DAIsy – Developing AI ecosystems improving diagnosis and care of mental diseases

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I. Introduction

The AI solutions developed for the use-cases of DAIsy have not been developed in isolation, but through regular dialogues between the technical and clinical partners of DAIsy, and in adherence to the AI governance and policies of the partner counties. The end-users, the AI-based solutions created and the partners who created them, together form the AI ecosystem for the clinical workflow. Alternatively, this ecosystem can be interpreted as the recovery journey of the patients undergoing treatment for depression and eating disorders (EDs), as illustrated in **Error! Reference source not found.**.

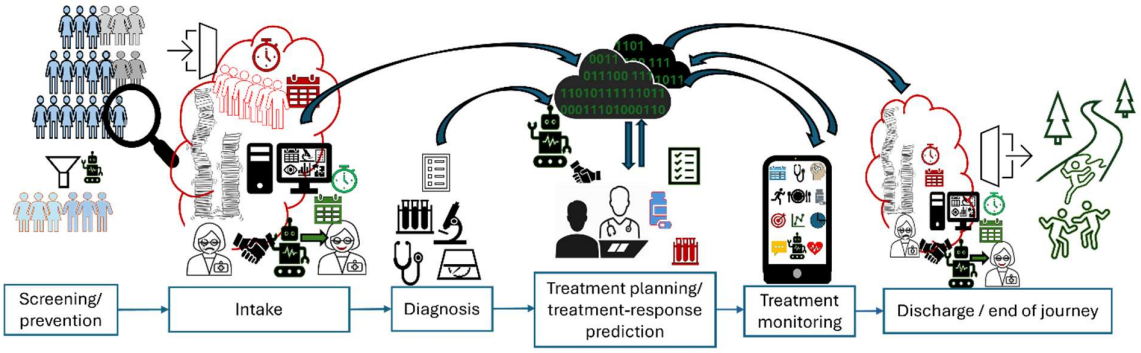

Fig- 1: Clinical workflow for managing depressive- and eating disorders. Alternatively, the patient-journey of patients who sought out treatment. (Inspired by Burger-Ghosh2025)

This report describes the collaboration between the international technical partners through workshops and work-package (WP) meetings, and between technical and clinical partners (including non-DAIsy project partners) through meetings of experts from both domains, and activities which facilitated more communication between both domains.

II. AI ecosystem in terms of patient pathway

In the real-world this pathway includes the initial step of awareness and intermediate steps of all documentation and administration, waiting period of patient, insurance and billing, updating of care plan of patient, follow-up, triggers and relapses. However, for simplicity we limited it to steps involving the two direct end-users, patients and clinicians, in the most straightforward scenario. This is why Fig-1 presents target patient demographics being identified via screening (which includes self-identification) that leads then to being assessed by mental health experts for intake.

1. Screening

The robot cartoon represents “AI” supporting the clinicians in analyzing data from the demographics being screened for depression or EDs. Partners like MATERNA and Philips are supporting this step through apps designed to provide tailored educational content to patients and at-risk demographics that would help prevent the increasing severity of their respective conditions. The DAIsy-DC app from OFFIS and Ascora is collecting clinical and environmental data of consenting population, along with their responses to PHQ-9 questionnaires for depression, to identify individuals with depressive symptoms who need immediate support (Schröter et al. 2025).

2. Intake

The step “Intake” in this figure then summarizes the documentation and administrative tasks of healthcare providers and scheduling into the single step of patient intake. This step too has a “AI” solution component which can significantly reduce waiting times of patients by helping the clinicians with their administrative burdens and scheduling. Within DAIsy MEDrecord and Semlab are providing clinical partner at GGZ OB with such solutions. Fig- 2 and Fig- 3 show the speech to text transcription, diarization and summarization provided by Semlab’s and MEDrecord’s AI solutions respectively, for this DAIsy clinical partner. Vestel’s AI solution is aimed at supporting clinical partners at NP Brain hospital with such documentation tasks. It also helps in emotion detection of the patients from recorded interviews or sessions between patients and their attending clinicians.

