Biometrics for UX – Fall 2025

Syllabus

Instructor: **Dr. Jacek Gwizdka**
Office: 5.532
Office Hours: By appointment (in person or online)
Email: jacekg@utexas.edu **(always include Biometrics4UX in your email's subject)**
Note: direct email is by far the best way to contact your instructor and TA

Class Meets: Mondays 12:00pm-3:00pm in UTA 1.504

Canvas @ UT: https://utexas.instructure.com/
Course schedule: a separate one-page document on Canvas (look under Canvas Syllabus)
Course announcements and email list: through Canvas

COURSE DESCRIPTION

This course examines theoretical foundations and explores practical applications of biometric data and signals in User Experience (UX) and Human-Computer Interaction (HCI). Students will gain knowledge in biometric measurement techniques including eye-tracking, pupillometry, electroencephalography (EEG), electrodermal activity (EDA), heart rate variability (HRV), and related physiological indicators. Through lectures, case studies and hands-on projects, working with their own data or available datasets, students will learn to design, conduct, and analyze studies using these biometric methods while critically examining their effectiveness, limitations, and ethical considerations. The course emphasizes the use of biometric data for UX evaluation but will also cover its potential as alternative input mechanisms in interactive systems.

LEARNING OBJECTIVES

The objective of this course is for students to:

1. Understand the theoretical foundations of biometric measurement techniques in HCI/UX applications
2. Critically evaluate the strengths, limitations, and ethical considerations of biometric methods for user experience assessment
3. Design and conduct studies using various biometric research methodologies including eye-tracking, EEG, EDA, and HRV
4. Collect, process, analyze and interpret biometric data for UX evaluation and user state assessment
5. Understand the use of biometric signals as alternative input mechanisms in interactive systems.

READINGS

Assigned articles, book chapters and other are listed on Canvas.

CLASS LECTURE SLIDES AND OTHER HANDOUTS

For your reference, class lecture slides will be posted on Canvas. You have my permission to save and print a copy for your personal use. Assignment and project descriptions are also posted on Canvas. The files posted on Canvas will be either linked to Canvas Modules/Syllabus/Calendar or available directly in the Files section. *Important*: No materials used in this may be shared online or in-person with anyone outside of the class unless you have my explicit, written permission. Please also consult section "Sharing of Course Materials is Prohibited" at the end of the syllabus.

CLASS STRUCTURE

Each week will have roughly these course components: reading assigned articles/chapters/etc., in-person class meeting, assignment or project work. The class meeting time will be split between content-based lectures, discussions, activities to demonstrate and practice the skills. The part of the class time used for lectures will be devoted to highlighting course materials, questions, and discussion. The composition of individual class meetings will differ somewhat throughout the semester. After the class meeting, students will work on assignments and, later in the semester, on a project.

HOMEWORK

There will be several assignments and a project. All due dates are on Canvas. It's your job to know when you should be working on assignments and when they are due. Ask when in doubt.

Submitting written homework and project assignments

You must prepare your assignments using a word processor and submit it by uploading to Canvas by the due date/time. Please always use appropriate three- or four-letter file extensions in submitted filename (e.g., .docx for Word files, .pdf for Adobe portable document format). Assignments may not be submitted via email. All documents which you are submitting should include on the front page of your submission your name (spelled in the same way as in the course roster), course number/name, instructor's name, semester and the date of submission. For group work, please additionally include on the front page all group member names, your project group number, and your project short name (or title). If you don't include all the required information your submission will be **returned ungraded**.

GRADING

Participation in class	10%
Homework – responses to questions (4 x 4%)	16%
Homework – written assignments (3 x 10%) (in pairs)	30%
Project (in small groups) – either user study or analysis of an existing dataset	44%
Total	100%

GRADING SCALE

- 96 or above (A superior
- 90-95 (A- distinguished)
- 87-89 (B+ good)
- 84-86 (B satisfactory)
- 80-83 (B- barely satisfactory)
- unsatisfactory: 77-79 (C+), 74-76 (C), 70-73 (C-).

Note: The final grading does not happen just by calculations. I consider many factors, and so your "Canvas points/%" are only a rough indication of the final grade. Ask when in doubt.

