BYU FLOW Lab New Undergrad Researcher Introductory Skills Development Tasks

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1   Introduction

The purpose of this document is to outline tasks every new undergrad working in the BYU FLOW Lab should accomplish during their first semester. Whether an undergrad spends a semester taking 497R credit, or years as a research assistant, these introductory tasks will help him/her find success in his/her research endeavors. The following sections introduce basic skills and associated tasks that should be gained/accomplished by new undergraduates (and new graduates if these skills haven't yet been attained.) For more information, refer to Dr. Ning's thoughts on the FLOW Lab website http://flow.byu.edu/resources/. Undergraduates should work with their graduate student mentors to create a timeline for task completion as well as get help with specific questions regarding the tasks.

2   Git

"Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency." (https://git-scm.com/)

2.1   Tasks (Shouldn't take more than 30 minutes to get everything initially set up with your mentor's help)

- Create a Github account.

- Explore the git learning resources page: https://try.github.io/ (just get familiar with where things are for future reference)

- Complete a tutorial like this one: https://www.codecademy.com/learn/learn-git

- Have your graduate student mentor give you access to the *undergrad-onboarding* repository from the FLOW Lab's git repository.

- Clone the *undergrad-onboarding* repository to your local computer.

- Add a branch to the repository named first-last, where first is your first name, and last is your last name.

- In the new branch, create a directory that describes your project (you can change the name later), this is where you will keep your first semester's work including your code and semester report. (Do a good job, we may use it as an example for other new students.)

- Regularly add, commit, and push your work, especially when asking your graduate student mentor for help.

- At the end of the semester, merge your branch into the master branch.

3   Coding

The majority of the work done in the FLOW Lab includes some element of coding, whether that be in Python, Julia, Matlab, or some other language (C/C++, Fortran, Bash, AWK, Javascript, etc. all are being, or have been, used in the lab.) Learning good coding practices now will help you work better on group projects in the future.

3.1 Tasks

- Read this page: http://flow.byu.edu/resources/research/

- Find the best practices/style guide for the language you'll be using. Review it periodically and make sure you're matching the standard style.

- Comment clearly and regularly. It's better to have too much than too little, you can always go back and make things more consise, but you don't want to forget what you did.

- Test as you go. Write a simple test now to make sure things work so you don't have to search for as many bugs later.

- Take note of when your graduate student mentor is confused when reading your code. This is a good indicator that you either don't have enough comments, aren't matching the standard style, or need to improve the organization of your code.

4 LaTeX

LaTeXis a powerful typesetting language that is more or less standard for paper writing in the research community. It makes many formatting things, including referencing and mathematics very easy.

4.1 Tasks (Shouldn't take more than 30 minutes to get everything initially set up with your mentor's help

- Download the LaTeX language. Work with your graduate student mentor to make this easier.

- If you want, download some sort of LaTeX IDE software. Note that you don't need a dedicated LaTeX editor to use LaTeX.

- Obtain some sort of reference manager. Again, work with your graduate student mentor on this.

- With your new found access to the *undergrad-onboarding* repository, navigate to the undergrad-onboarding/undergradResources/semsterReportTemplate/ directory and find the LaTeX template named template.tex. This file contains a template for your report as well as a great introduction to LaTeX. You should compile the pdf from the .tex file and read the entire thing. That should give you more than enough information to start using LaTeX.

- Practice as much as you want. For some ideas of how you might do this, use LaTeX instead of Word or Libre Writer, write class reports/memos in LaTeX, or write talks in LaTeX. Write up your math homework in LaTeX, and you'll be fluent in the math symbology by the end of the semester. This link is a useful resource for basic questions: https://www.sharelatex.com/learn/Main_Page, as is this one for math and symbols: https://artofproblemsolving.com/wiki/index.php?title=LaTeX:Symbols. Most of the time, a simple google search will get you the answer to basic and even advanced questions. Your graduate student mentor is also a good resource for more difficult questions.

- The minimum practice task is to write your semester report using LaTeX.

5 Writing

Writing is an important part of research. It is benificial to begin writing and receiving feedback early. Note that an important part of writing is reading.

5.1 Tasks

- Read this page: http://flow.byu.edu/resources/writing/. Do what it says.

- Also review the writing helps on the BYU ME website: https://me.byu.edu/students/resources *BYU ME Writing Materials* section.

- Read at least one peer reviewed journal article related to your project each week. For each paper, write a brief review/notes, taking note of the research question, major methodolgy, and main results/conclusions. Include a literature review based on the papers you read in your semester report introduction. Ask your graduate student mentor about good places to find good articles (don't limit yourself to google scholar).