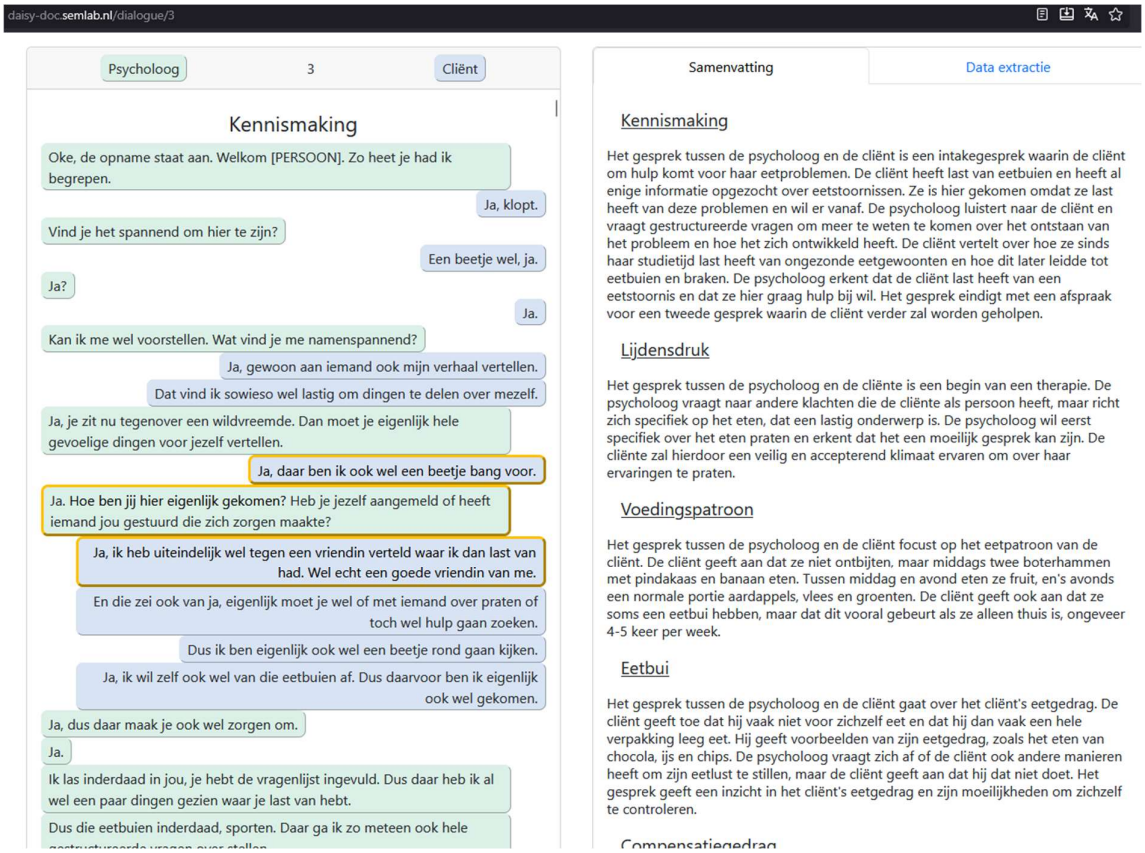

Fig- 2: Screenshot from a demo of Semlab’s intake interview transcription and documentation solution. Demo available at https://daisy-demo.semlab.nl/demo.

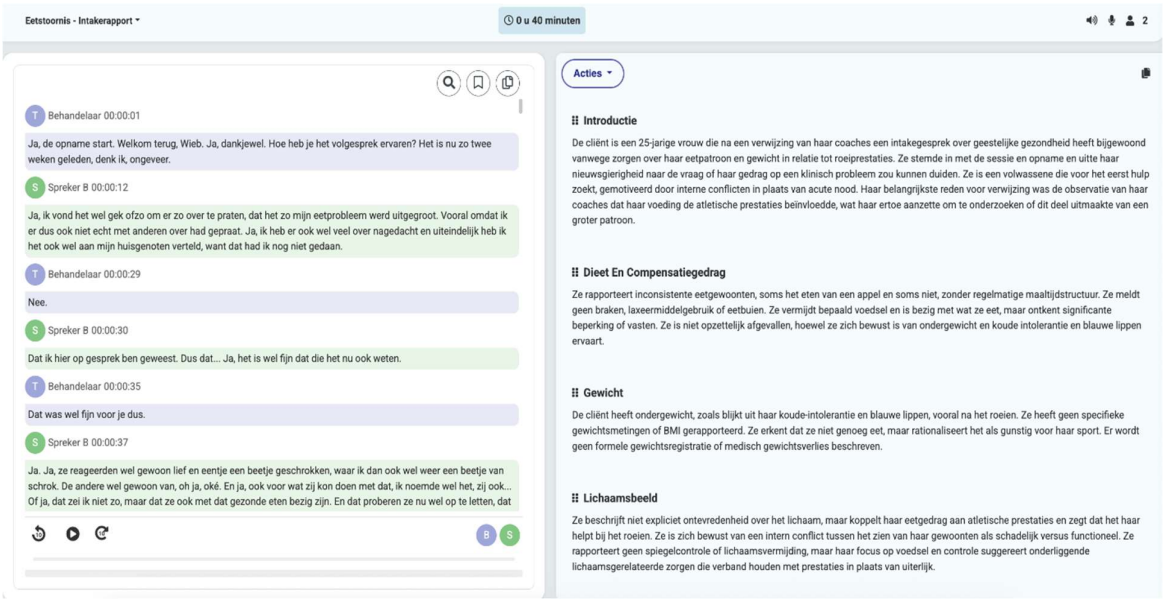

Fig- 3: Screenshot from a Eating disorder intake implemented in collaboration with Oost Brabant. Available live at app.ggzoostbrabant.healthtalk.ai

3. Diagnosis

In the next step of Fig- 1, named ‘Diagnosis’ the clinical, physiological, and demographic information of patients together with their respective filled out questionnaires are analyzed by the clinical team to come to a formal diagnosis. An AI-based solution here handles secure storage of these patient data on a dedicated cloud and supports the attending clinicians in diagnostic decisions. For example, ARD group’s MRI viewer (Fig- 4) helps the clinical partners at NP Brain Hospital see the regions of interests from the structural MRI of a patient’s brain that are biomarkers of depression, helping them in their diagnosis of unipolar vs bipolar depression. The LLM-based solutions from MEDrecord and Semlab can also be extended to support the clinicians with diagnostic decisions.

