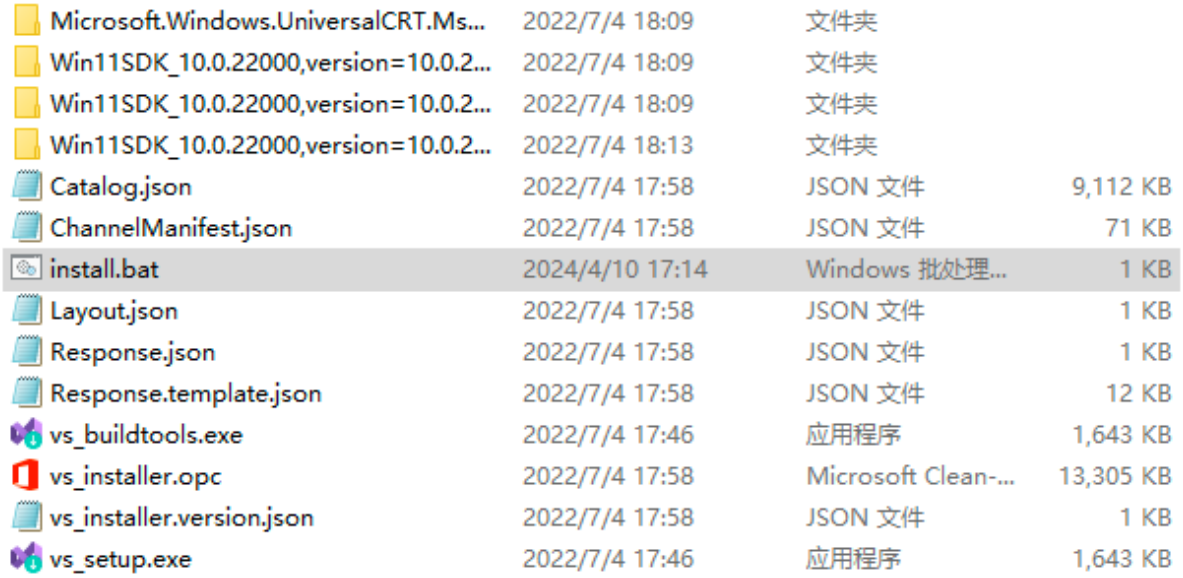
1 Prerequisites

1.1 Rust

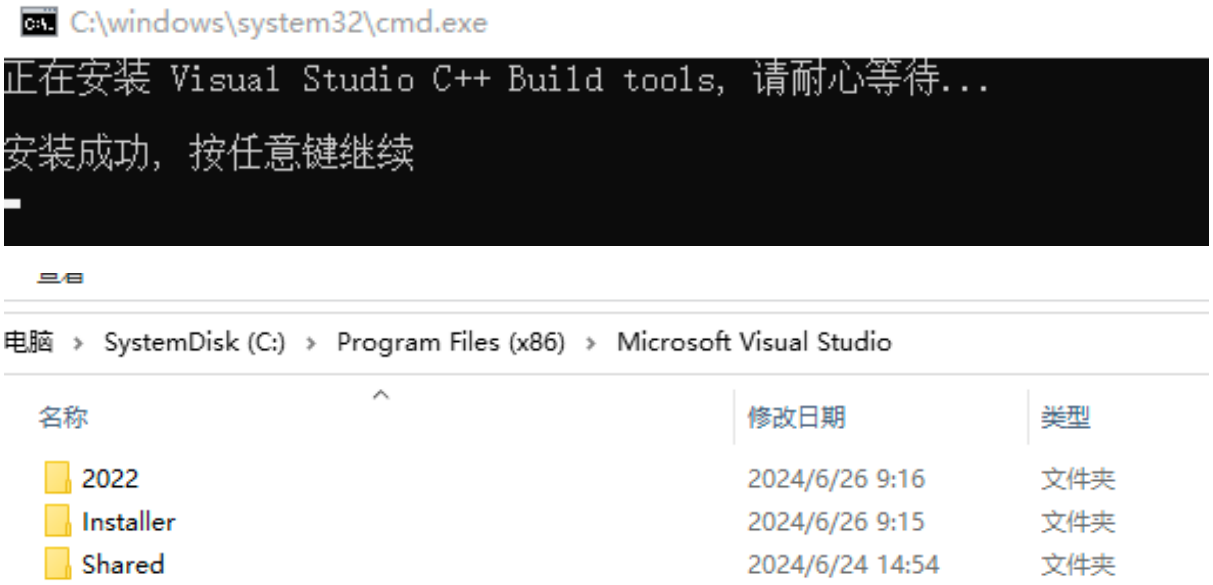
Rust needs to be installed in order to cross-compile the HuggingFace tokenizer for Android. To get started with Rust, first install the Visual Studio C++ Build Tools. The following steps are based on a Windows environment installation.

1.1.1 Installing Visual Studio C++ Build Tools Download the msvc-buildtools-with-sdk.zip file, extract it, and run the install.bat file.



Microsoft.Windows.UniversalCRT.Ms...	2022/7/4 18:09	文件夹	
Win11SDK_10.0.22000,version=10.0.2...	2022/7/4 18:09	文件夹	
Win11SDK_10.0.22000,version=10.0.2...	2022/7/4 18:09	文件夹	
Win11SDK_10.0.22000,version=10.0.2...	2022/7/4 18:13	文件夹	
Catalog.json	2022/7/4 17:58	JSON 文件	9,112 KB
ChannelManifest.json	2022/7/4 17:58	JSON 文件	71 KB
install.bat	2024/4/10 17:14	Windows 批处理...	1 KB
Layout.json	2022/7/4 17:58	JSON 文件	1 KB
Response.json	2022/7/4 17:58	JSON 文件	1 KB
Response.template.json	2022/7/4 17:58	JSON 文件	12 KB
vs_buildtools.exe	2022/7/4 17:46	应用程序	1,643 KB
vs_installer.opc	2022/7/4 17:58	Microsoft Clean-...	13,305 KB
vs_installer.version.json	2022/7/4 17:58	JSON 文件	1 KB
vs_setup.exe	2022/7/4 17:46	应用程序	1,643 KB

After successful installation.

