Lecture 4

408/508 *Computational Techniques for Linguists*

Today's Topic

- We're gonna need the Terminal
 - but we don't want our mistakes to kill the machine
 - can run stuff inside a guest **Operating System**, or be very careful
 - Example: rm -rf *
- Homework 2:
 - for Windows 10/11 users, install Microsoft WSL2
 - for Apple Intel users, install VirtualBox (or use existing Terminal)
 - for Apple Silicon users, install Multipass (or use existing Terminal)
 - for Linux users, do nothing

WSL2

• Windows Subsystem for Linux

https://docs.microsoft.com/en-us/windows/wsl/

🛅 🔝 Microsoft Store Windows Subsystem for Linux Microsoft Store 6 ... 🎍 🔍 Home Apps Games Devices Movies & TV Books Edge Departments V Search **Documentation** 07/22/2020 • 2 minutes to read • 🚇 ⊜ 🐼 🕼 🏘 The Windows Subsystem for Linux lets developers run a GNU/Linux environment -- including most command-line tools, utilities, and applications -- directly on Windows, unmodified, **Run Linux on Windows** without the overhead of a traditional virtual machine or dualboot setup. Install and run Linux distributions side-by-side on the Windows Subsystem for Linux (WSL). Learn more here • What is the Windows Subsystem for Linux? \bigcirc ٩ • What's new with WSL 2? • Compare WSL 2 and WSL 1 • Read frequently asked questions Debian GNU/Linux openSUSE Leap 42 SUSE Linux Kali Linux Ubuntu ***** Enterprise Server 12 ***** ***** ***** ***** Get started Installed Installed Owned Installed Owned • Install WSL1

Update to WSL2

WSL2

- Consider installing WSL2 (Windows Subsystem for Linux 2)
 - <u>https://learn.microsoft.com/en-us/windows/wsl/</u>
- Why?
 - gives you a Bash shell (*with quoting consistent with the lecture slides*)
 - (*simultaneously*) use Linux under Windows 10/11 (not dual-booting)
 - can access your Windows C: drive via directory /mnt/c

Get started

- Install WSL
- Install Linux on Windows Server
- Manual install steps
- Best practices for setting up a WSL development environment

WSL2

I installed Ubuntu



🧿 Ubuntu

Installing, this may take a few minutes...

Please create a default UNIX user account. The username does not need to match your Windows username. For more information visit: https://aka.ms/wslusers Enter new UNIX username: >

—



🔕 sandiway@DESKTOP-VEPP64Q: ~

Retype new password: passwd: password updated successfully Installation successful! To run a command as administrator (user "root"), use "sudo <command>". See "man sudo root" for details. Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.10.16.3-microsoft-standard-WSL2 x86 64) * Documentation: https://help.ubuntu.com Management: https://landscape.canonical.com * Support: https://ubuntu.com/advantage System information as of Fri Sep 10 10:01:52 MST 2021 System load: 0.13 Processes: 8 Users logged in: Usage of /: 0.5% of 250.98GB 0 Memory usage: 0% IPv4 address for eth0: 172.24.13.136 Swap usage: 0% 1 update can be applied immediately. To see these additional updates run: apt list --upgradable The list of available updates is more than a week old. To check for new updates run: sudo apt update

This message is shown once a day. To disable it please create the /home/sandiway/.hushlogin file. sandiway@DESKTOP-VEPP640:~\$

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Ubuntu Text Editor: nano



- Text editor (built in)
 - nano is a decent one for (use inside Terminal)
 - You might prefer it, but I can't stand Vi
 - can install others via
 - sudo apt-get install

or

 sudo apt install

VirtualBox

- permits the use of Guest Operating Systems (OS) in your computer
 - for x86 Intel/AMD only: virtual x86 machine(s)
 - they're sandboxed
 - install an OS running inside a window, we'll install Ubuntu (Linux) as a Guest OS



VirtualBox

- Free application at <u>https://www.virtualbox.org</u>
- Install VirtualBox on your x86 laptop:

Welcome to VirtualBox.org!

VirtualBox is a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 3. See "About VirtualBox" for an introduction.

Presently, VirtualBox runs on Windows, Linux, macOS, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.