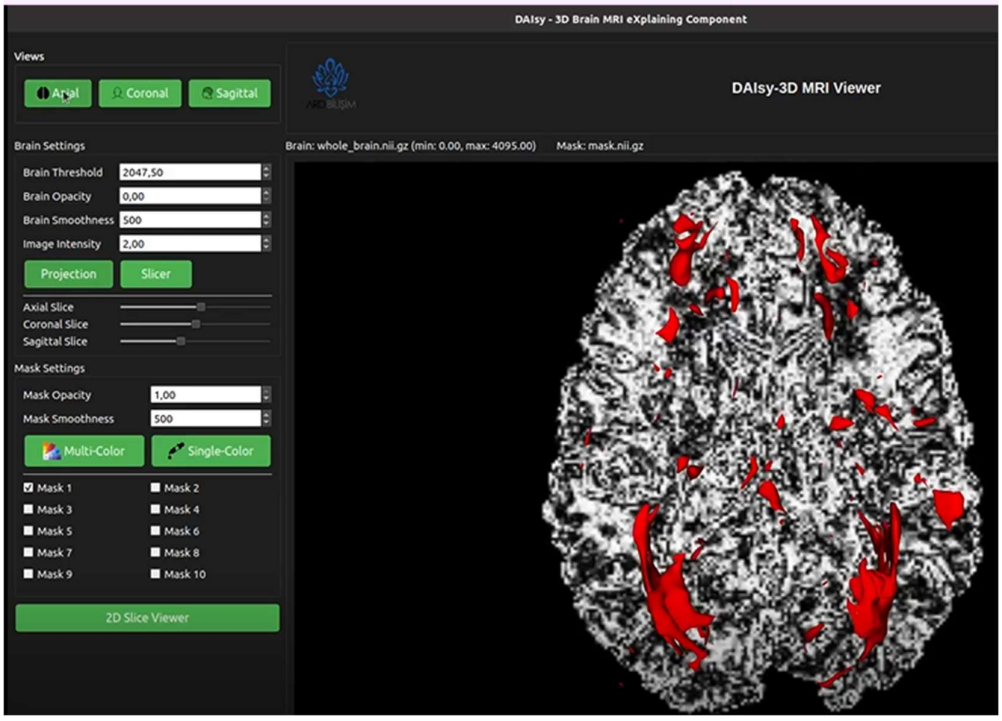

Fig- 4: ARD group's MRI viewer.

4. Treatment-planning/ Shared decision-making

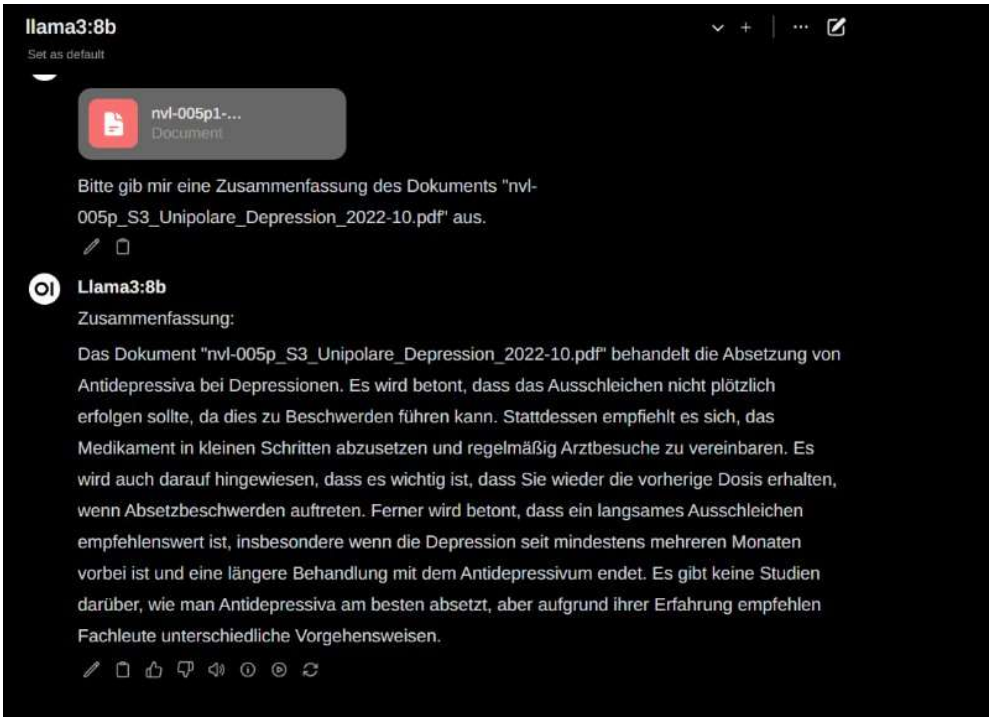

Fig- 5: Screenshot of therapist-assistant developed by MATERNA. This allows therapists quick access to relevant literature during interviews with patients.

In this step of the clinical workflow AI-based solutions facilitate the clinicians in creating a trustworthy, shared care-plan together with the respective patient party. Within DAIsy this

clinical decision-making solutions have been developed by TU/e, ARD group and AMC, for ED and depression. The AI solution from MATERNA support this shared decision making from a different perspective, by enabling the attending therapist to be more “in the moment” with the patient during a session (Fig- 5). They do so by facilitating quick access of the clinicians to reliable literature relevant for the patient with whom they are in session.