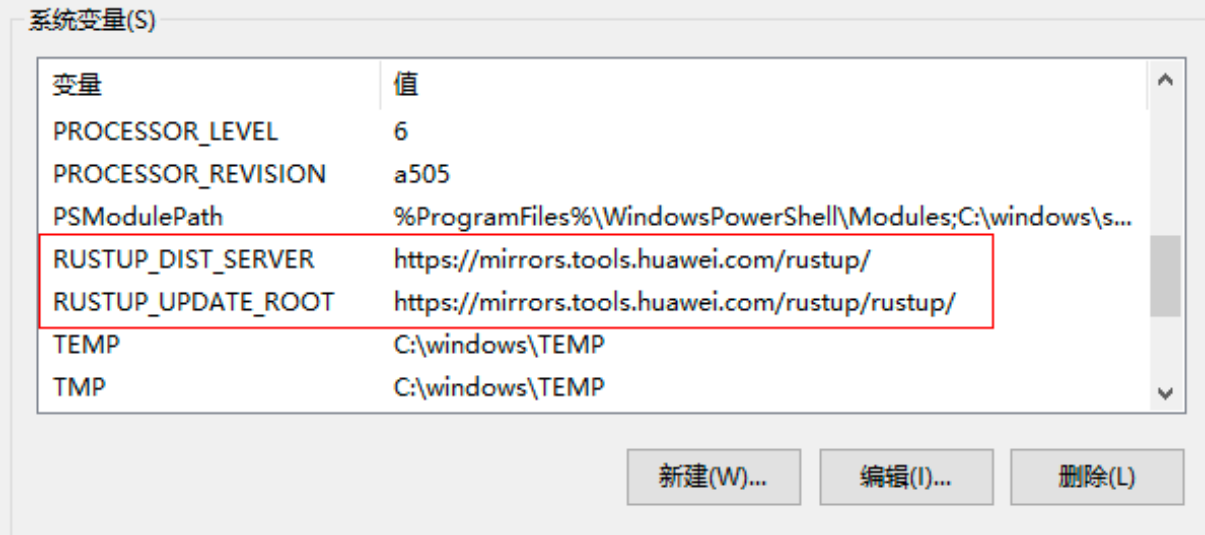


1.1.2 Installing Rust

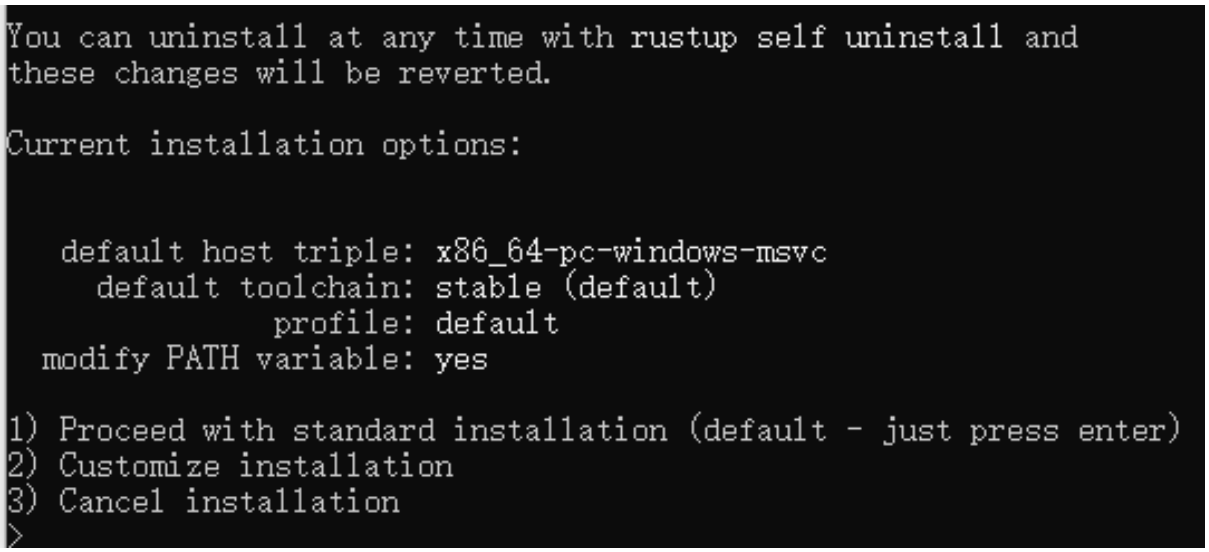
Setting Environment Variables

RUSTUP_DIST_SERVER https://mirrors.tools.huawei.com/rustup/

RUSTUP_UPDATE_ROOT https://mirrors.tools.huawei.com/rustup/rustup/



After downloading rustup-init.exe (change the file extension if necessary), simply double-click it.



Enter 2/x86_64-pc-windows-msvc/ enter/ enter/ y/ 1, in sequence, as shown below.

```
Current installation options:


   default host triple: x86_64-pc-windows-msvc
     default toolchain: stable (default)
               profile: default
  modify PATH variable: yes

1) Proceed with standard installation (default - just press enter)
2) Customize installation
3) Cancel installation
>2

I'm going to ask you the value of each of these installation options.
You may simply press the Enter key to leave unchanged.

Default host triple? [x86_64-pc-windows-msvc]
x86_64-pc-windows-msvc

Default toolchain? (stable/beta/nightly/none) [stable]


Profile (which tools and data to install)? (minimal/default/complete) [default]


Modify PATH variable? (Y/n)
y


Current installation options:


   default host triple: x86_64-pc-windows-msvc
     default toolchain: stable
               profile: default
  modify PATH variable: yes

1) Proceed with selected options (default - just press enter)
2) Customize installation
3) Cancel installation
>1
```

After a successful installation, the following message will be displayed

```
Current installation options:


   default host triple: x86_64-pc-windows-msvc
     default toolchain: stable
               profile: default
  modify PATH variable: yes

1) Proceed with selected options (default - just press enter)
2) Customize installation
3) Cancel installation
>1

info: profile set to 'default'
info: setting default host triple to x86_64-pc-windows-msvc
info: syncing channel updates for 'stable-x86_64-pc-windows-msvc'
info: latest update on 2024-06-13, rust version 1.79.0 (129f3b996 2024-06-10)
info: downloading component 'cargo'
info: downloading component 'clippy'
info: downloading component 'rust-docs'
info: downloading component 'rust-std'
 18.3 MiB /  18.3 MiB (100 %)  16.1 MiB/s in  1s ETA:  0s
info: downloading component 'rustc'
 57.7 MiB /  57.7 MiB (100 %)  15.8 MiB/s in  3s ETA:  0s
info: downloading component 'rustfmt'
info: installing component 'cargo'
info: installing component 'clippy'
info: installing component 'rust-docs'
 15.4 MiB /  15.4 MiB (100 %)   3.2 MiB/s in  3s ETA:  0s
info: installing component 'rust-std'
 18.3 MiB /  18.3 MiB (100 %)  18.3 MiB/s in  1s ETA:  0s
info: installing component 'rustc'
 57.7 MiB /  57.7 MiB (100 %)  18.0 MiB/s in  3s ETA:  0s
info: installing component 'rustfmt'
info: default toolchain set to 'stable-x86_64-pc-windows-msvc'

  stable-x86_64-pc-windows-msvc installed - rustc 1.79.0 (129f3b996 2024-06-10)


Rust is installed now. Great!

To get started you may need to restart your current shell.
This would reload its PATH environment variable to include
Cargo's bin directory (%USERPROFILE%\.cargo\bin).

Press the Enter key to continue.
```

#Configure rust environment variables

PATH=C:\Users\y60044858\.rustup\toolchains\innersource-distribution-x86_64-pc-windows-msvc\bin

To check the installation information, execute rustc --version.

```
C:\Users\y60044858>rustc --version
rustc 1.79.0 (129f3b996 2024-06-10)

C:\Users\y60044858>
```

1.2 JDK

Based on the Windows operating system, install JDK 1.8 (jdk-8u201-windows-x64.msi) and configure the environment variables.

Execute jdk-8u201-windows-x64.msi to complete the installation.

JDK Environment Variable Configuration:

JAVA_HOME=D:\D\Android\Java\jdk1.8.0_201
CLASSPATH=.;%JAVA_HOME%\lib\dt.jar;%JAVA_HOME%\lib\tools.jar
PATH=%JAVA_HOME%\bin;%JAVA_HOME%\jre\bin

To check the installation information, execute java -version.

```
C:\Users\y60044858>java -version
openjdk version "1.8.0_201"
OpenJDK Runtime Environment (build 1.8.0_201-Huawei_JDK_V100R001C00SPC060B003-b10)
OpenJDK 64-Bit Server VM (build 25.201-b10, mixed mode)

C:\Users\y60044858>
```

1.3 Git

Download Git

Extract Git-2.31.1-64-bit.rar and complete the installation.

