

# Internship report

internship at the Computational Design Systems research cluster

Sep 24 – Jan 25

by Jort Wiersma

company coach: Mathias Funk

teacher coach: Lu Yuan

Eindhoven, 06.01.25

```
[
  {
    role: 'assistant',
    content: 'Hello! You just entered a report by Jort Wiersma. How can I help you?'
  },
  {
    role: 'user',
    content: {
      type: 'text',
      content: 'input'
    }
  },
  {
    role: 'assistant',
    content: 'You want to learn more about his internship? Of course! We can help you with that!'
  },
  {
    role: 'function',
    content: 'textToText',
    prompt: 'You are a very enthusiastic assistant. Generate an internship report.'
  }
]
```

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## **Summary**

This report describes my internship at the Computational Design Systems research cluster at Eindhoven University of Technology. During the internship I worked on different projects aimed at making it easier for design students to create prototypes that incorporate AI. Among the results are two JavaScript libraries to support different types of students. Both of those will be used by students in the Artifice squad starting next Semester.

## Introduction

This semester I spent my time working on different AI-related design projects for the Computational Design Systems (CDS) research group at Eindhoven University of Technology where I was coached by Mathias Funk. During this time, I worked on three main projects. The first was designing and developing a JavaScript library that reduces the entry barrier of coding with AI for Industrial Design students (and also staff members). The library is able to pack hundreds of lines of code into as little as one intuitively written line. The second project was to design three example iterations for the Designing Conversational Experiences Master's course. These examples were used by students to help them understand how to build a physical-digital AI embodiment. In the third and final project I did research to find out how to best support students in quickly picking up the available AI tools to use them in their design projects, and I designed a solution to accompany this. In addition to these projects, I have had the opportunity to join the CDS group in their collaboration, which gave a unique perspective in professional academic life of both PhD students and professors. This report describes my activities, goals, learnings and reflections during this internship.

## Company Description

The CDS research group creates a collaborative environment for professors and PhD students who share an interest in technology in design. The research group is a fairly new structural group that was created as the result of a bottom-up effort to reorganize the Industrial Design faculty. Before, the faculty was organized in much larger research groups in which it was difficult to find common ground. Since this reorganization is fairly recent still, and the CDS cluster only got their own space during the time I was doing my internship, the purpose of the group and their shared activities were still in a re-invention process, which practically meant that I have been able to witness discussions on possible writing retreats, research discussions and who would organize those, how to find others in the cluster that work on overlapping topics, or how to design the common space. Please find a visualization of my interpretation of the cluster's organizational structure below, as well as a supporting explanation.



figure 1 - an impression of some of my days

The schematic shows the CDS research cluster and members in it. Some members of other clusters are “friends” (dashed arrow from member to cluster) to the CDS cluster, and join some of the activities or meetings without being a direct member. The cluster has a secretary, who takes care of organizational issues. Within the cluster, there is a very flat hierarchical structure. The cluster lead mostly has the function of a chairman as they organize and plan meetings but take input from all members. The PhD students are supervised by professors, and they do not join all cluster meetings. The CDS cluster is unique in that the members are part of the same squad (Artifice), so they work together in teaching as well as research. Squad members have obligations to external (funding) organizations, who make part of their research possible. These obligations exist both on a cluster and individual level. The schematic below highlights this individual level. The different members support PhD students, teach to students, conduct research together as well as alone, have research obligations to funding organizations, get support and feedback for their teaching from Teacher Support and are managed on a departmental level.

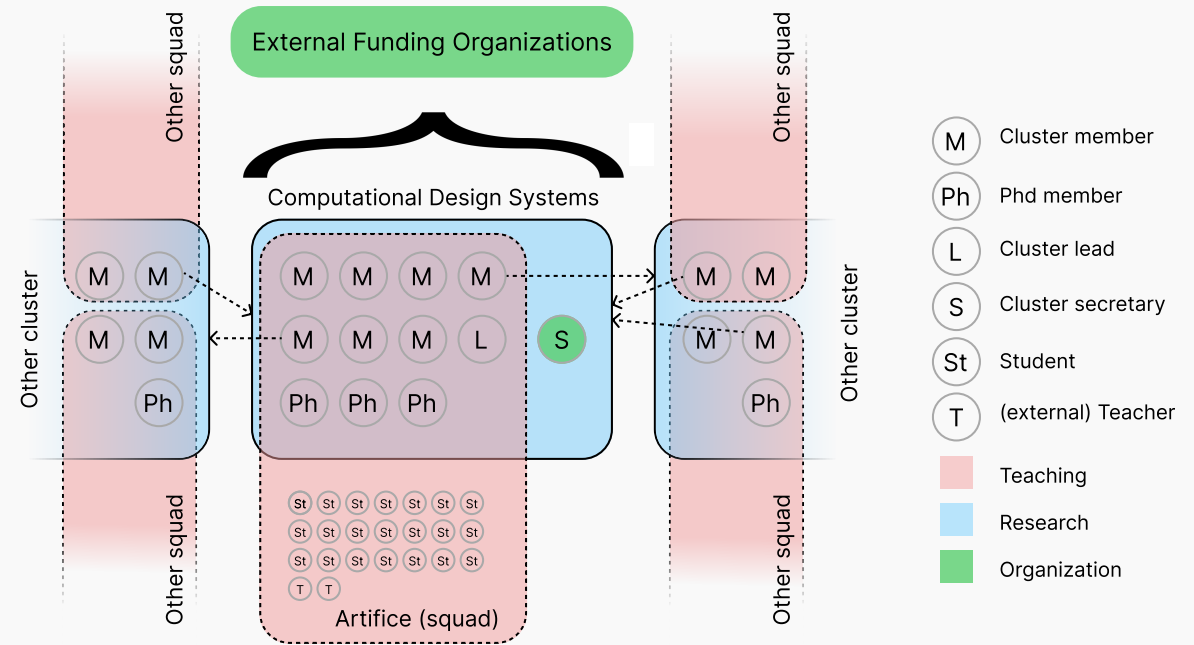


figure 2 - my impression of the company structure on team level

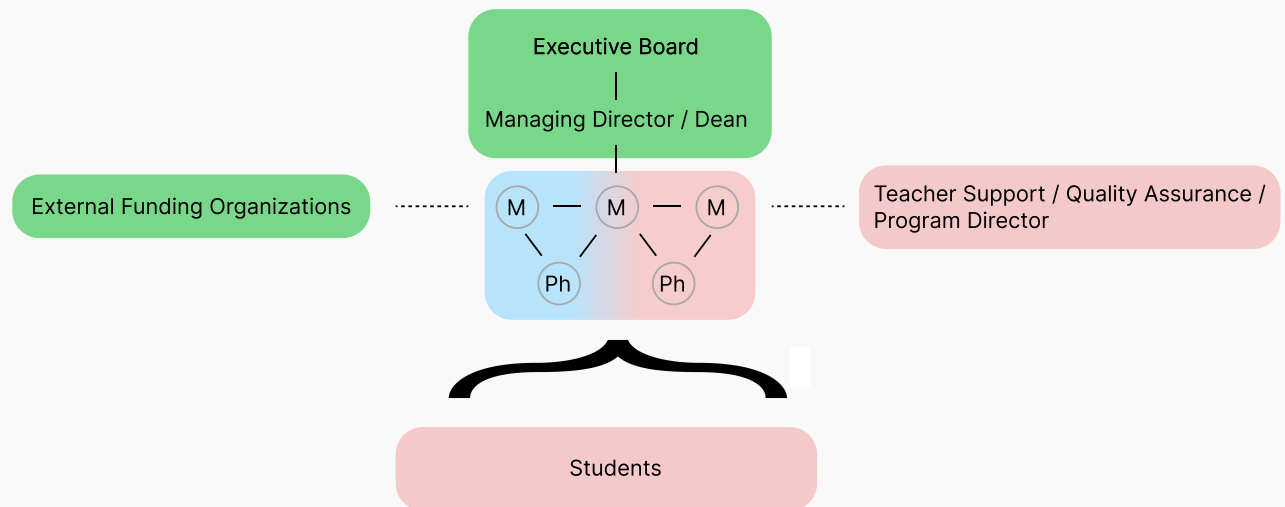


figure 3 - my impression of the company structure on individual level



Being part of the research cluster gave me a unique insider perspective on academic life. Before, I viewed PhD students the same as professors: teachers that do research. However, when I joined cluster meetings, it was very clear that the PhD students were young and passionate students, eager to take on any learning opportunity, but also to have fun. They look up to their supervisors and are looking to prove themselves. In addition, I never knew professors spend this much time writing papers.