VirtualBox 7.0.10 platform packages

- ➡Windows hosts
- ➡macOS / Intel hosts
- Linux distributions
- ➡Solaris hosts
- ⇒Solaris 11 IPS hosts

The binaries are released under the terms of the GPL version 3.

Installing VirtualBox



Installing VirtualBox

	Security & Privacy	Q Search		😓 Install Oracle VM VirtualBox 🔒
A login password has bee Require password Show a message w	Security & Privacy eral FileVault Firewall Privacy en set for this user Change Password immediately Cafter sleep or screen s when the screen is locked Set Lock Mes	Q Search	An Introduction Destination Select Installation Type Installation Summary	Install Oracle VM VirtualBox error occurred during installation. The installation failed.
System Extension I A program tried to load signed by "Oracle Amen these extensions, open Preferences. Open Security Pr	Blocked new system extension(s) ica, Inc.". If you want to enable Security & Privacy System eferences OK			The Installer encountered an error that caused the installation to fail. Contact the software manufacturer for assistance.

Installing VirtualBox

 Re-run installer after giving Oracle Computer permission





https://www.virtualbox.org/manual/ch01.html#idm 272

Start VirtualBox, select New

Тос	Toc Name and operating system						
	Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine. Name: 2022 Ubuntu Machine Folder: /Users/sandiway/VirtualBox VMs	:u					
	Version: Ubuntu (64-bit)						
	Expert Mode Go Back Continue Cancel						

- Note:
 - choosing the name with Ubuntu in it auto-fills the Type/Version

Virtual Machine Parameters



Virtual Machine Parameters



Virtual Machine Parameters

				Oracle VM VirtualBox	Manager				
5 mg		$\langle \neg \rangle$	\Rightarrow		<i>.</i>				
New	Settings	Discard	Start _♥		Machine Tools	Global Tools		Oracle VM VirtualBox Manager	
				File location and size	wy victual bard dick file into the bay below or		Tools	New Settings Discard Start	
				click on the folder icon to select	t a different folder to create the file in.	150	Virtual Ubuntu Ə Aborted	General Name: 2022 Ubuntu Operating System: Ubuntu (64-bit)	Preview
				Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.		Mojave (logged in) Powered Off	System Base Memory: 1024 MB Boot Order: Floppy, Optical, Hard Disk Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization	2022 Ubuntu	
			-			10.00 GB		2022 Ubuntu Image: Optimized Difference	
				4.00 MB 2.00 TB			📃 Display		
						Video Memory: 17 MB Graphics Controller: VMSVGA Remote Desktop Server: Disabled Recording: Disabled			
								Storage	
							_	Controller: IDE	
					Go Back Create Cancel				

Ubuntu ISO Image

- Now we need a guest operating system: we'll use the latest version of Ubuntu (Linux) LTS (*Long Term Support*).
- https://ubuntu.com/download
 Download Ubuntu Desktop
 The open-source desktop operating system that powers millions of PCs and laptops around the world. Find out more about Ubuntu's features and how we support developers and organisations below.
 Ubuntu Desktop homepage visit the Ubuntu Desktop blog v
 Ubuntu 22.04.1 LTS
 Download the latest LTS version of Ubuntu, for desktop PCs and laptops. LTS stands for long-term support — which means five years, until April 2027, of free security and maintenance updates, guaranteed.



The .iso file is a BIG download! It's a special file that is a virtual cd ISO images:

- Macs can mount ISO images.
- Macs can't boot off a multitrack ISO image
- some versions of Windows can't mount an ISO image
- (without extra software).
- Install Microsoft's Virtual CD-ROM Control Panel.