COURSE PROJECT

The project will involve either conducting a small-scale eye-tracking user study in the IX lab and analyzing collected data or analyzing an existing dataset with biometric data. Data analysis could use inferential statistics or machine learning approaches.

USE OF GENERATIVE AI TOOLS (genAI)

The creation of artificial intelligence tools for widespread use is an exciting innovation. These tools have both appropriate and inappropriate uses in classwork. The use of artificial intelligence tools (such as ChatGPT, Gemini, Llama, Claude, Perplexity, Elicit, and any other and generative language models (LLMs), generative programming tools or generative multimodal tools) **in this class shall be permitted on a limited basis**. Generally, allowed are "local" uses, while "global" uses are not. "Local" uses include using an LLM to check or improve language of a phrase or a sentence. Prohibited "global" uses include using AI to answer questions, solve problems, improve or create original language for large sections of an assignment, or rewrite a whole assignment. Further allowed uses include situations when, a) you are preparing an in-class article presentation on AI in HCI: you are allowed to use generative AI tools to try out or illustrate the topic of your article; In all cases, **the use of AI should be properly attributed in your submitted work**. You should be explicit where and how you used a genAI tool, and provide appropriate citations. When using genAI to find information, you should always ask it for citations/links and verify sources before including information from genAI in your assignment. You are also welcome to seek my prior approval for other uses of genAI tools on any assignment.

Using AI writing tools without my permission, or failing to properly cite AI even where permitted, shall constitute a violation of UT Austin Institutional Rules on academic integrity.

UNIVERSITY AND COURSE POLICIES

Due dates and times for handing in homework and project assignments

All homework and project assignments must be turned in at the beginning of class on the due date. You should think of all due dates for assignments, especially project assignments, as firm. The tight schedule of deliverables throughout the whole semester makes it nearly impossible to extend due dates. Any assignment that you do not hand in on time may be penalized in grading. If you are not able to complete an assignment by the due date, it would be best for you to hand in as much of it as you have done. It will help if you notify us about special circumstances that will adversely affect completion of an assignment.

Attendance

You will not be graded directly on attendance. You are adults and are *expected* to be present for all course-related activities. Beyond the occasional need to be absent from class for a good reason, please consider that much of the learning for the course occurs in class. You cannot participate in this learning if you are not present.

If you are absent or unable to participate on the day that your team meets, you are responsible for providing your team with the necessary information to compensate for your absence. It is crucial to keep in communication with your team members; you are responsible for letting both us and your team know if you cannot make it to a class.

Excused Absence: The only absences that will be considered excused are for religious holy days or extenuating circumstances due to an emergency. If you plan to miss class due to observance of a religious holy day, please let us know at least two weeks in advance. For religious holy days that fall within the first two weeks of the semester, the notice should be given on the first day of the semester. You will not be penalized for this absence, although you will still be responsible for any work you will miss on that day if applicable. Check with us for details or arrangements.

If you have to be absent, use your resources wisely. Ask your team and other classmates to get a run-down and notes on any lessons you miss. If you find there are topics that we covered while you were gone that raise questions, you may come by during office hours or schedule a meeting to discuss. Email specific questions you have in advance so that we can make the most of our time. "What did I miss?" is not specific enough.

If you have to miss class for an extended period due to a protracted illness or similar reason, we will treat your needs as a special case and I will do everything I can to help you survive.

E-mail Notification Policy

In this course e-mail will be used as the main means of communication with students. You will be responsible for checking your e-mail regularly for class work and announcements. If you are an employee of the University, your e-mail address in Canvas is your employee address. Please make sure that your email is configured in such way as to show your name in the same way as it appears on the official course roster (possibly in addition to your other preferred names). This most likely means that it should be spelled using Latin alphabet characters.

All email messages you send concerning the class should be addressed to the TA with a copy to the instructor. We will sort out which of us should act on the message and will make every effort to answer your email in a timely fashion. However, you should not necessarily expect to get an immediate reply. In particular, don't expect to get answers to questions about a homework or project assignment within the last few hours before that assignment is due. Please put **Biometrics4UX** as part of the subject line of your email; that will help us identify your emails more quickly.