5. Treatment-response monitoring

Fig- 6: Screenshot of notifications from the insight generator developed by 5M Software's Fitsprite Nutrition.

The subsequent step of this patient journey map (clinical workflow), referred to as “treatment monitoring” in Fig- 1, is monitoring how the patients are responding to their respective prescribed care-plans. This is often done via a patient app. In DAIsy this solution is primarily supported by 5M Software, OFFIS, and Ascora. For example, as seen in Fig- 6, 5M Software’s Fitsprite Nutrition shares personalized insights of patients with them.

On the clinician end there is a web app managing the patient data, including their treatment plan and their response to it, which is supported by Ascora. The models developed by AMC (Fig- 7) are directed towards prediction of personalized response to different treatment of depression, using the fMRI data of patients at follow-ups(Chen et al. 2025; Poirot et al. 2024). A MSc. Thesis was carried out by TU/e student which focused on prediction of treatment-response of hospitalized Anorexia Nervosa (a type of ED) patients, using demographic and clinical variables (biomarkers found in blood).

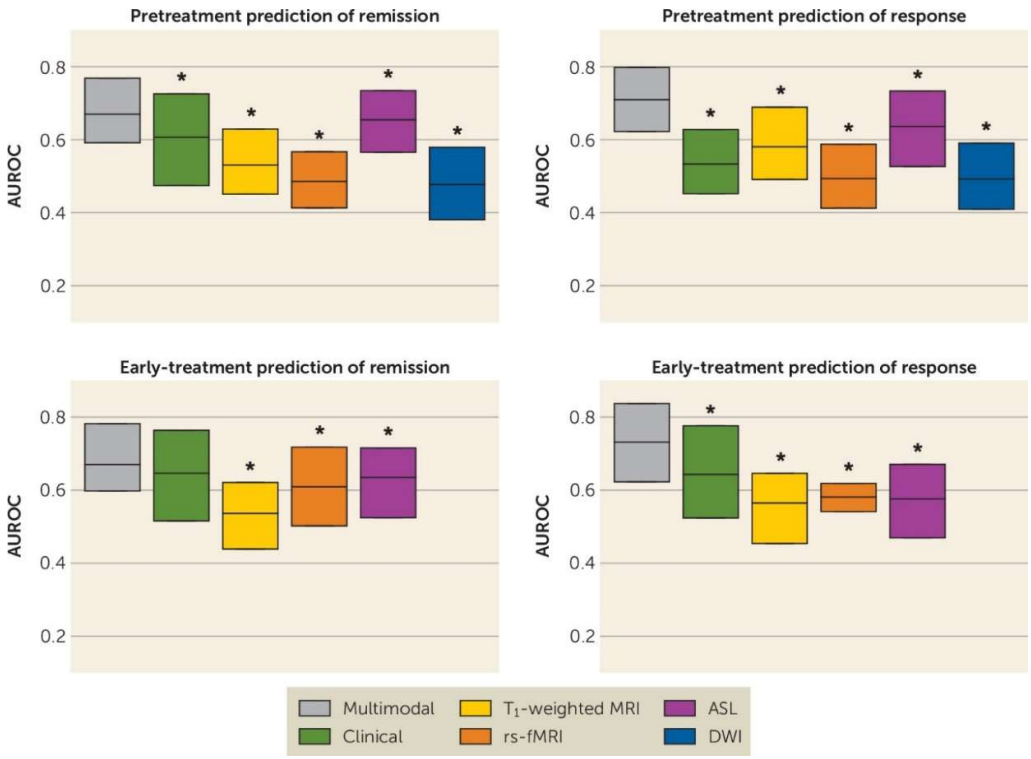

Fig- 7: Comparison of unimodal vs multi-modal models for prediction of treatment-response, from (Poirot et al. 2024) (AMC).

Similarly, Vestel's NOIRA BAND app helps patients at clinical partner NP Brain hospital, to track their vitals (pulse, O_2 saturation, heart rate, ECG), sleep patterns, activities, food and water intake, and their mood.