My role as intern in the cluster was not one most members were used to, but involved - besides my own projects that took up most of my time - introducing members to the new LLM tools in Data Foundry, creating example code projects for students in Artifice, listening to cluster conversations, and helping out at the Design & AI Symposium during the Dutch Design Week. As a work setting, I usually worked from home, only coming to university for specific events, a few lectures, and company coach or cluster meetings. This involved creating my own scheduling and keeping myself responsible to follow it.

## Goals

### Professional development goals:

The goals I set for my personal development evolved over time. Appendix E describes how these goals came to be and refers to influences of previous projects and experiences, as well as reasoning for the goals you find below. I was attracted to this internship as it would allow me to deepen my expertise in T&R while designing for a real user group, and because it would be a very different experience compared to my previous projects, which suits my PI&V well.

- My internship is remote. This offers a unique challenge: I am forced to schedule my own time, decide what to do, report and ask for feedback. The resulting goal is to take care of my own schedule and learn to be responsible for my own planning and goals during day-to-day activities (B&E).
- Support research and education (U&S, C&E), and gain understanding of academic design professional life (B&E). I will be working for and with researchers, teachers, and students. The internship gives me unique opportunities to understand different perspectives at the university. By supporting research and education I will gain an understanding of both of these, and perhaps gain a unique view in PhD life.

- Take an explorative approach (D&RP) that builds upon my learnings of a similar approach during my Project 3. Work on physical-digital and digital projects that are both exciting and purposeful, with a larger emphasis on digital projects (T&R, MD&C). I will be working a lot with AI, and as follows from my vision I find it important to work on a project I enjoy, while attempting to create a purpose for it. I want these projects to be both physical-digital and (with a higher emphasis) digital, as these will form adequate challenges while remaining within my field of expertise and the boundaries of the internship. In addition, I will not only focus on the development of these areas but also their use and creative perspectives. Specific skill areas I will focus on:

- Digital: JavaScript, Large Language Models, Data, Arduino, Github, Open-source code and larger codebases
- Physical-digital: Arduino, 3D modeling
- Develop my ethical opinion and future perspective of AI developments (Vision).

### Client-set goals:

“Design and develop a design-oriented library for prototyping with local AI models in different modalities and in different

### Background:

In the current state, many students in Artifice engage in design processes that are very conceptual until late stages of the process. Some making is done, but this is very time-consuming, sometimes done only by one group member, and focussed on the technology rather than on the design. Currently, the entry barrier for making with AI tools is high: it requires coding (often learning a new code language), downloading and installing complex files or systems, tuning settings, and researching possibilities. As a result, students choose to only start making when they are sure what exactly they want to make. This reduces the possibilities as well as time for testing, exploring, failing, and learning. If it were easier to try out different things, AI's, and techniques, the design process would be enriched. Many designers do not have the goal to become a great code expert. There are possibilities to design tools to make sure designers don't need to become one to be able to design with AI.

### Overview of activities

This report cannot describe all activities and projects in detail, and will highlight one project to present the design process, learnings, and reflections. The following table presents the different projects and activities for reference. To learn more about each individual project, please refer to appendix D. Many of the results are open-sourced and available on GitHub. The links to these GitHub repositories are presented in appendix E.

#### AI Foundry Library

Goal: to design and develop an all-in-one tool that removes the need to solve a wide variety of expected coding problems by providing various commonly used interactions and integrating this with Data Foundry. document this well to support the understanding of different audiences.

The JavaScript library is already being used in the projects of a select group of Artifice students and students in the Designing Conversational Experiences Master course. Next semester, it will be presented to all Artifice students.

```
async function example() {  
  let selectedImage = foundry.fileSelector('image')  
  let result = await foundry.imageToText({  
    api_token: 'df_abc123...=',  
    image: selectedImage,  
    prompt: 'describe this image'  
  })  
}
```

The image shows two small monkeys playing on a rock...

```
let result = await foundry.textToImage({  
  api_token: 'df_abc123...=',  
  prompt: 'A tall man in a wild west saloon',  
  steps: 25  
})
```

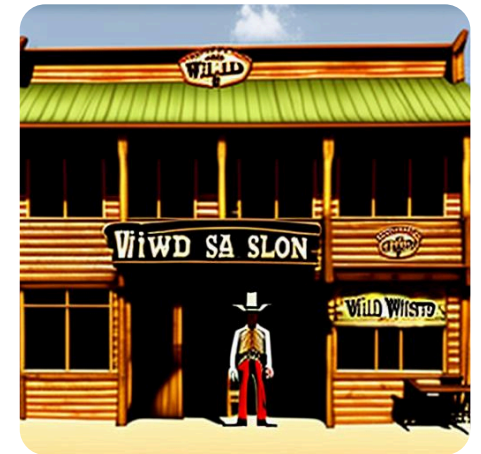


figure 4 - two examples of the functionality of the AI Foundry Library

### Example project for Master Course

Goal: to create three example iterations of a design project surrounding a human-AI conversation. The first iteration should be a scripted chatbot (no AI), the second iteration should be the same conversation but with AI integration, the third iteration should allow for physical interaction to enrich the conversation. The example iterations should be clear and simple, leaving room for student creativity.

### ConvoScript

Goal: to design a way for design students that are inexperienced in coding to make explorations and prototypes with different AI tools easily, while increasing their understanding of how they could create more complex AI interactions. Result presented in the next section.

### Miscellaneous

Other activities include

- Attending and helping out at the Design & AI Symposium during the Dutch Design Week
- Attending research cluster meetings
- Helping a PhD student to define their approach in using the Data Foundry AI tools for their research
- Presented and explained example projects to master students
- Helping out different Artifice students with problems they encounter in their coding (which helped me in my understanding of their needs)

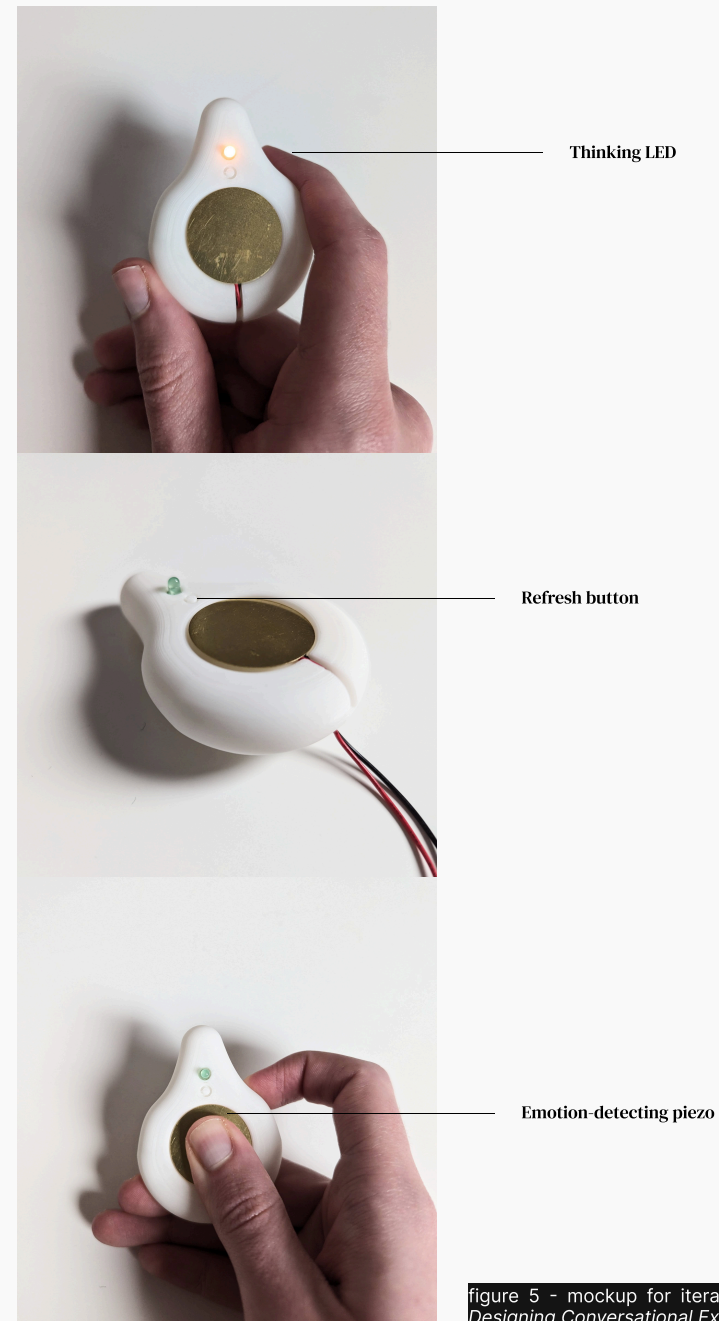


figure 5 - mockup for iteration 3 of the examples for *Designing Conversational Experiences*

## General Design Process

Before highlighting details, I want to highlight the process more generally. Very often, following up on my goals, an explorative process has been taken that uses code (usually JavaScript) as a material. With the goal in mind, different options are built on a basic level in order to experience their strengths and weaknesses. These options are made without planning them conceptually in an in-depth way. Each prototype is part of the process and some elements are taken from each one, while also learning from mistakes during development and interacting with it to understand the user perspective.

