جامعة عمان العربية
AMMAN ARAB UNIVERSITY

كلية تكنولوجيا المعلومات
College of Information Technology

برامج مطوري الأنظمة ومشاريع البرمجة المشتركة
Powershell, linux basics, Virtualization tools , GitHub and Git basics, Introduction to DevOps (YAML,GitHub Actions) Stack overflow

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Software Engineering Department
Amman Arab University
26.5.2025

slides adapted mainly from
https://www.library.unlv.edu/sites/default/files/inline-images/wfOPub9DRN3jzCgLUV3ps8ksRIPVMW8aIqoY7QHaPwkjPCUEXB.pdf
https://www2.cs.arizona.edu/classes/cs210/fall17/lectures/command_line.pdf

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Powershell, linux basics, Virtualization tools , GitHub and Git basics,

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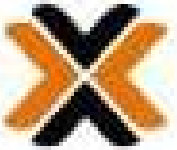
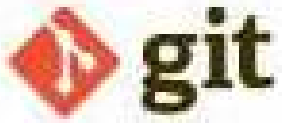




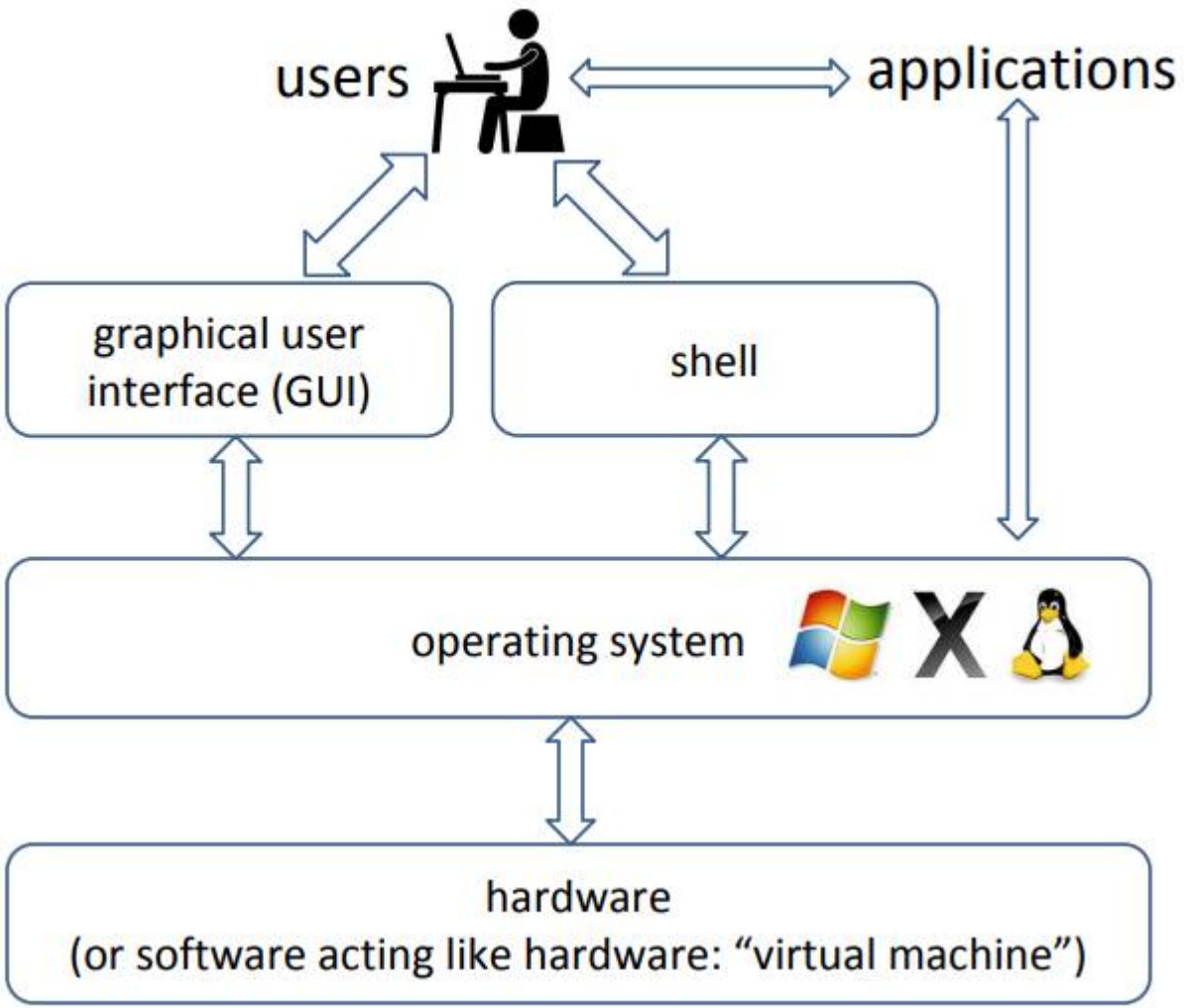
What is a Command Line Interface?

- **Interface**: Means it is a way to interact with the Operating System.
- **Command Line**: Means you interact with it through typing commands at the keyboard.

So a Command Line Interface (or a shell) is a program that lets you interact with the Operating System via the keyboard.

https://www2.cs.arizona.edu/classes/cs210/fall17/lectures/command_line.pdf

Organization of a computer system



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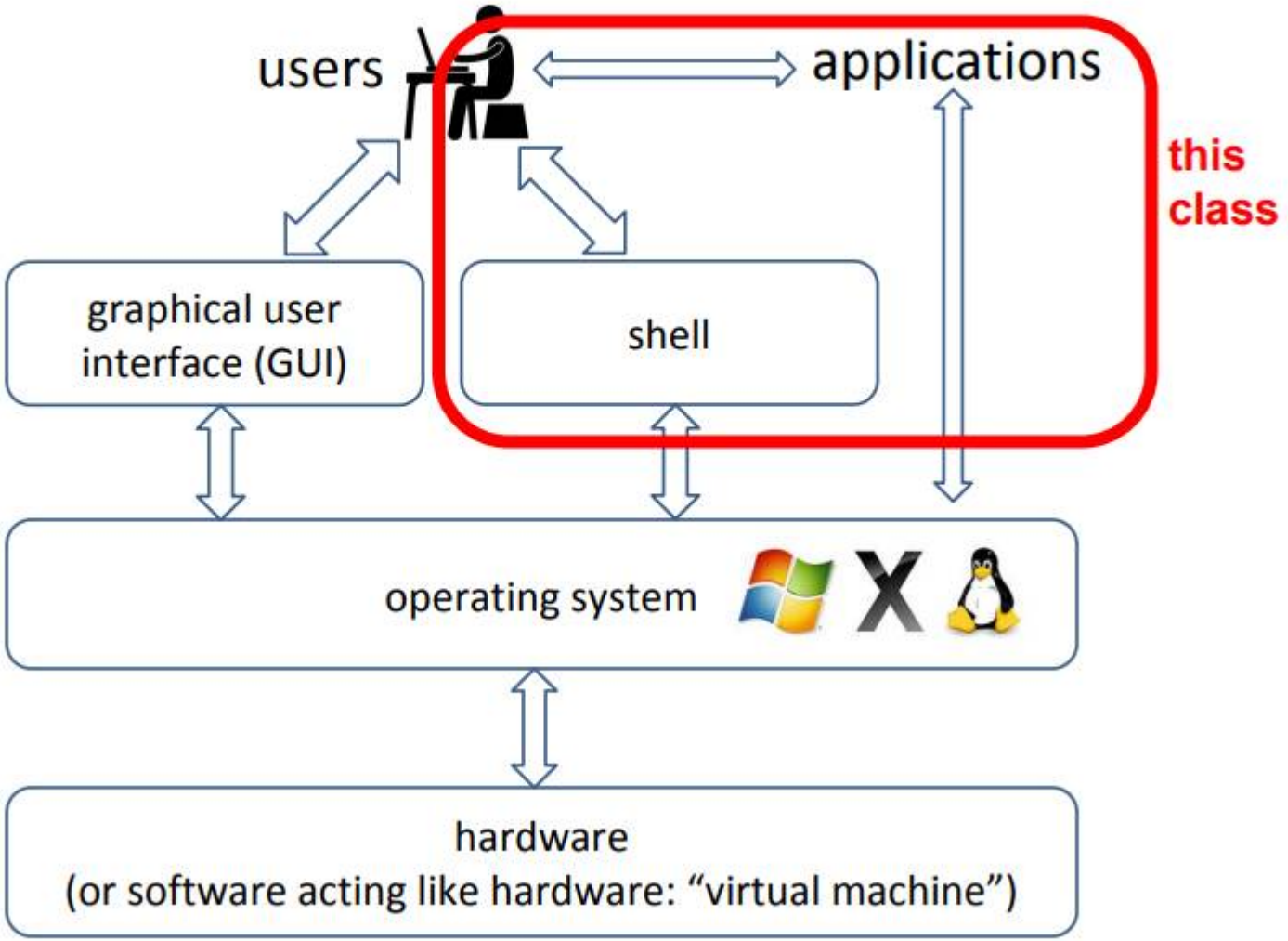
Organization of a computer system



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Why Use a Command Line Interface?

A. In the old days, there was no choice
   a. No commercial computer had a GUI until Apple released the Lisa in 1993 (at $10, 000!!!)
   b. There might still be no choice if you are interacting with a computer via a non-graphical terminal.
B. Many tasks are faster than in a GUI
   a. Suppose you wanted to see all the files in a directory that had the word "lecture" in their name.
C. Most shells let you write scripts (programs) to automate complex tasks which you could not do with a GUI

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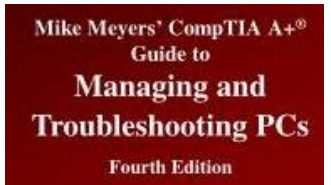
Command Line Interface (CLI)

- **How does a command-line interface work?**
  - It begins with a prompt indicating the computer is ready to do something (such as `C:\>`).
  - The user types in a command and presses ENTER.
  - The command is executed.
  - A new prompt is displayed—ready for the next command.
  - CLI executes commands just as the Windows GUI does.
    - In CLI, you type the command and press ENTER.
    - In GUI, you point and click to execute commands.