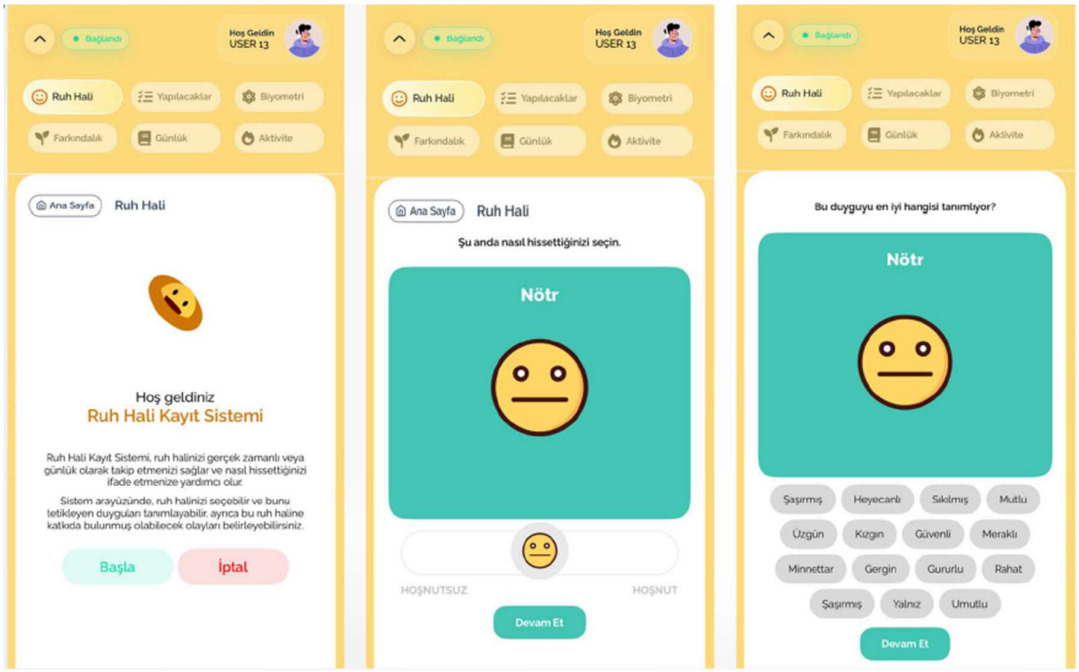

Fig- 8: Screenshots from Vestel's NOIRA BAND app, available in regional language (Turkish).

6. End of treatment/ discharge of patients

The end of clinical workflow with respect to a patient generally does not coincide with the timepoint of them being discharged or end of their treatment, as it involves follow-ups to review adherence of patients to their prescribed care plan beyond their treatment journey and discharge. However, for simplicity, in Fig- 1 we jump to the discharge step as the end-point. Hence the intermediate of “treatment monitoring” and “discharge” steps should be interpreted as timepoints encapsulating the hidden steps of follow-ups for review and revising of care plans, relapses, restarting of treatment due to relapses. The discharge step also includes high level of administrative burden including billing and insurance, possible home care. The AI-solutions from MEDrecord, Semlab, Ascora, MATERNA and Vestel help reduce this burden for the clinicians.

The trustworthiness of AI-based solutions among clinicians increases with the level of explainability of the model (which is at the backend of the presented solution), be it for screening, diagnosis, treatment planning or monitoring (Byeon 2023; Joyce et al. 2023; de Oliveira et al. 2025; Starke et al. 2022). The DAIsy WP4 partners are creating solutions tailored towards regional needs by providing large language model based solutions that cate to Dutch, German and Turkish languages.

III. Ecosystem between the partners developing AI solutions

This ecosystem includes the WP4 partners but naturally goes beyond that. This section describes the biweekly and monthly meetings of the WP4 partners, hereafter referred to as *regular meetings*, and the WP4 workshops.

1. Regular meetings

These contributed not only to technical knowledge exchange between partners, but also provided all involved partners an overview of what other partners have been working on. During each of the biweekly meetings between May-September 2024, two partners presented their ongoing work. This was followed by a lively Q&A session, where other WP4 partners could get further insights into the work of the presenting partners. These meetings have been recorded on Microsoft Teams, and uploaded on the dedicated meetings directory of the DAIsy WP4 channel.

Based on these presentation meetings synergistic working groups were created among the partners to achieve the goals illustrated in the flowchart in Fig- 9.

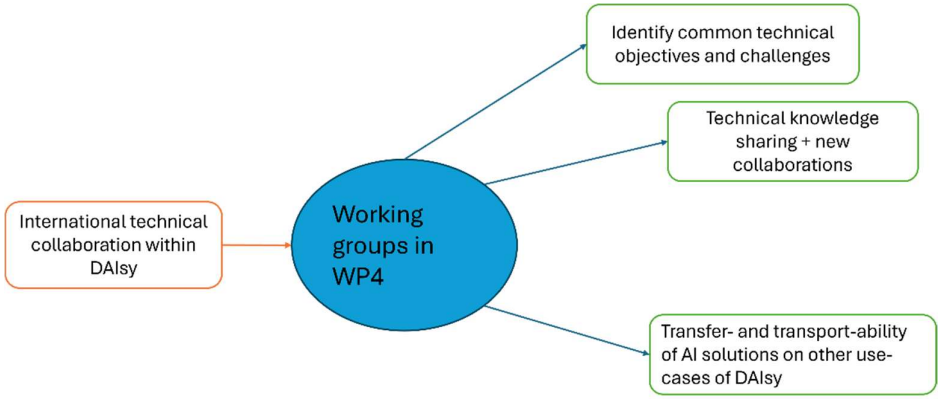

Fig- 9: Motivation for creation of working groups within WP4.

The working groups were divided into three broad themes, comprising of the partners contributing to WP4, as seen in Fig- 10. The themes of the working-groups are explained below:

a. Language models: Comprising of partners using Large Language Models (LLMs) like Whisper from Open AI and last-gen NLP models. Involved partners have been addressing all or some of the following objectives: Speech-to-text, Diarization and summarization, speech emotion detection, and extraction of relevant texts from reliable academic resources. These help in reduction of administrative burden of the clinicians, they allow clinicians to be more in the moment with the patients during their sessions, and provide clinicians quick and easy access to relevant clinical knowledge from trustworthy sources.
b. Mobile and web apps: This theme focuses on integration of different machine learning models and data analytic tools into mobile and web applications, for easy visualization of data and meta-data, and help in monitoring of patient's journey to recovery. While its theme is to integrate AI solutions in mobile platforms for patients and web platforms for clinicians, it also forms a bridge between WP4 and WP5.
c. Quantitative modelling: The theme focuses on development and application of quantitative models, i.e., computational models that are not language models. These include different machine learning models, including deep learning models for image and signal data.

