



Dr. Dinko Bačić
312-915-6595
dbacic@luc.edu
Schreiber 420,
16 E. Pearson, Chicago, IL
60611

Office Hours*:
Tuesday 11:30am – 1:30 pm
Thursday 11:30am – 1:30 pm
and by appointment
*Additional HW-related TA office hours
TBA

INFS 395, INDEPENDENT STUDY INFORMATION VISUALIZATION & BIOMETRICS

Spring 2020

Catalog Description

Business Intelligence & Analytics' (BI&A) dashboards, data visualizations, and visual analysis systems are cognitive tools that heavily rely on our understanding of sub-conscious-level processing, human perception and cognitive processes overall. This independent study will focus on exploring relevant literature and research opportunities focused on using users' physiological response using biometric technology (eye-tracking, EEG, GSR devices, etc.).

Course Overview

This is an independent study course. This course includes independent, student-led development of focused research outline, collection and review of relevant academic literature, and creation of academic manuscript focused on proposing a study or a series of studies at the nexus of information visualization and biometrics. Weekly student-instructor meetings will take place to ensure progress and guidance.

Course Objectives and Learning Outcomes

Students will be able to discuss current issues associated with business information visualization design and how biometrics could be used to assess its effectiveness and impact on business users.

Recommended Materials

In the process of manuscript writing, the students will develop their own list of reading materials with the guidance of the instructor. These materials will primarily focused on using leading academic journals discussing information visualization and biometrics

Initial Reading List

1. Bačić, D.: Biometrics and Business Information Visualization: Research Review, Agenda and Opportunities. In: Nah FH., Xiao B. (eds) HCI in Business, Government, and Organizations. HCIBGO 2018. Lecture Notes in Computer Science, vol 10923. Springer, Cham, (2018)
2. Bačić, D., Fadlalla, A.: Business information visualization intellectual contributions: an integrative framework of visualization capabilities and dimensions of visual intelligence. *Decis. Support Syst.* 89, 77–86 (2016).
3. Peck, E.M.M., Jacob, R.J.K., Yuksel, B.F., Ottley, A., Jacob, R.J.K., Chang, R.: Using fNIRS Brain Sensing to Evaluate Information Visualization Interfaces. In: Proceedings of

- the SIGCHI Conference on Human Factors in Computing Systems. pp. 473–482. ACM, New York, NY, USA (2013).
4. Rayner, K.: Eye movements in reading and information processing: 20 years of research. *Psychol. Bull.* 124, 372–422 (1998).
 5. Eckstein, M.K., Guerra-Carrillo, B., Singley, A.T.M., Bunge, S.A.: Beyond eye gaze: What else can eyetracking reveal about cognition and cognitive development? *Dev. Cogn. Neurosci.* 25, 69–91 (2017).
 6. Bacic, D.: Understanding Business Dashboard Design User Impact: Triangulation Approach Using Eye-tracking, Facial Expression, Galvanic Skin Response and EEG Sensors. In: *AMCIS 2017.*, Boston, MA (2017).
 7. Bera, P., Bera, B.Y.P.: How Colors in Business Dashboards Affect Users’ Decision Making. *Commun. ACM.* 59, 50–57 (2016).
 8. Borkin, M.A., Bylinskii, Z., Kim, N.W., Bainbridge, C.M., Yeh, C.S., Borkin, D., Pfister, H., Oliva, A., Member, S., Oliva, A.: Beyond Memorability: Visualization Recognition and Recall. *IEEE Trans. Vis. Comput. Graph.* 22, 519–528 (2016).
 9. Goldberg, J., Helfman, J.: Eye tracking for visualization evaluation: Reading values on linear versus radial graphs. *Inf. Vis.* 10, 182–195 (2011).
 10. Toker, D., Conati, C., Steichen, B., Carenini, G.: Individual User Characteristics and Information Visualization : Connecting the Dots through Eye Tracking. (2013).
 11. Goldberg, J.H., Helfman, J.I.: Comparing Information Graphics: A Critical Look at Eye Tracking. In: *Proceedings of the 3rd BELIV’10 Workshop: BEyond Time and Errors: Novel evaluation Methods for Information Visualization.* pp. 71–78. ACM, New York, NY, USA (2010).
 12. Peebles, D., Cheng, P.C.-H.: Modeling the Effect of Task and Graphical Representation on Response Latency in a Graph Reading Task. *Hum. Factors.* 45, 28–46 (2003).
 13. Hur, I., Yi, J.S.: SimulSort: Multivariate Data Exploration through an Enhanced Sorting Technique. In: Jacko, J.A. (ed.) *Proceedings of the 13th international conference on human–computer interaction.* pp. 684–693. Springer Berlin Heidelberg, Berlin, Heidelberg (2009).
 14. Hur, I., Kim, S.-H., Samak, A., Yi, J.S.: A Comparative Study of Three Sorting Techniques in Performing Cognitive Tasks on a Tabular Representation. *Int. J. Human–Computer Interact.* 29, 379–390 (2013).
 15. Kim, S.H., Dong, Z., Xian, H., Upatising, B., Yi, J.S.: Does an Eye Tracker Tell the Truth about Visualizations?: Findings while Investigating Visualizations for Decision Making. *IEEE Trans. Vis. Comput. Graph.* 18, 2421–2430 (2012).
 16. Siirtola, H., Laivo, T., Heimonen, T., Rähkä, K.J.: Visual Perception of Parallel Coordinate Visualizations. In: *2009 13th International Conference Information Visualisation.* pp. 3–9 (2009).
 17. Burch, M., Andrienko, G., Andrienko, N., Höferlin, M., Raschke, M., Weiskopf, D.: Visual task solution strategies in tree diagrams. In: *2013 IEEE Pacific Visualization Symposium (PacificVis).* pp. 169–176 (2013).
 18. Burch, M., Konevtsova, N., Heinrich, J., Hoferlin, M., Weiskopf, D., Member, S., Konevtsova, N., Markus, H., Weiskopf, D., Society, I.C.: Evaluation of Traditional, Orthogonal, and Radial Tree Diagrams by an Eye Tracking Study. *IEEE Trans. Vis. Comput. Graph.* 17, 2440–2448 (2011).
 19. Huang, W., Eades, P.: How People Read Graphs. In: *Proceedings of the 2005 Asia-Pacific Symposium on Information Visualisation - Volume 45.* pp. 51–58. Australian Computer Society, Inc., Darlinghurst, Australia, Australia (2005).
 20. Jianu, R., Rusu, A., Hu, Y., Taggart, D.: How to Display Group Information on Node-Link Diagrams: An Evaluation. *IEEE Trans. Vis. Comput. Graph.* 20, 1530–1541 (2014).