Setting Environment Variables

PATH=D:\D\Git\bin

To check the installation information, execute git -version

```
C:\Users\y60044858>git --version
git version 2.31.1.windows.1
```

GIT Network Proxy Configuration::
View global configuration variables
git config --list
Configure using commands

git config --global http.proxy http://y60044858:password@proxyhk.huawei.com:8080/
git config --global https.proxy https://y60044858:password@proxyhk.huawei.com:8080/
git config --global http.sslverify false
To remove the configuration, execute the following commands
git config --global --unset http.proxy
git config --global --unset https.proxy

1.4 Android SDK,NDK and CMake

Download android-sdk_r24.4.1-windows.zip and extract it.

1.4.1 adb Environment Variable Configuration

PATH=D:\D\Android\androidSDK\android-sdk_r24.4.1-windows\platform-tools

1.4.2 NDK Environment Variable Configuration

ANDROID_NDK=D:\D\Android\androidSDK\android-sdk_r24.4.1-windows\ndk\25.1.8937393
TVM_NDK_CC=%ANDROID_NDK%/toolchains/llvm/prebuilt/windows-x86_64/bin/aarch64-linux-android24-clang

1.4.3 CMake Environment Variable Configuration

PATH=D:\D\Android\androidSDK\android-sdk_r24.4.1-windows\cmake\3.22.1\bin

1.5 Android Studio

Download android-studio-2023.2.1.23-windows.exe and complete the installation.

1.5 Conda

Download Anaconda3-2024.02-1-Windows-x86_64.exe and complete the installation. Use conda to manage isolated Python environments to avoid missing dependencies, version incompatibilities, and package conflicts.

2 MLC-LLM Source code build for Android application

2.1 mcl-ai/mlc-llm source code download

Clone the repository with the specified branch

git clone -b docs_typo_mlc_chat --single-branch https://github.com/mlc-ai/mlc-llm.git

Enter the mlc-llm project

cd mlc-llm

Clone the submodule code

git submodule update --init --recursive

Enter the MLCChat directory

cd ./android/MLCChat

Environment variable configuration for the code

mlc-llm code path

MLC_LLM_SOURCE_DIR=D:\mlc-llm

TVM Unity runtime is located under MLC LLM's 3rdparty/tvm, so no additional installation is required. Set the following environment variable

TVM_SOURCE_DIR=D:\mlc-llm\3rdparty\tvm

2.2 Install MLC LLM python package

The MLC LLM Python package can be installed directly from pre-built developer packages or built from source.

Below are the steps to set up build dependencies using pre-built packages in Conda.

```
# make sure to start with a fresh environment
conda env remove -n mlc-chat-venv
# create the conda environment with build dependency
conda create -n mlc-chat-venv -c conda-forge "cmake>=3.24" rust git python=3.11
```

Anaconda Prompt - conda create -n mlc-chat-venv -c conda-forge "cmake>=3.24" rust git python=3.11

```
(base) C:\Users\y60044858>conda env remove -n mlc-chat-venv

(base) C:\Users\y60044858>conda create -n mlc-chat-venv -c conda-forge "cmake>=3.24" rust git python=3.11
Channels:
 - conda-forge
 - defaults
Platform: win-64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: D:\anaconda3\envs\mlc-chat-venv

  added / updated specs:
    - cmake[version='>=3.24']
    - git
    - python=3.11
    - rust


The following NEW packages will be INSTALLED:

  bzip2              conda-forge/win-64::bzip2-1.0.8-hcfcfb64_5
  ca-certificates    conda-forge/win-64::ca-certificates-2024.2.2-h56e8100_0
  cmake              conda-forge/win-64::cmake-3.29.2-hf0feee3_0
  git                conda-forge/win-64::git-2.44.0-h57928b3_0
  krb5               conda-forge/win-64::krb5-1.21.2-heb0366b_0
  libcurl            conda-forge/win-64::libcurl-8.7.1-hd5e4a3a_0
  libexpat           conda-forge/win-64::libexpat-2.6.2-h63175ca_0
  libffi             conda-forge/win-64::libffi-3.4.2-h8ffe710_5
  libsqlite          conda-forge/win-64::libsqlite-3.45.3-hcfcfb64_0
  libssh2            conda-forge/win-64::libssh2-1.11.0-h7dfc565_0
  libuv              conda-forge/win-64::libuv-1.48.0-hcfcfb64_0
  libzlib            conda-forge/win-64::libzlib-1.2.13-hcfcfb64_5
  openssl            conda-forge/win-64::openssl-3.2.1-hcfcfb64_1
  pip                conda-forge/noarch::pip-24.0-pyhd8ed1ab_0
  python             conda-forge/win-64::python-3.11.9-h631f459_0_cpython
  rust               conda-forge/win-64::rust-1.77.2-hf8d6059_0
  rust-std-x86_64-p~ conda-forge/noarch::rust-std-x86_64-pc-windows-msvc-1.77.2-h17fc481_0
  setuptools         conda-forge/noarch::setuptools-69.5.1-pyhd8ed1ab_0
  tk                 conda-forge/win-64::tk-8.6.13-h5226925_1
  tzdata             conda-forge/noarch::tzdata-2024a-h0c530f3_0
  ucrt               conda-forge/win-64::ucrt-10.0.22621.0-h57928b3_0
  vc                 conda-forge/win-64::vc-14.3-hcf57466_18
  vc14_runtime       conda-forge/win-64::vc14_runtime-14.38.33130-h82b7239_18
  vs2015_runtime     conda-forge/win-64::vs2015_runtime-14.38.33130-hcb4865c_18
  wheel              conda-forge/noarch::wheel-0.43.0-pyhd8ed1ab_1
  xz                 conda-forge/win-64::xz-5.2.6-h8d14728_0
  zstd               conda-forge/win-64::zstd-1.5.5-h12be248_0


Proceed ([y]/n)? y


Downloading and Extracting Packages:

Preparing transaction: done
Verifying transaction: done
Executing transaction: | 
```

 # enter the build environment
conda activate mlc-chat-venv
 # install zstd
conda install zstd
 # install vulkan loader、clang、git and git-lfs
conda install -c conda-forge clang libvulkan-loader git-lfs git

```
(base) C:\Users\y60044858>conda activate mlc-chat-venv

(mlc-chat-venv) C:\Users\y60044858>conda install zstd
Channels:
 - defaults
 - conda-forge
Platform: win-64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: D:\anaconda3\envs\mlc-chat-venv

  added / updated specs:
    - zstd


The following packages will be UPDATED:

  ca-certificates    conda-forge::ca-certificates-2024.2.2~ --> main::ca-certificates-2024.3.11-haa95532_0


Proceed ([y]/n)? y


Downloading and Extracting Packages:

Preparing transaction: done
Verifying transaction: done
Executing transaction: done

(mlc-chat-venv) C:\Users\y60044858>conda install -c conda-forge clang libvulkan-loader git-lfs git
Channels:
 - conda-forge
 - defaults
Platform: win-64
Collecting package metadata (repodata.json): done
Solving environment: done

## Package Plan ##

  environment location: D:\anaconda3\envs\mlc-chat-venv

  added / updated specs:
    - clang
    - git
    - git-lfs
    - libvulkan-loader


The following NEW packages will be INSTALLED:

  clang              conda-forge/win-64::clang-18.1.3-default_hb53fc94_0
  clang-18           conda-forge/win-64::clang-18-18.1.3-default_h3a3e6c3_0
  git-lfs            conda-forge/win-64::git-lfs-3.5.1-h57928b3_0
  libvulkan-loader   conda-forge/win-64::libvulkan-loader-1.3.250.0-hdfa14b1_0


Proceed ([y]/n)? y
```

