

Matlab on the Engaging HPC Cluster

Steven Finch, sfinch@mit.edu

Research Computing Specialist, Sloan Technology Services

This tutorial will grow with time. My purpose is to give simple examples, using only basic statistics and rudimentary SLURM (job scheduling) commands. As questions arise, I will update and add materials as needed.

Let us start with batch job submissions. SSH log into “eosloan1.mit.edu”. Upload (using SecureFX, for example) the following data file

[furnace.txt](#)

to your Engaging directory and (optionally) read

[furnace_desc.txt](#)

for background. To the same directory, upload both the Matlab program

[furnace_Matlab.m](#)

and the shell script

[furnace_Matlab.sh](#)

containing a number of commands starting with #SBATCH. We will explain these commands shortly; for now, our focus is on getting various statistical calculations to work. Type the command

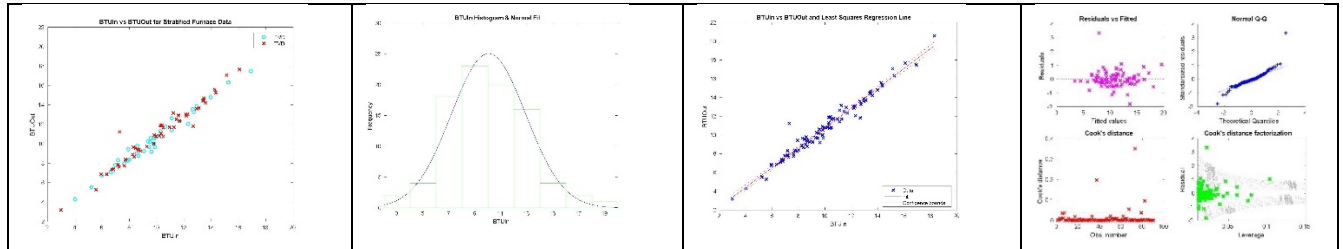
```
sbatch furnace_Matlab.sh
```

in your remote terminal (SecureCRT or PuTTY, for example) and hit <Return>. You have now submitted a job to Engaging! Because this job is very short, six new files should readily appear in your directory:

furnace_Matlab_err.txt, furnace_Matlab_out.txt,

FM1.pdf, FM2.pdf, FM3.pdf, FM4.pdf

The first of these should be empty since no errors ought to have occurred in the program execution. Download the five remaining files to your local computer. The 'TXT' output file contain all numerical tables and other texts from the job; the PDF output files correspond to four plots (the latter consisting of four subplots). If you wish to explore other statistical aspects of the furnace dataset, simply edit my Matlab code, overwrite the original program and resubmit the job.



Let us turn now to understanding the shell script:

```
#!/bin/bash

#SBATCH --job-name=furnace_Matlab
#SBATCH --output=furnace_Matlab_out.txt
#SBATCH --error=furnace_Matlab_err.txt
#SBATCH -p sched_any_quicktest
#SBATCH --ntasks=1
#SBATCH --cpus-per-task=1
#SBATCH --mem-per-cpu=2000

module load mit/matlab/2016a

srun matlab < furnace_Matlab.m
```

Note that, while the standard output and standard error filenames are prescribed in #SBATCH lines, the graphical PDF filenames are given within the Matlab code itself (four times in various locations). The line

```
#SBATCH -p sched_any_quicktest
```

specifies the SLURM partition (or queue) under which the script will be run. The “sched_any_quicktest” partition is ideal for small, classroom examples like ours. It imposes a maximum runtime of 15 minutes on any job. Another partition, named

“sched_mit_sloan”, imposes a maximum runtime of 2 weeks. Since many pre-existing jobs may already be running on this partition, you might be forced to wait a long time for your task to begin.

The lines

```
#SBATCH --ntasks=1
#SBATCH --cpus-per-task=1
#SBATCH --mem-per-cpu=2000
```

require more explanation. For now, it suffices to say that we’ve requested 1 core on the cluster using 2 GB of RAM per core. Memory-intensive jobs will necessitate more cores. To be continued...

We finally discuss briefly how to open an interactive Matlab session on Engaging. SecureCRT no longer suffices; you will need to use an X forwarding client such as MobaXterm (for Windows) or XQuartz (for Mac). With this in place, the SLURM commands

```
module load mit/matlab/2016a
srun --x11 --cpus-per-task=2 --mem=8000 --pty -p sched_mit_sloan matlab
```

open a new GUI window (resembling the familiar Matlab interface) into which you can type commands and perform analysis. Here we’ve requested 2 cores on the cluster using a total of 8 GB of RAM (hence 4 GB per core). This contrasts with our earlier batch Matlab job, which did not use multiple cores.

Please feel free to write to me (sfinch@mit.edu) with questions and suggestions on how to improve this tutorial.

Addendum: Replacing DOS line breaks

If you receive a "Batch script contains DOS line breaks instead of expected UNIX line breaks" error message, you need to replace all DOS carriage returns by UNIX carriage returns. This is easily done on the UNIX command line within Engaging:

```
dos2unix furnace_Matlab.sh
```

and eliminates the need to do further editing using VI or other UNIX text editor.