

The Art of Statistical Analysis for Game Design: Story Telling with Numbers

CTIN 110 Fall 2013

Professor: Dennis Wixon

Location: SCI 207

Days and Times: Thursday 2:00 - 5:50

SA: TBA

Course objectives:

1. Understand the fundamental concepts of data collection and analysis for game design
2. “Consume” empirical on game design in an effective and efficient way.
3. Plan and conduct statistical analysis of a game design for clarity and impact.

Prerequisite: No specific class is required. Students should be familiar with basic computational techniques and with games. Familiarity with office tools such as Excel will be assumed. Students in doubt of their ability to successfully complete the course should review the syllabus and seek advice from the instructor.

Description:

The course will consist of examples of statistical analysis used in for the assessment of game design and entertainment engagement. The fundamental concepts and assumptions which underlie these techniques will be presented and discussed. The class will include processing sample data sets using standard statistical software. Rote computational methods will not be included.

Speakers from the gaming industry and researchers in games will present their work. These presentations provide an industry and research perspective on the research methods and theory.

Upon completion students should be able to explain the concepts and techniques behind statistics and statistical analysis in Game Development and the User Assessment of games and software.

The class provides grounding in statistical models and analysis, training students to use those skills in specific game development environments so that they can apply to their skills to future project-based course work, and eventually in their careers. By focusing on how to use these skills in the Interactive Media environment and on statistical and research fundamentals, the course will prepare the students to do empirical assessment in many design environments. For example, students will be able to match data gathering method and a statistical technique to a design or research question and be aware of the strengths, weaknesses, and risks with these methods and techniques. They will also be able to plan research and analysis in relation to resource and time constraints. Finally, they will gain an understanding of how to present research results most effectively to various audiences.

The course is divided into two parts.

1. In the first part, statistical methods and tools and their application to games and entertainment products will be reviewed and discussed. This will include a review of the logic and purpose of statistical procedures. Particular emphasis will be placed on underlying assumptions of various statistical methods. These methods will include: hypothesis formation, descriptive statistics, exploratory data analysis, data scrubbing and analysis, modeling, hypothesis testing, reliability and validity, parametric and non-parametric inferential statistics and their relationship, and how to read accumulated data.

The fundamental outcome of this overview is an understanding of the relationship between research purpose, resources, and statistical and data gathering methods and tools. The course will have an applied emphasis. Theory will be included to facilitate understanding rather than for its own sake. Mastery will be judged by a series of assignments and quizzes and critiques of existing research and a final project.

2. The second part will consist of the application of the knowledge and skills gained in the first part of the class. The students will develop and present of a research proposal. The proposal will be based on both a research question and an initial set of data collection and review. The combination of early analysis of a limited or pilot data set and the goals of the research will form the basis for a proposal which includes planned data collection and analysis, proposed write up, and intended final assessment. An ideal proposal will provide the rationale for the chosen method of data collection and analysis and the rejection of other plausible approaches. When completed an ideal write-up will consist of either a report and presentation, or a research effort resulting in design impact. Their work products in part two will be the proposal, the initial pilot study and a research report Upon completion, students should be able to:
 1. Understand statistical methods, their application, and purpose in developing digital media.
 - a. Design a user research plan, based on statistical analysis.
 - b. Design a user analysis plan, including potential updates and changes based on the data gathered.
 2. Analyze and report the results of research including the use of statistical tools
 3. Document all results for appropriate audience
 4. Understand the role of statistical analysis in designing hands on user research, ongoing data mining, and digital media design.

Course Requirements and Grades

- The class will include regular quizzes on statistical methods and data analysis
- Class projects will be oriented towards writing research plans that highlight specific statistical methods and require data analysis.
- Class Reading will familiarize students with several statistical methods, the user assessment process, and ongoing data mining and live updating of online games and services.

Deliverable	Weight (points)	
	Instructor	Peers
Short assignments: Quizzes, Assignments, Survey	35	0
Research Proposals - Presentation of proposal, Data collection plan, Data collection instrument, Presentation of results, Final report	40	9
Class contribution - Instructor rating, Class rating	13	3
Total	88	12

Evaluations by class will be based on both instructor assessment and ratings of the individual's performance based by other students where appropriate (e.g. presentations). For these ratings students will be provided with guidance and a rating scale with quantitative and qualitative questions. The quantitative scale will have defined anchor points and will include clarity of presentation, coherence and persuasiveness of material, and creativity.

The following table lays out the course schedule of assignments week by week along with their point values. Each assignment has two dates: the date assigned and the date due.

Unless otherwise specified all assignments are due by end of day (Midnight) on Thursday.

