CSE5010 Wireless Network and Mobile Computing Fall 2023

Lab1

Development Environment Setup

MATLAB

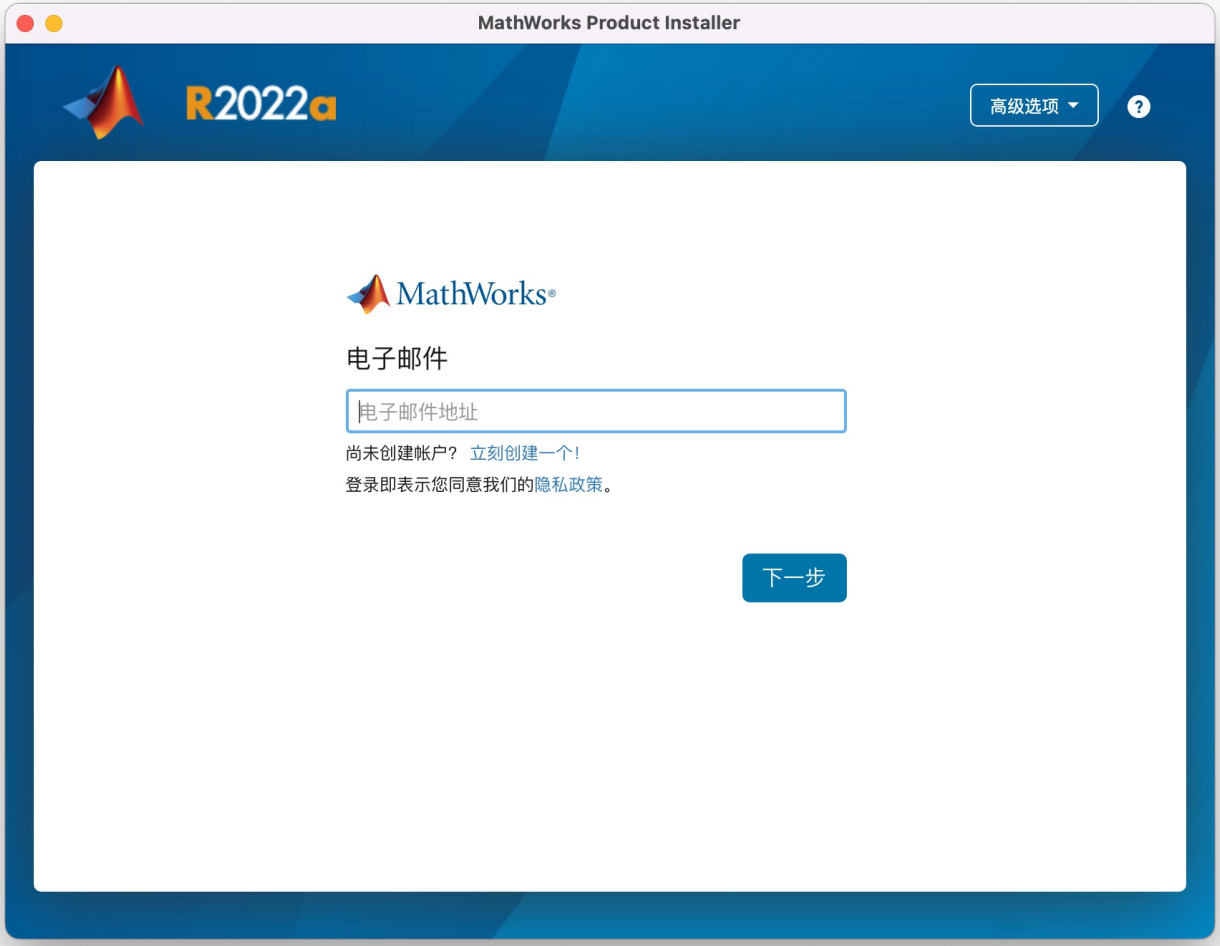
What is MATLAB?