During the internship I was lucky to have a defined user group: specifically one that I can relate to very well (design students, especially those in Artifice). In a design process where the user group was less defined or less available, I would have spent more time on evaluation and done more in-depth user testing. Also, a slightly less experimental approach could have been taken to allow more time to increase my understanding of the user needs.

Of course, not only user needs were accounted for, but also business needs. The internship has been different from a squad project in that the result has to be fully functional and needs to work within the existing

system. In this case, the code had to be flexible enough to be used in other organizations (as it would be open sourced) and should not interfere with other parts of the codebase. This sometimes meant compromising user experience or quality of interactions. Other recurring elements of the process have been striving for simplicity to keep the code lightweight and understandable, constantly documenting the code for both users and developers, and discussing the progress with the client for feedback.

## Design process of creating ConvoScript

Although multiple projects were worked on alongside each other to make designing and exploring with AI tools more accessible for design students, I will highlight one of them as an example of the design process taken as well as my learnings. The other projects can be found in the overview of activities above, and are described in more detail in the appendix.

This project started from the understanding that not all students are experienced in coding languages, nor do all of them want to spend time learning those as part of their design projects. Still, we want to enable those students to design with AI technologies in an explorative manner, and give them the opportunity to make

prototypes that include AI on different levels of complexity. This project started at a point in time when the AI Foundry Library (see overview of activities) was already available, so the design of this project should supplement the library, and not substitute it. That means the result of this project will be something targeted to the more novice coders among design students, who find it daunting to use the library. A sub-goal for this project was to be just technical and difficult enough to let students playfully learn how AI tools can be engaged with, how they can be connected together, how they can support each other, what can be made with them, and how they should be communicated with.

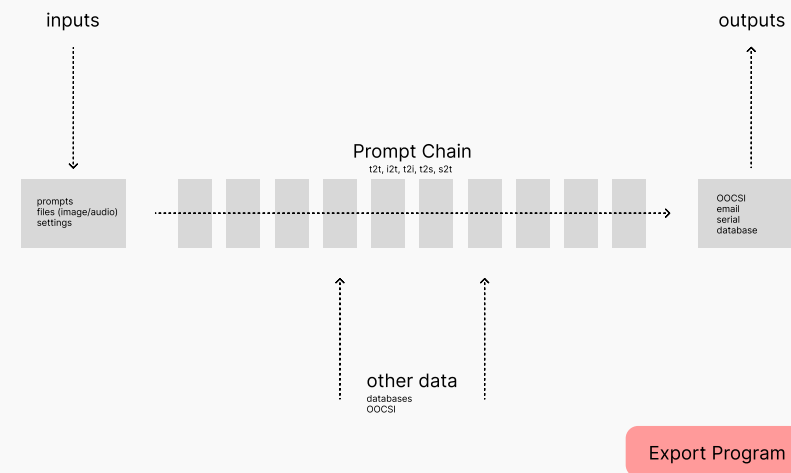


figure 6 - illustration of how one conceptual plan was visualized for communication with the client (details not of importance)

I proposed a few ideas to achieve this and swiftly made minimum viable products for testing and comparison:

- A fully graphical user interface for creating AI tools that utilizes drag-and-drop elements to design prototypes, which would allow for various inputs and outputs to connect this digital program to physical prototypes (fig. 8)
- A text-based solution where users can write text in a specific format resembling the common ways to communicate with AI, which would effectively have the same result as the previous solution but would lead to increased understanding of AI tools (fig. 7)
- A similar but JSON-based solution where users can specify messages (to and from the AI) to create a human-AI conversation following the exact style used by common AI tools
- A “zero-to-hero” manual that aims to get all students to a minimum level of experience that is required to understand the AI Foundry library. This would remove the need for a separate tool.
- And variants of those

Additional images of explorations are available in appendix G.

figure 8 - prototype for graphical user interface to completely remove burden of having to code

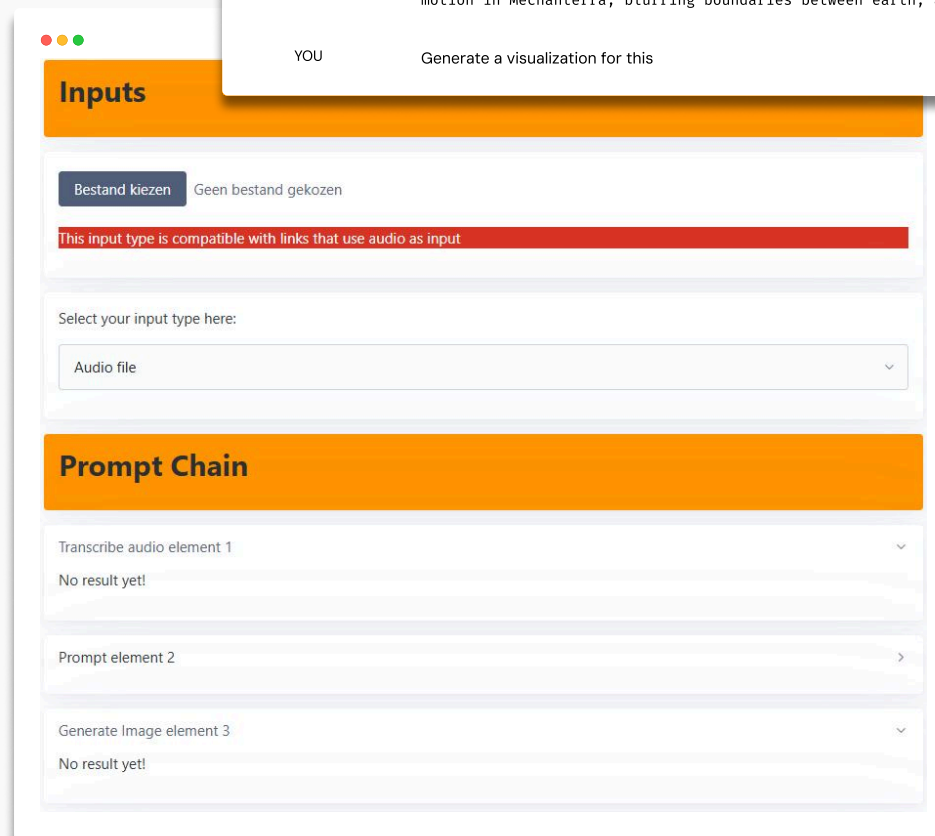


figure 7 - prototype for a conversation-style solution. For the first time a distinction was made between user view and designer view



It seemed to me that the quality of the comparisons could have been improved by organizing dedicated user tests, but instead the different proposals were discussed with the client, compared, and only quickly shown to a few potential users for general feedback. A real user test was not deemed necessary as these evaluation methods were sufficient for this stage in the process.

The conversation styling worked quite well as it was easy to understand, flexible, and applicable to different kinds of projects while also being useful stand-alone. In addition, it allows for a formatting that teaches how to communicate with AI, as does the required structure. It is more difficult to understand compared to the fully graphical interface, but will be a better bridge to the AI Foundry library which is more capable. The JSON style would be replaced by JavaScript style to be more similar to the library. The “zero-to-hero” manual would be useful generally but does not fit the goals as it is still labour-intensive to the user.

From there, specific requirements were founded and development began (which still included many design decisions). The result should be an app where users can program a partially scripted conversation with AI in a style that is very similar to

the messaging structure LLM’s use (as tested before). The user will only need to write the messages, and will be able to include AI functions and ask for user input in the same message style. The app should have understandable documentation, as well as examples to support understanding. The user group will be extended to other novice coders interested in making with AI. This way it can be used in design education and in AI-related workshops.