VirtualBox		Add Create Figure Refresh				
		Name	Virtual Size			
		 Attached 				
		APFS EFI Boo	t Image.iso 1.00 MB			
		 Not Attached 				
$\mathbf{O} \mathbf{O} \mathbf{O}$	Oracle VM VirtualBox Manager	darwin.iso	3.25 MB			
Start your virtual machir	ie (double-click or Start)	Mojave.isc				
Tools		ubuntu-22.04	4.1-desktop-amd64.iso 3.56 GB			
	New Settings Discard Start	VBoxGuestAd	Iditions.iso 60.85 MB			
	Conoral Dr					
64 Mojave (logged in)						
Powered Off	Name: 2022 Ubuntu					
Cre	ating process for virtual machine "2022 Ubuntu" (GUI/Qt)	···· Leave Empty		Cancel Choose		
			Please select a virtual optical disk file or a physioptical drive containing a disk to start your new machine from.			
	Display		The disk should be suitable for star	ting a computer from		
	Video Memory: 17 MB Graphics Controller: VMSVGA Remote Desktop Server: Disabled Recording: Disabled	ORASO	and should contain the operating sy install on the virtual machine if you The disk will be ejected from the vir automatically next time you switch off, but you can also do this yoursel	stem you wish to want to do that now. tual drive the virtual machine If if needed using the		
	Storage		Devices menu.	J. J		
	Controller: IDE					
			Mojave.iso (Inaccessible)			
and the second s		iClo	Go Back	Start Cancel		

	Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from.
ORACLE	The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.
	ubuntu-22.04.1-desktop-amd64.iso (3.56 GB) 💲 🔀
	Go Back Start Cancel

\circ	2022 Ubuntu [Running]	
	Aug 15 05:13 🚔 📣 🐇	+
	Install	×
Welcome		
English Español Esperanto Euskara Français Gaeilge Galego Hrvatski Íslenska Italiano Kurdi Latviski Lietuviškai Magyar Nederlands No localization (UTF-8) Norsk bokmål	Try Ubuntu Install Ubuntu You can try Ubuntu without making any changes to your computer, directly from this CD. Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long. You may wish to read the <u>release notes</u> .	
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	2022 Ubuntu [Running]	2022 Ubuntu [Running]				
	Aug 15 05:14 📥 🍁 🇌	Aug 15 05:16 👗 🌒 🏚				
	Install	Install				
Keyboard layout		Updates and other software				
Choose your keyboard layout: Debright English (Australian) English (Cameroon) English (Chana) English (Nigeria) English (South Africa) English (UK) English (UK) Esperanto Estonian Faroese Filipino Finnish French Type here to test your keybo	English (US) English (US) - Cherokee English (US) - English (Colemak) English (US) - English (Colemak-DH ISO) English (US) - English (Colemak-DH) English (US) - English (Dvorak) English (US) - English (Dvorak, alt. intl.) English (US) - English (Dvorak, alt. intl.) English (US) - English (Dvorak, intl., with dead keys) English (US) - English (Dvorak, intl., with dead keys) English (US) - English (Dvorak, right-handed) English (US) - English (Norman) English (US) - English (Norman) English (US) - English (US, Symbolic) Foolish (US) - English (US, Symbolic)	 What apps would you like to install to start with? Normal installation Web browser, utilities, office software, games, and media players. Minimal installation Web browser and basic utilities. Other options Download updates while installing Ubuntu This saves time after installation. Install third-party software for graphics and Wi-Fi hardware and additional media formats This software is subject to license terms included with its documentation. Some is proprietary. 				
Detect Keyboard Layout	Ouit Back Continue	Ouit Back Continue 2				

2022 Ubuntu [Running]	2022 Ubuntu [Running]
Aug 15 05:17 🎝 🔥 🍋	Aug 15 05:18 📥 🐗 👘
Install	r Install
Installation type	Installation type
This computer currently has no detected operating systems. What would you like to do? Crase disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems. Advanced Features None selected	This computer currently has no detected operating systems. What would you like to do? Case disk and install Ubuntu Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems. Advanced features None selected
Something else You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.	Write the changes to disks? × If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually. The partition tables of the following devices are changed: SCSI3 (0,0,0) (sda) The following partitions are going to be formatted: partition #2 of SCSI3 (0,0,0) (sda) as ESP partition #3 of SCSI3 (0,0,0) (sda) as ext4 Go Back Continue
Quit Back Install Now	Back Install Now

2022 Ubuntu [Running]	2022 Ubuntu [Running]
Aug 15 05:19 📥 🐠 🏚	Aug 14 22:20 📥 🐠 👘
Install	Install
Where are you?	Who are you?
	Your name: Your computer's name: The name it uses when it talks to other computers. Pick a username: Choose a password: Confirm your password: Log in automatically Require my password to log in Use Active Directory You'll enter domain and other details in the next step.
Phoenix	Back
	2 🕞 💯 🛃 🖉 🔲 🖳 🚰 🚺 🔇 💽 Left #