It should be noted that partners associated with a working group could be contributing to other working groups as well. For example, 5M Software is part of the Mobile apps group because the solution they develop is in the form of a mobile app, FitSprite. However, the food-identification tool of this app is built on a convolutional neural network model, which is also part of Quantitative models. For similar reasons, OFFIS is associated with both Quantitative model and Mobile and Web apps groups.

2. DAIsy WP4 workshop-1

Eindhoven: On 16th October 2024 at the TU Eindhoven campus, the first WP4 workshop was organized. It marked the first hybrid working session of the individual partners as working groups shown in Fig- 10.

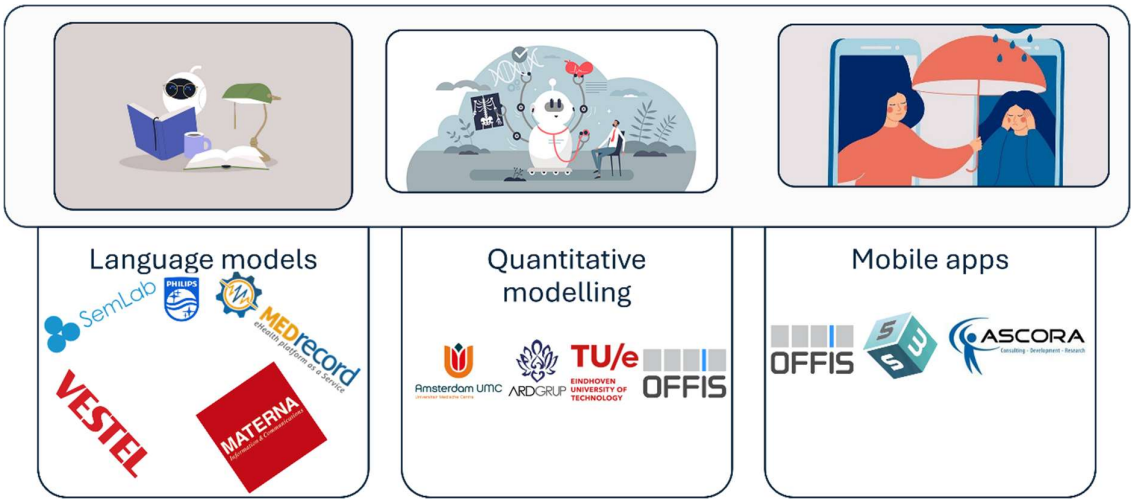

Fig- 10: Working-groups of WP4, themes and partners.

This grouping was made based on the availability of partner representatives for the break-out room brainstorming sessions.

The workshop comprised of a two-part brainstorming session within each of the aforementioned groups. During the first part, the partners within a working-group had to identify overlaps in their applications, challenges, and define common objective(s) of their group. During the second part, the partners had to strategize how to achieve at least one of the common objectives defined in the first part of the brainstorming session. The workshop concluded with a short presentation from each of the three groups, where they presented their common challenges and objectives, as explained below.

a. Language models:

Common objectives:

(i) Distill information to experts.
(ii) Search from general information sources.
(iii) Generate response for different roles (clinical expert vs patient).
(iv) Keep patient engaged in the therapy program.

Common challenges:

(i) Availability of in-domain data.
(ii) Defining the appropriate evaluation metrices and dimensions to assess what a good summary is, what the correct language is, and whether a generated answer is complete and grounded.
(iii) Efficient performance evaluation according to those metrics.
(iv) Large resource consumption when using cutting-edge LLMs.
(v) Re-using learnings in a fast paced field where a new(er) LLM is being introduced almost every other week.

b. Mobile and web apps.