While making this app, the additional need to be able to use results of the created conversation in design projects was established, so the described app was to also be created in library form. This way it can be better manipulated and included into both physical and digital design projects.

The development of this app and library (together: ConvoScript) posed additional problems that created friction between technological quality and usability. As an example, I wanted users to be able to refer to the conversation they created in code, making the conversation (array) self-referential. For this to work I was forced to make sacrifices to the flexibility of the code which could lead to unexpected errors. This is, of course, not great for the user experience and makes it more dangerous to include this code in larger

codebases. This example is not singular: for some problems a technical solution was found, while for others the interaction was changed.

The process has been comparatively linear, especially for a process that aims to take an explorative stance. It should be noted that this process happened in the last few weeks of the internship, during which time I was very familiar with the tools, and had already made a few versions of graphical AI scripting tools as I believed that would make the most sense to support novice coders. Design knowledge from a variety of explorations that happened throughout the internship was used to come to this result. Still, many design decisions were made during the creation of ConvoScript, which was my first experience of a project with a well-defined design brief and one that reached the latest stages of development.



The result meets the requirements described above, and the encountered problems have been solved. Please find the images in figures 9-11, which show how a simple script is used to create a human-AI conversation. The files and documentation are available on GitHub (see appendix B). The result presented is ready for further research (for example to learn more about how to teach explorative coding with AI and to improve the ConvoScript itself) but it will already be deployed within the university, likely as a tool for Artifice students before they learn about the AI Foundry library, and possibly in the Designing Conversational Experiences master course or external workshops.

The result of this project allows users to write a script for a human-AI conversation. If they wish, they can make the script more complex gradually by adding LLM influences or responses, adding multiple scripts that may or may not run depending on the user input, or adding multi-modal user input and AI responses. Users can write these scripts in a web app as well as in their own code projects, and can give the interactable conversation to one of their users (for user testing) or show it in a demo. In addition, it is possible to connect this conversation to a physical interface for richer interaction. If they want even more

flexibility the AI Foundry Library is theirs to use. All of this is available to everyone and open-sourced on GitHub.

figure 9 - (right) code example of the script for a conversation. Messages all have a role and content. The second message asks for user input. The last message generates an image using a text-to-image model.

```
[
  {
    role: 'assistant',
    content: 'Hi, tell me about a dream you remember.'
  },
  {
    role: 'user',
    content: {
      type: 'text',
      content: 'input'
    }
  },
  {
    role: 'assistant',
    content: 'Let me make an image about that for you'
  },
  {
    role: 'function',
    content: 'textToImage',
    prompt: '${script1[1].content}'
  }
]
```

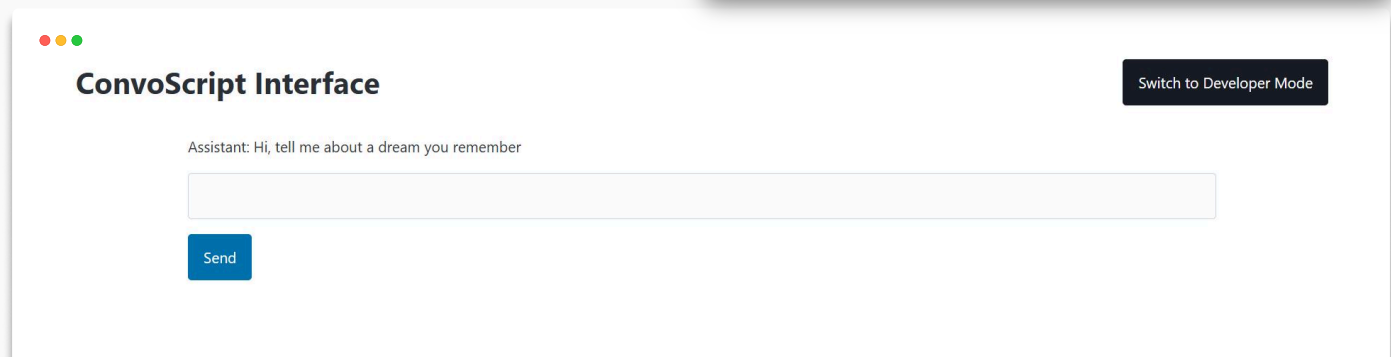


figure 10 - (above) user is asked for their input

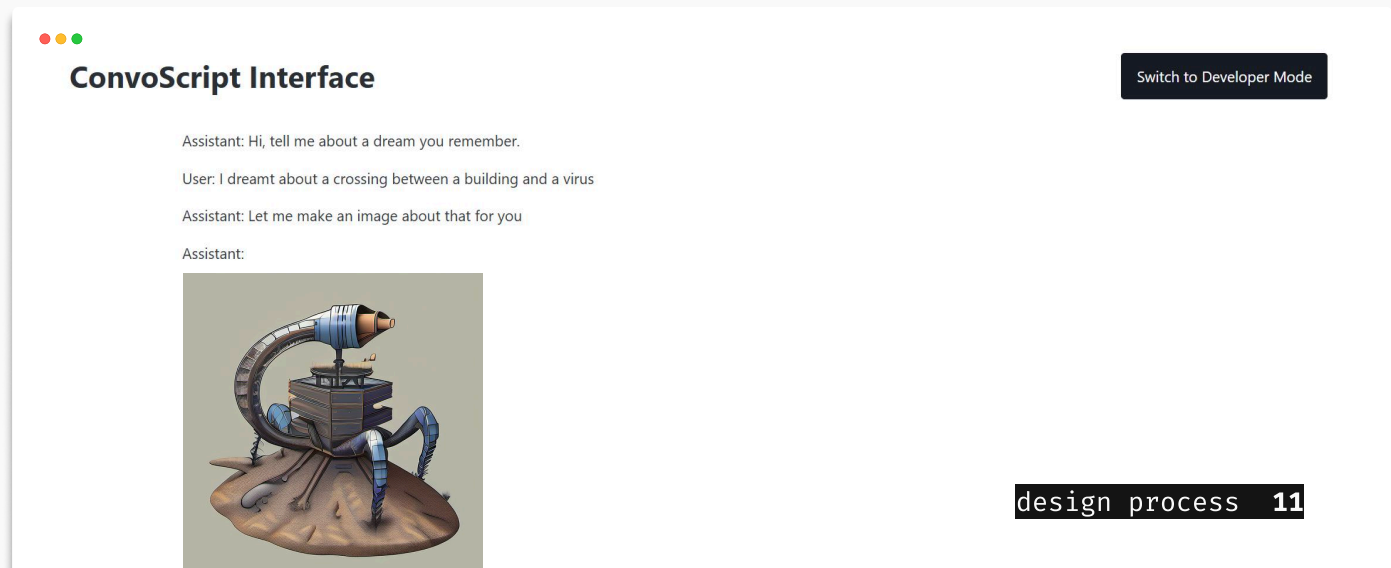


figure 11 - user has provided input, and conversation continues

## Reflection

Reflecting on the internship as a whole while using the design process described above as a guideline, it seems I have grown as a designer in a number of areas and I covered my goals successfully. In general, I am proud of the achieved internship results as well as my own development.

Taking a user-centered and explorative design process worked well for me. I did not always succeed in finding the right balance between conceptual planning and explorative making, and I sometimes spent too much time perfecting one exploration that was later discarded, but the process has generally been successful. Very often, when I made multiple minimum viable products, I ended up with a different option than I expected to be the best beforehand (e.g. I expected the GUI to make the most sense in the project that became ConvoScript). It is important, however, to realize that the circumstances were fit for this process, as the user group was readily available and quite similar to myself. In future design processes that focus on a more difficult to understand user group, I will take care to include the user group more (conversations, observations, and user testing) in the explorations to be sure my ideas and experiments make sense.

Compared to squad projects, the process I took during this internship

was - as Mathias highlighted in the company coach evaluation form - more result-oriented. I believe this was fitting as the internship did require a fully working final result, but it is good to realize I may have a tendency to lose track of the design process a bit in future projects. I do believe that my explorations were broad within the given frame, and I took the right measures to test and reflect on the design by having user contact, testing my work in realistic settings, and exploring different possibilities throughout the internship. This frame was rather narrow, which was a new experience for me as well. It was great to see the great amount of design decisions that are still required in a more narrow or late-stage design process.