- A powerful programming and numeric computing platform
  - matrix manipulations
  - plotting of functions and data
  - implementation of algorithms
  - creation of user interfaces
  - interfacing with programs written in other languages

Get Started with MATLAB

- https://ww2.mathworks.cn/en/products/matlab.html
- Register your own MATLAB account with SUSTech E-Mail (SID@mail.sustech.edu.cn)
- MATLAB Online https://ww2.mathworks.cn/products/matlab-online.html

MATLAB Installation



MATLAB Installation

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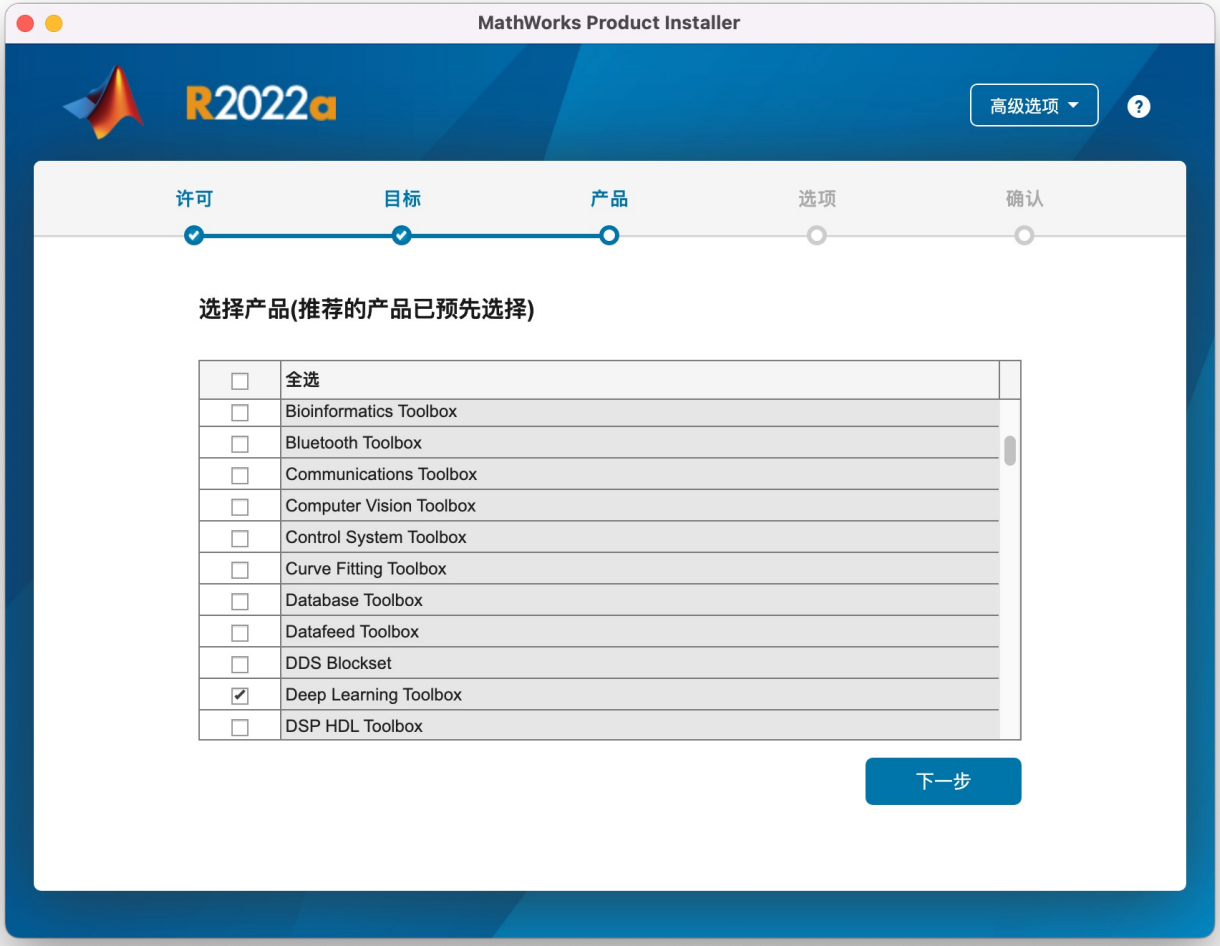
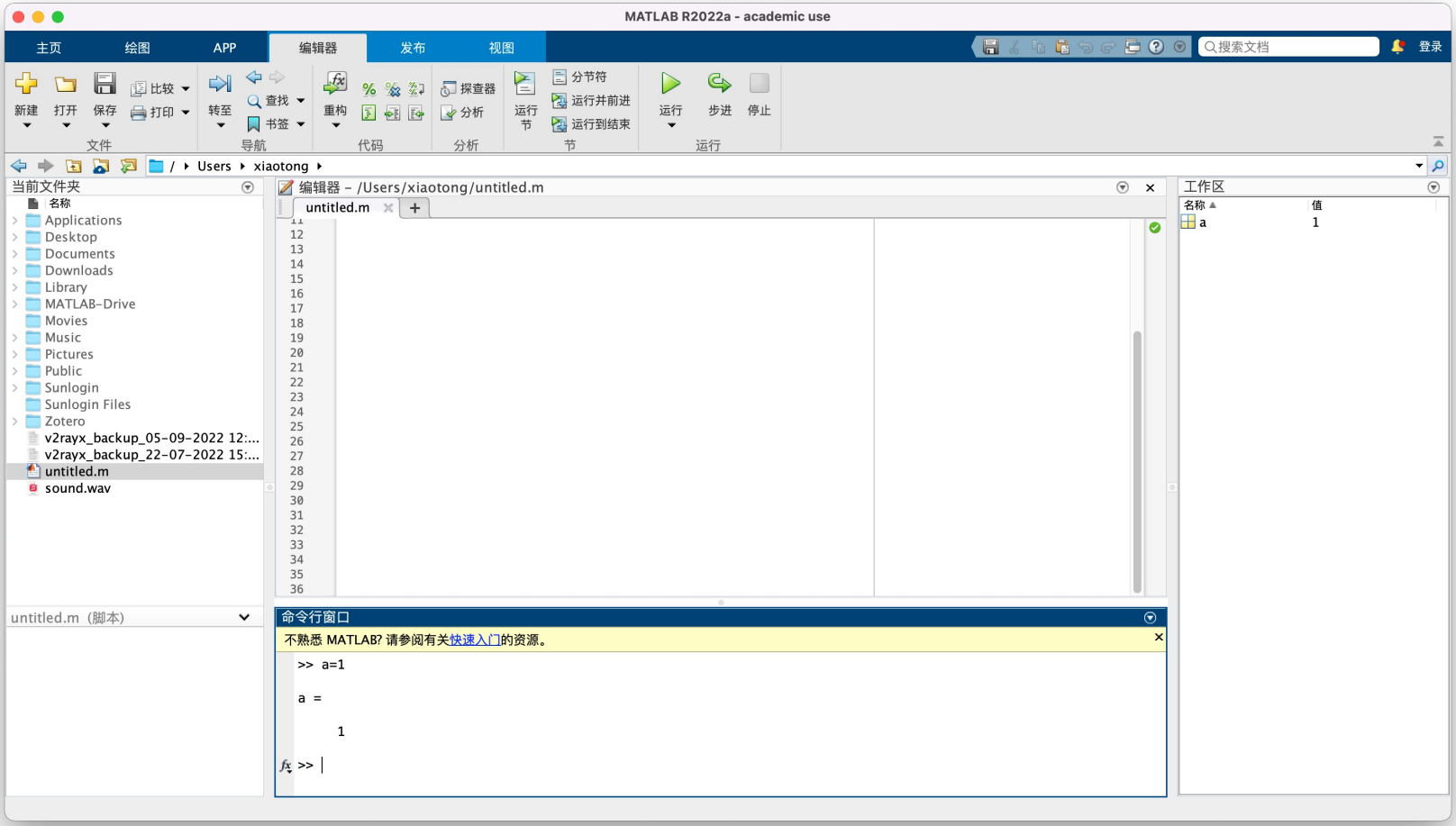


