BME 2200: Biostatistics and Research Methods

Lecture 1: Introduction, On-Line Literature Search

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Content, Schedule

1. Scientific literature:
   • Literature search
   • Structure biomedical papers, engineering papers, technical reports

2. Presentation skills:
   • Report – Written report on literature search (individual)
   • Talk – Oral presentation on biomedical implant (individual and group)

3. Graphical representation of data:
   • Introduction to MATLAB
   • Plot formats: line, scatter, polar, surface, contour, bar-graph, error bars. etc.
   • Labeling: title, label, grid, legend, etc.
   • Statistics: histogram, percentile, mean, variance, standard error, box plot

4. Biostatistics:
   • Basics of probability
   • Hypothesis testing, correlation, causality, significance
   • t-Test, ANOVA
   • Linear regression, cross-validation
   • Error analysis
   • Test power, sensitivity, specificity, ROC analysis
Stuff you need

Prerequisite:
BME 101, Math 203.

Literature
- Glantz, Primer on Biostatistics, 5th edition McGraw Hill (required)

Software
- MATLAB
- PowerPoint
- Web Browser

All software available in B level computer lab Mo-Fr 9AM -5PM
Grading

20% final exam, 20% presentation, 60% assignments
  less than 60%: F
  60% or more: D
  70% or more: C
  80% or more: B
  90% or more: A
  100% or more: A+

Exams and quizzes:
  • Quizzes will test reading and programming homework.
  • Final exam will test only biostatistics

Attendance:
  • 100% attendance is expected
  • No show, no help.
Assignments

1. MATLAB programming
   • Due one week from assignment.
   • Turn in by email prior to class!
   • May have pop quizzes to test “undisclosed collaborations”.

2. Literature search
   • Turn in as a report.

3. Reading
   • Understand the subject and cover gaps
   • May have pop quizzes on reading assignments.

4. Problems/Exercises
   • Turn in at the beginning of class.
   • Due on the next class.

All written assignments must include
   Name, date, course number, assignment number.
   Title whenever applicable.

Form matters!
Presentations

**Oral presentation** (group – in the middle of the semester)
- Will be developed as a group (3 students)
- Presented in sections by individual group member selected at random.
- Topics are implant devices:
  - artificial retina,
  - dental implant,
  - deep brain stimulation,
  - total hip replacement,
  - breast implant,
  - pacemaker,
  - cochlear implant,
  - cardiovascular stent.

**Written report** (individually – due date will be announced)
- Will be a summary of current state-of-the art research following literature search on any biomedical research topic of your choice.
Literature Search

Where to look?
- Pubmed (biomedical)
- scholar.google.com (all)
- ISI Web of knowledge (all science, citation search)
- IEEExplore (engineering)
- USPTO (US patents)
- CUNY+ (Books)
- Citeseer (computer science)

How to look?
- Start with google only if you really don't have a better idea.
- Read abstracts to narrow or generalize keywords
- Improve keywords as you learn the terminology
- Follow the author
- Follow the references
Literature Search (obvious do an don'ts)

**What to look for:** (loosely sorted by trustworthiness)
- Textbooks (n-th editions often easier to read)
- Review articles
- Heavily referenced articles
- High impact journals: e.g. Nature, Science
- Recent journal publications
- Scholarly journals in general

**What not to look for:**
- Do not always trust conference papers.
- Sometimes trust academic web sites (.edu).
- Do not much trust company web sites (.com).
- Never rely on a random individual's web page.

**Demonstrate** on a topic picked by the class.
Getting ready

Assignment 1: (due next class)

Select research question or engineering problem that interests you.

Find and bring the most relevant research paper to class.

Explain in writing (1 page):
• Define the topic in detail (what is it and what is it not)
• Why is this subject of relevance?
• What is the main research question?
• What is the main technical challenge?
• What are the relevant keywords to search for?

Pay attention to format! Your write-up has to be in print. Include CCNY logo, title, name, date, course #, and assignment #.

Document will be evaluated by other students!
Getting ready - Computers

• We will **try** to use laptops in class for on-line search and programming.
• We will have 11 laptops from the department.
• If you have a laptop please install the software and bring it to class (100% charged as we do not have sufficient outlets).
  Thanks!

**In-class computer use rules:**
• The computers must be turned OFF and CLOSED unless you are instructed to work on a specific task.
• You will work in groups of 2-3 students per computer.
• No private time with your laptop during class! Hence:
  • No email-ing,
  • No IM-ing,
  • No computer games,
  • No random browsing or reading the news.