My goal of working on physical-digital and digital design projects and hard-skills was achieved successfully, as I spent a large chunk of my time on these topics. I started the internship with just a very basic understanding of JavaScript; no experience with Github, open source or contributing to existing codebases; little experience with OOCSE and also ESP32 was new to me. I was lucky to slowly improve my understanding and skills on these topics and to get regular technical and design feedback from Mathias. In addition, this experience did not only teach me these

hard-skills, but also greatly increased by understanding of technical design processes and the challenges that come with those, such as having to comply with the existing technology that the project will be a part of, making compromises in user interaction, aesthetics, functionality or usability in order to solve a technical problem, and thinking creatively in a way that is realistic within the technical means available. In some cases, I had really big hopes for some aspects of projects in their features, implementation, or complexity but was forced to abide by limitations caused by factors such as technical possibilities, time, and clarity for students.

It was great that this internship had a real purpose and real users to design for. I set up the goal to support education, and the tools I designed are already being implemented successfully in Artifice and the Designing Conversational Experiences master course. In addition, it was great to be in close contact with PhD students, and I moved from considering them to be teachers to seeing them as specialized students. The internship provided a unique perspective on their lifestyle, and I would see myself possibly doing a PhD in the future.

The collaboration with the client required some time for me to get used to, but ended up being quite pleasant

with a clear understanding of the expectations for both parties. I would have regular meetings with Mathias in which we discussed the progress I made. Mathias would give feedback on the progress, and often had proposals for new project directions or functionality. We would discuss those, as well as my own, and together set up new plans. In between meetings I would send updates and ask for his opinion to make sure I was on the right track. This form of collaboration suited the project well, but not having the teammates I was used to was challenging as all design rationale decisions were mine to make and it was my individual responsibility to make sure I spent my time on the right things.

#### Professionalization

The unique experience of working on an entirely self-scheduled and self-responsible basis has not only been useful as a practice towards many of my expected future roles, but also on my needs within such a role. I expected to be successful in self-motivation as I prefer working alone and for sustained periods of time to truly make progress, and although I would not say that this has not been the case, it definitely was more difficult than expected. In my previous projects, (the feeling of) being stuck or the difficulty of

choosing the right direction could be resolved through (sometimes long and enduring) discussions with group mates. Now, I was on my own in these situations, which I resolved in different ways including switching to another task, changing work environment, breaks, pushing hard until I did get a decent result, brainwriting, rescheduling to fit my energy levels (I learned that I perform best in the early afternoon), asking Mathias, or rubber duckyng. The scheduling of my days went quite well: I decided to work from 9:00 to +-17:00 to keep my evenings and weekends free for other demands of life and leisure. After some weeks I started ending my work days with some form of physical activity to empty my head and pair my mental strain with physical strain, which led me to feel more fulfilled. Another part of organization is my correspondence with Mathias, for which I did have to find a balance, but which I feel I did fairly well. A measure I took to make sure I stayed on the right track throughout my internship was documenting and writing weekly reflections. Every week I wrote down my struggles and experiences, and reflected on how well I was achieving the goals I set. Although it is a simple act, it helped me actively think through my current and future actions, and I plan to keep this up

during my FBP as well.

#### Acknowledgements

I would like to thank Mathias Funk for offering me this internship and coaching me throughout, and Simone de Waart for bringing me in contact with Mathias. In addition, I want to thank Lu Yuan for guiding my professional development during this time.

#### References

- For creating the code snippets in this report, I made use of `carbon.now.sh`

#### Appendices

- A: Company coach evaluation form
- B: Links to GitHub repositories
- C: PI&V
- D: In-depth look in projects not highlighted in the report
- E: Goal development
- F: Explanation of some technical words
- G: Formal approval form
- H: Additional images of explorations

# Appendix A: Company coach evaluation form

Company coach evaluation form

## INTERNSHIP



|               |   |
|---------------|---|
| Student       | Jort Wiersma  |
| Company       | Computational Design Systems research cluster within Eindhoven University of Technology           |
| Company coach | Mathias Funk  |
| Position      | Industrial Design Intern  |
| Period        | <input checked="" type="checkbox"/> September / December <input type="checkbox"/> February / June |
| Total weeks   | 16  |

|   |                               |   |
|---|-------------------------------|---|
| Overall Competence of Chosen Design field | Assignment                    | Design and develop a design-oriented library for prototyping with local AI models in different modalities and in different interaction settings (function call and chatting-with). The intended users were scoped to the ARTIFICE squad and participants of the DAM210 course in Q2.  |
|   | Design and research processes | The assignment was comparatively narrow but allowed for depth in <i>how</i> they could be realized. From my perspective Jort worked in multiple iterations, seeking feedback and improving up to the last week of the internship. In our meetings and communication, Jort placed the work and results first, not so much the design process, which is something that he perhaps tuned to me as a client. From this perspective, I can see that this was a successful move. From an education perspective, more foregrounding of the design process could have helped align even more, as I was traveling for several moments. |
|   | Assignment deliverables       | The assignment deliverables were always on time or earlier, open-source and delivered via GitHub, and fully working. Throughout all deliverables were high-quality and explained well to the intended audience.   |
| Scientific and Professional Skills        | Presenting                    | Jort was well prepared during demo moments and gave students a good account of software features and possibilities. Beyond the expected level for this internship and Jort's current study block, I could see more attention to communication needs from student groups, however, working with individual students and small groups Jort handled presenting and communicating very well – also taking into account that he worked in a confident way with feedback from Master students in the course setting.<br><input type="checkbox"/> Not applicable / unable to judge   |
|   | Reporting                     | All deliverables were accompanied by a concise documentation which allowed users of the software to dive in quickly and explore main features.<br><input type="checkbox"/> Not applicable / unable to judge   |
|   | Organizing and planning       | Jort was very well organized and eager to participate in different collaborative meetings and also during sessions in squad and course that allowed him to understand user needs and feedback better. I appreciate his proactive attitude to getting feedback and working with stakeholders.  |
|   | Reflecting                    | Due to the rather narrow assignment, the nature of reflections took shape in working with, discussing, and revising deliverables. There were plenty of in-depth design decisions to be made, often without an obvious "right" one. Here, Jort explored the space, made proposals, worked with feedback and reflected on earlier choices – all without losing track of the assignment and deliverables.<br><input type="checkbox"/> Not applicable / unable to judge   |
|   | Cooperating                   | Great collaboration, matching the fast pace of domain progress (there are AI/ML news every week) and also the needs elicited from the squad and course feedback. I appreciate his working with me over multiple channels, Teams, email and in person, proactively and with lots of structure.   |

More information: ID.internshipcoordinator@tue.nl

Version 1.1

|                              |  |  |
|------------------------------|--|--|
| Vision and Identity          | Professional identity  | [To what extent was the student able to develop new knowledge and skills during the internship, or fine tune existing ones?]<br><input checked="" type="checkbox"/> Not applicable / unable to judge                 |
|                              | Vision   | [To what extent did the internship contribute to a critical reflection of the student's vision of their work/role and/or of the work field?]<br><input checked="" type="checkbox"/> Not applicable / unable to judge |
| Contribution and Development | How do you consider the specific contributions of the student within the internship assignment:  | Above average  |
|                              | Provide an indication of the development the student has made throughout the internship, independently of the results:   | As expected  |
| Feedback                     | In this internship Jort could play to his strength in software development. This was an intended plan and worked well. The assignment left less room for development than other assignments, however, there was lots of room for depth and Jort leveraged that. Overall, working with Jort was a pleasure both at personal and professional level. |  |

|                  |               |
|------------------|---------------|
| Email address    | m.funk@tue.nl |
| Physical address | Atlas 6.102   |
| Telephone number |               |
| Date             | 03/01/2025    |
| Signature        |               |

More information: ID.internshipcoordinator@tue.nl

Version 1.1

## Appendix B: Links to GitHub repositories

AI Foundry Library: <https://github.com/jortwi/AI-Foundry-Library>

ConvoScript Library: [https://github.com/jortwi/ConvoScript\\_Library](https://github.com/jortwi/ConvoScript_Library)

ConvoScript Interface: <https://github.com/jortwi/ConvoScript-Interface>

Designing Conversational Experiences example iterations:

Iteration 1: <https://github.com/jortwi/DCE-iteration-1>

Iteration 2: <https://github.com/jortwi/DCE-iteration-2>

Iteration 3: <https://github.com/jortwi/DCE-iteration-3>

### Vision

For a long time I believed it to be important to specifically design things that could change the world. I am slowly letting go of this idea as after reading and reflecting I am starting to believe design is not the best way to do so. Assuming this is the case, I can allow myself to design things that I consider to be exiting and purposeful without the need to create true life-changing innovation.