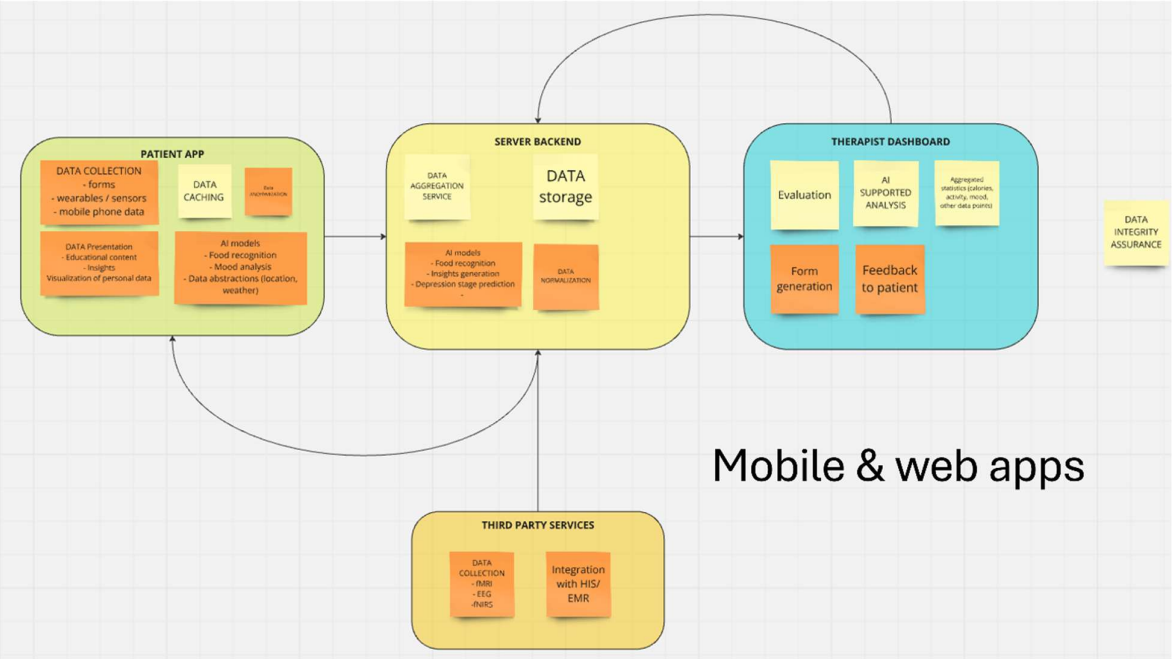

Fig- 11: Common objectives schematic presented by Mobile and web apps group

This working group presented four common blocks, that are interconnected as shown in Fig- 11: patient app, therapist dashboard, both connected to server backend which gets its input from third party services that collects data and integrates with EMR and HIS. These are supplemented by data integrity assurance.

c. Quantitative models:

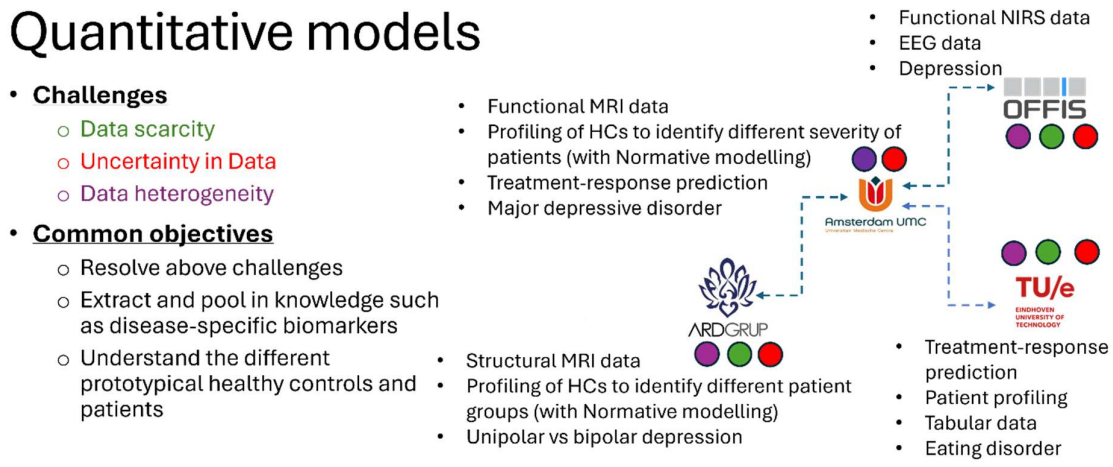

Fig- 12: Common and complementary challenges and objectives presented by Quantitative modelling group.

This group presented their common challenges and objectives, as shown in Fig- 12. As the partners found challenges that were not entirely overlapping across all of them, these were colour-coded to denote for which partner(s) these posed significant hindrances.

3. DAIsy WP4 workshop-2

Bremen: On 21st May 2025 WP4 had the 2nd iteration of its technical workshop at OFFIS, Bremen. This workshop comprised of revisiting the previously discussed challenges, and how each partner has dealt with these.

Within the quantitative modelling group the partners shared the technical solutions they themselves used to overcome a hurdle, along with those that they are aware of and they suspect could address some of the challenges being faced by the other partners.

A key theme within the Language Models working group was the scarcity of quality data for model development, and highlighted challenges related to this, including dataset quality and difference in languages. They also discussed the use of different APIs and integration methods, how to make models more transparent and interpretable for end-users. Participants discussed how the developed tools and models would be applied in real-world scenarios, following their application in the planned use cases.

IV. Ecosystem bringing together experts of AI and eating disorder domains

To form an ecosystem where experts and interested parties of two or more complementary domains can come together, establishing of common language is of utmost importance. Expert-meetings, workshops, and publications that help in bridging the knowledge-gap are some activities that can help achieve this.