Points for late assignments will be reduced by 25% per week. Any assignments more than two weeks late will cannot be graded, i.e. no points given. Exceptions to policy must be approved in advance in writing by the instructor or follow university policies regarding excused absence.

Week assigned	date assigned	date due	Short assignments Research Project Class Participation	Number/Description	Instructor evaluation	Peer evaluation
1	29-Aug	5-Sep	Assignment	1 Summary Campbell/Stanley	5	
1	29-Aug	30-Aug	Assignment	2 Survey	5 points for completing on time	
2	5-Sep	12-Sep	Assignment	3 analysis of five studies	5	
3	12-Sep	19-Sep	Assignment	4 Data plots	5	
4	19-Sep	26-Sep	Research Project	5 Slides/presentation of proposal	10	3
6	3-Oct	10-Oct	Research Project	6 Submit data collection plan	5	3
8	10-Oct	17-Oct	Research Project	7 Data collection instrument	5	
5	24-Oct	31-Oct	Assignment	8 Critique of article	5	
		14-Nov	Research Project	9 Presentation of results	5	3
13		22-Nov	Research Project	10 Report	15	
15		5-Dec	Quiz	11 Overview quiz	10	
Ongoing			Class participation	Contribution to discussion	13	3

Overview of Course: Class Sessions/ Readings/ Assignments

Week	Date Thursday	Class Sessions	Reading (detail below)	Assignment given	Assignment Due EOD Thursday (unless noted)
1	29-Aug	Intro: review of syllabus and grading History of statistics	1. Campbell and Stanley 2. Qualitative Methods in Design	1. 250 word summary of reading 1 2. Complete Survey	2. Survey EOD Friday (30-Aug)
2	5-Sept	Catalogue of methods and questions	3. The process of Conducting Qual/Quant Research 4. Read 5 studies	3. Analyze 5 studies using template	1. 250 word summary of first reading
3	12-Sept	Exploratory Data analysis / Big Data	5. Tukey Exploratory data analysis, 6. Halo 3: Wired magazine	4. Plot data from survey results	3. Analysis of 5 studies
4	19-Sept	Guest Speaker: John Hopson, Bungie		5. Prepare research proposal	4. Plot from survey data
5	26-Sept	Presentation of research proposal - all			5. Present research proposal
6	3-Oct	Method: Ethnographic methods and Usability tests	7. Usability engineering 8. The RITE method	6. Revise your research proposal; plan your data collection	
7	10-Oct	Method: Surveys and focus groups mid-course survey	9. Surveys, Chapter 5 in Research methods in HCI	7. Design collection instrument process	6. Submit plan data collection
8	17-Oct	Guest Speaker: Marientina Gotsis Director Games for Health			7. Submit Collection instrument

Week	Date Thursday	Class Sessions	Reading (detail below)	Assignment (detail below)	Assignment Due EOD Thursday (unless noted)
9	24-Oct	Method Statistics the logic and the folly	10. Campbell and Stanley 1966 25-37	Run pilot study 8. Read/ Critique article	Revise pilot - study
10	31-Oct	Guest Speaker: Dimitri Williams	11. The ultimate guide to AB testing	Collect data	Collect data/Analyze data 8. Submit article critique
11	7-Nov	Methods: Experiments and the A/B test	12. Matrix of tools and issues	9. Analyze data write report 10. Develop presentation	
12	14-Nov	Student Presentations		Finish report/ presentation	9. Presentation submitted
13	21-Nov	Student Presentation			10. Final study report (EOD Friday 22-Nov)
14	5-Dec 6 Dec	Class evaluation Feedback on final study reports individual Sessions During class and by appointment		Decide if you will revise report 11. Overview quiz in class	
15	12-Dec				Revisions to final report

Course readings (all readings are posted in blackboard or you will be given a link)

1. Campbell and Stanley (week 1)

Experimental and Quasi Experimental Designs for Research 1966, pages 1-25, posted on blackboard

2. Qualitative Methods in Design (week 1)

Qualitative Methods in Design and Development, Interactions Magazine, Oct 1995, 19-22

3. The process of Conducting Qual/Quant Research (week2)

The process of conducting research using Qualitative and Approaches Chapter 1
Pages 1-26 in Educational Research 4th edition

4. Read 5 studies (week 2)

The following 5 studies are posted on blackboard:

- a. *User performance with Command, Menu, and Iconic Interfaces*, Whiteside, J, et al
- b. *Perceptions of Web Site design characteristics A Malaysian/Australian Comparison*, Fink, D, & R. Laupase
- c. *Designing for Usability—Key Principles and What designers Think*, Gould, J. & C. Lewis
- d. *The effect of inductively versus Deductively Organized Text on American and Japanese Readers*, Spyrdakis, J. & W. Fakaoka.
- e. TBD

5. Tukey Exploratory data analysis (week 3)

Exploratory data analysis, J. Tukey, Chapters 1-2.