The University has an official e-mail student notification policy. It is the student's responsibility to keep the University informed as to changes in his or her e-mail address. Students are expected to check e-mail on a frequent and regular basis in order to stay current with University-related communications, recognizing that certain communications may be time-critical. Read the policy: http://www.utexas.edu/its/policies/emailnotify.html.

You can find and change your official email address of record at:
https://utdirect.utexas.edu/apps/utd/all_my_addresses

STUDENT RIGHTS & RESPONSIBILITIES

- You have a right to a learning environment that supports mental and physical wellness.
- You have a right to respect.
- You have a right to be assessed and graded fairly.
- You have a right to freedom of opinion and expression.
- You have a right to privacy and confidentiality.
- You have a right to meaningful and equal participation, to self-organize groups to improve your learning environment.
- You have a right to learn in an environment that is welcoming to all people. No student shall be isolated, excluded or diminished in any way.

***With these rights come responsibilities**:*

- You are responsible for taking care of yourself, managing your time, and communicating with the teaching team and with others if things start to feel out of control or overwhelming.
- You are responsible for acting in a way that is worthy of respect and always respectful of others.
- Your experience with this course is directly related to the quality of the energy that you bring to it, and your energy shapes the quality of your peers' experiences.
- You are responsible for creating an inclusive environment and for speaking up when someone is excluded.
- You are responsible for holding yourself accountable to these standards, holding each other to these standards, and holding the teaching team accountable as well.

CLASS MATERIALS & RECORDINGS

Class recordings are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Sharing of Course Materials is Prohibited

No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class without explicit, written permission of the instructor. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. The University is well aware of the sites used for sharing materials, and any materials found on such sites that are associated with a specific student, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity (Student Conduct and Academic Integrity) in the Office of the Dean of Students (Office of the Dean of Students). These reports can result in sanctions, including failure of the course.

ACADEMIC INTEGRITY

Each student in the course is expected to abide by the University of Texas Honor Code: "As a student of The University of Texas at Austin, I shall abide by the core values of the University and uphold academic integrity." **Plagiarism is taken very seriously at UT.** Therefore, if you use words or ideas that are not your own (or that you have used in previous class), you must cite your sources. Otherwise you will be guilty of plagiarism and subject to academic disciplinary action, including failure of the course. You are encouraged to discuss assignments with classmates, but anything submitted must reflect your own, original work. If in doubt, ask the instructor.
Students who violate University rules on academic dishonesty are subject to *severe* disciplinary penalties, such as automatically failing the course and potentially being dismissed from the University. **PLEASE do not take the risk**. We are REQUIRED to automatically report any suspected case to central administration for investigation and disciplinary hearings. Honor code violations ultimately harm yourself as well as other students, and the integrity of the University, academic honesty is strictly enforced. You are responsible for understanding UT's Academic Honesty and the University Honor Code which can be found at the following web address: https://deanofstudents.utexas.edu/conduct/standardsofconduct.php

UNIVERSITY RESOURCES FOR STUDENTS

Services for Students with Disabilities

The university is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Services for Students with Disabilities (SSD). Please refer to SSD's website for contact and more information: http://diversity.utexas.edu/disability/. If you are already registered with SSD, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

Counseling and Mental Health Center

The Counseling and Mental Health Center serves UT's diverse campus community by providing high quality, innovative and culturally informed mental health programs and services that enhance and support students' well-being, academic and life goals. To learn more about your counseling and mental health options, call CMHC at (512) 471-3515.
If you are experiencing a mental health crisis, call the CMHC Crisis Line 24/7 at (512) 471-2255.

The Sanger Learning Center

Did you know that more than one-third of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of Sanger Center's classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit http://www.utexas.edu/ugs/slc or call 512-471-3614 (JES A332).

Undergraduate Writing Center: http://uwc.utexas.edu/
Libraries: http://www.lib.utexas.edu/
ITS: http://www.utexas.edu/its/
Student Emergency Services: http://deanofstudents.utexas.edu/emergency/

BeVocal
BeVocal is a university-wide initiative to promote the idea that individual Longhorns have the power to prevent high-risk behavior and harm. At UT Austin all Longhorns have the power to intervene and reduce harm. To learn more about BeVocal and how you can help to build a culture of care on campus, go to: https://wellnessnetwork.utexas.edu/BeVocal.