MATLAB Installation

MATLAB	Version 9.12	(R2022a)
Audio Toolbox	Version 3.2	(R2022a)
Communications Toolbox	Version 7.7	(R2022a)
Control System Toolbox	Version 10.11.1	(R2022a)
Curve Fitting Toolbox	Version 3.7	(R2022a)
DSP System Toolbox	Version 9.14	(R2022a)
Deep Learning HDL Toolbox	Version 1.3	(R2022a)
Deep Learning Toolbox	Version 14.4	(R2022a)
Phased Array System Toolbox	Version 4.7	(R2022a)
Radar Toolbox	Version 1.2	(R2022a)
Signal Processing Toolbox	Version 9.0	(R2022a)
Statistics and Machine Learning Toolbox	Version 12.3	(R2022a)
Symbolic Math Toolbox	Version 9.1	(R2022a)

MATLAB Basics



MATLAB Basics

- **who**, **whos** – current workspace vars.
- **save** – save workspace vars to *.mat file.
- **load** – load variables from *.mat file.
- **clear all** – clear workspace vars.
- **close all** – close all figures
- **clc** – clear screen
- **clf** – clear figure

Arrays and Matrices

- **v = [-2 3 0 4.5 -1.5];** % length 5 row vector.
- **v = v';** % conjugate transposes v.
- **v = v.';** % transposes v.
- **v(1);** % first element of v.
- **v(2:4);** % entries 2-4 of v.
- **v([3,5]);** % returns entries 3 & 5.
- **v=[4:-1:2];** % same as v=[4 3 2];
- **a=1:3; b=2:3; c=[a b];** % c = [1 2 3 2 3];

Arrays and Matrices

- **x = linspace(-pi,pi,10);**
- % creates 10 linearly-spaced elements from –pi to pi.
- **logspace** is similar.
- **x = 1:10;**

- **A = [1 2 3; 4 5 6];** % creates 2x3 matrix.
- **A(1,2)** % the element in row 1, column 2.
- **A(:,2)** % the second column.
- **A(2,:)** % the second row.