Install mlc-llm-nightly and mlc-ai-nightly

python -m pip install --pre -U -f https://mlc.ai/wheels mlc-llm-nightly mlc-ai-nightly

```
(mlc-chat-venv) C:\Users\y60044858>python -m pip install --pre -U -f https://mlc.ai/wheels mlc-llm-nightly mlc-ai-nightly
Looking in indexes: http://cmc-cd-mirror.rnd.huawei.com/pypi/simple/
Looking in links: https://mlc.ai/wheels
WARNING: Retrying (Retry(total=4, connect=None, read=None, redirect=None, status=None)) after connection broken by 'ConnectTimeoutError(<pip._vendor.urllib3.connection.HTTPSConnection object at 0x00000223C509ECD0>, 'Connection to mlc.ai timed out. (connect timeout=15)')': /wheels
WARNING: Retrying (Retry(total=3, connect=None, read=None, redirect=None, status=None)) after connection broken by 'ConnectTimeoutError(<pip._vendor.urllib3.connection.HTTPSConnection object at 0x00000223C6C19110>, 'Connection to mlc.ai timed out. (connect timeout=15)')': /wheels
WARNING: Retrying (Retry(total=2, connect=None, read=None, redirect=None, status=None)) after connection broken by 'ConnectTimeoutError(<pip._vendor.urllib3.connection.HTTPSConnection object at 0x00000223C6C19990>, 'Connection to mlc.ai timed out. (connect timeout=15)')': /wheels
WARNING: Retrying (Retry(total=1, connect=None, read=None, redirect=None, status=None)) after connection broken by 'ConnectTimeoutError(<pip._vendor.urllib3.connection.HTTPSConnection object at 0x00000223C6C1A850>, 'Connection to mlc.ai timed out. (connect timeout=15)')': /wheels
```

If there is a timeout or the package cannot be found, you can manually download the whl package from the website https://mlc.ai/wheels and install it using:

python -m pip install *.whl

Download mlc_ai_nightly-0.15.dev404-cp311-cp311-win_amd64.whl and mlc_llm_nightly-0.1.dev1404-cp311-cp311-win_amd64 based on your Python version.

TVM Unity Editor Installation and Verification

```
# enter the folder of  *.whl
d:
cd D:\D\download
# TVM Unity installation:
python -m pip install mlc_ai_nightly-0.15.dev404-cp311-cp311-win_amd64.whl
# TVM verification:
python -c "import tvm; print(tvm.__file__)"
```

```
(mlc-chat-venv) C:\Users\y60044858>d:

(mlc-chat-venv) D:\>cd D:\D\download

(mlc-chat-venv) D:\D\download>python -m pip install mlc_ai_nightly-0.15.dev404-cp311-cp311-win_amd64.whl
Looking in indexes: http://cmc-cd-mirror.rnd.huawei.com/pypi/simple/
Processing d:\d\download\mlc_ai_nightly-0.15.dev404-cp311-cp311-win_amd64.whl
Collecting attrs (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/e0/44/827b2a91a5816512fcaf3cc4ebc465ccd5d598c45cefa6703fcf4a79018f/attrs-23.2
.0-py3-none-any.whl (60 kB)
     ---------------------------------------- 60.8/60.8 kB 814.7 kB/s eta 0:00:00
Collecting cloudpickle (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/96/43/dae06432d0c4b1dc9e9149ad37b4ca8384cf6eb7700cd9215b177b914f0a/cloudpickl
e-3.0.0-py3-none-any.whl (20 kB)
Collecting decorator (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/d5/50/83c593b07763e1161326b3b8c6686f0f4b0f24d5526546bee538c89837d6/decorator-
5.1.1-py3-none-any.whl (9.1 kB)
Collecting ml-dtypes (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/f0/36/290745178e5776f7416818abc1334c1b19afb93c7c87fd1bef3cc99f84ca/ml_dtypes-
0.4.0-cp311-cp311-win_amd64.whl (126 kB)
     ---------------------------------------- 126.8/126.8 kB 3.8 MB/s eta 0:00:00
Collecting numpy (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/9b/0f/022ca4783b6e6239a53b988a4d315d67f9ae7126227fb2255054a558bd72/numpy-2.0.
0-cp311-cp311-win_amd64.whl (16.5 MB)
     ---------------------------------------- 16.5/16.5 MB 72.5 MB/s eta 0:00:00
Collecting psutil (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/73/44/561092313ae925f3acfaace6f9ddc4f6a9c748704317bad9c8c8f8a36a79/psutil-6.0
.0-cp37-abi3-win_amd64.whl (257 kB)
     ---------------------------------------- 257.4/257.4 kB ? eta 0:00:00
Collecting scipy (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/91/1d/0484130df7e33e044da88a091827d6441b77f907075bf7bbe145857d6590/scipy-1.14
.0-cp311-cp311-win_amd64.whl (44.7 MB)
     ---------------------------------------- 44.7/44.7 MB 59.4 MB/s eta 0:00:00
Collecting tornado (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/d9/2f/3f2f05e84a7aff787a96d5fb06821323feb370fe0baed4db6ea7b1088f32/tornado-6.
4.1-cp38-abi3-win_amd64.whl (438 kB)
     ---------------------------------------- 438.5/438.5 kB ? eta 0:00:00
Collecting typing-extensions (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/26/9f/ad63fc0248c5379346306f8668cda6e2e2e9c95e01216d2b8ffd9ff037d0/typing_ext
ensions-4.12.2-py3-none-any.whl (37 kB)
Installing collected packages: typing-extensions, tornado, psutil, numpy, decorator, cloudpickle, attrs, scipy, ml-dtypes, mlc-ai-nightly
Successfully installed attrs-23.2.0 cloudpickle-3.0.0 decorator-5.1.1 ml-dtypes-0.4.0 mlc-ai-nightly-0.15.dev404 numpy-2.0.0 psutil-6.0.0 sci
py-1.14.0 tornado-6.4.1 typing-extensions-4.12.2
```

```
(mlc-chat-venv) D:\D\download>python -c "import tvm; print(tvm.__file__)"
D:\mlc-llm\3rdparty\tvm\python\tvm\__init__.py
```