IMPORTANT SAFETY INFORMATION

If you have concerns about the safety or behavior of fellow students, TAs or professors, contact BCCAL (the Behavior Concerns and COVID-19 Advice Line) at https://safety.utexas.edu/behavior-concerns-advice-line or by calling 512-232-5050. Confidentiality will be maintained as much as possible, however the university may be required to release some information to appropriate parties.

CLASSROOM SAFETY

- For any illness, students should stay home if they are sick or contagious, not only to stop the spread, but also to promote their personal wellness.

CAMPUS SAFETY INFORMATION

The following are recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767,

- Occupants of buildings on The University of Texas at Austin campus must evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- For more information, please visit emergency preparedness: https://preparedness.utexas.edu/

STUDENT EMERGENCY SERVICES

UT's Student Emergency Services (http://deanofstudents.utexas.edu/emergency/) provides assistance, intervention, and referrals to support students navigating challenging or unexpected issues that impact their well-being and academic success. If you need to be absent from class

due to a family emergency, medical or mental health concern, or academic difficulty due to crisis or an emergency situation, please register with Student Emergency Services. SES will verify your situation and notify your professors.

Emergency Evacuation Procedures

The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, http://www.utexas.edu/safety/

Coping with stress and personal hardships

The Counseling and Mental Health Center offers a variety of services for students, including both individual counselling and groups and classes, to provide support and assistance for anyone coping with difficult issues in their personal lives. As mentioned above, life brings unexpected surprises to all of us. If you are facing any personal difficulties in coping with challenges facing you, definitely consider the various services offered and do not be shy to take advantage of them if they might help. These services exist to be used.

Q Drop Policy

If you want to drop a class after the 12th class day, you'll need to execute a Q drop before the Q-drop deadline, which typically occurs near the middle of the semester. Under Texas law, you are only allowed six Q drops while you are in college at any public Texas institution. For more information, see: http://www.utexas.edu/ugs/csacc/academic/adddrop/qdrop

Title IX Reporting

Title IX is a federal law that protects against sex and gender-based discrimination, sexual harassment, sexual assault, unprofessional or inappropriate conduct of a sexual nature, dating/domestic violence and stalking at federally funded educational institutions. UT Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When unprofessional or inappropriate conduct of a sexual nature occurs in our community, the university can:

1. Intervene to prevent harmful behavior from continuing or escalating.
2. Provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation.
3. Investigate and discipline violations of the university's relevant policies.

Faculty members and certain staff members are considered "Responsible Employees" or "Mandatory Reporters," which means that they are required to report violations of Title IX to the Title IX Coordinator. **I am a Responsible Employee and must report any Title IX-related incidents** that are disclosed in writing, discussion, or one-on-one. Before talking with me or with any faculty or staff member about a Title IX-related incident, be sure to ask whether they are a responsible employee. If you would like to speak with someone who can provide support or remedies without making an official report to the university, please email advocate@austin.utexas.edu. For more information about reporting options and resources, visit http://www.titleix.utexas.edu/, contact the Title IX Office via email at titleix@austin.utexas.edu, or call 512-471-0419.

LAND ACKNOWLEDGMENT

We would like to acknowledge that we are meeting on Indigenous land. Moreover, (I) We would like to acknowledge and pay our respects to the Carrizo & Comecrudo, Coahuiltecan, Caddo, Tonkawa, Comanche, Lipan Apache, Alabama-Coushatta, Kickapoo, Tigua Pueblo, and all the American Indian and Indigenous Peoples and communities who have been or have become a part of these lands and territories in Texas, here on Turtle Island.

Readings

Fundamental Readings

Fairclough, S. H. (2009). Fundamentals of physiological computing. *Interacting with Computers*, *21*(1–2), 133–145. **https://doi.org/16/j.intcom.2008.10.011 (https://doi.org/16/j.intcom.2008.10.011)** **Link to the full text (https://physiologicalcomputing.org/wp-content/uploads/2015/03/fundamentals1.pdf)** from the author

Cacioppo, J. T., Tassinary, L. G., & Berntson, G. G. (2007). Psychophysiological Science: Interdisciplinary Approaches to Classic Questions About the Mind. In J. T. Cacioppo, L. G. Tassinary, & G. Berntson (Eds.), Handbook of Psychophysiology (3rd ed., pp. 1–16). Cambridge University Press. https://doi.org/10.1017/CBO9780511546396.001 **Chapter 1 PDF is uploaded (https://utexas.instructure.com/courses/1425666/files/85910072?wrap=1)** .

