Fundamental Research Skills and Tools

MBSC-GA 4473

Course Description for Bulletin:

This course will provide students with a set of skills to support their graduate work and future research careers. The course will include the following topics: literature searching, research data management, data visualization, team science, citation management, Git/GitHub, publication metrics, and publication models. Research data management topics will include rigor and reproducibility, data documentation, data preservation, and sharing of research data. Best practices in data visualization will be covered, as well as an introduction to GraphPad Prism. The team science class will include team building, collaboration, and communication skills. Information discovery and management skills taught will include database searching and citation management. The course will also explain new biosketch requirements, the use of publication metrics, and open access and other publishing models. Students will learn to manage basic coding projects and to code collaboratively using Git and GitHub, and will engage in hands-on activities in data management, data visualization, searching, and citation management to provide them with concrete skills for their research.

Aims:

- Students will be able to:
  - comply with NIH rigor and reproducibility requirements
  - identify appropriate venues for sharing research data.
  - navigate current funding agency and publisher requirements for sharing data
  - develop documented file and variable naming conventions.
  - identify and create visualizations of a data-set to explore and analyze the data.
  - develop effective search strategies and apply them to PubMed and other relevant databases.
  - develop strategies for maintaining currency with the literature.
  - build an EndNote Library and use EndNote’s Word plugin to generate in-text citations and bibliography.
  - articulate terms to negotiate when forming a collaboration, and communication skills to facilitate collaboration.
  - manage and collaborate on code using Git and GitHub
  - create an NIH Biosketch that best highlights the full range of their scientific contributions.
  - use PubsHub to identify high impact journals for submission/publication.
Detailed course topics and readings/assignments

Week 1: Expert Searching 1: PubMed & Other Databases

- Developing a comprehensive search strategy

In class exercise:
- Searching PubMed, Embase, Google Scholar, and Web of Science

Week 1 Readings:


Google Scholar Search Tips

Pre-class assignment:
Bring a topic of interest to class that you can use as the basis of your search

Week 2: Publications: Metrics, Models, and More

- Publication metrics
- Publishing models
- NIH Biosketch/SciENcv
- ORCID
- Finding where to publish using PubsHub

In-class exercise:
- Create NIH biosketch
- Identify an appropriate journal for publication

Week 2 Readings:


Pre-class assignment:
Set up JournalTOCs account

Week 3: Expert searching 2: Endnote & Advanced Searching tools
- Build Endnote Library
- Sync Library with Endnote web
- Input citations from Endnote Library into Microsoft Word
- Change citation formats in Endnote
- Save searches, create filters, and create collections in myNCBI

In-class exercise:
- Export references to Endnote
- Syncing Endnote Library with Endnote Web
- Insert in-text citations into Microsoft Word

Important: Before class:
Must install Endnote on computer and set up Endnote Web login.
- Endnote Install Instructions: http://hslguides.med.nyu.edu/citationmanagement

Week 2 Readings:
NYU Health Sciences Library: Endnote Basics

Week 4: Git and GitHub
- Reviewing command line basics
- Understanding and using version control
- Using Git to manage basic projects
- Using GitHub to collaborate remotely
- Understanding and using specific functions including branching, forking, merging, pushing, and pulling

Important: Before class:
- Download and Install GitBash: https://git-scm.com/downloads
• Create a GitHub account: [https://github.com/](https://github.com/)

**Week 4 Readings:**
If you haven’t used the command line interface before, please familiarize yourself with it using the tutorial listed below.

• Django Girls. Introduction to the command-line interface.  

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**Week 5: Team Science**

- Sample collaboration agreements
- Legal issues (MTA, etc)
- Communication, team structure, authorship, roles
- Resources for identifying research collaborators

**Week 5 Readings:**


Collaboration form

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**Week 6: Approaches to Research Data Management**

- Collecting research data
- Organizing research data
- Preserving research data
- Storing research data
- Sharing research data
- Rigor and reproducibility

**Week 5 Readings:**


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**Week 7: Hands on Research Data Management & Open Data**

- In class exercise on data organization
- FAIR principles
- Big Data to Knowledge Initiative
- Open Data and Open Science in practice

**Week 7 Readings:**


**Why data management matters**


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**Week 8: Concepts in data visualization and GraphPad Prism**

- Why visualize?
- Best Practices/Essential Concepts (i.e. perception with regards to pre-attentive attributes of color and shapes)
- Ways to Visualize/Common Visualization Types and When/Why to use them (i.e. heat maps, bar charts, scatter plots)
- Creating visualizations with GraphPad Prism (conceptualizing, choosing tools, pen and paper sketching etc)

**In-Class Exercise:**

- Group charting of hypothetical dataset to uncover trends in data.
- Hands on GraphPad Prism introduction
Important: Before class:
Go to the MCIT software portal and install GraphPad Prism

Week 8 Readings:


Evaluation
Pass/Fail

Pass requires attendance at a minimum of 7 classes (or equivalent) and completion of all in-class and at-home activities.