Psych 840

Goals:

1) For me, to have fun.

2) For you, to see (together, all at once):

likelihood
matrix algebra
computing in R and C++…

3) … so you can ultimately do stuff …

The Plan (first half)

Base Topic	Statistical Methods	Matrix Algebra	Computing
Bock's Chapter 4	Polynomial Regression	√	R: minimal I/O, matrices
Bock's Chapter 4	Polynomial Regression	√	C++: minimal I/O, matrices
IRT: Estimating θ	Univariate Nonlinear ML+	√	R; C++: more classes
Bock & Jones Chapter 2	Multivariate Nonlinear ML+	√	R; C++: minimizers
Johnson & Albert Ch. 1-3	MCMC	√	R: MCMCpack

The Plan (continued)

Bock & Lieberman	IRT: Highly Multivariate ML	√	R: item response data handling
Bock & Aitkin	IRT: An EM-like Algorithm	√	R; C++: more matrix libraries
Albert +	IRT: MCMC	√	R: MCMCpack plus the matrix libraries
Bock &Baargmann + Joreskog + Rubin & Thayer	Factor Analysis	√	From IRT to Factor Analysis
	Your Presentations		

What do we need of matrix algebra?

Not a lot (on the scale of Math Dept. "Matrix Algebra" or "Linear Algebra:" courses):

- Matrix/vector addition & multiplication
  (so we know how matrices represent systems of linear equations)
- Inverse of a matrix
  (solving a system of linear equations)
- Rank, determinants
  (how many independent linear equations?)

Bock's Chapter 2 is massive overkill for this, including many other things as well as computational procedures for which we'll count on libraries. For a start, the "appendix on matrix algebra" in many regression books will do.

Beyond this, useful optional stuff to learn involves "matrix derivatives."

The plan for today:

1) This introduction

2) Your introductions
- specifically, your computing backgrounds

3) A bit of history of computing…