mlc-llm Installtion and Verification

```
# Install mlc_llm_nightly
python -m pip install mlc_llm_nightly-0.1.dev1404-cp311-cp311-win_amd64.whl
# mlc_llm Verification
mlc_llm --help
python -c "import mlc_llm; print(mlc_llm)"
```

```
Collecting typing-extensions (from mlc-ai-nightly==0.15.dev404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/26/9f/ad63fc0248c5379346306f8668cda6e2e2e9c95e01216d2b8ffd9ff037d0/typing_ext
ensions-4.12.2-py3-none-any.whl (37 kB)
Installing collected packages: typing-extensions, tornado, psutil, numpy, decorator, cloudpickle, attrs, scipy, ml-dtypes, mlc-ai-nightly
Successfully installed attrs-23.2.0 cloudpickle-3.0.0 decorator-5.1.1 ml-dtypes-0.4.0 mlc-ai-nightly-0.15.dev404 numpy-2.0.0 psutil-6.0.0 sci
py-1.14.0 tornado-6.4.1 typing-extensions-4.12.2

(mlc-chat-venv) D:\D\download>python -m pip install mlc_llm_nightly-0.1.dev1404-cp311-cp311-win_amd64.whl
Looking in indexes: http://cmc-cd-mirror.rnd.huawei.com/pypi/simple/
Processing d:\d\download\mlc_llm_nightly-0.1.dev1404-cp311-cp311-win_amd64.whl
Collecting fastapi (from mlc-llm-nightly==0.1.dev1404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/e6/33/de41e554e5a187d583906e10d53bfae5fd6c07e98cbf4fe5262bd37e739a/fastapi-0.
111.0-py3-none-any.whl (91 kB)
     ---------------------------------------- 92.0/92.0 kB 2.6 MB/s eta 0:00:00
Collecting uvicorn (from mlc-llm-nightly==0.1.dev1404)
  Downloading http://cmc-cd-mirror.rnd.huawei.com/pypi/packages/b2/f9/e6f30ba6094733e4f9794fd098ca0543a19b07ac1fa3075d595bf0f1fb60/uvicorn-0.
30.1-py3-none-any.whl (62 kB)
```

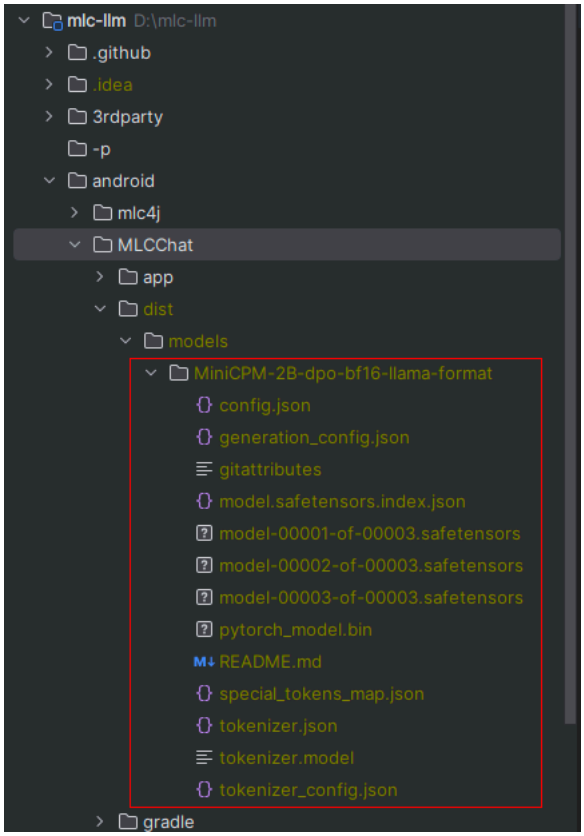
```
(mlc-chat-venv) D:\D\download>mlc_llm --help
usage: MLC LLM Command Line Interface. [-h] {compile,convert_weight,gen_config,chat,serve,package,calibrate}

positional arguments:
  {compile,convert_weight,gen_config,chat,serve,package,calibrate}
                        Subcommand to to run. (choices: compile, convert_weight, gen_config, chat, serve, package, calibrate)

options:
  -h, --help            show this help message and exit

(mlc-chat-venv) D:\D\download>python -c "import mlc_llm; print(mlc_llm)"
<module 'mlc_llm' from 'D:\\anaconda3\\envs\\mlc-chat-venv\\Lib\\site-packages\\mlc_llm\\__init__.py'>

(mlc-chat-venv) D:\D\download>
```

2.3 Converting Model Weights

To run the model using MLC LLM, the model weights need to be converted. The Hugging Face model is used as input and quantized into weights compatible with MLC.

Download the MiniCPM-2B-dpo-bf16-llama-format model library from Hugging Face.

Download openbmb/MiniCPM-2B-dpo-bf16-llama-format from the official Hugging Face website and place it in the dist/models directory.

