1 Build an machine on HPC

$ Login to NREC HPC facility

```
ssh -i ~/.ssh/id_rsa ubuntu@158.37.63.141
```

1.1 Install and associated packages

$ Let know from which list to download the latest (using)

```
sudo vim /etc/apt/sources.list
```

> Add repo

```
deb https://cloud.r-project.org/bin/linux/ubuntu focal-cran40/
deb http://ftp.uninett.no/ubuntu/ bionic-backports main restricted
universe
```

Attention

The second line starts with "http", *not* "https".

$ Let know this key is authentic so don't freak out about security

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys
E298A3A825C0D65DFD57CBB651716619E084DAB9
```

$ Install

```
sudo apt-get update
sudo apt-get install r-base
```

$ Install some libraries in order to enable to build its own packages

```
sudo apt-get install libgsl-dev libgit2-dev libssl-dev
libcurl4-openssl-dev libxml2-dev libudunits2-dev libfontconfig1-dev
libcairo2-dev libgeos-dev libgdal-dev libgmp_dev libharfbuzz-dev
libfribidi-dev
```

$ Get into

```
R
```

R> Install the first package

```
install.packages("data.table", dependencies = TRUE)
```

's personal library

Answer yes to both questions so that a personal library can be created and installation process can begin.

$ Install

```
sudo apt install git
git config --global user.name "Tony Tan"
git config --global user.email "tctan@uio.no"
```

$ Manually install an R package colorout because it is not in CRAN

```
git clone https://github.com/jalvesaq/colorout.git
R CMD INSTALL colorout
```

$ Tell R to automatically load colorout each time it starts

```
cd
touch .Rprofile
```

$ Open .Rprofile using Vim

```
vim .Rprofile
```

> Autoload R packages

```
old <- getOption("defaultPackages")
options(defaultPackages = c(old, "colorout"))
```

$ Install Java Developer Kit

```
sudo apt-get install default-jre default-jdk
sudo R CMD javareconf
```

$ Go back to R and continue installing packages

```
R
```

You may be interested in the following R packages

- BiocManager: enable package installation from Bioconductor
- remotes: enable package installation from github
- Orcs: manage working directories for multiple operating systems
- MplusAutomation: link R with Mplus
- intsvy: for analysing ILSA data
- mice, micemd, miceadds, jomo: for multiple imputation
- ggplot2, tidyr etc.: commonly used R packages
- rhdf5: MplusAutomation needs this to function. N.B. This package must be installed from Bioconductor

R> Continue package installation

```
install.packages(c("BiocManager", "remotes", "Orcs", "MplusAutomation",
"intsvy", "mice", "micemd", "miceadds", "jomo", "ggplot2", "tidyr",
"dplyr", "tibble", "stringr", "shiny", "shinythemes", "modelr", "mlr";
"readr"), dependencies = TRUE)
BiocManager::install("rhdf5")
```

colouration

Now you should see output in different colours.

R> Update all packages, then quit

```
update.packages(ask = FALSE, checkBuilt = TRUE)
q()
n
```

1.2 Install necessary packages

1.2.1 Install pip

$ Check which version of HPC already has

```
python3 --version
```

version

You should see a one-line output "Python 3.8.5"

$ Install pip

```
sudo apt install python3-pip
```

1.2.2 Install radian

$ Install radian

```
pip3 install -U radian
```

Add radian to path

We need to tell where radian lives so that it can be triggered automatically each time we type "r" shorcut. We need to modify two files: .profile and .bashrc.

$ Get into .profile

```
vim .profile
```

> Add radian path to .profile

```
# Use radian to better manage R interface
export PATH=$PATH:/home/ubuntu/.local/bin/
```

$ Get into .bashrc

```
vim .bashrc
```

> Create some shortcuts

```
# Use r key as shortcut to radian
alias r="radian"

# Update Python3
alias pyupdate="sudo pip3 list --outdated --format=freeze | grep -v
'^\-e' | cut -d = -f 1 | xargs -n1 pip3 install -U"

# Create shortcut to UiO M Drive
alias m="sshfs tctan@login.uio.no:  /uio -o reconnect,modules=iconv,from_-
code=ISO-8859-1,ConnectTimeout=10"
```

$ Create a new file .bash_profile

```
touch .bash_profile
```

> Bring .profile and .bashrc together

```
. ~/.profile
. ~/.bashrc
```

$ Refresh these files

```
source .bash_profile
source .profile
source .bashrc
```

1.2.3 Update

$ Install some libraries so that will not complain

```
sudo apt install python3-testresources libcups2-dev
libgirepository1.0-dev libparted-dev
```

$ Update

```
pyupdate
```

1.3 Link UiO M Drive to HPC

$ Create a receiving folder named "uio" in the home directory

```
mkdir uio
```

$ Install sshfs

```
sudo apt install sshfs
```

$ Login to M Drive using shortcut "m"

```
m
```

ECDSA key fingerprint

Type "yes" to the warning:
The authenticity of host 'login.uio.no (129.240.12.7)' can't be established.
ECDSA key fingerprint is SHA256:efy2GuDcvOC2HEe0PwkuCaYVL8tKC77Bi8uHM+m4K6s.
Are you sure you want to continue connecting (yes/no/[fingerprint])?

If you receive "read: Connection reset by peer", type shortcut "m" again to re-connect—it only happens the very first time M Drive is established.

1.4 Install *Mplus*

Switch to local

Switch back to local 🐧 home directory for the following steps. (If you are in HPC environment, type "exit" to switch back to local machine.)

$ Get into .bashrc

```
vim .bashrc
```

> Link local 🐧 to HPC

```
# Logon to HPC
alias hpc="ssh -i ~/.ssh/id_rsa ubuntu@158.37.63.141"
```

$ Renew .bashrc and push some local files to HPC

```
source .bashrc
```

Switch to HPC

Now switch back to HPC terminal. (In local environment, type "hpc" to switch to HPC.)

$ Copy *Mplus* installer from M Drive to home directory

```
m
(Type your UiO M Drive password)
cp /home/tony/uio/pc/Dokumenter/ComboLinux64.bin /home/tony/
```

$ Set up *Mplus* installation folder

```
cd /opt
sudo mkdir mplus
sudo chmod 777 mplus
cd mplus
sudo mkdir 8.5
sudo chmod 777 8.5
cd
```

$ Install *Mplus*

```
chmod a+x ComboLinux64.bin
./ComboLinux64.bin
```

Accept all default settings

Follow instructions on the screen. Press ENTER when asked.

1.5 Update and reboot HPC

$ Update and reboot

```
sudo apt-get update
sudo apt-get upgrade
sudo reboot
```

Let HPC reboot

Give a couple of minutes for HPC to reboot. Then your HPC would be ready.

1.6 Interact with HPC from local 🐧 computer

$ Logon to HPC via shortcut

```
hpc
```

$ Monitor HPC performance

```
hpc
htop
```