Slide credit



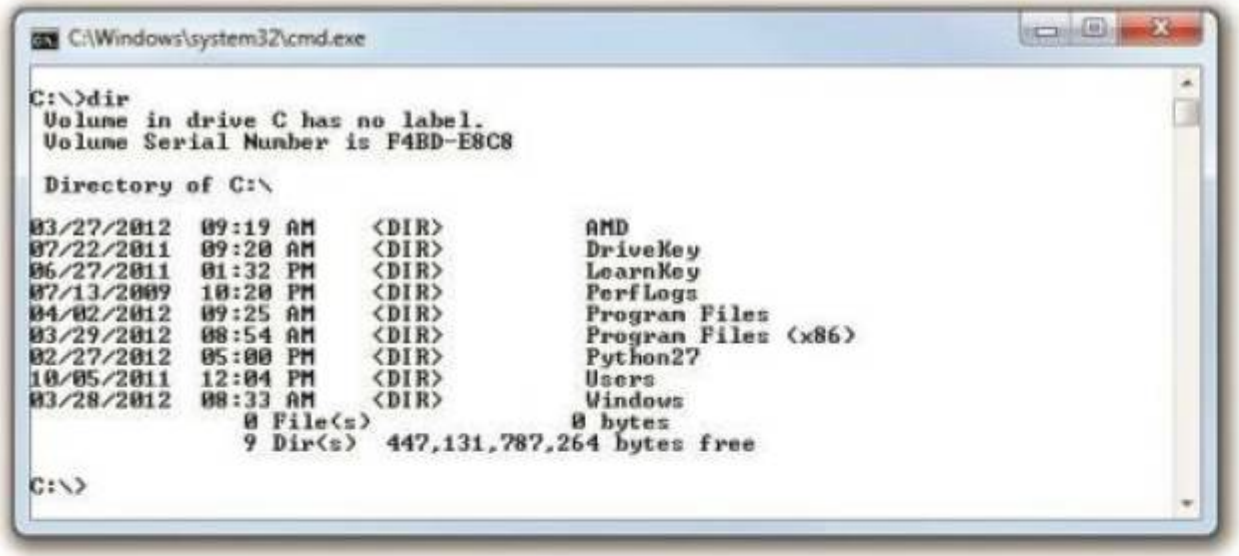
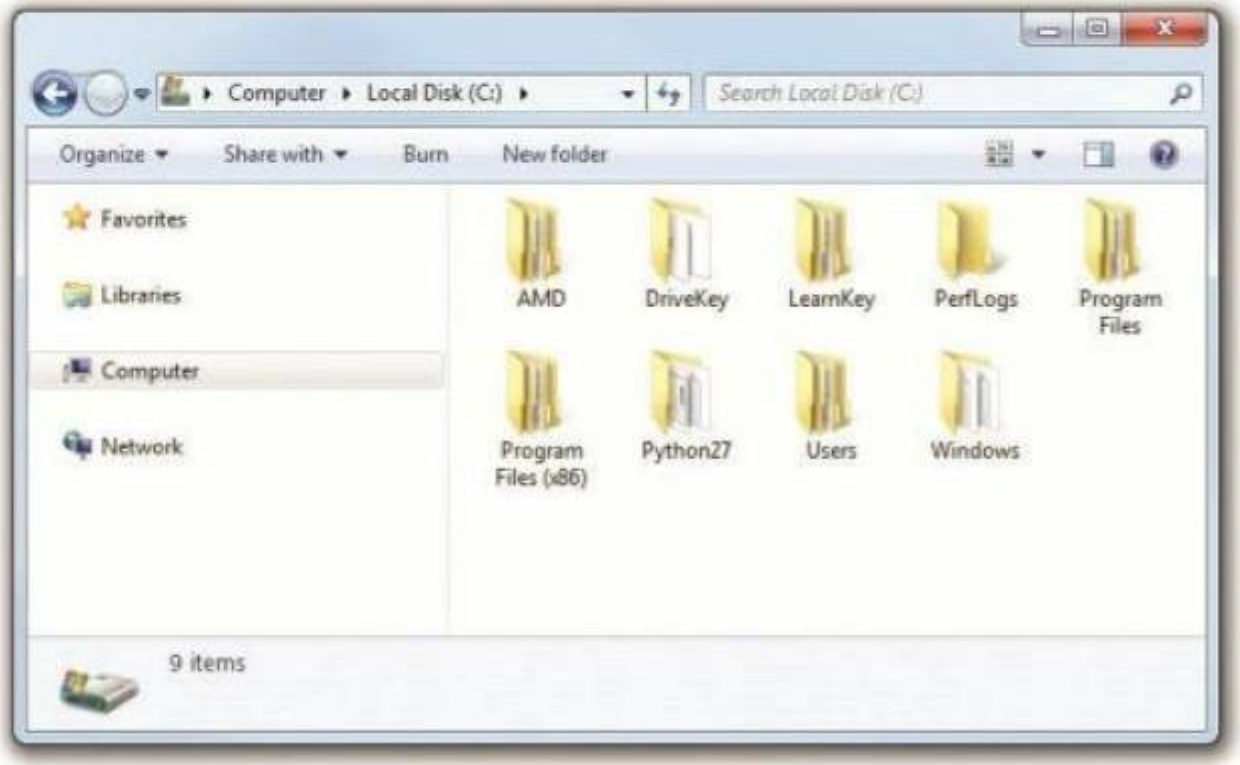


Figure 1: Contents of C: directory from the command line

Figure 2: Contents of C: in Computer—Icon view



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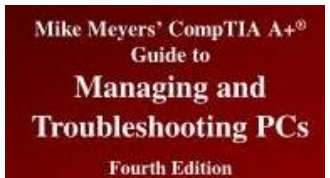
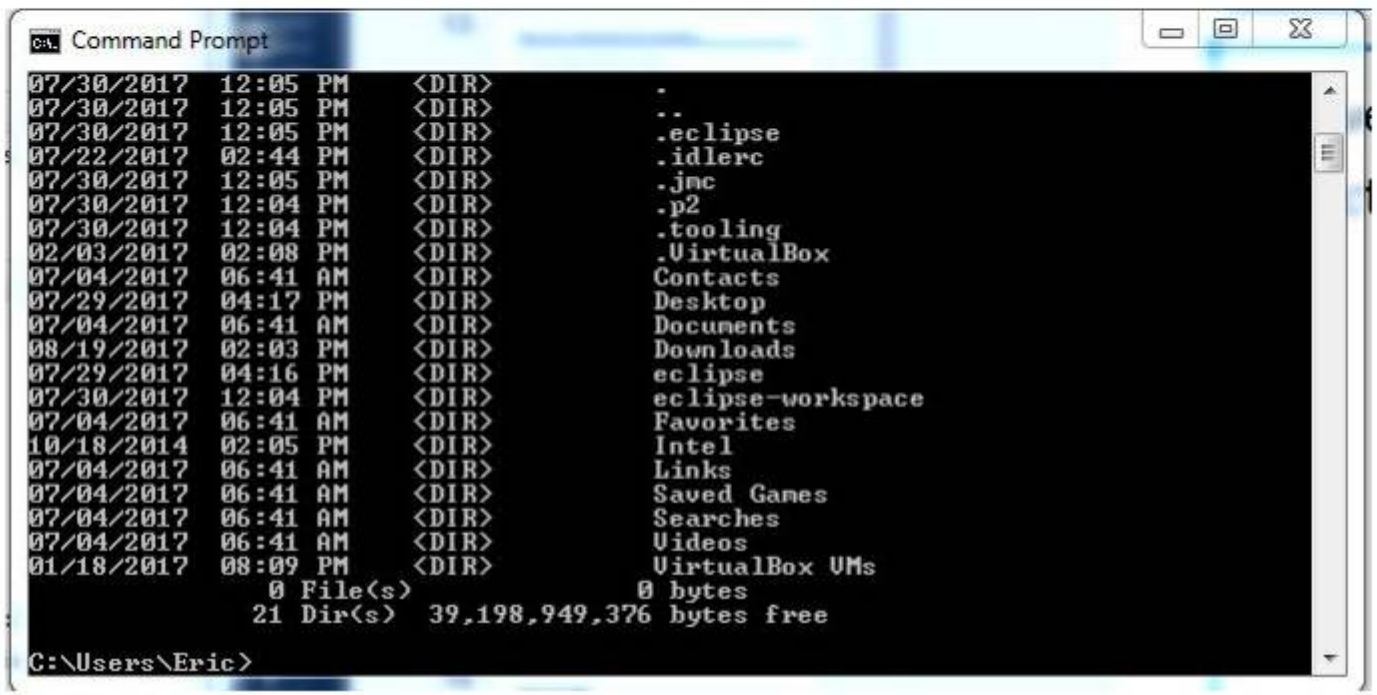


Command Prompt

All versions of Windows have included a Command Prompt program. It acts like a MSDOS interface to the computer.



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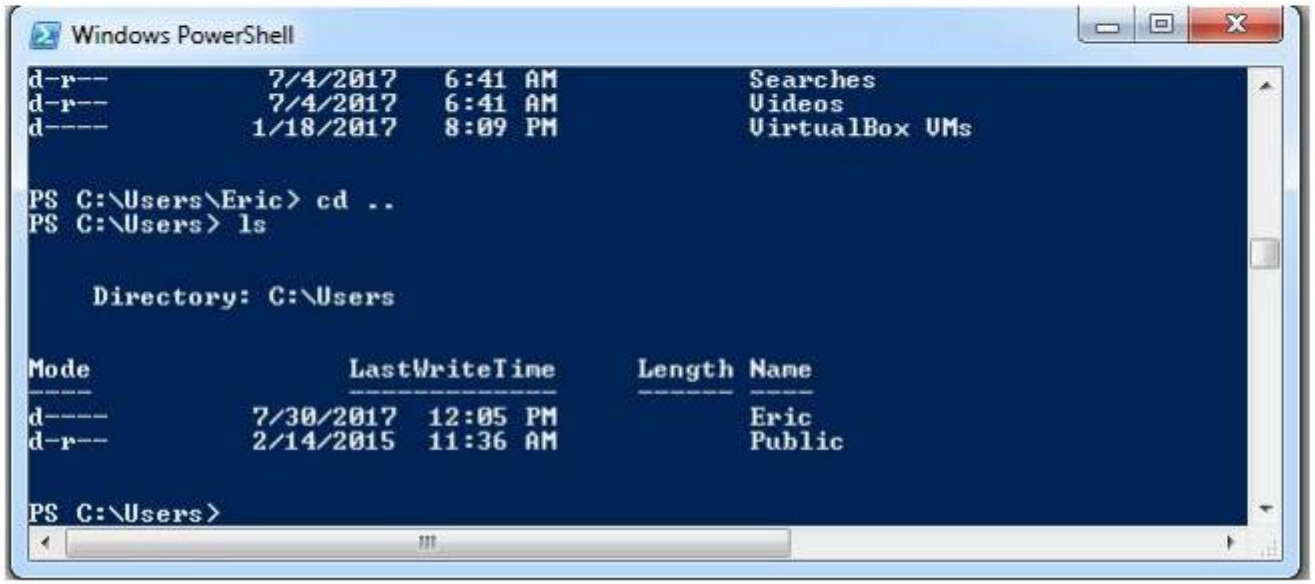
Windows Powershell

Windows Powershell was an improved shell for Windows first released in 2006. The latest version came out in 2016.