Working with data readings

Wickham, H. (2014). Tidy Data. Journal of Statistical Software

The Grammar of Graphics. (2005). Springer-Verlag. **https://doi.org/10.1007/0-387-28695-0 (https://doi.org/10.1007/0-387-28695-0)**

Peng, R. D., & Matsui, E. (2016). The Art of Data Science: A Guide for Anyone who Works with Data. Lulu.com.

Statistics readings

Navarro, D. J., Foxcroft D. R. and Faulkenberry, T. J. (2019). Learning statistics with JASP: A tutorial for psychology students and other beginners. https://learnstatswithjasp.com/

Spatz, C. (2019). Exploring statistics: Tales of distributions. (Selected chapters) **https://exploringstatistics.com (https://exploringstatistics.com)**

Eye-tracking readings

The Eye-tracking "bible": Holmqvist, K., et al. (2011). Eye tracking: A comprehensive guide to methods and measures. Oxford University Press.

Eye-tracking for UX book: Bojko, A. (2013). Eye tracking the user experience: A practical guide to research. Rosenfeld Media.

Eye-tracking for UX article: Pernice, K., & Nielsen, J. (2009). How to conduct eyetracking studies. Nielsen Norman Group. **Link (https://www.nngroup.com/reports/how-to-conduct-eyetracking-studies/)**
(PDF uploaded)

Adamczyk, K. A. (n.d.). Top Ten Misconceptions about Eye Tracking.

Bojko, A. (n.d.-a). Eye Tracking and Usability Testing in Form Layout Evaluation.

Bojko, A. (n.d.-b). Eye Tracking in User Experience Testing: How to Make the Most of It.

Bojko, A. (2006). Using Eye Tracking to Compare Web Page Designs: A Case Study. Journal of Usability Studies, 1(3), 112–120.

Bojko, A., & Stephenson, A. (n.d.). How eye tracking can help answer usability questions.
[PDFs uploaded for all above articles]

Su, C., Huang, M., Zhang, J., & Yang, R. (2023). The Application of Eye Tracking on User Experience in Virtual Reality. 2023 IEEE 2nd International Conference on Cognitive Aspects of Virtual Reality (CVR), 000057–000062. https://doi.org/10.1109/CVR58941.2023.10395365

More advanced articles on eye-tracking measures:

Very useful succinct review of eye-tracking measures:

Mahanama, B., Jayawardana, Y., Rengarajan, S., Jayawardena, G., Chukoskie, L., Snider, J., & Jayarathna, S. (2022). Eye Movement and Pupil Measures: A Review. Frontiers in Computer Science, 3. https://www.frontiersin.org/article/10.3389/fcomp.2021.733531
(PDF uploaded, open access)

Eye-tracking data and Entropy:

Krejtz, K., Duchowski, A., Szmidt, T., Krejtz, I., González Perilli, F., Pires, A., Vilaro, A., & Villalobos, N. (2015). Gaze Transition Entropy. ACM Trans. Appl. Percept., 13(1), 4:1-4:20. https://doi.org/10.1145/2834121

Krejtz, K., Szmidt, T., Duchowski, A. T., & Krejtz, I. (2014). Entropy-based statistical analysis of eye movement transitions. Proceedings of the Symposium on Eye Tracking Research and Applications, 159–166. https://doi.org/10.1145/2578153.2578176

Eye fixation detection algorithms:

Tobii. (n.d.). Tobii I-VT Fixation Filter—Algorithm Description.
Tobii I-VT Filter
(https://connect.tobii.com/s/article/Gaze-Filter-functions-and-effects?language=en_US) (PDF uploaded)

Salvucci, D. D., & Goldberg, J. H. (2000). Identifying Fixations and Saccades in Eye-tracking Protocols. Proceedings of the 2000 Symposium on Eye Tracking Research & Applications, 71–78. https://doi.org/10.1145/355017.355028