There are a few areas of interests where I hope to find this purpose for my work. Firstly, the optimization of human health and performance, such as the effects of different kinds and levels of light exposure during the day. I believe there is an opportunity in design to supplement and accessibilize various techniques for life optimization. Another general interest is AI. Like many, I see opportunities in AI as a tool to design with and for. Its rapidly increasing influence on the world, ethics, and applications are topics for design discussion. Moreover, I have gotten interested in material-centered design during my time in Sensory Matters, as I believe it is an area in design that is able to have real impact on the world in various sustainable or innovative ways. Finally, I have been intrigued by educational systems and their

effectiveness for a long time. I believe significant changes should be made (specifically in individualization of education) to the (mostly primary and secondary) education systems used in the Netherlands, but have never designed for this.

Slightly contrasting to my ambitions on purpose and impact, I do believe commercial value to be a very important part of a design, as real-world success is dependent on this. Many products can only be successful if people are willing to buy it. This is also the most effective approach to get customer validation. By taking an experimental approach, rapidly creating MVP's that could be launched commercially, this user feedback can be gathered quickly, followed by reiteration.

Expressing what I believe it means to be a designer, it seems to me there are elements of truth to be found in design panism (everything is design). But then, what are design professionals? I believe industrial designers could be described as experts of the industrial design process, often focusing on a specific field. The difference between these design professionals and designers in other disciplines such as engineering is that the latter adapts the design



to their own requirements, thus adapting the design to themselves, while the first adapts themselves to be what the thing that is being designed requires. Because I believe designers are experts of the process, I see value for myself in exploring different areas of industrial design.

Finally, I want to shortly share a few thoughts of mine for the far future. These are thoughts I believe design can play a role in. I dream of the abolishing of the bioindustry and trust cultured meat can be part of the solution. I believe AI can reach a point where it can completely individualize education, in the sense that every student will learn at their own pace. School can be the place to get education and learn human interaction. As a last thought, I envision that endless energy will lead to exponentially increased possibilities for the human race, and design as well as politics, engineers, and business will play a role in managing these possibilities and using them for good.

### **Professional identity**

I like to say I am a creative, technical, and analytical designer. Creative in concept development, technical in making, and analytical in approach. This analytical approach may not be the best in design processes,

so I am currently trying to take a more explorative approach, while playing on my analytical strengths when possible.

Personally, I am very driven, expecting a lot from both myself and others. I have learned that this can lead to me taking on too much work, reducing the overall work quality. I like to work with a strict plan and to stay in control, and have to practice working in unpredictable environments. I get motivated when the project I work on starts to feel unique, interesting, challenging, or useful, and I get inspired by other projects that are the same. Often, such projects have strong technological or scientific influences, but they may also touch upon problem areas I consider to be important, such as health or education.

In a design process I am driven and opinionated, motivate myself and others, take care of scheduling, try to be a source of creativity, refer to existing research, take on technical tasks, and look for opportunities for development for both myself and my group mates. In addition, when possible, I like to take a entrepreneurial approach by looking for market opportunities and thinking in a user-centered manner. This does, however, somewhat suppress my

creativity, which is something I should take careful note of.

As a designer, I am torn between specializing and broadening my knowledge and skill base. Partly, I want to continue my physical-digital design skills and apply them in real life. At the same time, I get excited by learning opportunities in material-centered design, social design, and more traditional physical design areas.

Finally, to shortly list my hard-skills, I have gained experience with various programming languages and frameworks, 3D modeling, ideation techniques, design research, the material-driven design process, material research, user-centered design, user research, technology entrepreneurship, Arduino, and electronics.

### AI Foundry Library

Creating the AI Foundry Library was the first dedicated project of my internship and required me to design and develop an open source JavaScript library that simplifies designing and coding with the LocalAI LLMs available through Data Foundry (which is in the process of being open sourced as well). The library provides a number of functions that can be called in any web project to use the LocalAI. These functions accept different parameters to tweak how the program and AI behave. The library itself is discussed in more detail in the Results section.

The design process of this library has been rather experimental and iterative, as its development started by writing code, which I tested and discussed with Mathias, in order to find how the different functions can become more intuitive to use, more flexible in their implementation, and less disruptive in their implementation in larger code-bases. The design and development of the library went hand-in-hand with careful code documentation, which was absolutely necessary for me to understand my own code, and for others to be able to use the library in their own projects. In addition I should mention that before starting this project I spent quite some time exploring different capabilities for

interaction and difficulties when using the LocalAI capabilities in Data Foundry, which the library is based on. This explorative time was spent making small projects, example projects including documentation, and using different code languages or platforms to achieve similar results.

Designing this library has been my first ever experience of designing a 'product' that will actually be used by real people. I did not have to look for a user group that would fit my ideas or that I would have to adapt my process to. Instead, I knew that my work would be used by Industrial Design students, specifically Artifice students. Not only have I been an Artifice student, but also do I have access to Mathias' expert knowledge as a coach. As a result, I consistently designed the functionality of the library in a way that would assist students' in their projects by removing the barrier of difficult code challenges, while retaining flexibility. Sometimes, my intended assisting functionality would disrupt the flexibility and safety of a codebase in which the library would be implemented, in which cases Mathias taught me how to reduce such dangers (e.g. by removing all side-effects of functions). Designing this library has taught me about these different 'stakeholders' in real design processes: the users' wishes, the

practicality of granting their wishes, and the industry-side issues that have to be accounted for when attempting to grant user wishes.

I am very content with the results of this project, which fit the goals I set with the client. The library is being used by different Artifice students and students who follow the Designing Conversational Experiences Master course. So far, I have received positive feedback from different people, and I look forward to seeing how further implementation of this project will go. To see examples of how the library can be used, please find the overview of activities or the GitHub repository associated with this project.

### Example iterations for Designing Conversational Experiences

The second project (although it must be mentioned that the projects were not worked on one after the other) had the aim to be an example project for students of the master course Designing Conversational Experiences taught by Minha Lee and Mathias. In this course, students are first asked to design a scripted chatbot that is able to keep a very basic conversation going, and are then asked to expand that chatbot by adding LLM functionality to them for richer answers. Finally, they will design a physical embodiment of this chatbot,

with the aim to design for the conversation with this chatbot.

For a long time, I was stuck in the ideation phase, trying to select the perfect topic for an example project. I did attempt to just start making (to follow my goal of taking an experimental approach) but could not stay confident in any idea as the project should be able to split in three iterations that all show the different techniques of how to approach such an iteration technically while staying interesting conceptually. After discussing this with Mathias, I learned that the true goal of the examples is to stay as simple as possible and purely show a technical starting point for students. My learning here is that it is not always necessary to keep pushing when I get stuck and frustrated. When possible, ask for help!

From there, I was able to continue the examples, only limited by my lack of knowledge in OOC SI. In this case, it was not a problem to be a beginner, as I should take the perspective of one to provide a good example. As there was a slight time pressure, I decided to finish all iterations before refining and improving them, which was appreciated by Mathias.

The students seemed to respond well to the examples and used them intensively for their own projects. I

did notice that the level of complexity was still high for some of the students, and I gave a presentation explaining the code of the last iteration in detail to provide further support. It seems that the project would be improved by a supporting tool to increase understanding for more novice coders. Such a tool could be ConvoScript, which is described earlier in this report.

### Miscellaneous

The other activities mentioned in the overview of activities were not as much projects with processes, but I would like to spend some words on them. The Design & AI symposium was a great experience during which I listened to interesting speakers from companies such as IBM and Philips, and from academic backgrounds. The speeches were a great source of inspiration. My own contribution to this event was very basic and included what could be expected of any student assistant, such as giving out badges and handing microphones.

Another activity mentioned is making example projects for Artifice students. During the first weeks of the internship I created many example projects with code explanation and documentation for students to use. I sent those to Janet, Artifice's squad leader, and on her request I made more

dedicated examples. Also, due to this, I was able to increase my contact with Artifice students, which helped me understand my target group for my other projects.

### Goal development

Previous semester, I did my Project 3 Research project in Sensory Matters. I made that choice to challenge myself to step away from my usual technology-driven design style. In Sensory Matters, I learned to deepen myself in one topic to become a very specific expert (in my case of the material Polycaprolactone). To achieve this, my group took an experimental approach: we made small plans, executed them, and then made necessary changes in both our approach and our knowledge.