Signal Generating

```
clear
clc

Fs = 48000;                          % Sampling Frequency    (Unit: Hz)
T = 4;                               % Time Duration         (Unit: s )
f = 1000;                            % Signal Frequency      (Unit: Hz)
y = sin(2*pi*f .* (0:1/Fs:T));       % Generate the Sound
sound(y,Fs);                         % Play the Sound
audiowrite('sound.wav',y,Fs);        % Save

Fs = 48000;                          % Sampling Frequency    (Unit: Hz)
T = 4;                               % Time Duration         (Unit: s )
Rec = audiorecorder(Fs,16,1);        % Generate a recording element
record(Rec,T);                       % Start recording
pause(T);                            % Wait
z = getaudiodata(Rec);               % Retrieve data from the element
audiowrite('record.wav',z,Fs);       % Save
```

Signal Generating

```
>> help audiowrite
 audiowrite write audio files
    audiowrite(FILENAME,Y,FS)  writes data Y to an audio
    file specified by the file name FILENAME, with a sample rate
    of FS Hz.
    Stereo data should be specified as a matrix with two columns.
    Multi-channel data should be specified as a matrix of N columns.

    audiowrite(URL, Y, FS) writes the audio file at a remote location
    (URL). When writing data to remote locations, you must specify the full
    path using a uniform resource locator (URL). For example,
    to write an audio file to Amazon S3 cloud specify the full URL for the
    file:
        s3://bucketname/path_to_file/my_audio.wav
```

```
>> doc audiowrite
```

Documentation Examples Functions Apps — Trial Software — Product Updates

audiowrite

Write audio file

R2022a

collapse all in page

Syntax

```
audiowrite(filename,y,Fs)
audiowrite(filename,y,Fs,Name,Value)
```

Description

`audiowrite(filename,y,Fs)` writes a matrix of audio data, y, with sample rate `Fs` to a file called `filename`. The `filename` input also specifies the output file format. The output data type depends on the output file format and the data type of the audio data, y. — example

`audiowrite(filename,y,Fs,Name,Value)` uses additional options specified by one or more `Name,Value` pair arguments. — example

Homework

- Generate a piece of music
- do re mi fa sol la xi (do)
- Frequency of do (Middle C) is 261.63 Hz

音阶	Do	$^{\#}Do$	Re	$^{\#}Re$	Mi	Fa	$^{\#}Fa$	Sol	$^{\#}Sol$	La	$^{\#}La$	Ti	Do
频率	X	$2^{\frac{1}{12}}X$	$2^{\frac{2}{12}}X$	$2^{\frac{3}{12}}X$	$2^{\frac{4}{12}}X$	$2^{\frac{5}{12}}X$	$2^{\frac{6}{12}}X$	$2^{\frac{7}{12}}X$	$2^{\frac{8}{12}}X$	$2^{\frac{9}{12}}X$	$2^{\frac{10}{12}}X$	$2^{\frac{11}{12}}X$	$2X$

- Pack your codes and wav files into SID.zip
- Hand in your SID.zip in bb system.

ANDROID DEVELOPMENT TOOLS (OPTIONAL)

What is Android?

- A software stack for mobile devices that includes
  - An operating system
  - Middleware
  - Key Applications
- Uses Linux to provide core system services
  - Security
  - Memory management
  - Process management
  - Power management
  - Hardware drivers