Komogortsev, O. V., Gobert, D. V., Jayarathna, S., Koh, D. H., & Gowda, S. M. (2010). Standardization of Automated Analyses of Oculomotor Fixation and Saccadic Behaviors. IEEE Transactions on Biomedical Engineering, 57(11), 2635–

2645. https://doi.org/10.1109/TBME.2010.2057429

Cognitive Load - Index of Pupillary Activity

Duchowski, A. T., Krejtz, K., Krejtz, I., Biele, C., Niedzielska, A., Kiefer, P., Raubal, M., & Giannopoulos, I. (2018). The Index of Pupillary Activity: Measuring Cognitive Load Vis-à-vis Task Difficulty with Pupil Oscillation. Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems, 282:1-282:13. https://doi.org/10.1145/3173574.3173856

Duchowski, A. T., Krejtz, K., Gehrer, N. A., Bafna, T., & Bækgaard, P. (2020). The Low/High Index of Pupillary Activity. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, 1–12. https://doi.org/10.1145/3313831.3376394

Ambient/Focal Attention - Coefficient K

Krejtz, K., Çöltekin, A., Duchowski, A., & Niedzielska, A. (2017). Using Coefficient to Distinguish Ambient/Focal Visual Attention During Cartographic Tasks. Journal of Eye Movement Research, 10(2), 10.16910/jemr.10.2.3. https://doi.org/10.16910/jemr.10.2.3

Krejtz, K., Duchowski, A., Krejtz, I., Szarkowska, A., & Kopacz, A. (2016). Discerning Ambient/Focal Attention with Coefficient K. ACM Trans. Appl. Percept., 13(3), 11:1-11:20. https://doi.org/10.1145/2896452

EEG readings

Wang, S., Gwizdka, J., & Chaovalitwongse, W. A. (2016). Using Wireless EEG Signals to Assess Memory Workload in the n-Back Task. IEEE Transactions on Human-Machine Systems, 46(3), 424–435. https://doi.org/10.1109/THMS.2015.2476818
(PDF uploaded)

Kumar, J., & kumar, J. (2016). Affective Modelling of Users in HCI Using EEG. Procedia Computer Science, 84, 107–114. https://doi.org/10.1016/j.procs.2016.04.073
(PDF uploaded)

Luck, S.J. (2014). An Introduction to the Event-Related Potential Technique

Makeig, S., & Onton, J. (2011). ERP Features and EEG Dynamics

Nicolas-Alonso, L. F., & Gomez-Gil, J. (2012). Brain Computer Interfaces, a Review. Sensors, 12(2), 1211–1279. https://doi.org/10.3390/s120201211

Wolpaw, J. R., Birbaumer, N., McFarland, D. J., Pfurtscheller, G., & Vaughan, T. M. (2002). Brain–computer interfaces for communication and control. Clinical Neurophysiology, 113(6), 767–791. https://doi.org/10.1016/S1388-2457(02)00057-3

Zander, T. O., & Kothe, C. (2011). Towards passive brain–computer interfaces: applying brain–computer interface technology to human–machine systems in general. Journal of Neural Engineering, 8(2), 025005.

Autonomic nervous system

Cacioppo, J. T., Tassinary, L. G., & Berntson, G. G. (Eds.). (2007). Handbook of psychophysiology (3rd ed.). Cambridge University Press. (Chapter 1 PDF uploaded separately)

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. Biological Psychology, 84(3), 394-421. **https://doi-org.ezproxy.lib.utexas.edu/10.1016/j.biopsycho.2010.03.010 (https://doi-org.ezproxy.lib.utexas.edu/10.1016/j.biopsycho.2010.03.010)**

Shaffer, F., & Ginsberg, J. P. (2017). An overview of heart rate variability metrics and norms. Frontiers in Public Health, 5, 258. https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2017.00258/full

Jerritta, S., Murugappan, M., Nagarajan, R., & Wan, K. (2011). Physiological signals based human emotion recognition: a review. IEEE 7th International Colloquium on Signal Processing and its Applications, 410-415.