Virtual Ubuntu [Running]	2022 Ubuntu [Running]
You have the Auto capture keyboard option turned on. This will cause the Virtual Machine to automatically capture the keyboard every 💿 📎	Aug 14 22:21 👗 🌒 🍋
Install The Virtual Machine reports that the guest OS supports mouse pointer integration. This means that you do not need to <i>capture</i> the 🔹 📎	Install
Who are you?	Welcome to Ubuntu
Your name: sandiway ✓ Your computer's name: sandiway-VirtualBox ✓ The name it uses when it talks to other computers. Pick a username: sandiway ✓ Choose a password: Confirm your password: Log in automatically ● Require my password to log in	Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for
Back Continue	
• • • • • •	> Copying files
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$\circ \circ \circ$	2022 Ubuntu [Running]				202	2 Ubuntu [Runni	ng]	
Activities O	Welcome to Ubuntu Aug 14 22:37	∴ ♦) ₩	Activi	ties 🗛 Soft	ware Updater	Aug 14 22:38		A 🕪 🍋
	Online Accounts	Skip				Online Accounts		Skip
	Connect Your Online Accounts Connect your accounts to easily access your online calendar, documents, photos and more.		•) De	Updated so released. De tails of updates	Software Updater ftware has been issued sin o you want to install it now	ce Ubuntu 22.04 was ?	
0	Ubuntu Single Sign-On		0		The updates have a	lready been downloaded. Remind Me Late	er Install Now	
	Nextcloud			_	•O• Nextclo	ud		-
?	Microsoft		?		Microso	ft		
	Accounts can be added and removed at any time from the Settings applicatior	٦.			Accounts can be a	idded and removed at any time fr	om the Settings application.	
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- Software packages
 - Terminal: sudo apt-get install <pkg-name>
 - **sudo** prefix: means execute the apt-get command with superuser privileges (typically needed for packages)
- How to find Terminal: use search via the app menu (9 squares icon)



- Add Terminal to favorites:
 - Control-Click Terminal icon: add/remove from Favorites





- Click top-right icon to bring up Power Off etc.
- In Settings, you can also change the screen resolution from the default 800 x 600

2022	Ubuntu [Running]	2022 Ubuntu [Running]
Activities Settings Settings Image: Settings Image: Settings Image: Settings	Ubuntu [Running]	Activities Settings Activities Settings Settings Displays Notifications Notifications Nultitasking Multitasking Multitasking Multitasking Multitasking Privacy Privacy Online Accounts Sharing J Sound Power
 ○ Online Accounts ≪° Sharing □ Sound 		Displays Mouse & Touchpad Show Applications
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Ubuntu: python3 is already installed!

$\bullet \bullet \bullet$	2022 Ubuntu [Running]	
Accivici		
~	Image: sandiway@sandiway-VirtualBox: ~ Q ≡ _ □ ×	
	<pre>sandiway@sandiway-VirtualBox:-\$ which python sandiway@sandiway-VirtualBox:-\$ apt install python E: Could not open lock file /var/lib/dpkg/lock-frontend - open (13: Permission denie d) E: Unable to acquire the dpkg frontend lock (/var/lib/dpkg/lock-frontend), are you r oot? sandiway@sandiway-VirtualBox:-\$ sudo apt install python [sudo] password for sandiway: Reading package lists Done Building dependency tree Done Reading state information Done Package python is not available, but is referred to by another package. This may mean that the package is missing, has been obsoleted, or is only available from another source However the following packages replace it: python2-minimal:i386 python2:i386 python2-minimal python2 dh-python 2to3 python-is-python3 E: Package lists Done Building dependency tree Done Reading package lists Done Building dependency tree Done Reading package lists Done Building dependency tree Done Building dependency tree</pre>	
23	python3 set to manually installed.	
	0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.	
	sandiway@sandiway-virtualBox:-\$ python3 Python 3 10 4 (main lun 29 2022 12:14:53) [GCC 11 2 0] on linux	
	Type "help", "copyright", "credits" or "license" for more information.	
	2	🔽 🚫 💽 Left 🕱

