Setting up models
Part 2
NITP 2011
How this works

- Model setups based on FSL list questions!
- I’ll pose the problem and you work out the design matrix and contrasts
Model 1

- You have estimated successful stop pre and post training (2 runs) for each subject. At the group level you have 8 subjects with 2 measures each, what is the appropriate model?
  - How do you test post-pre training?
Paired t test
Model 2

- You have 9 subjects and all but one subject have complete pairs of data (one subject missed the second scan)
  - Can you still use a paired t test?
  - Other options?
Model 2

• Suggestions
  – If there is high within subject correlation (like in the tire example earlier) you need a paired test
    • Toss the subject with incomplete data
  – If there isn’t a high correlation, a two-sample t-test may be okay
    • Be careful or else you’ll be losing power
    • Use complete data to compare paired t test to 2 sample t test
Model 3

- You have 5 subjects scanned under 3 conditions (A, B & C) and you want to make all pairwise comparisons in one model
  - You must account for repeated measures
  - Construct 3 contrasts: A-B, B-C, A-C
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If you’re totally stuck, set up a factor effects ANOVA model and I’ll show you how to build off that in a second…
### Triple paired t test

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Triple paired t test

• Really just a repeated measures ANOVA using factor effects
Note on repeated measures ANOVA

- As long as each subject has repeated measures for all cells of the ANOVA use factor effects and split up the intercept into subject-specific means.
Note on repeated measures ANOVA

• As long as each subject has repeated measures for all cells of the ANOVA use factor effects and split up the intercept into subject-specific means

• Won’t work if you do not have repeated across both factors
Note on repeated measures ANOVA

• As long as each subject has repeated measures for all cells of the ANOVA use factor effects and split up the intercept into subject-specific means

• Won’t work if you do not have repeated across both factors
  – Eg. 2x2 ANOVA
    • Factor 1: Pre/post training (everybody has both)
    • Factor 2: control/patient (each subject only in one group or the other)
Model 4

- **Goal:** Set up an 2 way ANOVA where
  - Repeated measure on first factor (Time two levels: time 1 and time2)
  - Not repeated on second factor (Group, 2 groups patients and controls)
- **Contrast of interest**
  - Test whether the difference in activation between the two times differs between groups
What is wrong with this?
What is wrong with this?

Rank deficient...but a good effort!
Suggested model

- Extension of the paired t test
- Adjust for repeated measure within group

\[ c = [1, -1, 0, 0, \ldots, 0] \]
Another model

c = [ 0 1 0 0 ........0]
Model 5

• I would like to run a higher level repeated measures analysis on a group of 8 subjects scanned twice including a covariate (time between 1st and 2nd scan). I’m interested in the difference between the 1st and 2nd scan and the effect of the time between the 2 scans. I’m not sure how to set up the design.
Model 5

• Summary
  – Sort of like a paired t-test
    • Want to compare scan 1 to scan 2
  – BUT, second scan occurred at a different time for each subject, so they also want to adjust for this effect

• Construct design for 3 subjects where second scans occurred at 2, 5, and 3 months, respectively
Model 5

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1 & 0 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 & 0 \\
1 & 0 & 0 & 0 & 1 \\
-1 & 2 & 1 & 0 & 0 \\
-1 & 5 & 0 & 1 & 0 \\
-1 & 3 & 0 & 0 & 1
\end{pmatrix}
\]
Model 5

\[
\begin{bmatrix}
1 & 0 & 1 & 0 & 0 \\
1 & 0 & 0 & 1 & 0 \\
1 & 0 & 0 & 0 & 1 \\
-1 & 2 & 1 & 0 & 0 \\
-1 & 5 & 0 & 1 & 0 \\
-1 & 3 & 0 & 0 & 1
\end{bmatrix}
\]

Note: It isn’t likely that the parameter corresponding to the first regressor would be significant, in the presence of the 2\textsuperscript{nd} regressor.
Questions?