Setup Development Environment

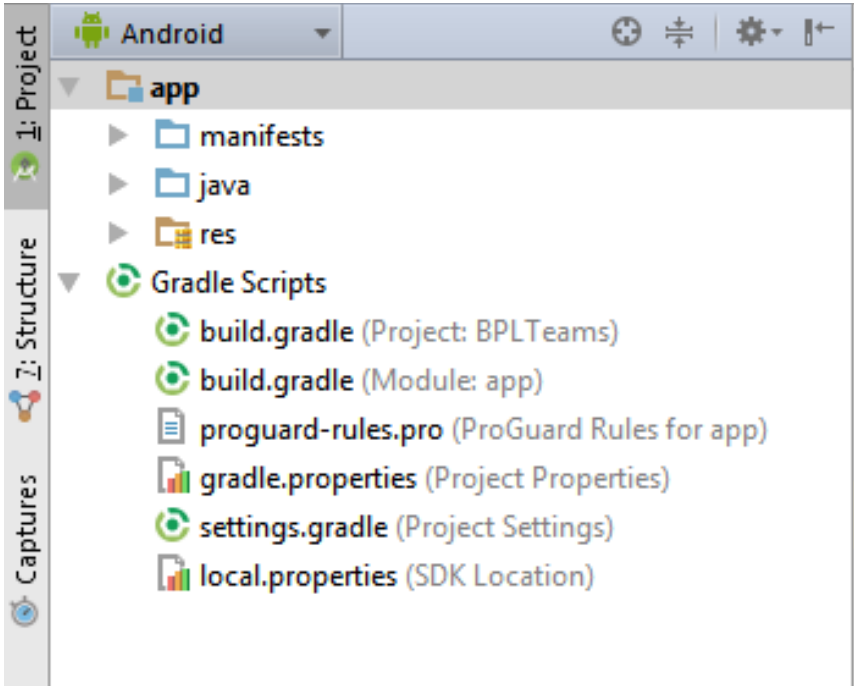
- Install JDK 8 or 10
- Install Android Studio
  - includes API level 29
- Use SDK manager to download lower API levels
- Detailed install instructions available on Android site http://developer.android.com/sdk/installing.html

Elements of Android Projects

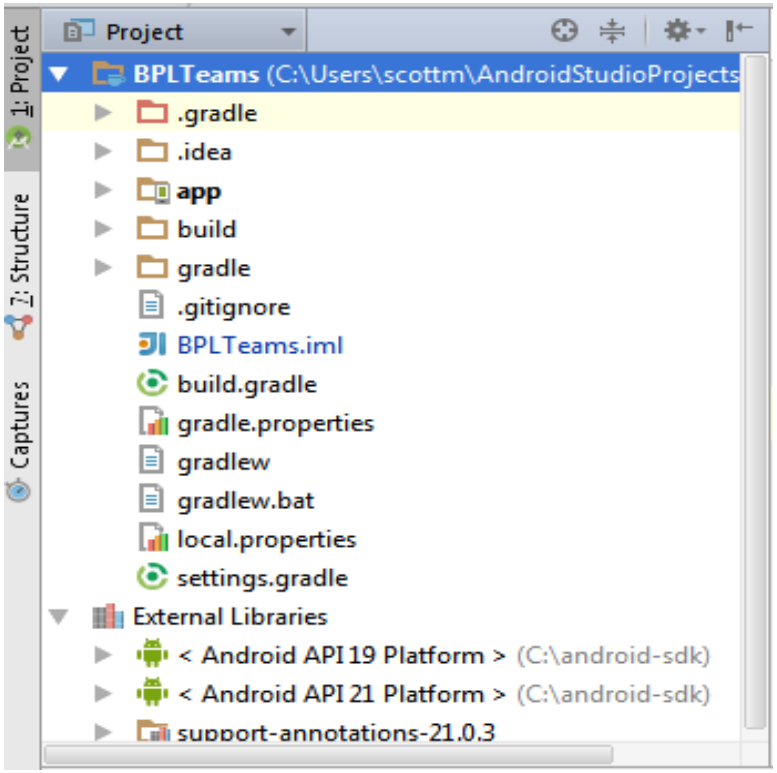
- ***Application Name***
  - seen by users on app chooser, app list, store
- ***Project Name***
  - in IDE, can be different, often directory
- ***Package Name***
  - Java package name, not using default package
- ***Minimum SDK Level***
  - how far back do you support, ~21 as of June 2018
- ***Target SDK Level***
  - device / api you had in mind for app, most recent?
- ***Theme***
  - look and feel of app, color scheme, various built in themes such as Theme, Holo, Material (Design)

Android Projects

- Creating a project results in multiple files and resources being created



Android Project View



Classic Project View

Reference

- https://iot-book.github.io
- http://developer.android.com/guide/components/activities.html
- Android Introduction by Marko Gargenta, http://www.lecturemaker.com/2009/10/android-software-platform/
- https://ww2.mathworks.cn/help/matlab/getting-started-with-matlab.html