- which python returns nothing
- apt install python doesn't work: 1) not adminstrator, and
 2) there's no such package!
- sudo apt install python3 says it's already there
- python3

places you in the interpreter at the prompt >>>

- <Control>-D
- quits Python

Ubuntu: python3 is already installed!

```
sandiway@sandiway-VirtualBox: ~
                                                               Q \equiv -
                                                                              X
sandiway@sandiway-VirtualBox:~$ python3
Python 3.10.4 (main, Jun 29 2022, 12:14:53) [GCC 11.2.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> 4+5
>>> 9/8
1.125
>>> "hello" + "goodbye"
'hellogoodbye'
>>> import math
>>> math.pi
3.141592653589793
>>>
sandiway@sandiway-VirtualBox:~$ 🗌
```

Keep Ubuntu up to date

https://ubuntu.com/tutorials/install-ubuntu-desktop#1-overview

	ubuntu.com/tutorials/install-ubuntu-desktop#11-dont-for: 🔒 👄 🛛 🕕 🕕 +	Activities	A Ubuntu Software					
			A obtailed boilenait	e	Aug 14 23:20			A 🐠 値
1 Overview	11. Don't forget to Update!		C	Ø Explore	⊘ Installed	G Updates		- 0 ×
2 Download an Ubuntu Image	It's always good practice to ensure your system is up to date, especially after a fresh install.		Арр	lication Updates			Update All	
3 Create a Bootable USB stick 4 Boot from USB flash drive	The easiest way to do this is via the Software Updater app. Search for Software Updater via the app menu (the icon with 9 squares in the bottom corner of your window) and it will check for updates and apply them.	\bigcirc		firefox 103.0.1			Update 171.2 MB	
5 Installation Setup	Software Updater _ 8			core20			Update	
6 Drive Management7 (Optional) Enable Encryption	The software on this computer is up-to-date.	• <u>Â</u>		20220729			65.0 MB	
8 Choose your Location	Settings OK	?						
9 Create Your Login Details	You can also update Ubuntu using the terminal.	>_						
Don't forget to Update!	Press CTRL+ALT+T to bring up a Terminal window (or click the terminal icon in the sidebar).	_						
12 You've installed Ubuntu!	Type in:							
	sudo apt update	•••				0	o ha 🖛 🗢 🗂 🗖	🚛 🗐 🕐 💶 l aft 99

Keep Ubuntu up to date

• sudo apt update

• sudo apt upgrade



https://discourse.ubuntu.com/t/how-to-guides/27142



💿 😑 💿 san		
[(base) ~\$ multipass version multipass 1.12.2+mac multipassd 1.12.2+mac [(base) = # multipase lowpeb		diwaybash _ 80×30
Retrieving image: 42%	(base) ~\$ multipass version multipass 1.12.2+mac multipassd 1.12.2+mac (base) ~\$ multipass launch Launched: prudent-elver (base) ~\$	Idiway — -basii — 60×30

• Terminal:

\$ multipass launch

Launched: prudent-elver

\$ multipass info prudent-elver

Name:	prudent-elver
State:	Running
IPv4:	192.168.64.2
Release:	Ubuntu 22.04.3 LTS
Image hash: LTS)	9c59c6097711 (Ubuntu 22.04
CPU(s):	1
Load:	0.00 0.02 0.00
Disk usage:	1.4GiB out of 4.8GiB
Memory usage:	153.3MiB out of 962.4MiB
Mounts:	

\$ multipass shell prudent-elver

Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.0-79-generic aarch64)

To run a command as administrator (user "root"), use "sudo <command>". See "man sudo_root" for details.

ubuntu@prudent-elver:~\$ uname -a

Linux prudent-elver 5.15.0-79-generic #86-Ubuntu SMP Mon Jul 10 16:11:29 UTC 2023 aarch64 aarch64 aarch64 GNU/Linux

ubuntu@prudent-elver:~\$ pwd

/home/ubuntu

ubuntu@prudent-elver:~\$ which nano

/usr/bin/nano

ubuntu@prudent-elver:~\$



ubuntu@prudent-elver:~\$ ls -a
. .. .bash_logout .bashrc .cache .profile .ssh
ubuntu@prudent-elver:~\$ nano .bashrc
ubuntu@prudent-elver:~\$

