Introduction To



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Slides credit: Barry Grant (bjgrant@ucsd.edu)

Introduction to Biocomputing

Monday	Introduction to UNIX
Tuesday	Introduction to Programming with Python
Wednesday	Data Analysis and Graphics with R
Thursday	Version Control & Cluster Computing
Friday	Group Projects

Todays Menu

	Time	Topics
	9:00-10:15 AM	Setup and
	10:15-10:30 AM	Coffee Bre
	10:30-12:00 AM	Beginnin
	12:00-1:00 PM	Lunch
	1:00-2:15 PM	Working
	2:15-2:30 PM	Coffee Bre
/	2:30-4:00 PM	How to G

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Setup and Motivation Coffee Break Beginning Unix Lunch Working with Unix Coffee Break

How to Get Working

Lets get started.

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PC MobaXterm

Do it Louis Solar

Mac Terminal

Setup Checklist

- Mac: Terminal or PC: MoblXterm
- Mac: Git install or PC: MoblXterm git & CygUtils plugins
- Python Anaconda install
- R and RStudio install

In your terminal typewhich gitgit --version

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- Cluster access form submitted and Duo mobile app obtained
- Example data downloaded: <u>http://tinyurl.com/day1-unix</u>

MotivationWhy do we use Unix?

Modularity	Core programs are modular and work well with others
Programmability	Best software development environment
Infrastructure	Access to existing tools and cutting- edge methods
Reliability	Unparalleled uptime and stability
Unix Philosophy	Encourages open standards

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Modularity

The Unix shell was designed to allow users to easily build complex workflows by interfacing smaller **modular programs** together.



An alternative approach is to write a **single complex program** that takes raw data as input, and after hours of data processing, outputs publication figures and a final table of results.

All-in-one custom 'Monster' program





Advantages/Disadvantages

The 'monster approach' is customized to a particular project but results in massive, fragile and difficult to modify (therefore inflexible, untransferable, and error prone) code.

With **modular workflows**, it's easier to:

- Spot errors and figure out where they're occurring by inspecting intermediate results.
- Experiment with alternative methods by swapping out components.
- Tackle novel problems by remixing existing modular tools.

Unix 'Philosophy'

"Write programs that do one thingand do it well. Write programs to work together and that encourage open standards. Write programs to handle text streams, because that is a universal interface."



— Doug Mcllory

Unix family tree [1969-2010]



Source: https://commons.wikimedia.org/wiki/File:Unix history-simple.svg

Basics	File Control	Viewing & Editing Files	Misc. useful	Power commands	Process related
IS	mv	less	chmod	grep	top
cd	ср	head	echo	find	ps
pwd	mkdir	tail	WC	sed	kill
man	rm	nano	curl	uniq	Crl-c
ssh	pipe)	touch	source	git	Crl-z
	> (write to file)		cat	R	bg
	< (read from file)		tmux	python	fg

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Test: Connecting to remote machines (with ssh)

- Most high-performance computing (HPC) resources can only be accessed by ssh (Secure SHell)
 - > ssh [user@host.address]
 - > ssh jianghui@scs.dsc.umich.edu

Test: Your software versions

- We will use the which command to locate your versions of the major software we will be using this week.
 - > which R
 - > R --version
 - Now do the same for **python** and **git**, *i.e.*
 - > which git
 - > git --version
- If you get an 'error' or 'not found' msg let us know!