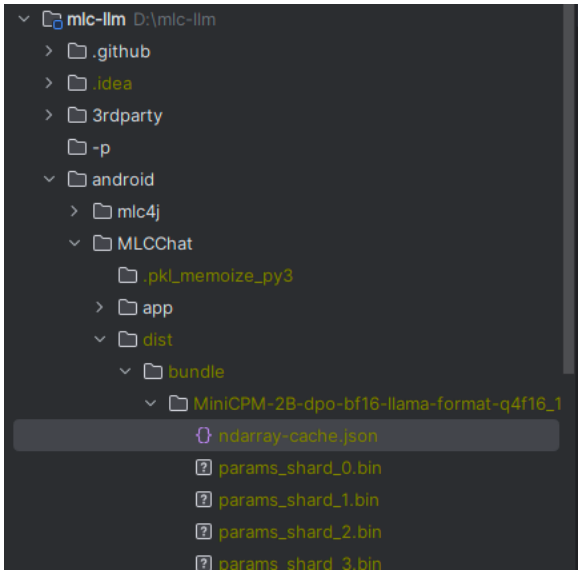


convert_weight

```
# Enter mlc-llm\android\MLCChat
cd D:\mlc-llm\android\MLCChat
# MiniCPM-2B-dpo-bf16-llama-format
mlc_llm convert_weight ./dist/models/MiniCPM-2B-dpo-bf16-llama-format/ --quantization q4f16_1
-o dist/bundle/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1
```

```
(mlc-chat-venv) D:\mlc-llm\android\MLCChat>mlc_llm convert_weight ./dist/models/MiniCPM-2B-dpo-bf16-llama-format/ --quantization q4f16_1 -o dist/bundle/MiniCPM-2B-dpo-bf1
6-llama-format-q4f16_1
[2024-06-28 10:30:54] INFO auto_config.py:116: Found model configuration: dist\models\MiniCPM-2B-dpo-bf16-llama-format\config.json
[2024-06-28 10:30:56] INFO auto_device.py:88: Not found device: cuda:0
[2024-06-28 10:30:58] INFO auto_device.py:88: Not found device: rocm:0
[2024-06-28 10:31:00] INFO auto_device.py:88: Not found device: metal:0
[2024-06-28 10:31:04] INFO auto_device.py:79: Found device: vulkan:0
[2024-06-28 10:31:04] INFO auto_device.py:79: Found device: vulkan:1
[2024-06-28 10:31:04] INFO auto_device.py:79: Found device: vulkan:2
[2024-06-28 10:31:06] INFO auto_device.py:88: Not found device: opencl:0
[2024-06-28 10:31:06] INFO auto_device.py:35: Using device: vulkan:0
[2024-06-28 10:31:06] INFO auto_weight.py:71: Finding weights in: dist\models\MiniCPM-2B-dpo-bf16-llama-format
[2024-06-28 10:31:06] INFO auto_weight.py:130: Found source weight format: huggingface-torch. Source configuration: dist\models\MiniCPM-2B-dpo-bf16-llama-format\pytorch_m
odel.bin
[2024-06-28 10:31:06] INFO auto_weight.py:144: Found source weight format: huggingface-safetensor. Source configuration: dist\models\MiniCPM-2B-dpo-bf16-llama-format\mode
l.safetensors.index.json
[2024-06-28 10:31:06] INFO auto_weight.py:107: Using source weight configuration: dist\models\MiniCPM-2B-dpo-bf16-llama-format\pytorch_model.bin. Use `--source` to overri
de.
[2024-06-28 10:31:06] INFO auto_weight.py:111: Using source weight format: huggingface-torch. Use `--source-format` to override.
[2024-06-28 10:31:06] INFO auto_config.py:154: Found model type: llama. Use `--model-type` to override.
Weight conversion with arguments:
  --config          dist\models\MiniCPM-2B-dpo-bf16-llama-format\config.json
  --quantization    GroupQuantize(name='q4f16_1', kind='group-quant', group_size=32, quantize_dtype='int4', storage_dtype='uint32', model_dtype='float16', linear_weight_l
ayout='NK', quantize_embedding=True, quantize_final_fc=True, num_elem_per_storage=8, num_storage_per_group=4, max_int_value=7, tensor_parallel_shards=0)
  --model-type      llama
  --device          vulkan:0
  --source          dist\models\MiniCPM-2B-dpo-bf16-llama-format\pytorch_model.bin
  --source-format   huggingface-torch
  --output          dist\bundle\MiniCPM-2B-dpo-bf16-llama-format-q4f16_1
[2024-06-28 10:31:06] INFO llama_model.py:52: context_window_size not found in config.json. Falling back to max_position_embeddings (4096)
[2024-06-28 10:31:06] INFO llama_model.py:72: prefill_chunk_size defaults to 2048
Start storing to cache dist\bundle\MiniCPM-2B-dpo-bf16-llama-format-q4f16_1
[2024-06-28 10:31:17] INFO huggingface_loader.py:185: Loading HF parameters from: dist\models\MiniCPM-2B-dpo-bf16-llama-format\pytorch_model.bin
[2024-06-28 10:31:26] INFO group_quantization.py:218: Compiling quantize function for key: ((122753, 2304), float16, vulkan, axis=1, output_transpose=False)
[2024-06-28 10:31:27] INFO huggingface_loader.py:167: [Quantized] Parameter: "model.embed_tokens.q_weight", shape: (122753, 288), dtype: uint32
[2024-06-28 10:31:28] INFO huggingface_loader.py:167: [Quantized] Parameter: "model.embed_tokens.q_scale", shape: (122753, 72), dtype: float16
```

After successful execution, ndarray-cache.json and params_sh will be generated in the dist/bundle/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1 directory



Generating MLC Chat Configuration

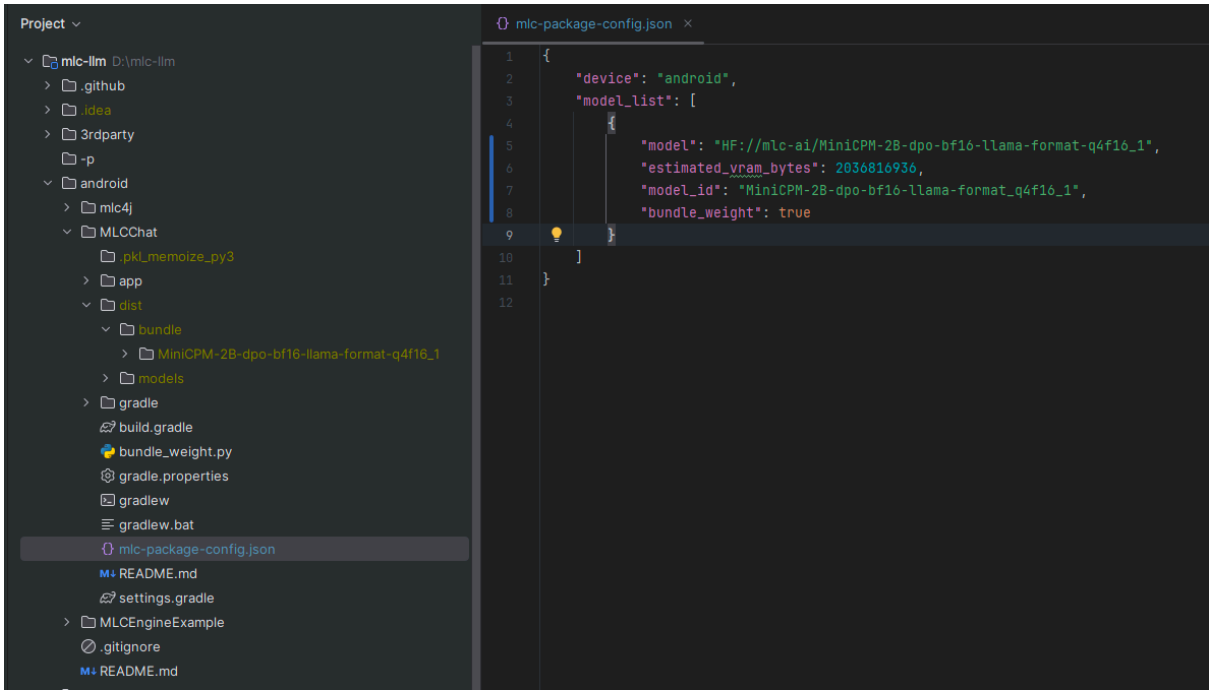
 # Generate MLC Chat Configurations
mlc_llm gen_config ./dist/models/MiniCPM-2B-dpo-bf16-llama-format/ --quantization q4f16_1 --conv-template redpajama_chat -o dist/bundle/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1/

```
(mlc-chat-venv) D:\mlc-llm\android\MLCChat>mlc_llm gen_config ./dist/models/MiniCPM-2B-dpo-bf16-llama-format/ --quantization q4f16_1 --conv-template LM -o dist/bundle/Min
iCPM-2B-dpo-bf16-llama-format-q4f16_1/
[2024-06-28 10:38:32] INFO auto_config.py:116: Found model configuration: dist\models\MiniCPM-2B-dpo-bf16-llama-format\config.json
[2024-06-28 10:38:32] INFO auto_config.py:154: Found model type: llama. Use `--model-type` to override.
[2024-06-28 10:38:32] INFO llama_model.py:52: context_window_size not found in config.json. Falling back to max_position_embeddings (4096)
[2024-06-28 10:38:32] INFO llama_model.py:72: prefill_chunk_size defaults to 2048
[2024-06-28 10:38:32] INFO config.py:107: Overriding max_batch_size from 1 to 80
[2024-06-28 10:38:32] INFO gen_config.py:143: [generation_config.json] Setting top_p: 0.8
[2024-06-28 10:38:32] INFO gen_config.py:143: [generation_config.json] Setting temperature: 0.8
[2024-06-28 10:38:32] INFO gen_config.py:143: [generation_config.json] Setting bos_token_id: 1
[2024-06-28 10:38:32] INFO gen_config.py:143: [generation_config.json] Setting eos_token_id: 2
[2024-06-28 10:38:32] INFO gen_config.py:155: Found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\tokenizer.model. Copying to dist\bundle\MiniCPM-2B-dpo-
bf16-llama-format-q4f16_1\tokenizer.model
[2024-06-28 10:38:32] INFO gen_config.py:155: Found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\tokenizer.json. Copying to dist\bundle\MiniCPM-2B-dpo-b
f16-llama-format-q4f16_1\tokenizer.json
[2024-06-28 10:38:32] INFO gen_config.py:157: Not found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\vocab.json
[2024-06-28 10:38:32] INFO gen_config.py:157: Not found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\merges.txt
[2024-06-28 10:38:32] INFO gen_config.py:157: Not found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\added_tokens.json
[2024-06-28 10:38:32] INFO gen_config.py:155: Found tokenizer config: dist\models\MiniCPM-2B-dpo-bf16-llama-format\tokenizer_config.json. Copying to dist\bundle\MiniCPM-2
B-dpo-bf16-llama-format-q4f16_1\tokenizer_config.json
[2024-06-28 10:38:32] INFO gen_config.py:216: Detected tokenizer info: {'token_postproc_method': 'byte_fallback', 'prepend_space_in_encode': True, 'strip_space_in_decode'
: True}
[2024-06-28 10:38:32] INFO gen_config.py:32: [System default] Setting pad_token_id: 0
[2024-06-28 10:38:32] INFO gen_config.py:32: [System default] Setting presence_penalty: 0.0
[2024-06-28 10:38:32] INFO gen_config.py:32: [System default] Setting frequency_penalty: 0.0
[2024-06-28 10:38:32] INFO gen_config.py:32: [System default] Setting repetition_penalty: 1.0
[2024-06-28 10:38:32] INFO gen_config.py:223: Dumping configuration file to: dist\bundle\MiniCPM-2B-dpo-bf16-llama-format-q4f16_1\mlc-chat-config.json

(mlc-chat-venv) D:\mlc-llm\android\MLCChat>
```

