

Course Title: Empathetic Design for Human-AI Collaboration

Course Description: This independent study explores the intersection of design, empathy, and artificial intelligence. Students will investigate the role of biometric feedback in creating empathetic AI systems, focusing on the development of a color-changing light system that responds to user emotions. Through a combination of design thinking, prototyping, and experimentation, students will create a tangible, interactive experience that demonstrates the potential of empathetic AI in enhancing human-AI collaboration.

Learning Objectives:

[I] Analyze the relationship between biometric feedback and emotional state

- Conduct literature reviews on the current state of biometric research, focusing on the correlations between physiological signals (e.g., heart rate, skin conductance) and emotional states (e.g., anxiety, excitement)
- Investigate existing biometric sensing technologies (e.g., ECG, GSR) and their applications in emotional analysis
- Develop a conceptual framework for understanding the emotional spectrum and its relationship to biometric feedback

[II] Design and prototype an empathetic AI system that responds to user emotions

- Develop a design brief outlining the requirements and constraints for the color-changing light system
- Sketch and prototype various design concepts for the light system, incorporating feedback from users and stakeholders
- Implement a working prototype of the light system, integrating biometric sensors and AI-driven emotional analysis
- Test and iterate on the prototype, refining its emotional responsiveness and user experience

[III] Develop a deeper understanding of the role of empathy in human-AI collaboration

- Research and analyze case studies on human-AI collaboration, highlighting the impact of empathy on collaboration outcomes
- Investigate the psychological and social factors influencing empathy in human-AI interactions
- Develop a theoretical framework for understanding the role of empathy in human-AI collaboration, highlighting its benefits and challenges

[IV] Explore the potential applications of empathetic AI in various fields

- Conduct a survey of industries and domains where empathetic AI could have a significant impact (e.g., healthcare, education, customer service)
- Research and analyze existing applications of empathetic AI, highlighting their successes and challenges
- Develop a roadmap for potential future applications of empathetic AI, outlining key challenges and opportunities

Deliverables:

- A functional prototype of the color-changing light system
- A written report detailing the design process, technical implementation, and testing results
- A presentation summarizing the project's findings and implications for empathetic AI
- A companion interface for Nitr0, integrating the biometric sensor data and AI-driven emotional analysis

Reports:

HRV Algorithm & Biometrics

[MAT] Write a report detailing the implementation and results of the HRV analysis algorithm

[MAT] Write a report detailing the refined HRV analysis algorithm

[HMX] Write a report detailing the design and specifications of the biometric sensor interface and data acquisition protocol

[DES] Write a report detailing the refined design and prototype development

Emotional State Classification Model

[DES] Write a report detailing the refined emotional state classification model and experiment results

[MAT] Write a report detailing the development and implementation of the emotional state classification model

Testing and Experimentation Results

[DES] Prepare a written report detailing the design process, technical implementation, and testing results

[MAT] Write a report detailing the system-level testing and refinement

Course Timeline

PLANNING & PROTOTYPING		
Week 1-2 Literature review and biometric feedback analysis	Week 3-4 Design brief and prototype development	Week 5-6 Technical implementation and testing
<ul style="list-style-type: none"> Introduce the concept of empathetic AI and biometric feedback Brainstorming and idea generation for the color-changing light system Conduct a literature review on the applications of biometric signal processing in empathetic AI 	<ul style="list-style-type: none"> Develop a detailed design brief and specification for the light system Research and select biometric sensors and AI frameworks for integration Conduct experiments to evaluate the performance of the emotional state classification model 	<ul style="list-style-type: none"> Implement and prototype the color-changing light system Integrate biometric sensors and AI frameworks Conduct experiments to evaluate the performance of the emotional state classification model
M1	M2	M3
<ul style="list-style-type: none"> Students submit a brief written summary of their ideas and proposed approach Feedback and guidance provided by instructor 	<ul style="list-style-type: none"> Students submit their design brief and specification documents Feedback and guidance provided by instructor 	<ul style="list-style-type: none"> Students demonstrate a functional prototype of the light system Feedback and guidance provided by instructor

ITERATION AND DEPLOYMENT		
Weeks 7-8 Integration of biometric sensor and AI framework with designed interface	Week 9 Finalize report, presentation, and prototype preparations	Week 10 Final project presentation and demo
<ul style="list-style-type: none"> Refine and iterate on the prototype based on feedback [MAT] Design and develop a customizable interface for the empathetic AI system [DES] Implement a real-time data streaming system to enable seamless communication between the biometric sensor and the emotional intelligence system Write a report detailing the integration of the biometric sensor and AI framework with the designed interface 	<ul style="list-style-type: none"> Prepare a written report detailing the design process, technical implementation, and testing results Write a report detailing the implementation and testing results Prepare a final project presentation and demo, showcasing the empathetic AI system and its capabilities Rehearse the presentation and demo to ensure a polished and professional delivery 	<ul style="list-style-type: none"> Prepare a final project presentation and demo, showcasing the empathetic AI system and its capabilities Rehearse the presentation and demo to ensure a polished and professional delivery
		Week 10+ Future development.
		<ul style="list-style-type: none"> Identifying areas for improvement and optimization Outlining potential new features and capabilities Developing a roadmap for future development and integration
M4	M5	Final
Submit a final system implementation and a report detailing the refinement and optimization process.	<ul style="list-style-type: none"> A functional demonstration of the biometric signal processing and machine learning components A visual representation of the system's output, such as a dashboard or interface 	<ul style="list-style-type: none"> Deliver the final project presentation and demo, receiving feedback and evaluation from the instructor and peers A detailed report outlining the system's performance, limitations, and potential applications

Notes:

The deliverables we outlined are indeed reasonable, given the scope and timeline of the independent study. By focusing on the design and prototyping of the color-changing light system, students can still gain valuable hands-on experience with empathetic AI and biometric feedback, even if we don't fully achieve objectives 3 and 4.

By prioritizing the development of a functional prototype and a written report, we can ensure that students demonstrate a solid understanding of the design process, technical implementation, and testing results.

The presentation summarizing the project's findings and implications for empathetic AI can serve as a culminating experience, allowing students to showcase their work and share their insights.

My initial concerns are the technical implications. Finding a biometric sensor we can use, as well as a platform for Nitro (AI Partner) to interface with this sensor are what I sense to be the primary concerns of the other independent study, but also the biggest obstacles to overcome.

The technical implementation and testing will build upon the biometric signal processing and emotional state classification work done in the Math Independent Study.