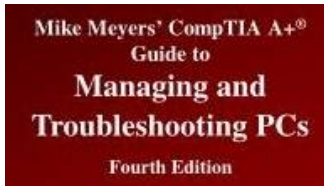
https://www2.cs.arizona.edu/classes/cs210/fall17/lectures/command_line.pdf

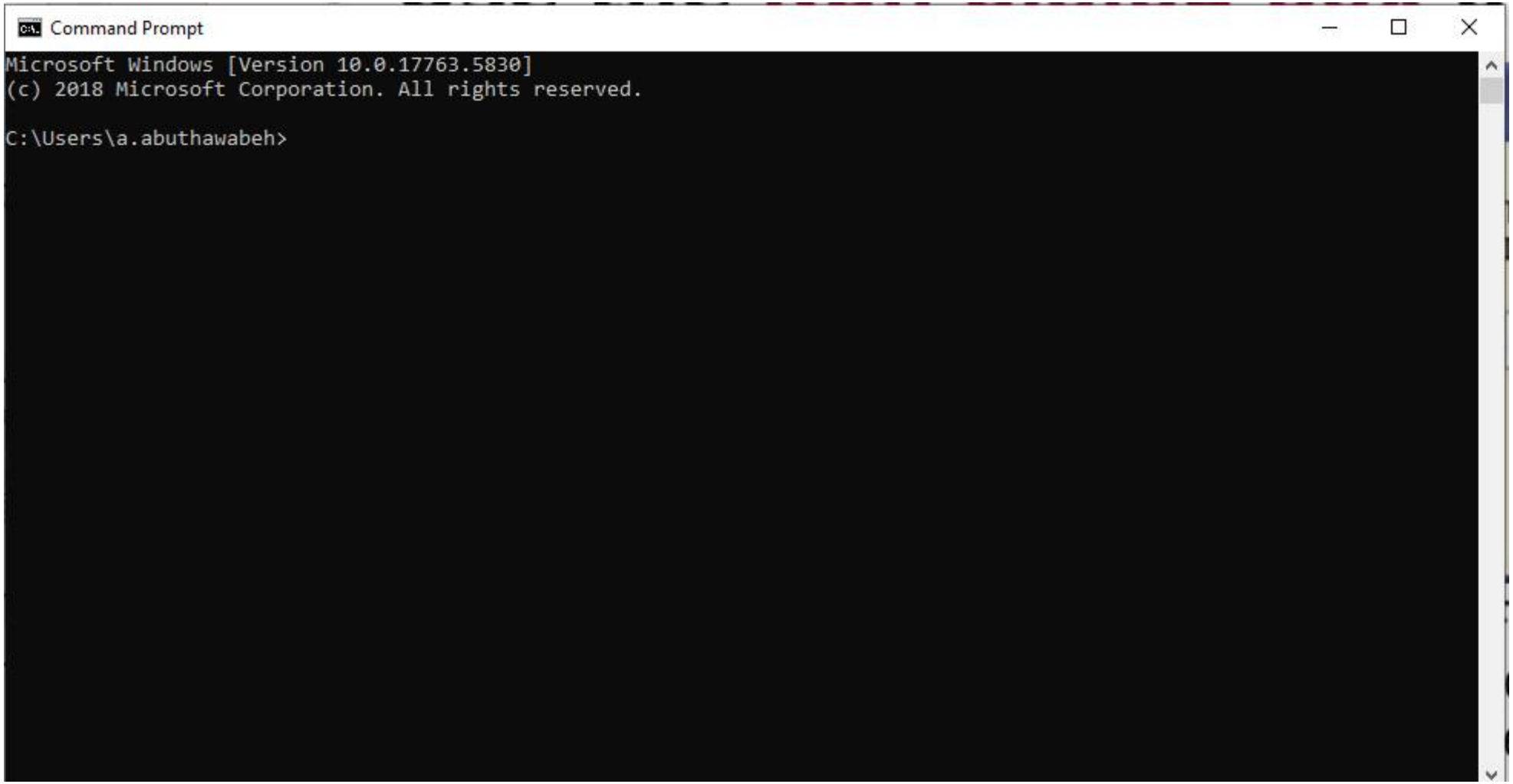
- **Use the Run dialog box or Start Search text box**
  - Start | Run
  - Type **cmd**
    (or)
  - Type **command**
  - Either runs the cmd.exe executable program found in %systemroot%\system32

Figure 5: Type cmd in the Run dialog box to open a command-line interface window in Windows XP.

- **You can also access the command line through the Start | All Programs menu.**

Slide credit

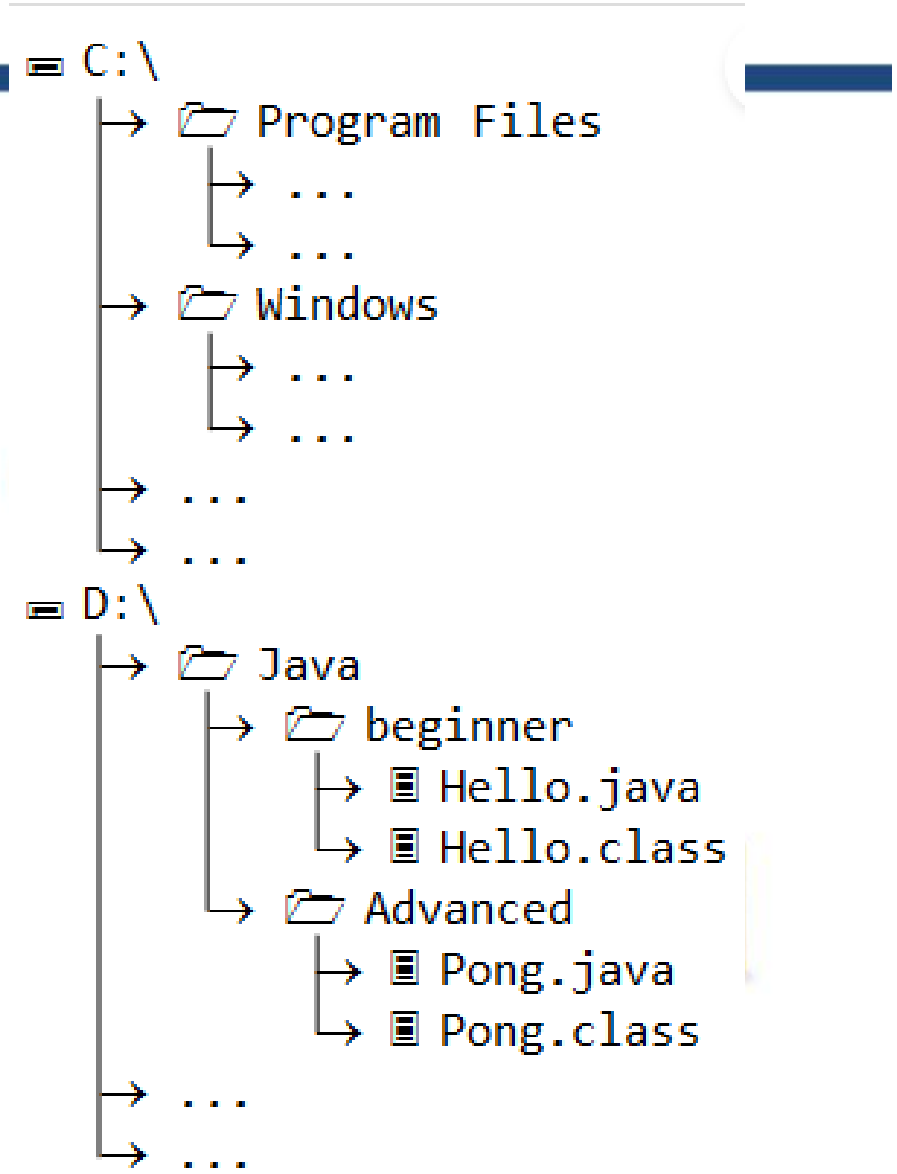



Command Prompt
Microsoft Windows [Version 10.0.17763.5830]
(c) 2018 Microsoft Corporation. All rights reserved.
C:\Users\a.abuthawabeh>

The file system

- Collections of files are grouped into *directories* (folders)

- A directory is itself a file
  - file system has a hierarchical structure (i.e., like a tree)
    - the root is referred to as "/"

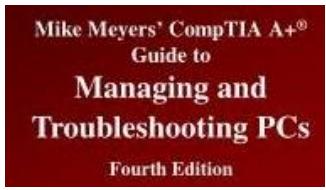


https://www2.cs.arizona.edu/classes/cs210/fall17/lectures/command_line.pdf

- **Each program or piece of data is stored as a file on the drive.**
- **Filenames have two parts:**
  - Filename
    - In DOS, up to 8 characters long
  - Extension
    - In DOS, up to 3 characters long
    - Optional
- **The filename and extension are separated by a dot**
  - Called the 8.3 naming system
- **These characters cannot be used today:**

  / \ < > | : " * ?

