

9ECT

240 hours

Research Elective | Machine Learning for Design

Student: Joram Boumans

Mentors: Dave Murray-Rust Jacky Bourgeois

Learning Objectives

- Develop proficiency in conducting design research and adeptly evaluating its outcomes.
- Acquire the capability to analyze Machine Learning models, comprehending the intricacies of the underlying programming.
- Cultivate the skills to design for data-driven and machine learning systems, with a focus on creating innovative value.

This project is an extension of a prior research endeavor that successfully developed a machine learning system for classifying product usage events (Doorn et al, see link). Employing a range of machine learning techniques, the project has yielded a toolkit designed to empower designers in understanding and analyzing the data generated by their designs. The system takes input from various sensors that capture the product's actions.

The aim of this research elective is to delve into this toolkit and uncover new opportunities for further feature development and applications. This involves exploring scalability to reach a larger audience of designers, optimizing model performance, and enhancing general usability and added value.

Brief

This research elective is geared towards advancing the Machine Learning for Design toolkit to its next stage. Our objective is to pinpoint fresh opportunities and devise innovative ways to interact with the system, while also delving into design optimizations within the system itself. As we map out these new opportunities, we'll concurrently develop new features. Ultimately, the research will culminate in a thorough evaluation of the iterations made on the model, providing valuable insights into the enhancements implemented.

Research Questions

Possible research questions:

- How can the toolkit be scaled effectively to cater to a larger audience of designers with varying levels of expertise in machine learning and sensor data analysis?

- How can the toolkit be designed to enhance data immersion and understanding for designers, allowing them to gain deeper insights from sensor data for their design projects?

- What features or functionalities can be added to support effective communication and knowledge sharing among designers using the toolkit?

Expected Deliverable

Primary deliverable:

A research paper will serve as the main outcome and deliverable of this research elective. It will encompass the approach, methodology, findings, and insights derived from the research project focused on supporting designers in their utilization of sensor data through the Machine Learning for Design toolkit.

Approach / Plan

The research will be divided into three sections, each being 3 ECT in total spread along 3 quarters

2023 Q2	2024 Q3	2024 Q4
3 ECT	3 ECT	3 ECT

Phase 1: Explore Opportunities During the initial quarter, the focus will be on immersing in the intricacies of the existing Machine Learning model. This entails a comprehensive exploration of current features and the proactive identification of opportunities for enhancement by doing an autobiographical study. This will be done by creating multiple use cases individually and analyzing the different outcomes, resulting in the insights that will map out further opportunities

Phase 2: Design & Development The subsequent quarter will be dedicated to translating the opportunities unearthed in Phase 1 into tangible solutions. This involves the design and development of features and functionalities that align with the identified opportunities. The overall goal for these solutions is to facilitate the designers in their process when using sensor data to improve their design solutions. The solutions developed in this phase should bring forward a better understanding of the designer needs and improve data immersion & understanding.

Phase 3: Insights & Testing In the final quarter, efforts will shift towards validating the efficacy of the newly designed solutions. This phase will involve rigorous testing with users to ensure that the implemented solutions generate insights about the expected outcomes. This should result into a better understanding of the context, where designers can be supported more effectively in using machine learning during the design process.