

Introduction to Data-Enabled Design

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ABSTRACT

During the Introduction to Data-Enabled Design (DED) course attendees will learn about designing for intelligent ecosystems while using data as a creative material. We will take the course participants through both major steps, contextual and informed, of this method by means of data collected (upfront) from the attendee's personal context. This course offers a careful balance between hands-on work and DED theory. The learning outcomes focus on topics of (physical) prototyping, (remote) data collection and analysis, using data as a creative material, and designing remote interventions.

CCS CONCEPTS

• **Human-centered computing** → **User studies; Field studies.**

KEYWORDS

data design, context, behavior, experience, prototyping, situated explorations

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1 BENEFITS

Although data plays an increasingly important role in the intelligent products, services and systems we design for, it is not yet so present in contemporary design processes. Established data design methods, as data-driven design [4], emphasize the power of data to evaluate and validate design decisions. Data-enabled design (DED) [5] provides a more designerly perspective, where data is used as creative material to inspire and inform new design interventions. DED is characterized as a quick and iterative approach that sets out to design, deploy and remotely adapt prototypes while they are situated in the daily life of people. Design researchers and practitioners use DED to acquire in-depth contextual insights of both

quantitative and qualitative nature, and inform their subsequent, iterative design steps.

Participants of this course will learn how to use data as creative material for design, both at conceptual and at hands-on prototyping level. We will show participants how to setup and execute contextual design explorations that are open and flexible so they allow for a variety of contexts, scenarios and situations. Participants of this course will collect contextual, behavioral and experiential data using both sensor data and qualitative data in the form of data-enabled interviews and self reports. During the course the instructors and participants will together analyse the collected data to discover rich and nuanced personal stories and design opportunities.

This course not only serves as a platform to teach the DED methodology, but is also meant as a place where different designers working with data can connect with each other and share their experiences around designing with data. The assignments will be done in groups of three or four participants, to stimulate an exchange of knowledge, and to allow participants to familiarise themselves with methods that others are using to design with data.

2 INTENDED AUDIENCE(S)

This course will be open to a diverse audience of design researchers and practitioners working already with data in design—and also those starting out in the field. We welcome Master and PhD students, but also more seasoned researchers who are willing to learn more about the data-enabled design methodology. Besides an academic audience, we are also looking for an audience of practitioners who are using or wanting to use data in their design practice.

This entire course will take place at the conference venue, as prototyping is an important part of the course. Materials for preparation will be shared prior to the conference. Limited materials and equipment will be available for ad-hoc participants. We are committed to create a workshop experience that is accessible and enjoyable for everyone attending.

3 PREREQUISITES

There are no prerequisites for this course other than an affinity with either design or data, or both. No scientific pre-knowledge is needed. Participants will conduct multiple exercises during the course in teams. We will make sure that these teams are complimentary in terms of data and design knowledge, based on a form that we will ask the participants to submit beforehand. A similar approach has proven successful in other DED courses: multi-disciplinary teams are important to the open-endedness and richness of qualitative insights and have always led to interesting collaborations.

*Both first and second author contributed equally to this proposal.

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Experienced data designers are welcome to bring their own data trackers to use within the course, although they are requested to discuss this with the instructors beforehand to ensure compliance with international cross-border data protection requirements.

4 CONTENT

The main objective in this course is to offer designers and researchers an opportunity to experience what it is like to conduct data-enabled design projects. There will be a balance between theoretical background and hands-on experience with the methodology, as working with the data is just as important to a meaningful understanding of the methodology as the theory. The content will be spread over three sessions of 75 minutes, ideally with sessions taking place on different days. In the event that this is not possible in scheduling, we will make small changes to the program in order to accommodate for a shorter data collection period. This could be done by either asking participants to collect data prior to the conference, or by providing a data set that was collected by the instructors.

4.1 Session one (150 minutes)

The first session of the course focuses on the introduction to the DED methodology, in a 20-minute introduction with material from the DED PhD thesis [5], specific application cases that were conducted at Philips Experience Design [1, 3, 6, 7], as well as some examples from projects by students created in a DED course in our Master program. After the introduction, the teams will get time to discuss what kind of data they want to gather. We will facilitate a quick prototyping session that enables the teams to create their own design probes (the teams can choose between prototypes, and off-the-shelf products with tracking capabilities) and connect them to a cloud-based Data-enabled Design Canvas, called Data Foundry [2]. There will also be some room to adapt the sensors to cater to the team's interest, for example, by adding a layer of qualitative probing techniques on top of the sensor data. We will also provide a sensor kit that includes Flic buttons¹ (simple push buttons to keep track of specific behaviours), Arduino board(s)², air quality sensors, fitness trackers (for step count and heart rate) and an app that can facilitate manual exports of Google Fit and/or Apple Health data from your phones. We will test together whether data is collected properly and each team will be assigned another team that will use their prototype for data collection during their time at the conference.