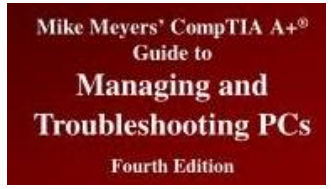
Slide credit

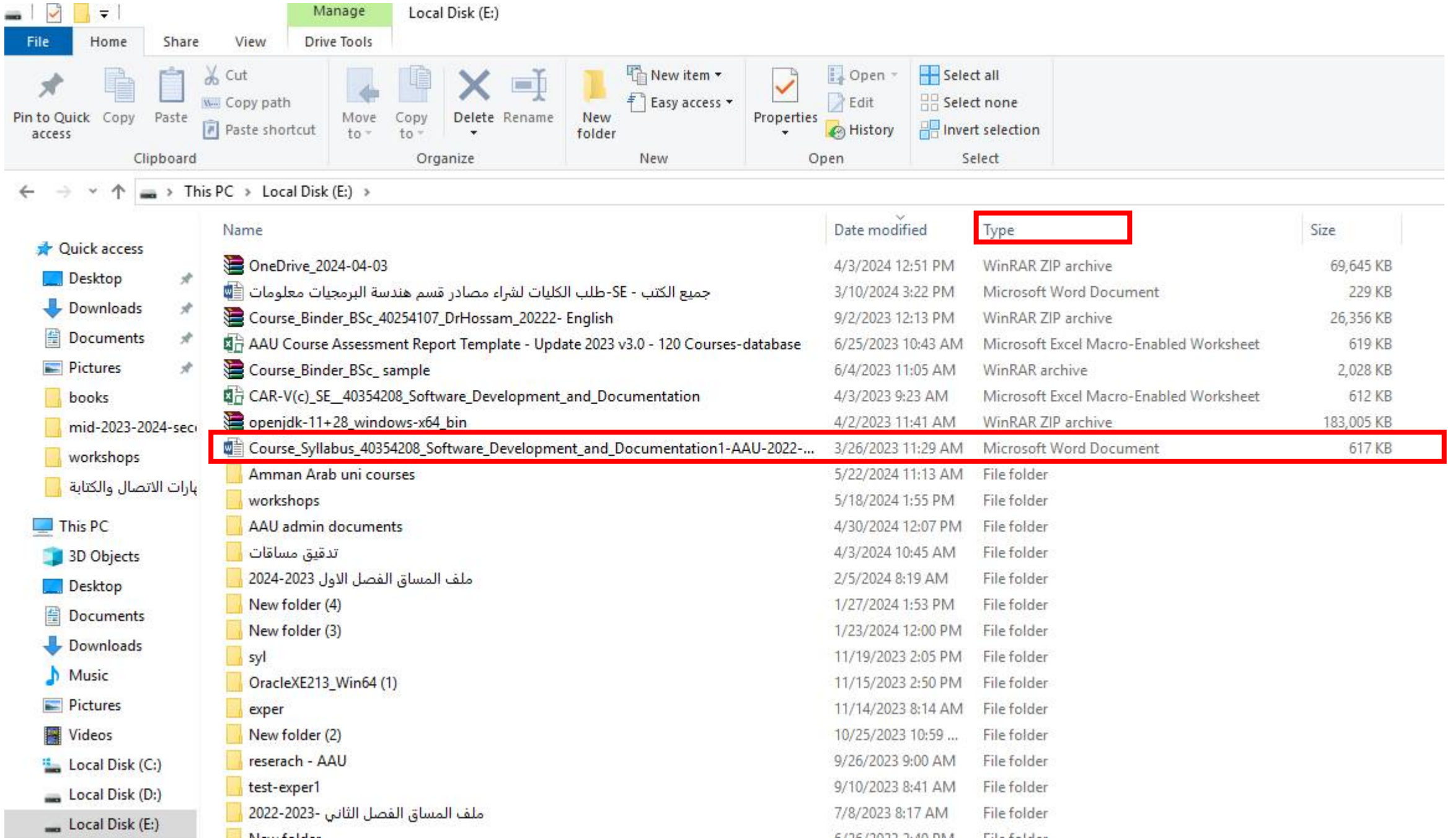


- **Windows does not restrict the filename to 8.3 (it can be up to 255 characters).**
  - To be backward-compatible with DOS, you need to follow the 8.3 standard.
  - Windows creates two filenames for every file to ensure backward-compatibility.

- **The extension tells the computer the type of file.**
  - .exe, .doc, .xls
  - .gif, .jpg, .png
  - .chm (help file)

Slide credit




Manage
Local Disk (E:)
File
Home
Share
View
Drive Tools
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organize
New folder
New item
Easy access
New
Properties
Open
Edit
History
Open
Select all
Select none
Invert selection
Select
This PC
Local Disk (E:)
Quick access
Desktop
Downloads
Documents
Pictures
books
mid-2023-2024-sec
workshops
مهارات الاتصال والكتابة
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Local Disk (D:)
Local Disk (E:)
Name
Date modified
Type
Size
OneDrive_2024-04-03 4/3/2024 12:51 PM WinRAR ZIP archive 69,645 KB
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openjdk-11+28_windows-x64_bin 4/2/2023 11:41 AM WinRAR ZIP archive 183,005 KB
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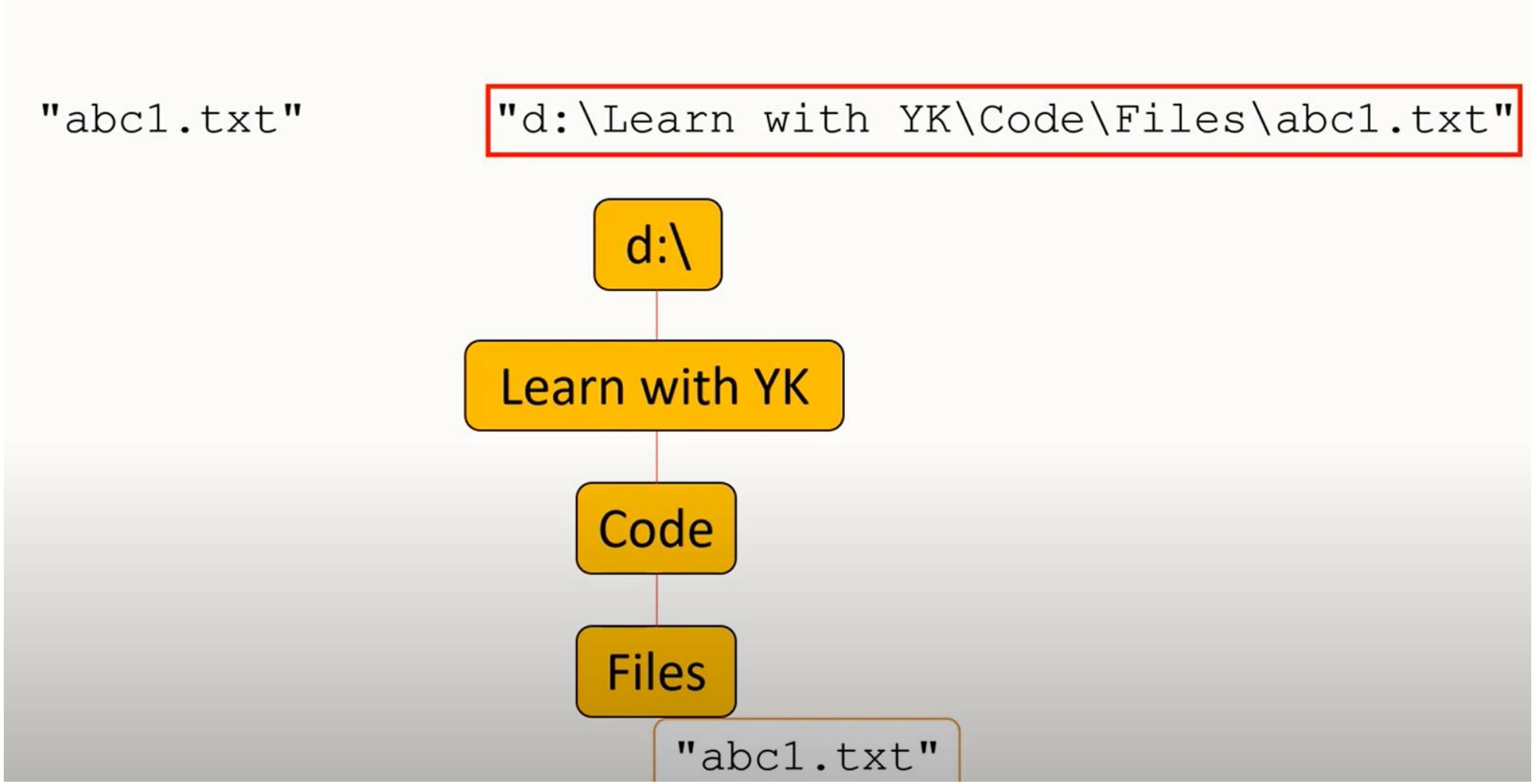
Amman Arab uni courses 5/22/2024 11:13 AM File folder
workshops 5/18/2024 1:55 PM File folder
AAU admin documents 4/30/2024 12:07 PM File folder
تدقيق مساقات 4/3/2024 10:45 AM File folder
ملف المساق الفصل الاول 2024-2023 2/5/2024 8:19 AM File folder
New folder (4) 1/27/2024 1:53 PM File folder
New folder (3) 1/23/2024 12:00 PM File folder
syl 11/19/2023 2:05 PM File folder
OracleXE213_Win64 (1) 11/15/2023 2:50 PM File folder
exper 11/14/2023 8:14 AM File folder
New folder (2) 10/25/2023 10:59 ... File folder
reserach - AAU 9/26/2023 9:00 AM File folder
test-exper1 9/10/2023 8:41 AM File folder
ملف المساق الفصل الثاني -2022-2023 7/8/2023 8:17 AM File folder

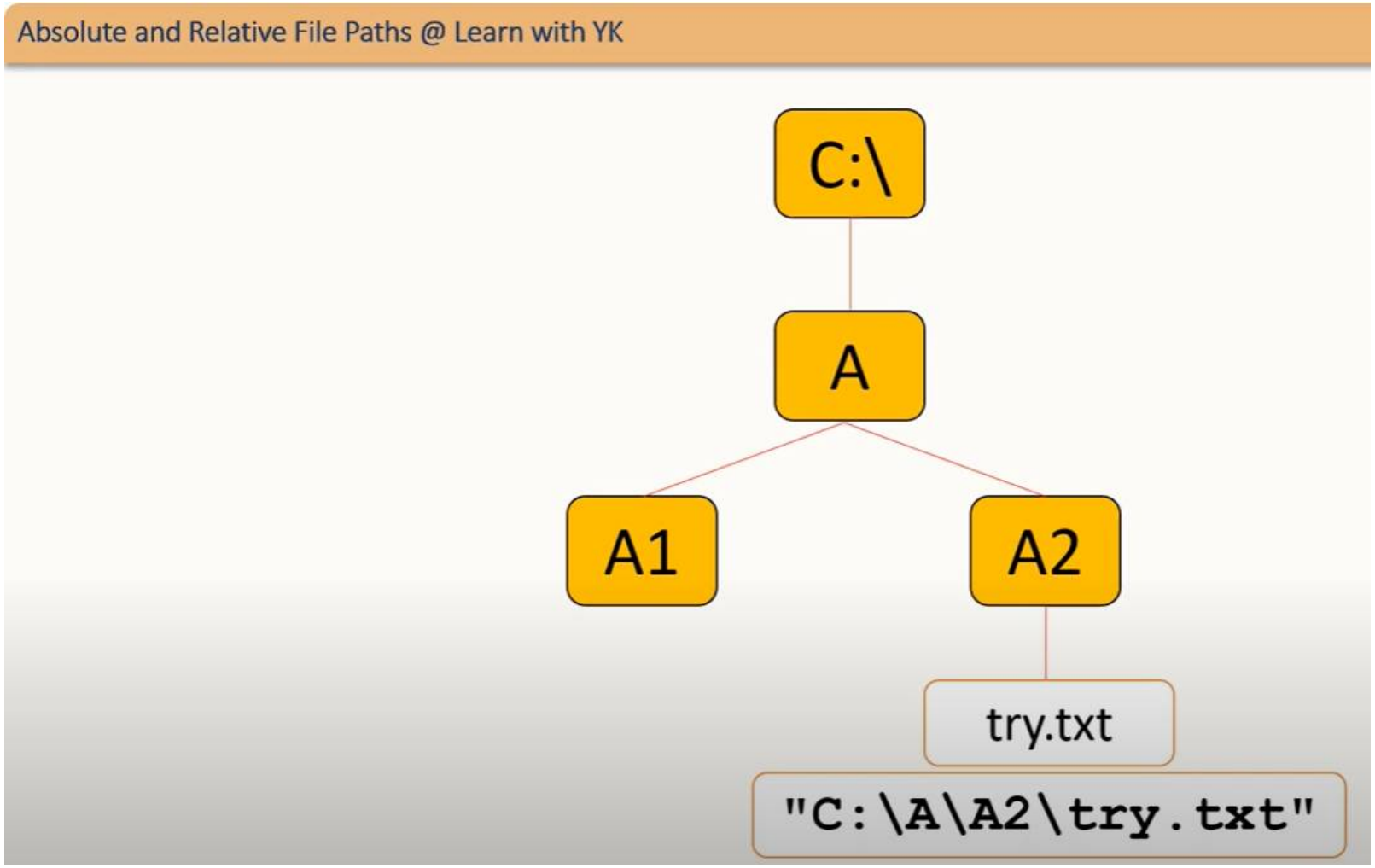
1. An absolute path refers to the same fixed location, whereas a relative path refers to a location which is relative to the current working directory.
2. An absolute path always starts with the root directory in a drive (C:\, D:\, etc.), whereas a relative path never starts with drive name.