6. Halo 3: Wired magazine (week 3)

Halo 3 How Microsoft Labs Invented a new Science of Play, Wired Magazine Issue 15.9

[http:// http://www.wired.com/gaming/virtualworlds/magazine/15-09/ff_halo?currentPage=all](http://www.wired.com/gaming/virtualworlds/magazine/15-09/ff_halo?currentPage=all)

7. Usability engineering (week 6)

Usability Engineering: Our Experience and Evolution. In the *Handbook of Human Computer Interaction*, 1988 791-817

8. The RITE method (week 6)

The Rapid Iterative Test and Evaluation Method: Better Products in Less Time, In Cost Justifying Usability. An Update for the Internet Age. Morgan Kaufmann (2006)

9. Surveys, Chapter 5 in Research methods in HCI (week 7)

Kohavi, R.; Longbotham, R., Sommerfield, D., Henne, R.M. (2009). "[Controlled experiments on the web: survey and practical guide](#)". *Data Mining and Knowledge Discovery* (Berlin: Springer) **18** (1): 140-181. doi:10.1007/s10618-008-0114-1. ISSN 1384-5810.

<http://www.springerlink.com/content/r28m75k77u145115/>

posted on blackboard

10. Campbell and Stanley 1966 25-37 (week 9)

Campbell and Stanley, 1966 *Experimental and Quasi Experimental Designs for Research*, 1966, pages 25-57.

11. The Ultimate guide to AB testing (week 10)

<http://www.smashingmagazine.com/2010/06/24/the-ultimate-guide-to-a-b-testing/>

12. Matrix of tools and Issues (week 11)

Isbister, K. and Schaffer, N. Matrix of Tools and Issues, Chapter 21 237-265 in *Game Usability* 2008

Assignments and Quizzes

- 1. Summary of Campbell and Stanley - write a 250 word summary of the reading.**
Evaluation will be based on clarity, accuracy and completeness
- 2. Down load survey from blackboard and complete it.**
No credit will be given if survey is late
- 3. Five Studies summary**
Use the template provided in blackboard to summarize five studies. The studies are available in blackboard.
- 4. Create a plot of the data from the survey**
Use the principles discussed in Tukey reading to create a meaningful plot of the data.
- 8. Critique of an article**
Use the template provided in black board to critique an article (also provided in blackboard)
- 11. Overview quiz**
An in-class open-book quiz. Will cover material presented in lectures and readings.

Research Project

- 5. Presentation of proposal**
A slide deck which describes the study you are proposing (see blackboard for specifics)
- 6. Data collection plan**
A document that describes how will you get the data and who will you get it from.
- 7. Data collection instrument**
The actual instrument you will use to collect the data (e.g. a survey)
- 9. Presentation of findings**
A slide deck describing your study, what the results, what you learned, and what you would do differently.
- 10. Final Report**
A document consisting of an abstract, an introduction, a methods section, results section including data plots and analysis, discussion section describing what the results showed, and conclusion summarizing the study.

Instructor Bio

Dennis has worked in user research since 1981. He was a usability manager at Digital Equipment Corporation, where methods such as Usability Engineering, Contextual Inquiry, and data logging were developed. For the past 14 years he managed research teams at Microsoft, which have covered a wide spectrum of products, including: the Games User Research team, which developed RITE (Rapid Iterative Testing and Evaluation) and TRUE (Tracking Real-time User Experience) methods. TRUE has been successfully applied to many products, including the Halo franchise. Dennis has also been an active member of the CHI community for many years, serving as in a number of roles including Conference Co-chair and was elected Vice President for Conferences in 2004. He has co-authored over 50 articles, book chapters and talks on HCI with many valued colleagues. Dennis is also has coauthored of two books: Field Methods Casebook for Software Design (with Dr. Judy Ramey) and Brave NUI World (with Dr. Daniel Wigdor). He is adjunct full professor at University of Washington in the department of Human Centered Design and Engineering Design. I hold a PhD. in experimental social psychology from Clark University

SA Bio

TBD

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: <http://www.usc.edu/dept/publications/SCAMPUS/gov/>. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <http://www.usc.edu/student-affairs/SJACS/>.

Emergency Preparedness/Course Continuity:

In case of emergency, and travel to campus is difficult, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. Instructors should be prepared to assign students a "Plan B" project that can be completed at a distance. For additional information about maintaining your classes in an emergency please access: <http://cst.usc.edu/services/emergencyprep.html>