The course setup and the data collection that will happen as part of the course has already been approved by the Ethical Review Board of our own university.

4.2 Session two (75 minutes)

The second session will again start with a theoretical introduction, covering how to use the collected data to find meaningful insights, making sense of both quantitative and qualitative data and connections therein. This will be followed by another hands-on exercise of data visualization, data annotation and qualitative interviews based on the sensor data. Tools and templates will be provided for

the participants to streamline this process. The teams will then get the opportunity to interview the individual of their assigned team that used their data trackers in a data-enabled interview [5]. The teams will receive guidelines and pointers to use the gathered data in these interviews, which will help them to identify interesting contextual patterns, trends, and outliers in the data. We will end the course with a discussion amongst all participants about how to use the methodology in their own work and how to move the methodology forward. This discussion will evolve around how to apply the methodology in diverse contexts, where we will share our own experience of using it in clinical, industrial and educational contexts, and modifications that were required to successfully apply application area-specific variants of DED as described in [8].

5 PRACTICAL WORK

During this course, the participants are expected to actively engage with the instructors and the other participants through several exercises. Diverse teams will be created based on participants' backgrounds and interests. The exercises will include the prototyping of a set of data trackers, data analysis and annotation, and data-enabled interviews. These activities will be conducted in a lively workshop setting with all instructors available to help the teams with any questions, and to provide feedback on their work. Between session two and three, one member of each team will track personal data with the data trackers of another team to generate data to be used in the final session. Most of this data tracking is expected to happen in the periphery without requiring too much attention on the days that the course is not taking place.

6 INSTRUCTOR BACKGROUND

Peter Lovei is Data Designer at Philips Experience Design and PhD candidate at the Industrial Design department of Eindhoven University of Technology (TU/e). His main research interest lies in the intersection of computer science and design research. He is applying and improving the data-enabled design process by developing scalable and modular components that can be applied across a wide range of care pathways. He is achieving this via his research through design projects around the topics of sleep, pregnancy, elderly care, improvement of clinical care for cardiovascular patients, and patients who underwent a bariatric surgery. He is one of the lecturers in the Data-enabled Design Master course. In his lectures he is explaining the technical background of DED and how to scale the approach in larger studies.

Renee Noortman is a doctoral researcher in the department of Industrial Design at Eindhoven University of Technology. She has a background in interaction design and user-centered design. Her research is focused on expanding the data-enabled design methodology by using storytelling to give meaning to data and future data practices. She works on multiple projects around envisioning the future of healthcare through speculative design, design fiction and data-enabled storytelling, in collaboration with Philips Experience Design and various hospitals. She is one of the lecturers in the Data-enabled Design Master course, providing lectures and workshops on the user-centered aspects of the methodology and how to meaningfully collect and use qualitative data.

¹<https://flic.io/>

²<https://www.arduino.cc/>

Mathias Funk is an Associate Professor in the department of Industrial Design and is interested in design theory and processes for systems, designing systems for musical expression, and designing with data. He has a background in computer science and electrical engineering. His main research interest is how designers can design with and for data and systems behavior. He works primarily on design tools and the layers between engineering and modern industrial design. He is the responsible lecturer for the Data-enabled Design course in the Industrial Design Master program of Eindhoven University of Technology.

7 RESOURCES

We will introduce the course participants to our data-enabled design toolkit, that helps in running remote data-enabled design explorations. We will follow the Data-enabled Design PhD thesis by Kollenburg and Bogers [5], as well as our own work that extends this work towards micro intelligence and storytelling. For the hands-on sessions, we will provide templates for the course participants to use, in order to speed up the process and to fit the content into the three 75-minute sessions.

To allow for a quick and streamlined process, much of the infrastructure for the data collection will be provided to the participants. This includes a set of sensors and a cloud-based data collection infrastructure, as well as templates that assist in data analysis and the presentation of the narratives.

The three sessions will have a workshop character and make use of projection screen and working tables. Ideally, tables can be arranged in a flexible way to support both instructive and interactive moments in the course.

8 ACCESSIBILITY

The course is open to everyone, we strongly encourage a diverse audience. Data-enabled design looks at “personally big data”. This means that we have an explicit focus on the data stories of individuals and individual contexts, and we cherish the richness that comes from gathering and, most importantly, understanding the nature of personal data narratives. The data-enabled toolkit is diverse to cater to different data tracking needs and to customise to individual preferences. All participants will be instructed to be mindful and respectful towards individual boundaries, in terms of in-class interaction as well as data collection and inquiry. The activities during the workshop do not require significant physical strain, and all course materials will be inclusive, by e.g. providing all theory in PDF format with alt-text available prior to the start of the course.

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