Absolute path



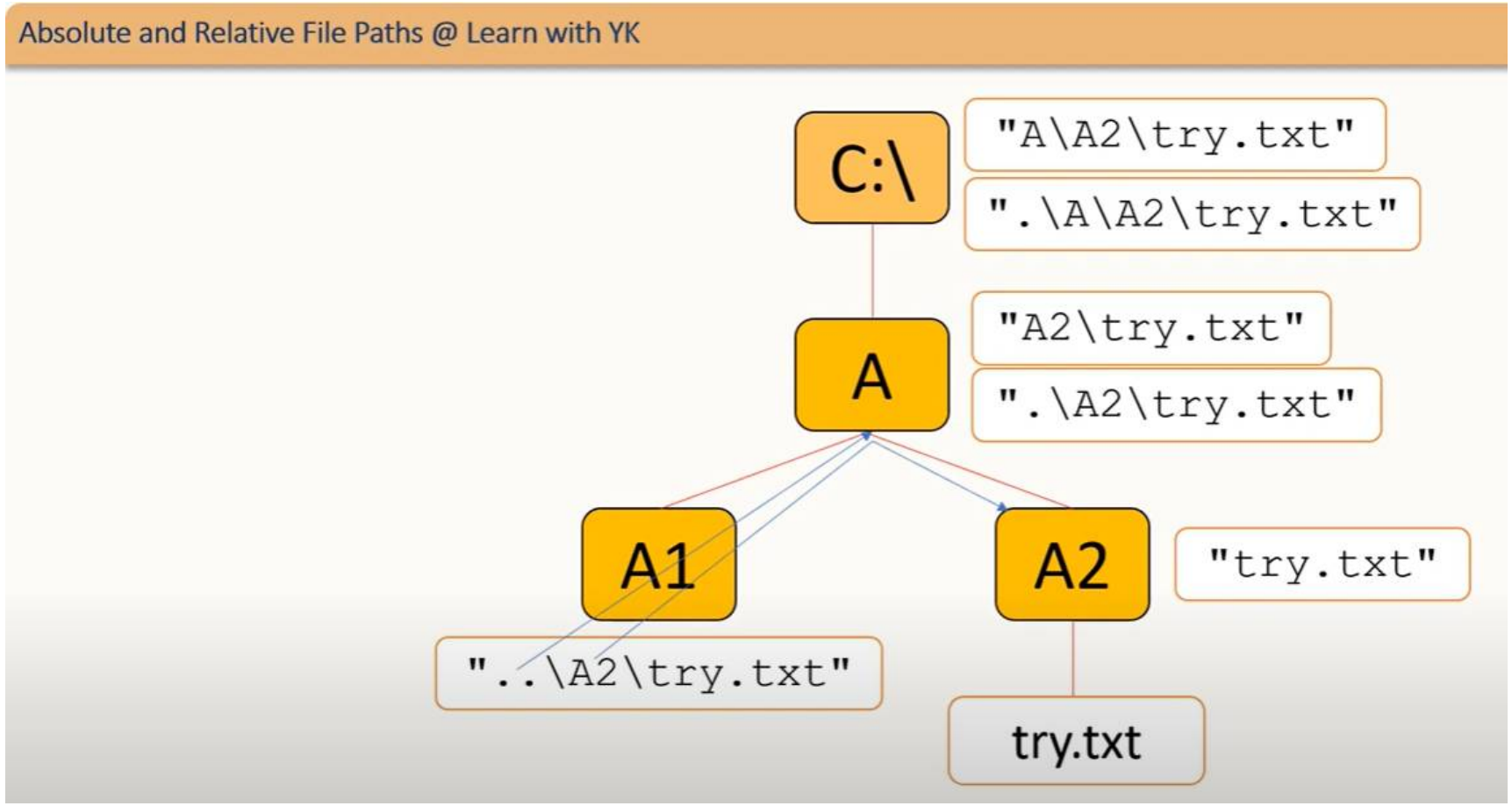
https://www.youtube.com/watch?app=desktop&v=hTX2gItOECw

Absolute path



https://www.youtube.com/watch?app=desktop&v=hTX2gItOECw

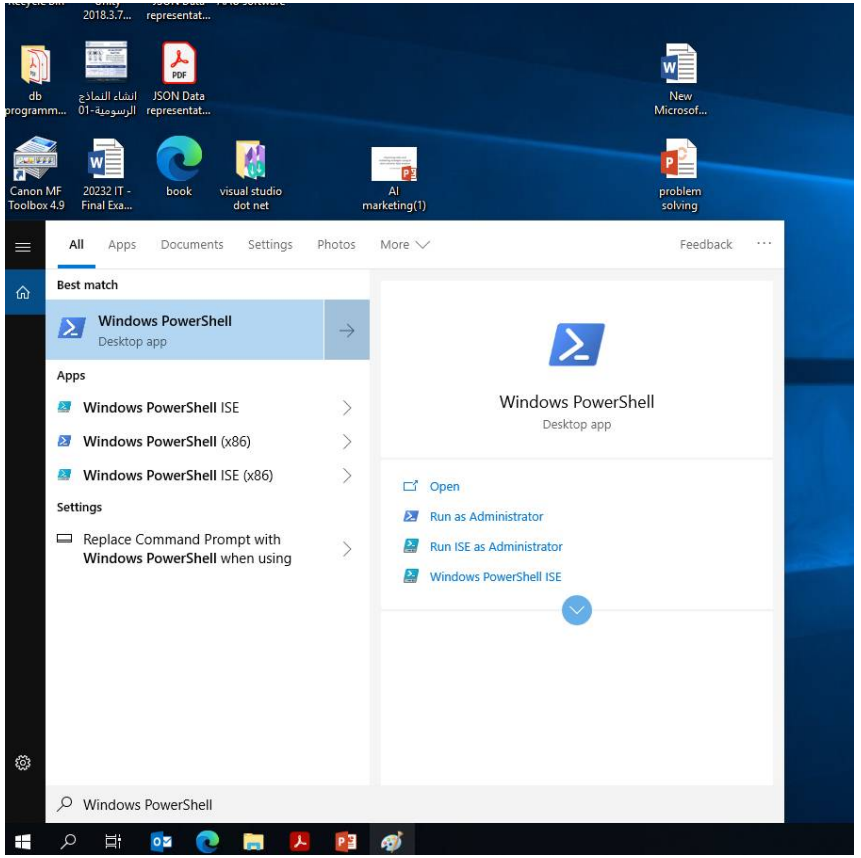
Relative path

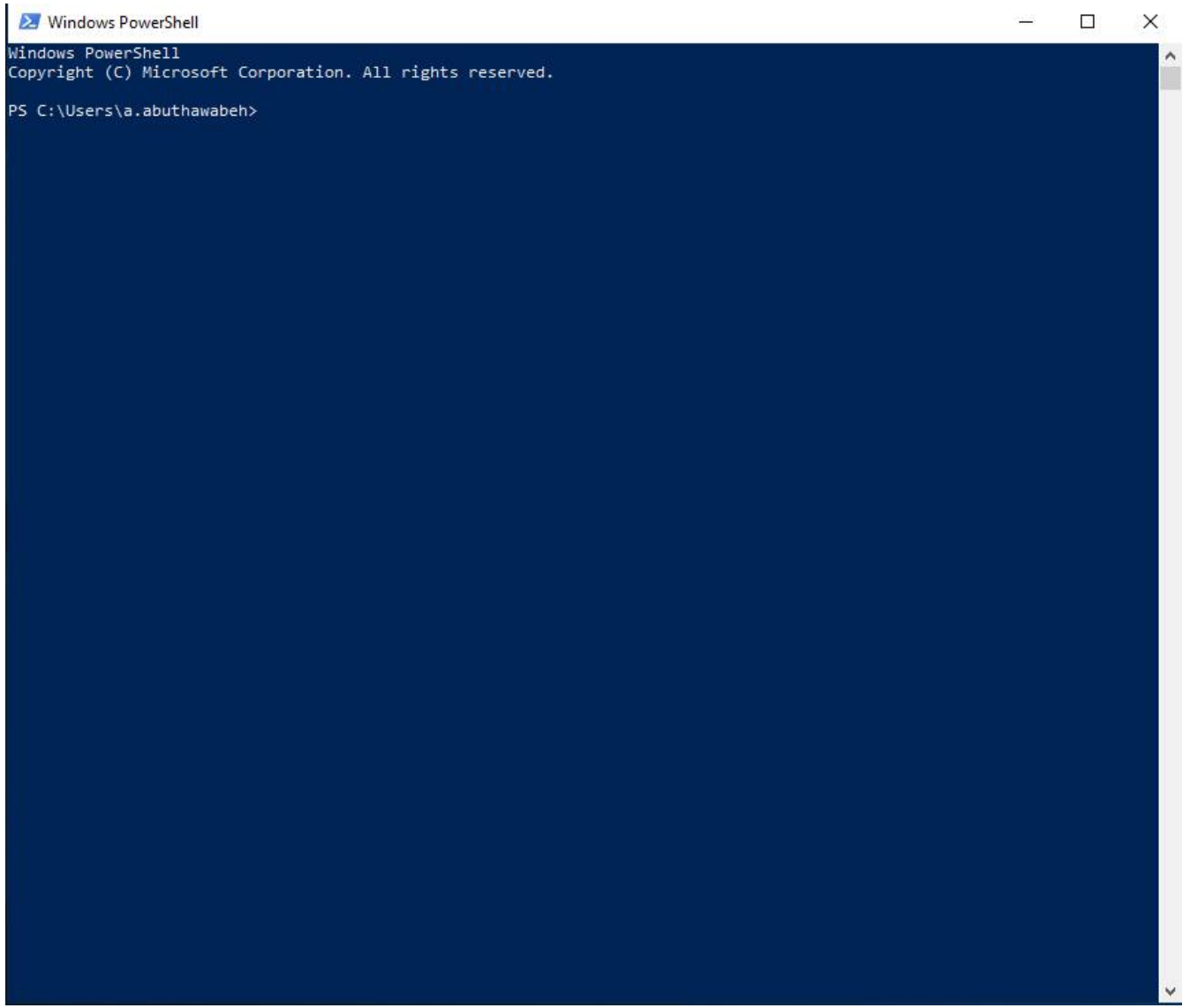


https://www.youtube.com/watch?app=desktop&v=hTX2gItOECw

Let’s get started by opening PowerShell

- To open PowerShell, use the taskbar to search for PowerShell and select ‘Windows PowerShell’




Windows PowerShell
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
PS C:\Users\a.abuthawabeh>