After Sucessful execution, ***Four files:*** **mlc-chat-config.json**、**tokenizer.json, tokenizer.model**、**tokenizer_config.json** will be generated under dist/bundle/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1

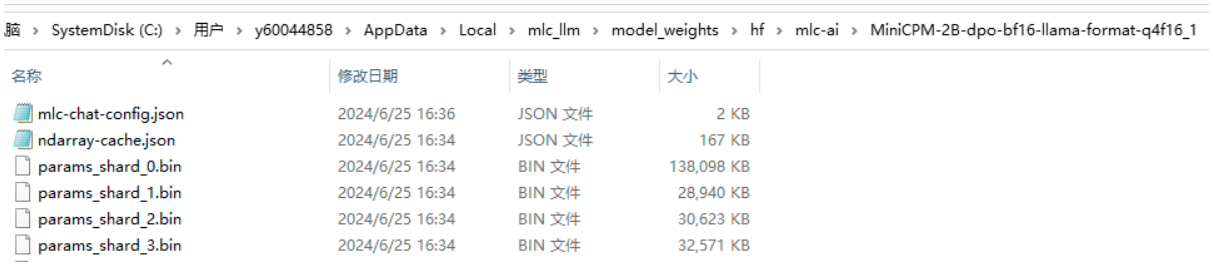
2.4 Compiling **tvm4j_core.jar and libtvm4j_runtime_packed.so** Dependency Library

1. Modify the MLCChat/mlc-package-config.json file to customize the model built into the Android application.



2. Copy the converted MiniCPM-2B-dpo-bf16-llama-format-q4f16_1 model to the following directory on your local machine:
C:\Users\y60044858\AppData\Local\mlc_llm\model_weights\hf\mlc-ai

Note: During the compilation process, the system will first search for the model locally in the specified directory. If the model is not found locally, it will be downloaded from the official website: https://huggingface.co/mlc-ai.



3. Run the mlc_llm package command. The execution process might be slightly slow, so please be patient. Use the Git Bash interface to execute the mlc_llm command. First, configure the environment variables for Python and mlc_llm:

PATH=D:\anaconda3\envs\mlc-chat-venv
PATH=D:\anaconda3\envs\mlc-chat-venv\Scripts

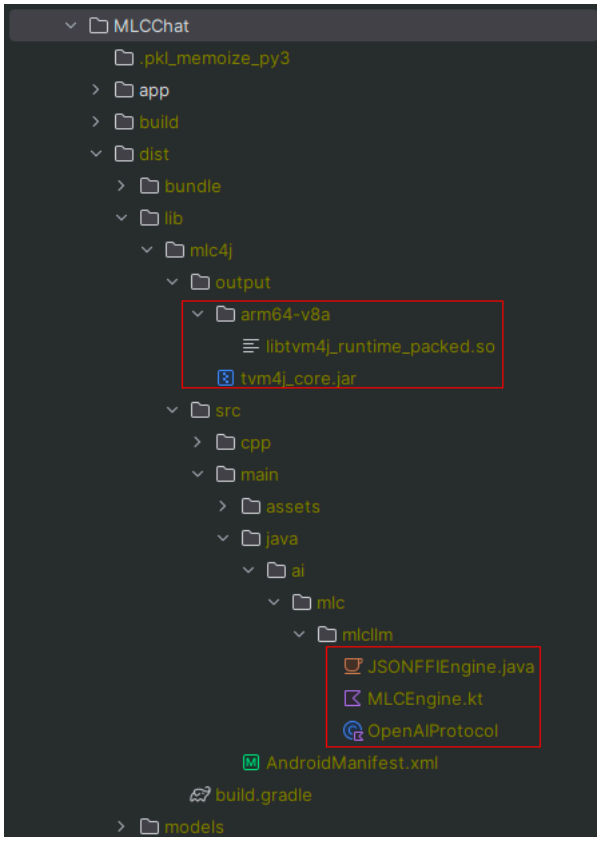
Run the mlc_llm package command:

mlc_llm package

MINGW64:/d/mlc-llm/android/MLCChat

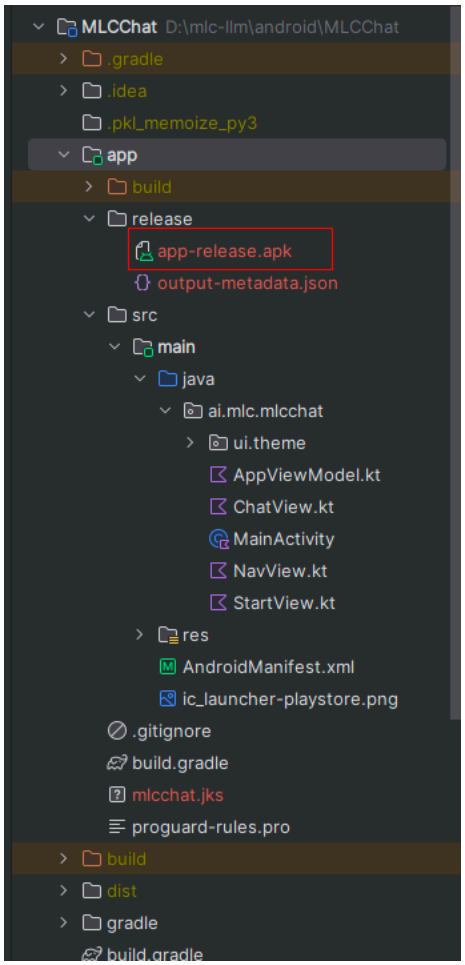
```
y60044858@Y60044858-fdEBc MINGW64 /d/mlc-llm/android/MLCChat (main)
$ mlc_llm package
[2024-06-28 12:37:48] INFO package.py:327: MLC LLM HOME: "D:\mlc-llm"
[2024-06-28 12:37:48] INFO package.py:28: Clean up all directories under "dist\bundle"
[2024-06-28 12:37:49] INFO jit.py:43: MLC_JIT_POLICY = ON. Can be one of: ON, OFF, REDO, READONLY
[2024-06-28 12:37:49] INFO download_cache.py:227: Downloading model from HuggingFace: HF://mlc-ai/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1
[2024-06-28 12:37:49] INFO download_cache.py:29: MLC_DOWNLOAD_CACHE_POLICY = ON. Can be one of: ON, OFF, REDO, READONLY
[2024-06-28 12:37:49] INFO download_cache.py:166: Weights already downloaded: C:\Users\y60044858\AppData\Local\mlc_llm\model_weights\hf\mlc-ai\MiniCPM-2B-dpo-bf16-llama-format-q4f16_
1
[2024-06-28 12:37:49] INFO package.py:81: Model lib is not specified for model "MiniCPM-2B-dpo-bf16-llama-format_q4f16_1". Now jit compile the model library.
[2024-06-28 12:37:49] INFO jit.py:158: Using cached model lib: C:\Users\y60044858\AppData\Local\mlc_llm\model_lib\e6d35b927d1ef93fb60ba8137d62cf84.tar
[2024-06-28 12:37:49] INFO package.py:129: Bundle weight for MiniCPM-2B-dpo-bf16-llama-format_q4f16_1, copy into dist\bundle\MiniCPM-2B-dpo-bf16-llama-format_q4f16_1
[2024-06-28 12:37:49] INFO package.py:154: Dump the app config below to "dist\bundle\mlc-app-config.json":
{
  "model_list": [
    {
      "model_id": "MiniCPM-2B-dpo-bf16-llama-format_q4f16_1",
      "model_lib": "llama_q4f16_1_938b473cd04bb62be838141ef7eb5bbc",
      "model_url": "https://huggingface.co/mlc-ai/MiniCPM-2B-dpo-bf16-llama-format-q4f16_1",
      "estimated_vram_bytes": 2036816936
    }
  ]
}
[2024-06-28 12:37:50] INFO package.py:211: Creating lib from ['C:\\Users\\y60044858\\AppData\\Local\\mlc_llm\\model_lib\\e6d35b927d1ef93fb60ba8137d62cf84.tar']
[2024-06-28 12:37:50] INFO package.py:212: Validating the library dist\lib\libmodel_android.a
[2024-06-28 12:37:50] INFO package.py:213: List of available model libs packaged: ['llama_q4f16_1_938b473cd04bb62be838141ef7eb5bbc'], if we have '-' in the model_lib string, it will
be turned into '_'
[2024-06-28 12:37:50] INFO package.py:256: Validation pass
[2024-06-28 12:37:50] INFO package.py:270: Moving "dist\lib\libmodel_android.a" to "build\lib\libmodel_android.a"
[2024-06-28 12:37:50] INFO package.py:274: Building mlc4j
info: component 'rust-std' for target 'aarch64-linux-android' is up to date
[2024-06-28 12:37:52] INFO prepare_libs.py:91: Entering "D:\mlc-llm\android\MLCChat\build" for MLC LLM and tvm4j build.
[2024-06-28 12:37:52] INFO prepare_libs.py:95: Set TVM_SOURCE_DIR to "D:\mlc-llm\3rdparty\tvm"
[2024-06-28 12:37:52] INFO prepare_libs.py:23: Running cmake
[2024-06-28 12:37:52] INFO prepare_libs.py:49: Using ninja in windows, make sure you installed ninja in conda
-- The C compiler identification is Clang 14.0.6
-- The CXX compiler identification is Clang 14.0.6
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Check for working C compiler: D:/D/Android/androidSDK/android-sdk_r24.4.1-windows/ndk/25.1.8937393/toolchains/llvm/prebuilt/windows-x86_64/bin/clang.exe - skipped
-- Detecting C compile features
-- Detecting C compile features - done
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Check for working CXX compiler: D:/D/Android/androidSDK/android-sdk_r24.4.1-windows/ndk/25.1.8937393/toolchains/llvm/prebuilt/windows-x86_64/bin/clang++.exe - skipped
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Hide private symbols
-- TVM_SOURCE_DIR: D:\mlc-llm\3rdparty\tvm
-- Hide private symbols...
-- Forbidding undefined symbols in shared library, using -Wl,--no-undefined on platform Android
-- Building for Android
-- Didn't find the path to CCACHE, disabling ccache
-- Performing Test SUPPORT_CXX17
-- Performing Test SUPPORT_CXX17 - Success
-- VTA build with VTA_HW_PATH=D:/mlc-llm/3rdparty/tvm/3rdparty/vta-hw
-- Build VTA runtime with target: sim
```

Upon successful execution, the following files will be generated in the /dist/lib/mlc4j directory.



2.5 Generate APK

Click on "Build → Generate Signed Bundle / APK". If this is your first time generating an APK, you will need to create a key according to the official Android guidelines. This APK will be placed in android/MLCChat/app/release/app-release.apk.



2.6 Install ADB and Enable USB Debugging

Add Platform-Tools to the PATH Environment Variable

 # adb tools variable configuration
PATH=D:\D\Android\androidSDK\android-sdk_r24.4.1-windows\platform-tools

Enable "USB Debugging" in Developer Mode in your phone settings. Run the following command, and if ADB is installed correctly, your phone will show up as a device:

adb devices

```
C:\Users\y60044858>adb devices
List of devices attached
7TD5T21713005531        device
```

2.7 Install the APK and Weights on Your Phone

Open a CMD window and enter the following commands:

 # Open mlc—llm/android/MLCChat
cd D:\mlc-llm\android\MLCChat
python bundle_weight.py --apk-path app/release/app-release.apk

```
D:\>cd D:\mlc-llm\android\MLCChat

D:\mlc-llm\android\MLCChat>python bundle_weight.py --apk-path app/release/app-release.apk
[2024-06-28 14:53:26] INFO bundle_weight.py:15: Install apk "D:\mlc-llm\android\MLCChat\app\release\app-release.apk" to
device
Performing Streamed Install
Success
[2024-06-28 14:53:28] INFO bundle_weight.py:19: Creating directory "/storage/emulated/0/Android/data/ai.mlc.mlcchat/file
s/" on device
[2024-06-28 14:53:28] INFO bundle_weight.py:29: Pushing local weights "D:\mlc-llm\android\MLCChat\dist\bundle\MiniCPM-2B
-dpo-bf16-llama-format_q4f16_1" to device location "/data/local/tmp/MiniCPM-2B-dpo-bf16-llama-format_q4f16_1"
D:\mlc-llm\android\MLCChat\dist\bundle\MiniCPM-2B-dpo-bf16...pushed, 0 skipped. 39.0 MB/s (1700472548 bytes in 41.557s)
[2024-06-28 14:54:10] INFO bundle_weight.py:34: Move weights from "/data/local/tmp/MiniCPM-2B-dpo-bf16-llama-format_q4f1
6_1" to "/storage/emulated/0/Android/data/ai.mlc.mlcchat/files/"
[2024-06-28 14:54:12] INFO bundle_weight.py:36: All finished.
```

2.8 Run the MLCChat Application

Open the MLCChat application on your phone and run it.