Mandryk, R. L., Inkpen ,Kori M., & and Calvert, T. W. (2006). Using psychophysiological techniques to measure user experience with entertainment technologies. Behaviour & Information Technology, 25(2), 141–158. https://doi.org/10.1080/01449290500331156

Mauss, I. B., & Robinson, M. D. (2009). Measures of emotion: A review.

Biometrics for UX – Fall 2025

Instructor: Jacek Gwizdka, PhD

Assignments

- **Assignment 1: Eye-Tracking Study Design**

Design a simple eye-tracking experiment for a specific UX scenario. Students can choose a website, an app interface, or a product prototype. Students should outline the goals, define areas of interest (AOIs), and specify the eye-tracking metrics they plan to collect (like fixation duration, scanpaths, etc.).

- **Assignment 2: Analyzing Biometric Data (Eye-tracking, EEG and/or GSR)**

Students will work with a sample dataset (Eye-tracking, EEG or GSR), process data and analyze it. Either traditional statistical methods (like calculating means, t-tests) or a basic machine learning classification should be employed. Students should interpret what the biometric signals reveal about user experience.

- **Assignment 3: Multimodal Integration Project**

Students will work in small groups to propose a UX evaluation that combines at least two biometric methods, like eye-tracking and GSR. Students will outline how they would synchronize and integrate the data, and what kind of insights they hope to gain from a multimodal approach.

Grading Rubrics

Assignment 1: Eye-Tracking Study Design

- **Clarity of Objectives (20%)**: How well-defined are the research goals and questions?
- **Experimental Design** (30%): Are the AOIs, tasks, and metrics appropriate and well-justified?
- **Practical Feasibility** (20%): Is the study realistic in terms of equipment and participant management?
- **Written Presentation** (30%): Is the study design clearly documented and well-organized?

Assignment 2: Analyzing Biometric Data

- **Data Processing (25%)**: How effectively did the student apply preprocessing and artifact removal?
- **Statistical Analysis (25%)**: Are the statistical methods used correctly and interpreted accurately?
- **OR: Machine Learning Application (25%)**: Was a basic classifier implemented and explain the results?
- **Reporting and Interpretation (50%)**: Is the analysis well-documented with thoughtful insights?

Assignment 3: Multimodal Integration Project

- **Integration Plan (30%)**: How well did the group outline the synchronization and combination of multiple biometric signals?
- **Rational and Justification (25%)**: Is there a clear rationale for why they chose those methods and what they hope to learn?
- **Feasibility and Creativity (20%)**: Is the proposed project both feasible and innovative?
- **Group Collaboration (25%)**: How well did the group present their work together?

INF385T: Special Topics in Information Science : Biometrics 4 UX– Instructor: Dr. Jacek Gwizdka

Course Schedule (subject to change)

Fall 2025 - Mon. 12:00 PM - 03:00 PM

#	Date	Topic	Reading Assignment (readings and online discussions ***before*** class)	Assignments (due before class meeting, unless indicated otherwise)
1	Aug 25	Intro		
	Sept 1	Labor Day		
2	Sept 8	Theoretical Foundations	Fundamental readings	
3	Sept 15	Working with Biometric Data	Data readings	QS1
4	Sept 22	Biometric Signal Processing Pipeline	Signal processing readings	
5	Sept 29	Statistical Analysis for Biometric UX Data	Statistics readings	
6	Oct 6	Machine Learning Classification of Biometric Data	ML readings	QS2
7	Oct 13	Human visual system and Eye Tracking Fundamentals	Eye-tracking readings	
8	Oct 20	Eye Tracking Data Analysis	Advanced eye-tracking readings	QS3
9	Oct 27	Brain and EEG basics	EEG readings	A1
10	Nov 3	EEG Data Processing		
11	Nov 10	Autonomic nervous system measures (EDA, HRV)	"Autonomic" readings	A2
12	Nov 17	Multimodal approaches and Biometrics as input		QS4
13	Nov 24	No class: Fall break / Thanksgiving		
14	Dec 1	Review, Challenges & Future Directions		A3
15	Dec 8	Final presentations		P - Project report

Readings: Assigned articles and book chapters are listed on Canvas (Pages) in topical sections.

Assignments: QS – Question Set; A – Assignment; P - Project