Review

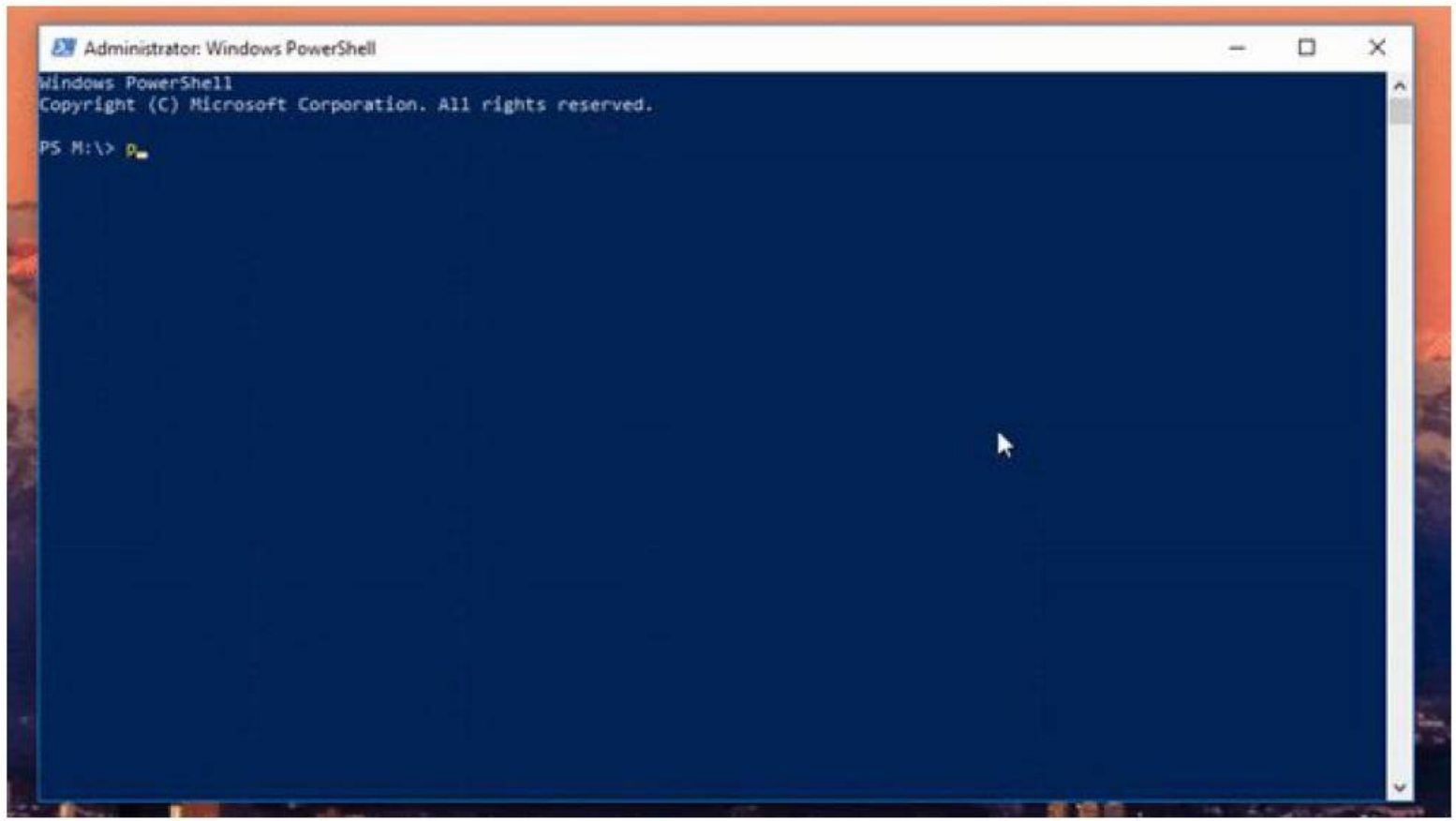
Reference the table below to review the material we covered in this tutorial.

Command:	Stands for:	Does what?
pwd	Print working directory	Lets you know where you are in your file system
ls	List files	Lists the files in your current directory
cd	Change directory	Changes the current directory
cd ..	Navigate up one directory	Navigate up one directory from the current directory
cd ..\..	Navigate up two directories	Navigate up two directories from the current directory
mkdir	Make directory	Creates a directory
mv	Move	Moves a file, can also be used to rename a file
rm	Remove	Deletes a file
cat	Concatenate	Will read a file
exit	Exit	Exit PowerShell

Moving Around Using PowerShell

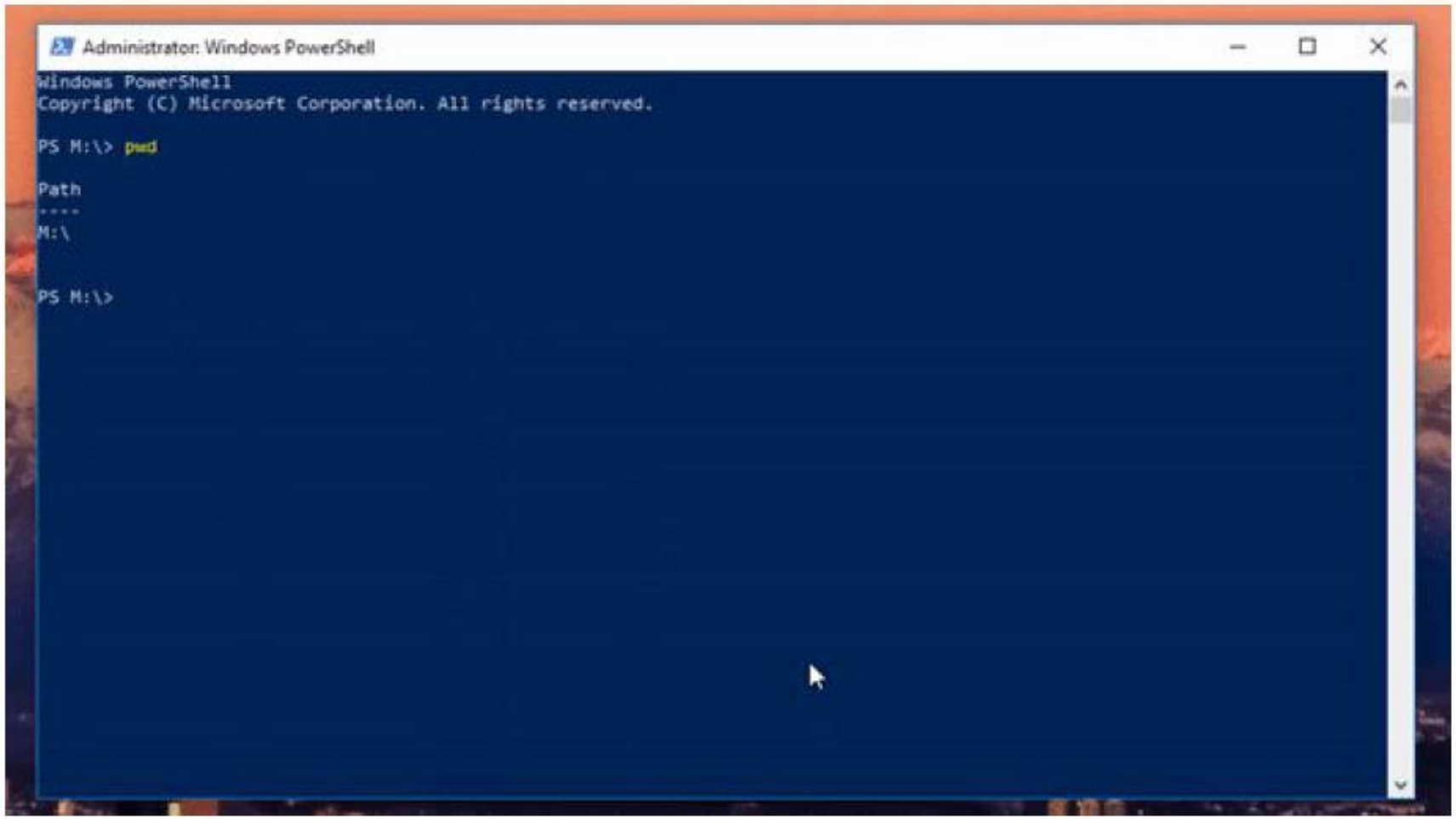
If you are feeling lost after opening PowerShell, it is important to find out where you are in your filesystem. Go ahead and enter the following command to **print the working (your current) directory**:

```
pwd
```



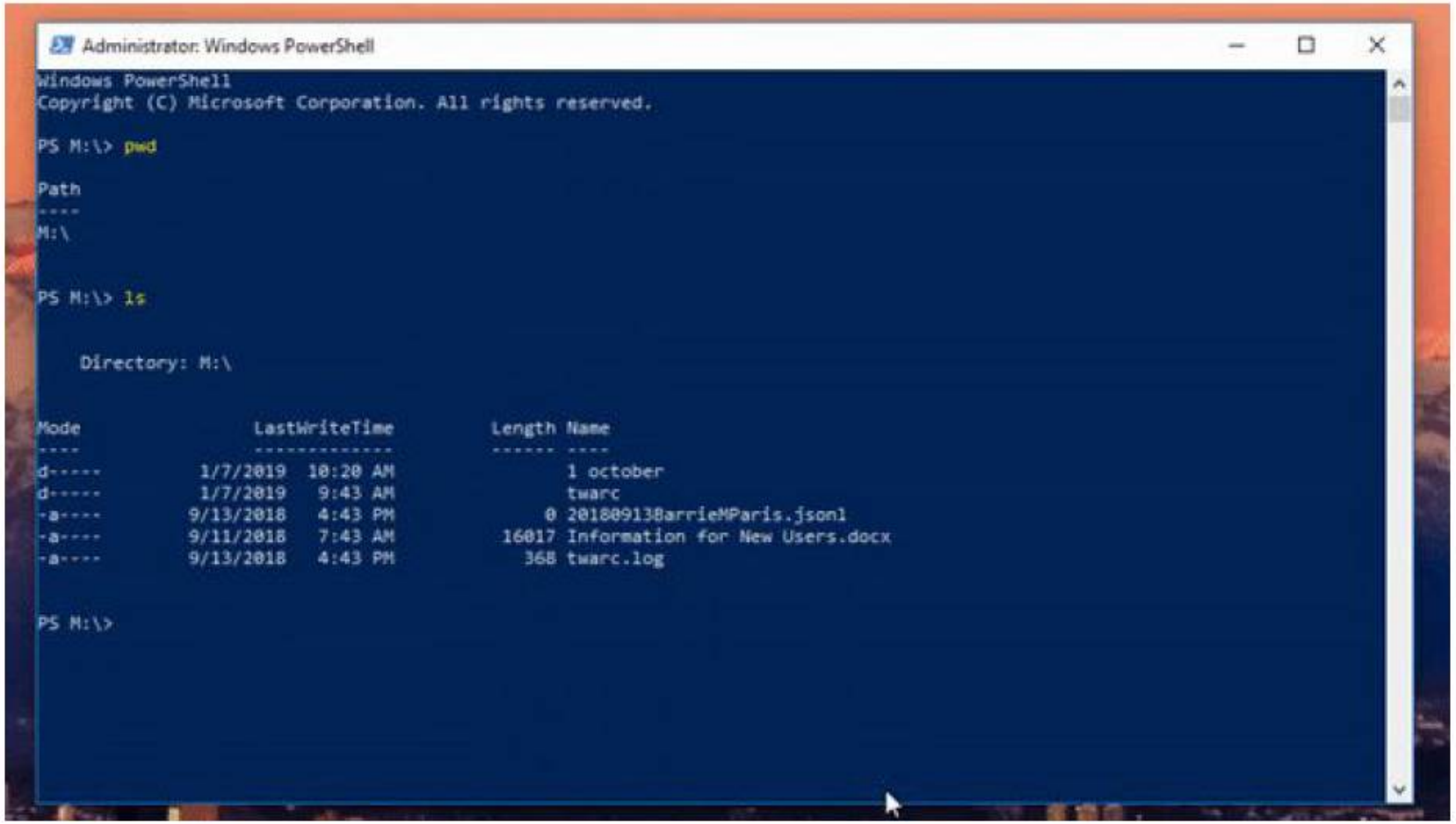
Nice job! Now let's see which directories and files are available in your location by entering the **list files** command:

```
ls
```



