



UN5390: Scientific Computing I

Fall 2016 Training Camp #01

**DO NOT SHARE AND/OR DISTRIBUTE THIS MATERIAL WITHOUT
INSTRUCTOR'S EXPLICIT CONSENT**

Guidelines

1. Follow the numerical sequence of training camps, and the sequence of problems/tasks therein. Each problem usually tends to build upon results (from a previous problem). Each training camp should take 2-3 hours to complete.

There is no due date by which these need to be completed. However, doing so before the beginning of Fall instruction will help you bootstrap (i.e., lacing up the shoes before beginning the journey), and in turn, make a better use of your time and opportunities.

2. Replace `john` with your ISO username, and `John Sanderson` with your real/full name. ISO credentials refer to your Michigan Tech ISO username and password (i.e., the ones you use to log into Banweb or Canvas or Michigan Tech Gmail).

3. Keeping detailed handwritten notes is a very good habit to develop. It can/will save time and frustration when things go wrong. Saving meaningfully named electronic screenshots of workflows (commands and their output) is another very useful habit.

Notes should include date and time, location (building, floor and room #), and host-name of the workstation being used. External help, from instructor or anyone else, will be very limited in their absence.

4. Set yourself up with a reliable data backup scheme, and use it.
5. Acknowledging that you need help and asking for it when necessary is not a sign of weakness. Be sure to appropriately cite the source of any such help.

Problem 1

[[Lab access](#)] Do you have access to a lab with an IT-managed Linux workstation? Can you log in using your Michigan Tech ISO credentials?

Problem 2

[[Change default shell](#)] Once successfully logged in, open the URL below in a web browser.

`https://mylogin.mtu.edu/`

Log into the portal using your Michigan Tech ISO credentials. If this is your first time using this portal, you will be required to accept the terms of use. Click on **My Profile**. Select `/bin/bash` from the drop-down list for **NIS Shell**. Click on **Submit**. It can take up to twenty minutes for the changes to take effect.

Problem 3

[[System variables](#)] Locate and open the Terminal application. Note down the output of the following commands.

```
echo $HOSTNAME
echo $SHELL
echo $USER
echo $HOME
echo $PWD
echo $PS1
```

Problem 4

[[Remote log in](#)] Open a Terminal, and type the following command.

```
ssh -Y colossus.it.mtu.edu
```

If this is the first time you are connecting to **colossus**, you will need to accept the RSA key fingerprint by typing **yes**. Enter your Michigan Tech ISO password when prompted. Was the login attempt successful? Did the command prompt change indicating you are now in **colossus**?

Type **exit** to log out of **colossus** and return to the local workstation (the command prompt should have changed to indicate success).

Problem 5

`[HOME/.ssh]` Check if the `$HOME/.ssh` folder already exists.

```
file $HOME/.ssh
```

If yes, then type the following command to check its contents.

```
ls -latrh $HOME/.ssh
```

Are there files named `id_rsa` and `id_rsa.pub`? If yes, skip part #01 of Problem 6.

How would you determine if a listed entity is a file or a folder or a symbolic link? Attempt to understand various options used in conjunction with `file` and `ls` commands by running the `man file` and `man ls`. Note down the meaning of each option. You can scroll down by using the down arrow key or the space bar. When done, you can type `q` to exit the manual.

Problem 6

`[SSH authentication keys]` Part #01: By design, your campus home directory is shared/-mounted across all IT-managed workstations (unless explicitly indicated otherwise). As such, setting up SSH keys once for your account on any one such workstation using the following command will suffice.

```
ssh-keygen -t rsa -b 1024 -C "john@mtu.edu"
```

Accept the default location for `$HOME/.ssh/id_rsa`, set a passphrase (must be different from your Michigan Tech ISO password). These keys constitute your *campus identity*. Do not ever share or distribute `$HOME/.ssh/id_rsa`.

Part #02: Run the following commands to set up authentication using the SSH public key.

```
ssh-copy-id colossus.it.mtu.edu
```

Enter your ISO password when prompted. Attempt to SSH into `colossus`.

```
ssh -Y colossus.it.mtu.edu
```

Were you prompted for the passphrase you chose while setting up the SSH keys? Were you prompted for the ISO password? Use `man ssh` to learn more about various options.

Optional: How would you go about setting up SSH authentication with a non IT-managed workstation or a workstation that does not share your campus home directory?

Problem 7

[Basic commands] Try these commands in a Terminal, and note down the output. Make it a habit to use the `man` command to learn more instead of looking things up in Google. Meaning of an option for a command could be different based on the flavor of Linux OS.

```
hostname
whoami
pwd
date
date +"%Y%m%d_%H%M%S"
cal
df -h
free -g
ps
top -u $USER -b -n 1
dingdong
```

Problem 8

[Creating files, folders and symbolic links] Run `ls -latrh` after every command given below.

```
mkdir $HOME/UN5390_Sandbox
cd $HOME/UN5390_Sandbox
mkdir folder_01 folder_02
mkdir folder_{03,04,05}
mkdir folder_06/sub_folder_01
mkdir -p folder_06/sub_folder_01
touch file_01.txt file_02.txt file_{03,04,05}.txt
ln -s folder_01 folder
ln -s folder_02 folder
ln -sf folder_02 folder
ln -sf file_01.txt file.txt
file folder_01
file file_02
file folder
file file.txt
```

Symbolic link can be very useful and time saving entities when developing computational workflows (or using the ones developed by others). For e.g., a file or folder name is hard-coded into the workflow; multiple files/folders need to be processed using that workflow.

Problem 9

[\[Navigating the file system\]](#) The path to an entity (i.e., a file or a folder or a symbolic link) is said to be **absolute** if it begins with a leading / or ~ or \$HOME. The path is said to be **relative** otherwise – i.e., it begins with no leading / (meaning, same as the current folder), ./ (meaning, under the current folder) or ../ (meaning, one level above the current folder).

Both (**absolute** and **relative**) have advantages and disadvantages. Absolute path names can be useful when referencing system entities – they usually don't change for a given flavor of Linux OS. Relative path names can be useful when referencing user-developed workflows – such an approach makes the workflow easily portable.

Run `pwd` followed by `ls -latrh` after every command given below. Doing so, as a habit, will ensure that you are indeed in the appropriate folder and that folder contains necessary entities before attempting subsequent commands.

```
cd /
cd usr/local
cd bin
cd ../src
cd -
cd
cd /usr/local/share
cd ~/
cd /root/
cd $HOME
cd UN5390_Sandbox/folder_06/sub_folder_01
cd ../../folder_01
cd -
cd -
cd ~/UN5390_Sandbox
ls -R
tree
```

What do the `cd` (without any option or argument), `cd -` and `tree` commands do?

Problem 10

[\[Command history\]](#) If you missed noting down some commands, you can use the `history` command. Does the history match your notes? This only shows the commands and not their output, and the number of commands it can recall/retrieve can also be very limited.