ED751: Scaling Methods for the Behavioral Sciences
"We must measure what is measurable and make measurable what cannot be measured"

-Galileo

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Office Hours for Fall 2010:
Mondays: 1:00 to 2:30 p.m.
Fridays: 12:30 to 2:00 p.m.
Other times by appointment

Course Syllabus for Fall 2013
This course provides an introduction to the philosophy of measurement and to the methods used in
developing scales for measuring attributes of objects and people. The course emphasizes scaling
methods used in educational testing and psychological research. Mathematical procedures useful for
discovering the structure of multivariate data are also covered. A central focus of the course is on
multidimensional scaling (MDS) and its use in evaluating the consistency of data structure across
groups and individuals. An important scaling method that is not covered in this course is item
response theory, since it is comprehensively covered in EDUC736 and other courses.

In this course, students will learn different perspectives of the science of measurement, and they will
learn specific scaling techniques such as Thurstone scaling, Likert scaling, Guttman scaling, and
MDS. Cluster analysis methods will also be covered as a form of discrete scaling. Upon successful
completion of this course, students will have an increased understanding of measurement scales and
their proper uses and they will be able to apply MDS and cluster analysis to a wide variety of
educational and psychological research problems.

Textbooks (Monographs)
I will give numerous handouts throughout the semester. Students should purchase the following
research monographs, which are available from the UMASS Textbook Annex and Sage publishers
(www.sagepub.com).


If you can afford to buy them, I also recommend the following seminal books, which are not in the
textbook annex, but can be purchased online at Amazon.com and similar sites:
New York: Springer-Verlag.
**Grading:**
Your grade in this course is based on attendance/participation (15%), homework assignments (35%), research critique (10%), and final project (40%). The final assignment will involve analysis of data using MDS and writing a report of the results. This project will be discussed in class. Attendance/participation and all assignments are graded on a 0-100 scale. Final grades of 94-100 receive an A, 90-93 receive an A-, 87-89 receive a B+, 81-86 receive a B, 79-80 receive a B-, 77-78 receive a C+, 70-76 receive a C, and below 70 receive an F.

**Research Critique:** In this assignment you are to select one of the application articles below and address the following questions and topics:

1. What were the objectives of the study? What is the significance of these objectives?
2. Briefly describe the MDS model(s) used. Discuss how the author(s) evaluated data/model fit and interpretation of the stimulus space (and subject space, if applicable).
3. What are the strengths and weaknesses of the study? Do you agree with the author(s)' conclusions? Describe any plausible rival hypotheses and discuss the generalizability of the results.
4. Discuss the implications of this study for future research in this area.

**Papers should be typed, 3-6 pages single-spaced, and otherwise conform to APA style (6th ed.).**

**APPLICATION ARTICLES**


**Academic Honesty Statement:** Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent.
**Plagiarism policy:** It is expected that you will speak with others about course content and even work collaboratively on some class assignments. However, direct copying of someone else’s work is not allowed. Printing out someone else’s computer output, and handing it in as your own work, is also not allowed. Passing off someone else’s work as your own will result in failing this course. According to the University’s Academic Regulations (www.umass.edu/registrar/media/academicregs.pdf), plagiarism is defined as “knowingly representing the words or ideas of another as one’s own work in any academic exercise. This includes submitting without citation, in whole or in part, prewritten term papers of another or the research of another, including but not limited to commercial vendors who sell or distribute such materials.” Please see me if you have questions about this policy, or if you have trouble completing any assignments.

**Accommodation policy:** I strive to provide an equal educational opportunity for all students. If you have a physical, psychological, or learning disability, you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

**Additional Course References**

The literature on scaling and related issues is rich and extensive. I found the following references useful and some are addressed in my lectures. Some are required reading as indicated on the class schedule, and will be distributed in class. Others will be valuable resources if you continue to use scaling techniques after completing the course.


**ED751: Scaling Methods for the Behavioral Sciences**

**TENTATIVE Class Schedule for Fall 2013**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading Assignment</th>
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<tbody>
<tr>
<td>9/10</td>
<td>History and Philosophy of Measurement</td>
<td>Stevens (1946)</td>
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<td>Psychophysical Scaling</td>
<td>Lord (1952)</td>
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<td>Measurement Scales and Statistics</td>
<td>Michell (1986)</td>
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<td>9/17</td>
<td>The Permissible Statistics Controversy</td>
<td>Thurstone (1927a, 1927b)</td>
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<td>Scaling the Psychological I: Thurstone’s Attitude Scaling</td>
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<td>9/24</td>
<td>Scaling the Psychological II:</td>
<td>Thurstone (1927)</td>
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<td>Likert Scaling, Guttman Scaling</td>
<td>Thurstone (1927)</td>
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<td>Guttman (1950)</td>
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<td>10/1</td>
<td>Scaling Educational Tests: Thurstone Scaling</td>
<td>Thurstone (1925)</td>
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<td>Engelhard (1984)</td>
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<td>10/8</td>
<td>Introduction to Multidimensional Scaling</td>
<td>Kruskal &amp; Wish (1978)</td>
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<tr>
<td>10/15</td>
<td>NO CLASS—Monday Schedule</td>
<td>RESEARCH CRITIQUES DUE</td>
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<td>See (attached) list of</td>
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<td></td>
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<td>application articles</td>
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<td>10/22</td>
<td>Classical MDS</td>
<td>Davison (1992, Ch. 5)</td>
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<td>10/29</td>
<td>Evaluating Fit in MDS</td>
<td>Sireci &amp; Geisinger (1992)</td>
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<td>Replicated MDS</td>
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<td>11/5</td>
<td>Weighted Multidimensional Scaling</td>
<td>Davison &amp; Sireci (2000)</td>
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<td>11/12</td>
<td>Interpreting MDS Stimulus and Weight Spaces</td>
<td>Young &amp; Harris (1993)</td>
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<td>MacCallum (1981)</td>
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<td>Discrete Scaling II: Partitioning Methods</td>
<td>Aldenderfer &amp; Blashfield, (1984*)</td>
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<td>11/26</td>
<td>Evaluating Test Dimensionality and Data Structure</td>
<td>Hattie (1985)</td>
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<td>Meara, Robin, &amp; Sireci (2000)</td>
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<td>12/16</td>
<td>FINAL PROJECT DUE (No Class)</td>
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Note: The instructor will provide handouts for all required readings with the exception of the Sage monographs listed as required textbooks.