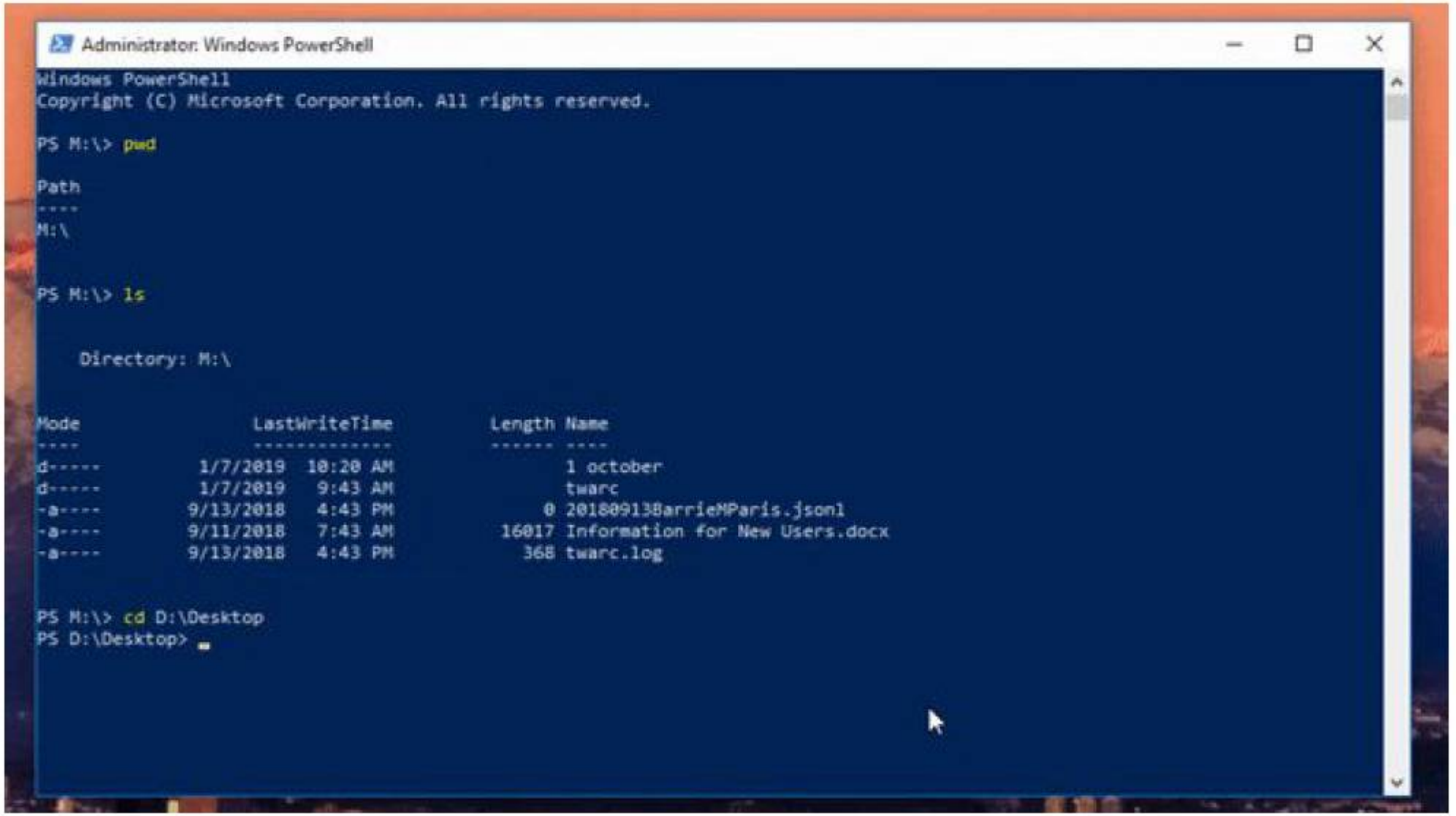
Let's change directories. Navigate to your Desktop by entering the **change directory** command:

```
cd D:\Desktop
```



let's create a directory by entering the **make directory** command:

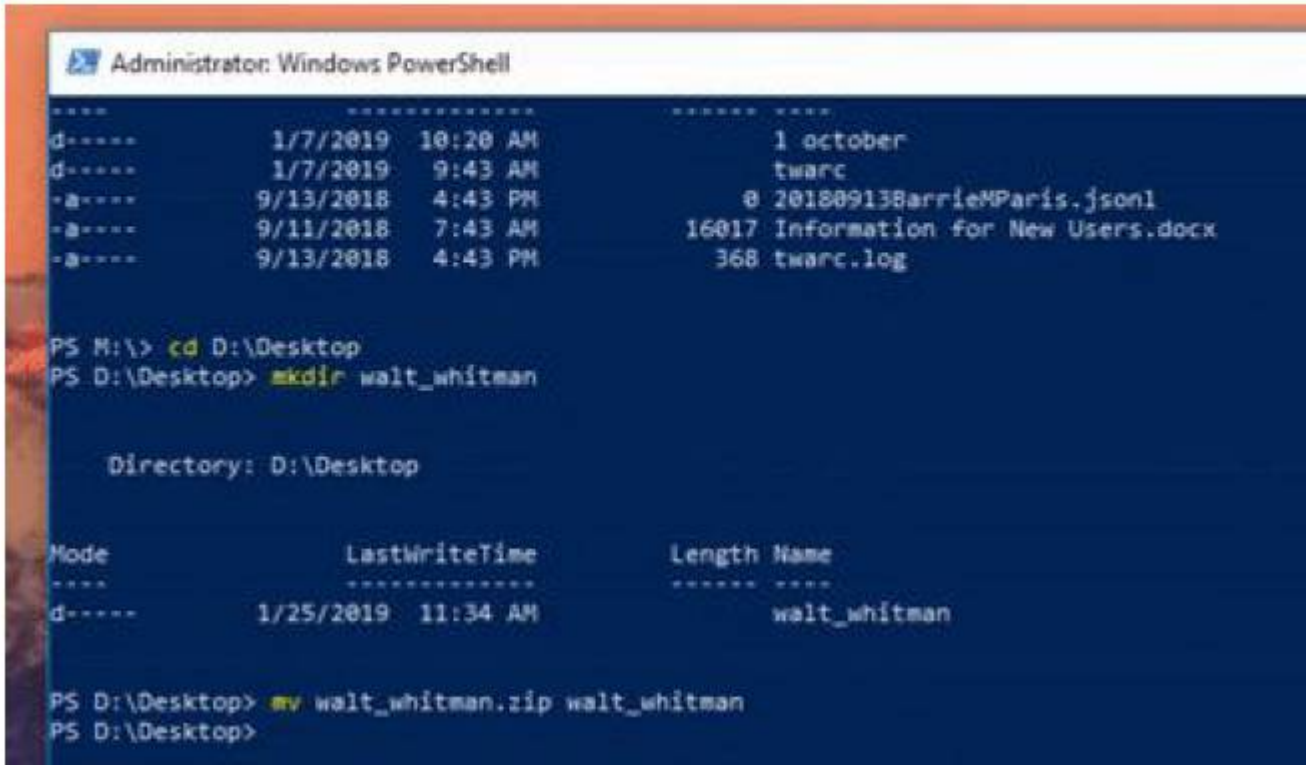
```
mkdir walt_whitman
```



We're going to move the 'walt_whitman' zip file you downloaded from your Desktop into your 'walt_whitman' directory by using a new command, **move**:

```
mv walt_whitman.zip walt_whitman
```

```
cd D:\Desktop\walt_whitman
```



Let's check out the 'readme.txt' file to see if it tells us about any of the other poems. You can open the file by using the **cat** (concatenate) command:

```
cat readme.txt
```

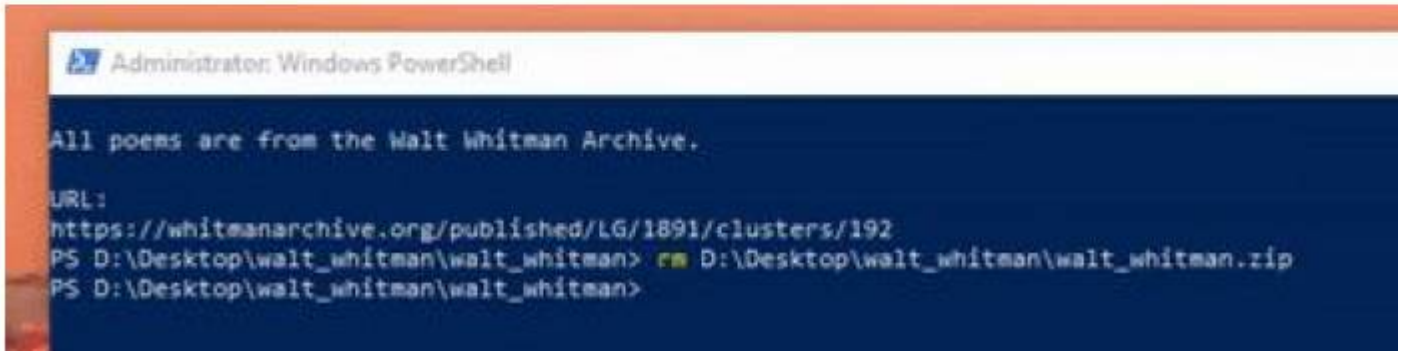
Before we exit PowerShell, let's get rid of the 'walt_whitman.zip' file since we don't need it anymore. Do this by entering the **remove** command:

```
rm D:\Desktop\walt_whitman\walt_whitman.zip
```

