Subjects My Teachers Never Taught Me

What to Learn in Graduate School: Biostatistics

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Overview

- Target audience: eventual doctorate in Biostatistics
- Brief advice without many details
- Identify the issues; solutions left to you
The Basics of Grad School

- Pre-requisites
  - English/Communication/Writing
  - Calculus, Linear Algebra, + More
  - Statistics
- Course material, grading
- Comp exam content
- Graduation requirements
- Job market

All obvious
What You Really Need To Know

- Information Intake
  - Read
  - Listen
- Information Creation: Research
- Information Output
  - Write
  - Speak

Not as obvious

Plus tools of the trade.
Learn

- Learning how to learn
- Not just ‘be taught’
- Active participation in learning
- Teaching: guide to learning
- Life long learning
  - Work/Professional environment: constant change
  - Continue to learn after graduation
  - Use it or lose it
Learn: Required Courses

- Backbone of Statistics
  - Basic, but old
  - Does not use the modern language of statistics
  - Does not cover everything
  - Must be supplemented BY YOU
    - Books
    - Articles
    - Topic Courses
    - Seminars!
    - Conferences
Read: Books

Read as many textbooks and monographs as possible
- The more you know, the better
- Build on your interests
  - Material you like
  - Not necessary to follow through on every topic
- Explore!
Read: Journals

- Thick Rich Cheese Cake
- By end of first year doctoral
- Important journals (you choose)
  - JASA, JRSS-B, ...
  - Biometrics, Stat in Med, ...
  - Others: Applied Statistics, Bayesian Analysis, JCGS
- The art of reading journal articles
- Requires practice
Steps to Reading a Journal Article

- Skip most articles
- Title.  <Decide: Continue?>
- Authors & institutions, <Continue?>
- Abstract <Continue?>
- References (any you’ve noticed before?)
- Introduction (particularly if new to area) <Continue?>
- Section 2: methods
- Computing section: algorithms
- Examples?
- Simulation studies worthless?
Thinking About: Journal Articles

Think!

- Is it important?
- Did you like it?
- Did they do it right? best way?
- How can it be improved?
- Presented: Well? Poorly?
- How related to other work?
All knowledge is interrelated

Need to learn the structure of knowledge

Not necessary to learn linearly

Remember relationships of concepts

Even if you don’t understand either concept

Important material gets filled in... eventually

Articles & seminars

You *will* make the connections
Listen: Seminars

- Language of statistics
- Frontiers of research
- Variety
  - Topics
  - Speakers
  - Styles
  - Approaches
  - Solutions
- Understand *something* not *everything*
- Start filling in your own web of knowledge
Research

- Discovering something new (It's yours!)
- Digging up material already discovered by someone else
- Asking the right questions
- The opposite of homework
- Examples of completed research:
  - Journal articles
  - Monographs
  - Theses
- Apprenticeship
Communication Skills: Writing

- Communication skills perhaps more important than math skills
- Work at them. All the time.
- Scientific Writing
- Efficiency: Information per word
- Inexperienced writers will improve rapidly
- Use words and sentences in writing up homework
Writing Practice

I work at my writing virtually every day

Recently read:

King, Stephen. (2000). On Writing


Vocabulary: dictionary: expand

Edit: Everything, HW, email, papers

Word Games
Organize Your Writing

- Outline what you want to say

- Organize Hierarchically
  - Chapters (in a dissertation or book)
  - Sections (in a chapter or paper)
  - Subsections of a section
  - Paragraphs of a (sub)section
  - (Sentences in a paragraph)

- Good writing is bad writing edited
  - Rearrange: Like with like
  - Edit
  - Re-edit again – 10 or more times
Mathematics and Writing

- Each paper defines a new language
  - Define: Words, Symbols, Mathematics
  - At first use
  - Every symbol must be defined

- Keep the reader in mind
  - Readers must translate math (or learn it)
  - What does the reader know?
  - When does the reader know it?
  - Never use a symbol the reader does not know
Communication Skills: Speak

- English language
- Practice English (at home, with friends, at work)
- Rephrase to perfection
- Practice explanations
- Teaching
- Vocabulary
Giving Seminars

- Give good talks!
- One bad talk is remembered more than 10 good talks
- Practice important talks 10-20 times

Audience
- Remember the listener
- What does the listener know?
- Read the audience: bored or listening?

Afifi’s talk on talks
Tools

Know the tools of professional statisticians

- Journal research: Researching the past and present.
  - Current Index to Statistics (ASA)
  - Science Citation Index ([isiknowledge.com](isiknowledge.com))
  - Online journal access (Biomed library)
  - PubMed; NIH grant abstracts; citeseer; google scholar

- Writing math: \LaTeX, \texttt{AMS-LaTeX}

- Statistical Programming: R [www.r-project.org](www.r-project.org), Matlab, Gauss, etc

- Learning how to learn a package
More Stuff

- Do I have the right stuff?
- Social & Health
  - Interacting with faculty, staff, students
  - Staying sane, healthy, and happy
  - Recreate
- Choosing an advisor and thesis topic
- How to do research
- Attending conferences; professional development,
- Jobs: what is required, expected; financial issues
- CV, hiring, job search
Summary: Things to Know

- How to
  - Take in information: reading and listening
  - Create information: research
  - Disseminate information: writing, speaking
- The tools: Latex, R, CIS, Science Citation Index, Search, ...