21. Huang, W.: Using eye tracking to investigate graph layout effects. In: Asia-Pacific Symposium on Visualisation 2007(APVIS). pp. 97–100. , Sydney (2007).
22. Huang, W., Eades, P., Hong, S.-H.: A graph reading behavior: Geodesic-path tendency. In: 2009 IEEE Pacific Visualization Symposium. pp. 137–144 (2009).
23. Pohl, M., Schmitt, M., Diehl, S.: Comparing the Readability of Graph Layouts Using Eyetracking and Task-oriented Analysis. In: Proceedings of the Fifth Eurographics Conference on Computational Aesthetics in Graphics, Visualization and Imaging. pp. 49–56. Eurographics Association, Aire-la-Ville, Switzerland, Switzerland (2009).
24. Körner, C.: Sequential processing in comprehension of hierarchical graphs. Appl. Cogn. Psychol. 18, 467–480 (2004).
25. Ko, C.: Eye Movements Reveal Distinct Search and Reasoning Processes in Comprehension of Complex Graphs. 905, 893–905 (2011).
26. Carpenter, P.A., Shah, P.: A Model of the Cognitive and Perceptual Processes in Graphical Display Comprehension. J. Exp. Psychol. Appl. 4, 75–100 (1998).
27. Blascheck, T., Ertl, T.: Towards Analyzing Eye Tracking Data for Evaluating Interactive Visualization Systems. In: Proceedings of the 2014 BELIV Workshop: Beyond Time and Errors - Novel Evaluation Methods for Visualization (2014).
28. Cernea, D., Kerren, A., Ebert, A.: Detecting Insight and Emotion in Visualization Applications with a Commercial EEG Headset. In: SIGRAD 2011. pp. 53–60 (2011).
29. Anderson, E.W., Potter, K.C., Matzen, L.E., Shepherd, J.F., Preston, G.A., Silva, C.T.: A User Study of Visualization Effectiveness Using EEG and Cognitive Load. 30, (2011).

Course Requirements and Grading Criteria*

Outline	- 50 points
Literature Review	- 100 points
Final Manuscript(s) (35 pages)	- 250 points
Total	- 400 points

*Grading rubric will be created and communicated

Course Grading Scale

A	368 and above
A–	360 - 367
B+	348 - 359
B	328 - 347
B–	320 - 327
C+	308 - 319
C	280 - 307
C–	260 - 279
D+	240 - 259
D	220 - 239
F	below 220

Academic Integrity

All members of the Quinlan School shall refrain from academic dishonesty and misconduct in all forms, including plagiarism, cheating, misrepresentation, fabrication, and falsehood. Plagiarism or cheating on the part of the student in individual or group academic work or in examination behavior will result minimally in the instructor assigning the grade of “F” for the assignment or examination. In addition, all instances of academic dishonesty must be reported to the chairperson of the department involved.

For further information about expectations for academic integrity and sanctions for violations, consult the complete Quinlan School of Business Honor Code and Statement of Academic Integrity on the Quinlan website:

<http://luc.edu/media/lucedu/quinlan-graduate/pdfs/Honor-Code-Quinlan-July2012.pdf>

Schedule

Weeks/Dates (Meet every Thursday at 12:45)	Topics/ Due Dates
Week 1: January 16	Introduction and Course Expectations
Week 2: January 23	
Week 3: January 30	
Week 4: February 6	Project outline DUE
Week 5: February 13	Begin compiling literature review
Week 6: February 20	
Week 7: February 27	Literature Review – First Draft DUE
Week 8: SPRING BREAK	
Week 9: March 12	
Week 10: March 19	
Week 11: March 26	First 15 pages of research paper DUE
Week 12: April 2	
Week 14: April 9	
Week 14: April 16	
Week 15: April 23	
FINALS WEEK: April 29	35-Page research paper DUE

Meeting times: Once a week, every Thursday

Notes:

This class may occasionally deviate from the stated course outline below.

The instructor reserves the right to make changes as needed to the course syllabus.

Any issue that is not described in this syllabus will be resolved at the sole discretion of the instructor.