For my internship, I wanted to take a technology-driven design approach again, but this time by taking an experimental or explorative approach. As I enjoy all sorts of technology and making-styles, I looked for an internship where I could either combine or focus on digital, physical-digital, or physical technologies. My coach Simone de Waart advised me to send a message to Mathias Funk and ask if he had a project I could assist with. We decided to meet online, where he shared a few possible projects I may be able to help him with. Together we agreed that I would be working with a new local set of Large Language Models (LLM), and would support education with these tools by creating example projects.

When I started the internship, my project was not completely defined

yet. Initially, I experimented with the LLMs and made some small example projects, but I could have used a bigger challenge. It was around this time I finished up my initial goals for the internship, which I discussed with Mathias. During the internship, my project changed to fit my goals, my level of experience, and Mathias' goals. My specific activities and projects are outlined in the next two sections.

The goals I decided to pursue changed during the internship, as I was better able to evaluate what I wanted and what my internship offered. However, initially I planned to:

- Take care of own schedule and learn to be responsible for own planning and goals during day-to-day activities
- Work on physical-digital and digital projects that are both exciting and purposeful
- Gain deepened experience in physical-digital and digital development (technical and aesthetic)
- Support research and education
- Increase understanding of both daily activity and ambitions of field and (technical) design experts by working together and be able to reflect on my own future ambitions based on this understanding

I understood that the internship is a great opportunity to prepare for

my FBP. Although I had not decided on a direction or topic, I would be working on my own for large amounts of time. This meant I would be forced to take care of my own schedule, work without anyone keeping me in check, and make sure I spent my time on the right things to both learn as much as possible and deliver the right results. In addition, I saw the internship as a unique way to get a look behind the scenes of academic life, which is why I stated a goal to take advantage of this. More content-related, I wanted to get experience in both physical-digital and digital design and development. This relates more to hard-skills (although I had not defined those yet) but also design processes. Finally, I planned to support research and education.

During the internship I refined many of these goals. Physical-digital design was placed more on the background as this internship clearly was an opportunity to really deepen myself in digital design and development, which I had not done before in previous design projects. I defined specific technologies to gather experience in, and found out how I could support education. I updated my goals to be:

- My internship is remote. This offers a unique challenge: I am forced to schedule my own time, decide what to

do, report and ask for feedback. The resulting goal is to take care of my own schedule and learn to be responsible for my own planning and goals during day-to-day activities (B&E).

- Work on physical-digital and digital projects that are both exciting and purposeful, with a larger emphasis on digital projects (T&R, MD&C). I will be working a lot with AI, and as follows from my vision I find it important to work on a project I enjoy, while attempting to create a purpose for it. I want these projects to be both physical-digital and (with a higher emphasis) digital, as these will form adequate challenges while remaining within my field of expertise and the boundaries of the internship. In addition, I will not only focus on the development of these areas but also their use and creative perspectives. Specific skill areas I will focus on:
  - Digital: JavaScript, Large Language Models, Data, Arduino, Github, Open-source code and larger codebases
  - Physical-digital: Arduino, 3D modeling
- Support research and education (U&S, C&E), and gain understanding of academic design professional life (B&E). I will be working for and with researchers, teachers, and students. The internship gives me unique opportunities to understand different

perspectives at the university. By supporting research and education I will gain an understanding of both of these, and perhaps gain a unique view in PhD life.

- Take an explorative approach (D&RP) that builds upon my learnings of a similar approach during my Project 3.
- Develop my ethical opinion and future perspective of AI developments (Vision).

### Explanation of some technical words

- OOCSEI - tool developed at TU/e to make communication between design prototypes simpler
- ESP32 - tool for DIY electronics prototyping with built-in wifi capabilities, similar to Arduino
- JavaScript - programming language used for functionality of web pages (and more)
- Codebase - complete body of code for a program or system
- GitHub - developer platform to manage and share code
- Open-source - allowing the code of a program or system to be available to the general public
- LLM - large language model, type of generative AI
- Library - pre-written code that can be added to a coding project to handle a specific task
- Data Foundry - platform developed at TU/e that provides all sorts of data and connectivity related tools and which now also includes localAI capabilities
- LocalAI - open source alternative to OpenAI. The AI can be run on local servers making LocalAI more privacy friendly



# Appendix G: Formal approval form

## INTERNSHIP



Date: 24/6/2024

Student  
Teacher coach  
Period activity

Jort Wiersma  
**Simone de Waart**  
☒ September - December

☐ February - June

|   |  |   |
|---|--|---|
| Personal Development Plan for formal approval   | Does the choice of the learning activity align with the Professional Identity and Vision development of the student and are his/her choices well-argued?   | Yes<br>[Additional feedback]  |
|   | Does the learning activity contribute to the development of the student?   | Yes<br>[Additional feedback]  |
|   | Does the chosen learning activity contribute to a balanced development in the Bachelor program of Industrial Design?   | Okay<br>[Additional feedback]   |
|   | Are the goals well formulated?   | Yes<br>[Additional feedback]  |
| Complete the aspects only for the chosen learning activity:                                     |  |   |
| Internship (worth 25 ECTS) (requisites: 100 ECTS + P1, P2, P3)                                  | Does the company profile align with the requirements for internships?  | Okay<br>[Additional feedback]   |
|   | <ul style="list-style-type: none"> <li>Doing an internship at one-man businesses is not allowed; unless the company owner is currently teaching at the Department of Industrial Design, Eindhoven University of Technology.</li> <li>The company must support development in several expertise areas.</li> </ul>                                       |   |
|   | Does the company coach align with the guidelines for internships?  | Okay<br>[Additional feedback]   |
|   | Can the student work on a clearly framed design project or tasks?  | Okay<br>[Additional feedback]   |
|   | Personal Development Goals (minimum 1 - to include on Assessment form as well):<br><br>*Discuss goals and positive and negative points in the coach meeting to guide how the student can develop expertise areas that might not be covered within the internship. The same goals will be included in the assessment form at the end of the internship. | * Combining digital technology (specifically AI) and physical interaction. This could take shape as a technically challenging project with, for example, complex coding. I will challenge myself to use API's minimally to learn more;<br>* Designing the physical aspect, considering aesthetics, interaction, meaning, and product goal.<br>* Understand the business-side of running a company: client contact, project management, user research, and partner collaboration |
| Exchange (worth 25 ECTS) (requisites: 90 ECTS when the student leaves on exchange)              | Name Exchange University and Department  | [Name exchange university and department option 1]<br>[Name exchange university and department option 2]<br>[Name exchange university and department option 3]<br>[Name exchange university and department option 4]  |
| Minor (worth 25 ECTS) (requisites: 100 ECTS (of which P1, P2, P3) + EC approval for free minor) | Minor at Department of Industrial Design at University of Twente; or at the Department Industrial Design Engineering at Delft University of Technology. (No other departments at these Universities or other Universities in the Netherlands are allowed without permission of the Examination Committee.)   | [Name University and Department where Minor is done]<br>Course name + ECTS, Course name + ECTS, Course name + ECTS, Course name + ECTS, Course name + ECTS  |
|   | Minor at a University elsewhere in the Netherlands   | [Name University and Department where Minor is done]<br>Course name + ECTS, Course name + ECTS, Course name + ECTS, Course name + ECTS, Course name + ECTS  |
| Electives (worth 25 ECTS)   | What are the chosen electives?<br><br>In case a student chooses to do more than 15 ECTS worth of electives outside of the Department of Industrial Design, the student needs, next to the formal approval of the coach, to file a request to the Examination Committee.  | Elective + ECTS, Elective + ECTS, Elective + ECTS, Elective + ECTS, Elective + ECTS,<br>[Generations before 2015-2016 choose 6 electives, later generations choose 5 electives]   |
| Approval  | The personal development plan and chosen learning activity are approved by the coach**:<br><br>**Provided the request is granted/supported by the Examination Committee.   | [Select answer]<br>[When the answer above is no, please explain why]  |

Please note:

- For exchange and activities that take places abroad it is strongly advised to consult the exchange coordinator for arranging insurance and to explore scholarship opportunities. Please be aware that exchange students need to be nominated by the exchange coordinator.

### More information:

This form needs to be completed and signed by the teacher coach. In case of an internship as activity, the student has to add their personal development plan plus this form signed by the teacher coach to the appendix of their internship report. In case of an exchange, the student needs to deliver (a copy of) this form to the International Office at the Department of ID.