Since we're all done in this directory, navigate up two directori

the **change directory** command:

```
cd ..\..
```

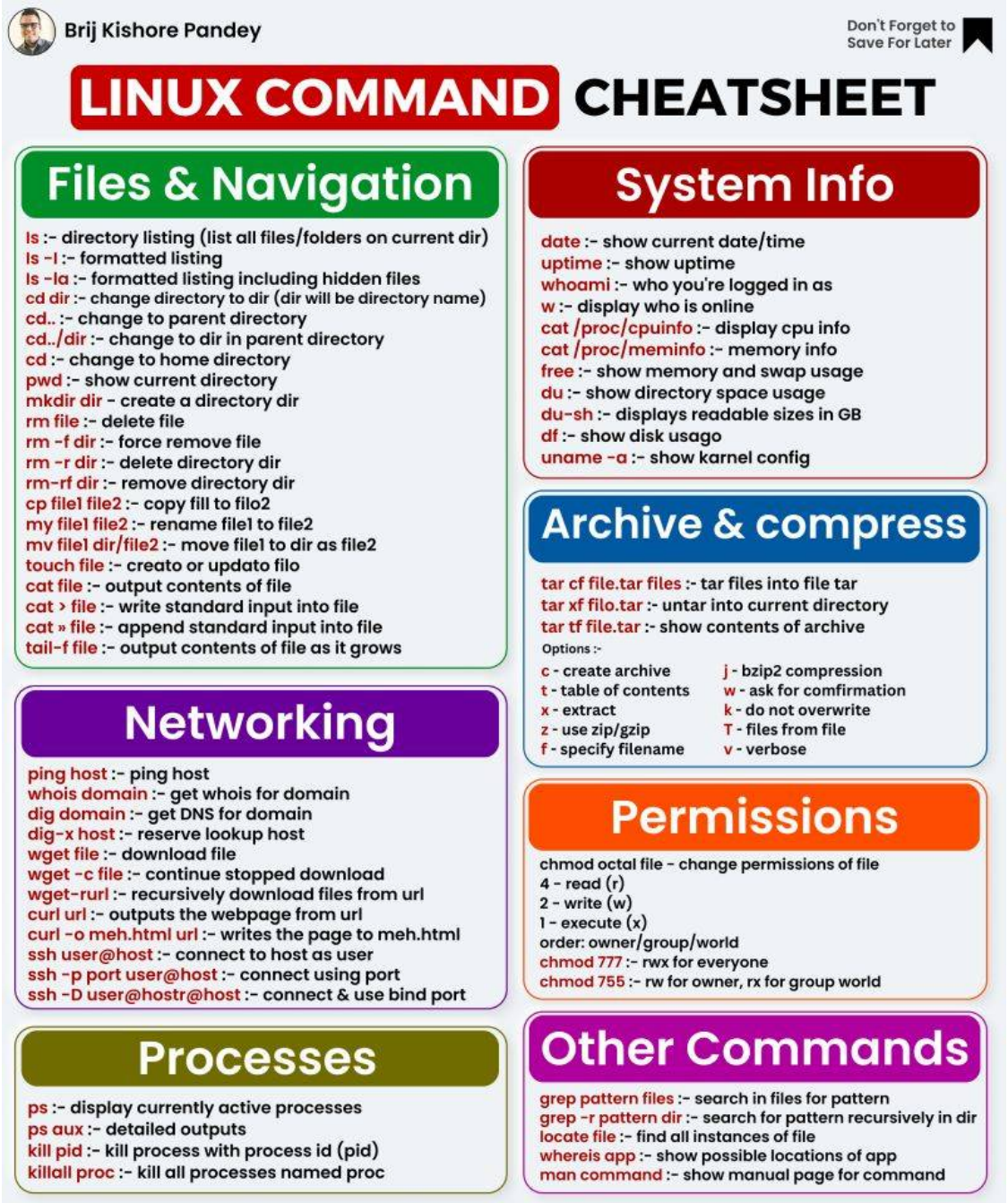



```
exit
```

Windows Command	Linux Command	Explanation
dir	ls	List files in current directory
copy	Cp	Copy a file
move	mv	Move a file
ren	mv	Rename a file
del	rm	Delete a file
mkdir	mkdir	Create a new folder
cls	clear	Clear the terminal screen
find	Grep	Search strings in a file
exit	exit	Close the terminal
cd	cd	Change directory location

Compare linux with windows commands examples
https://angrytools.com/command/

Linux commands categories



Linux commands examples

NAVIGATE FILES

LIST DIRECTORIES (WITH TYPE INDICATOR)

```
$ ls --file-type
```

CHANGE DIRECTORY TO ``EXAMPLE``

```
$ cd example
```

MOVE UP ONE DIRECTORY

```
$ cd ..
```

MOVE UP TWO DIRECTORIES

```
$ cd ../..
```

CHANGE TO HOME DIRECTORY

```
$ cd ~
```

GET CURRENT DIRECTORY

```
$ pwd
```

GET ABSOLUTE PATH TO A FILE OR FOLDER

```
$ readlink -f example
```

GET FILE TYPE OF ``EXAMPLE.EXT``

```
$ file example.ext
```

INSTALLING SOFTWARE

- On Fedora and CentOS, `[COMMAND]` is `dnf`
- On Ubuntu and Debian, `[COMMAND]` is `apt`
- On OpenSUSE, `[COMMAND]` is `zypper`
- Other distributions may use different commands

SEARCH FOR AN APPLICATION CALLED EXAMPLE

```
$ sudo [COMMAND] search example
```

INSTALL AN APPLICATION CALLED EXAMPLE

```
$ sudo [COMMAND] install example
```

UNINSTALL AN APPLICATION CALLED EXAMPLE

```
$ sudo [COMMAND] remove example
```

SERVICES

START SERVICES

```
$ sudo systemctl start example
```

STOP SERVICES

```
$ sudo systemctl stop example
```

GET STATUS OF SERVICES

```
$ sudo systemctl status example
```

By Seth Kenlon

Linux commands examples

FILE MANAGEMENT

COPY A FILE IN PLACE

```
$ cp example.txt example-1.txt
```

COPY A FILE TO DOCUMENTS

```
$ cp example.txt ~/Documents/example-1.txt
```

MOVE A FILE TO DOCUMENTS

```
$ mv example.txt ~/Documents
```

CREATE A DIRECTORY (FOLDER)

```
$ mkdir example
```

REMOVE AN EMPTY DIRECTORY

```
$ rmdir example
```

SAFELY REMOVE A FILE

```
$ trash example.txt
```

REMOVE A FILE (WITHOUT TRASH COMMAND)

```
$ mv example.txt ~/.local/share/Trash/files
```

PERMANENTLY DELETE A FILE

```
$ shred example.txt
```

DOWNLOAD A FILE FROM AN NETWORK LOCATION

```
$ wget http://example.com/file
```

By Seth Kenlon

More Linux commands examples

File and directory commands	
Command	**Action**
ls	displays files/directories in 3 column format
ls -la	displays files/directories in long format, including hidden files
ls -R	displays files/directories recursively
ls -F	displays files/directories and appends indicator for file type or directory
ls --color=auto	control whether color is used to distinguish file types. (never, always or auto)
cd *dir*	change directory to *dir*
pwd	show current directory
mkdir *dir*	create a directory *dir*
rmdir *dir*	delete directory *dir*
rm *file*	delete *file*
rm -r *dir*	delete directory *dir*
rm -f *file*	force remove *file*
rm -rf *dir*	force remove *dir* (DANGEROUS)
cp *file1 file2*	copy *file1* to *file2*
cp *file1 file2*	copy *dir1* to *dir2*; create *dir2* if it doesn't exist
mv *file1 file2*	rename or move *file1* to *file2* if *file2* is an existing directory, moves *file1* into directory *file2*
touch *file*	create or update *file*
cat *file*	displays contents of *file*
less *file*	displays contents of *file*, allows for forward/reverse navigation of file
head *file*	output the first 10 lines of *file*
tail *file*	output the last 10 lines of *file*
tail -f *file*	output the last 10 lines of *file* and output continues as *file* is being updated, to end CTRL+C
grep *word* or *"phrase" file*	search *file* for *word* or *"phrase"* **NOTE**: case sensitive. *Phrase* must be enclosed in quotes
grep *word* or *"phrase"**	search *all* files in current directory for *word* or *"phrase"* **NOTE**: case sensitive. *Phrase* must be enclosed in quotes
grep -i *word* or *"phrase" file*	search *file* for *word* or *"phrase"* Case insensitive. *Phrase* must be enclosed in quotes
grep -i *word* or *"phrase"**	search *all* files in current directory for *word* or *"phrase"* **NOTE**: case insensitive. *Phrase* must be enclosed in quotes
find . –name *file*	Starting at current directory look for the file named *file*
find *dir* –name *file*	Starting at *dir* look for the file named *file*

File Permissions

chmod *octal file* – **change the permissions of *file* to *octal*, which can be found separately for user, group, and world by adding:**

- **4 – read (r)**
- **2 – write (w)**
- **1 – execute (x)**

Examples:

chmod 777 – **read, write, execute for all**

chmod 755 – **rwx for owner, rx for group and world**

Help commands

Command	Action
progname --help* or *progname -h	displays help/usage for program – if provided
man *progname*	displays documentation for *progname*
man -k *progname*	searches all documentation containing *progname*

System commands

Command	Action
date	shows the current date and time
cal	show this month's calendar
whoami	who you are logged in as
df	show quota information/disk usage
which *progname*	shows path information for *progname*

Short cuts	
Command	**Action**
Ctrl+C	halts current command
Ctrl+D	logout, similar to exit
Ctrl+U	erases line of input at command line
!!	repeats last command
history	displays history of commands with number of command
!#	repeats # of command from history, Example: !76 will repeat the 76th command in history
up arrow	displays last command, continually pressing up arrow will allow to scroll through previous commands
tab	auto complete

Remote Access	
Command	**Action**
ssh $USER@$HOST	open a secure shell connection as $USER at $HOST
ssh -Y $USER@$HOST	open a secure shell connection as $USER at $HOST allowing to run X11 tunneling
scp $USER@$HOST: *file dir/*	secure copy a file to $HOST as $USER
ssh *username@dragon2.cs.clemson.edu*	Accessing a $HOST on campus
1. **ssh *username@access.cs.clemson.edu*** 2. ***ssh dragon2.cs.clemson.edu***	Accessing a $HOST from off campus. 1st ssh into access.cs.clemson.edu, with username. Once logged into access.cs.clemson.edu, you can then ssh into any lab machines (username not necessary)

Methods for Running Linux on Windows

1- Install Ubuntu on Windows 11 using WSL

https://www.ssl.com/how-to/enable-linux-subsystem-install-ubuntu-windows-10/

https://www.youtube.com/watch?v=9SugKtGGn_c

2- Install Ubuntu on Windows 11 using VirtualBox tool

https://www.youtube.com/watch?v=nvdnQX9UkMY

3- Run linux online:

https://linuxcontainers.org/incus/try-it/

https://labex.io/tutorials/linux-online-linux-playground-372915