1. Meeting of AI and Eating Disorder experts

On 13th September 2024, TU Eindhoven hosted a whole-day meeting and brainstorming session between experts from AI and eating disorder (ED) domains, along with experts on Ethics of AI for human applications. During the event, invited experts presented a 10 minute pitch of their expertise, research interests, and what they hoped to gain from the meeting. Thereafter the experts were divided into two groups, comprising of the same proportions of ED, AI, and Ethics of AI experts, and were led to two separate break-out rooms. In each break-out room the clinical experts explained what they expect from AI experts, what resources they can provide, and their limitations (in terms of availability and accessibility of data, computing resources, etc.). The AI experts answered the realistic possibilities given the constraints mentioned by the clinical experts. The discussion proceeded with AI experts questioning the eating disorder experts about what would make a developed AI solution trustworthy and reliable for the latter. The experts on Ethics of AI presented critical design aspects of AI solutions that both AI experts and ED experts who want to use these solutions need to bear in mind. The discussion also brought to light that while academic AI researchers will adhere to the clinical trials and AI governance regulations, the bar is much lower for commercial AI solutions. This is because these solutions are not focused on healthcare and therefore do not require to adhere to all the safety and security regulations that a dedicated medical device (including software solutions) requires. However, in reality, despite the lack of scrutiny that is required for any medical device, the commercial general purpose AI solutions in the market are often used by the patient population for managing different aspects of their health and diseases. Academic AI researchers cannot compete with this, not only due to financial resources, but also due to the easy accessibility of the general purpose, less scrutinized, fast developing alternative solutions from industry, and

the low AI-literacy of the end-users of these solutions. A qualitative paper presenting the results achieved in this symposium is currently being prepared for submission (named "Artificial Intelligence in Eating Disorder Treatment: A Qualitative Analysis of Clinical Opportunities, Barriers, and Ethical Considerations from Multi-Disciplinary Focus Groups") to International Journal of Eating Disorders.

2. Invitation to write a commentary article for International Journal of Eating Disorder (IJED)

Invitation by the Chief-Editor of the IJED, Prof. Ruth Weismann, to write a commentary on Deaken University's Eating Disorder expert, Dr. Linardon's article 'Using Artificial Intelligence to Advance Eating Disorder Research, Treatment and Practice' (Linardon and Fuller-Tyszkiewicz 2025). TU/e and GGz Oost-Brabant representatives accepted this invitation to address the knowledge gap between the AI and ED domains respectively. Even though the invitation was to two authors, all of the WP4 partners of DAIsy supported the contribution by engaging in constructive Q&A with the authors about what constitutes fairness in AI solutions, and how much does open access resources correlate with fair and reliability of these tools. While working on the commentary the authors came across evidence of the crucial need for AI literacy for its end-users, as was also discussed in the meeting of AI and ED experts in September 2024. This commentary article(Burger and Ghosh 2025), published on 15th April 2025, marks an important milestone for DAIsy.

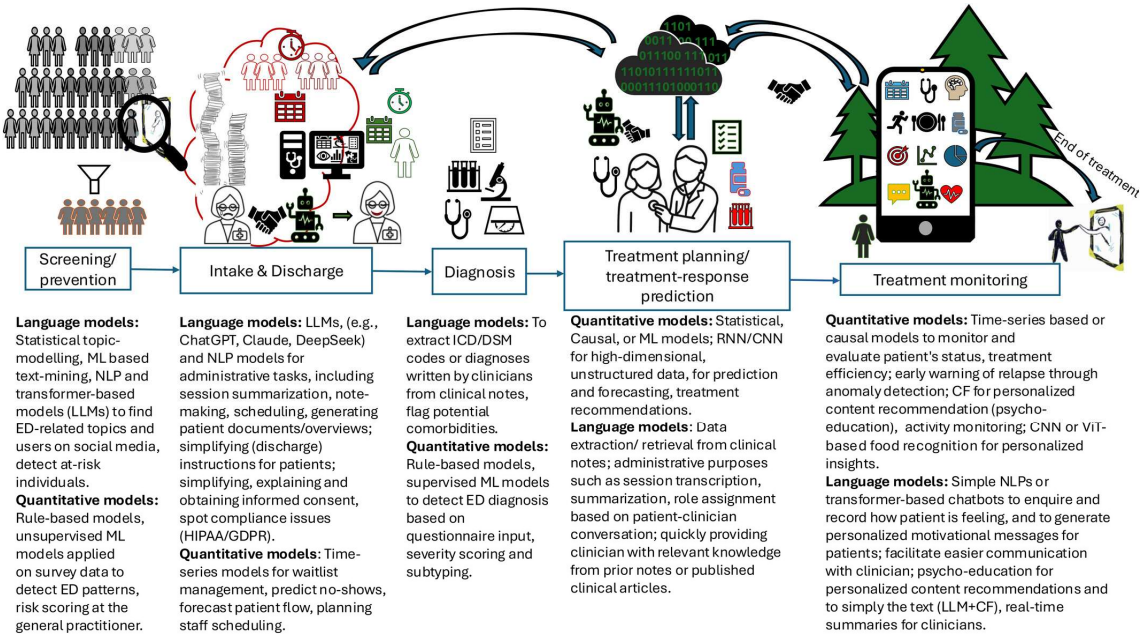

Fig- 13: AI Ecosystem in the clinical workflow for managing Eating disorders, from invited commentary of DAIsy "All in the name of Artificial Intelligence."

the international community of ED experts reaching out to DAIsy and WP4 responding to it promptly. Through this DAIsy WP4 not only could share the knowledge its partners pooled in, but also paved the way for finding potential new collaborators to continue working with, beyond DAIsy. This paper illustrates the AI ecosystem for the clinical management of ED, in terms of the different types of AI solutions at different points of the clinical workflow as illustrated in Fig- 13 (which inspired Fig- 1 of this document).

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