- For an internships it is strongly advised to contact Linda Martens (Internship Coordinator) for arranging your internship details.
- For all B3.1 options: In total students are allowed to choose a maximum of 45 ECTS of courses outside the Industrial Design Department next to the Industrial Design major. When they would like to choose more than 15 ECTS of electives outside the Industrial Design department, they have to motivate their choices and get approval of the Examination Committee (next to the formal approval of the coach per this formal approval form).

Teacher Coach: **Simone de Waart**

Signature: \_\_\_\_\_

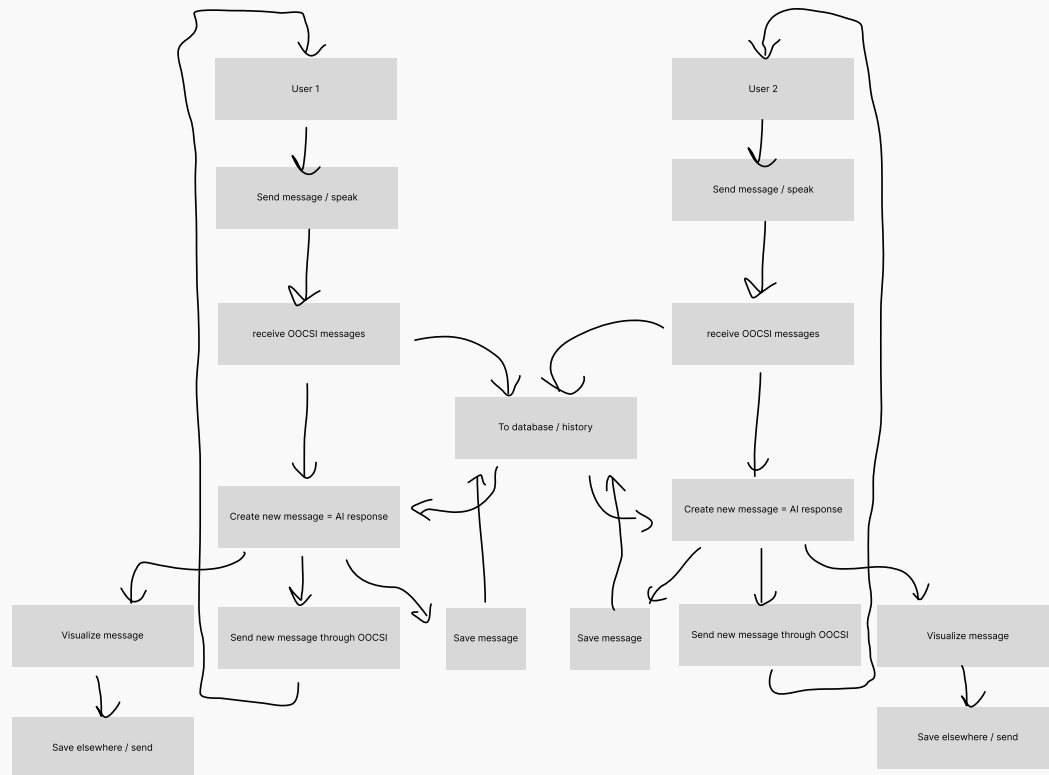
*[Handwritten signature]*

### More information:

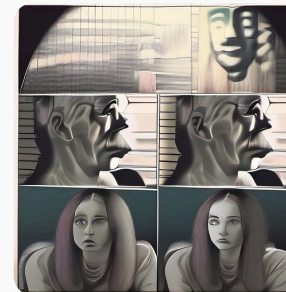
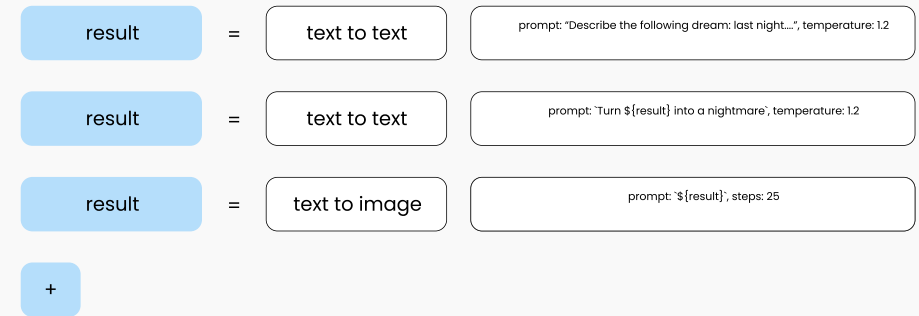
This form needs to be completed and signed by the teacher coach. In case of an internship as activity, the student has to add their personal development plan plus this form signed by the teacher coach to the appendix of their internship report. In case of an exchange, the student needs to deliver (a copy of) this form to the International Office at the Department of ID.

# Appendix H: Additional images of explorations

A program that has two users on the phone with AI, where both conversations affect each other



A schematic I made to check the required tools to create a program that allows two users to have a conversation with AI, with both conversations indirectly affecting each other



An prototype that later became ConvoScript. Here, each message required an AI generation, for which different options could be chosen. One input would lead to one output, processed by multiple AI's

### Option 1

```
let script1 = [  
  {  
    role: "function",  
    content: "textToText",  
    messages: [{}, {}],  
    max_tokens: 1000,  
  },  
  {  
    role: "condition",  
    content: "${script1[0].content === script1[1].content}",  
    true: "script1",  
    false: "script2",  
  },  
  {  
    role: "code",  
    content: 'console.log("test1"); console.log("test2")',  
  },  
];
```

### Option 2

```
let script2 = [  
  {  
    role: "code",  
    content: {  
      type: "textToText",  
      messages: [{}, {}],  
      max_tokens: 1000,  
    },  
  },  
  {  
    role: "code",  
    content: {  
      type: "condition",  
      content: "${script1[0].content === script1[1].content}",  
      true: "script1",  
      false: "script2",  
    },  
  },  
  {  
    role: "code",  
    content: {  
      type: "execute",  
      content: 'console.log("test1"); console.log("test2")',  
    },  
  },  
];
```

(below) Image of a possible user interface that would be generated by a designer-written script

Hi, thank you for testing this prototype. Please answer the question below!

Press the button to record and tell us about the last dream you remember

Record

⌋ waiting...

A difficult design decision that I had to make. Option 1 is easier to understand, while option 2 resembles AI messaging better. It was decided that option 1 sufficiently resembled AI messaging, so this option was chosen.

# Appendix H: Additional images of explorations

ASSISTANT      Hi, tell me about your experience with scooters

YOU              I actually have barely any experience with scooters. At least no first hand. I do see them around every now and then though.

ASSISTANT      Interesting! Personally, I have little experience with scooters, but I heard a variety of information about them. On the one hand, they are a great way to provide flexible means of travel for different groups of people. On the other hand, their pollution can become a problem with excessive use. All in all, when cycling is an option for you, it would be wise to consider this option.

ASSISTANT      Let's write a story about different means of transportation. What could it be about?

YOU              Sure, it could be about more obscure means of transportation like excavators?

ASSISTANT      Interesting! This is the story I came up with: In the land of Mechanterra, transportation wasn't by cars or trains, but by burrowing mechabeasts called Diggorys. These sentient excavator-like creatures had metallic limbs that scooped earth and extended necks lined with conveyor belts. Citizens climbed into glass pods on their backs, while Diggorys tunneled beneath cities, creating a labyrinth of glowing transit burrows. The wealthiest rode Sky-Scapers, enormous clawed machines that scaled vertical cliffs, while waterfolk used Aqua-Crunchers, submersible diggers with drill-tipped noses. One daring engineer invented a hybrid named Zephyr-Mole, capable of digging, flying, and swimming. It roared to life, redefining motion in Mechanterra, blurring boundaries between earth, air, and sea.

YOU              Generate a visualization for this



ASSISTANT      Thank you for this conversation!

A conversation / user interface that would need to be generated by through a designer-written script

messagesArray

```
[
{
  role: user,
  content: Hi, can you tell me about egypt?
},
]
```

functionArray

```
[
{
  function: textToText,
  parameters: {
    api_token : df_abc123...=,
    messages: messagesArray,
    temperature: 1.2
  }
},
{
  function: addUserMessage,
  message: {
    role: user,
    content: Thank you. Now, could you compare it to the US?
  }
},
{
  function: textToText,
  parameters: {
    api_token : df_abc123...=,
    messages: messagesArray,
    temperature: 1.2
  }
},
]
```

A script that would be used to generate a conversation. This was an early prototype that resembles ConvoScript fairly closely.