Personalised health monitoring

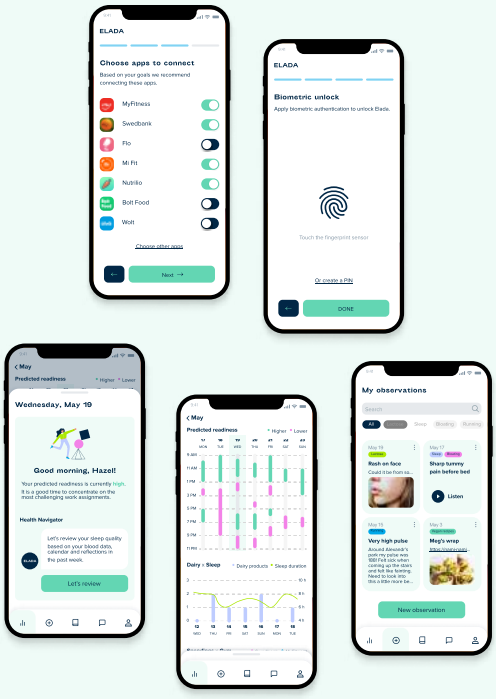
- **Disease prevention** is often ignored, preventative medicine remains unexplored due to high costs, where treating an existing disease is cheaper for the state. However, prevention has a lower social cost and higher rate of positive results.
- Conditions with prominent activation of the inflammatory response fall into three main groups: infections, autoimmune diseases, and some hematological malignancies. Each is identified by different biomarkers in the body and **can be detected early using blood tests**.
- One way to monitor and prevent a disease is **identify its presence before symptoms occur**, by monitoring such body responses as finger blood inflammatory markers.
- By using regular tests, a baseline can be established, and variation can be recorded, where **drastic changes would trigger a medical visit** to identify and fix the problem.
- **Early diagnosis allows for easier treatment and faster recovery**; however this is rare and in most cases the disease has already progressed and requires more invasive treatments.

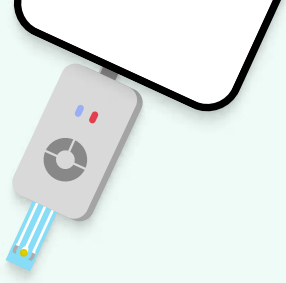
Objective

- To train a neural network to predict body responses and modify the developed individual-value-weighted model (IVW-M) using the daily finger test results.
- Train a model to integrate multiple data sources and give weight to their coefficients in the developed model (IVW-M).
- Test the single use strip-sensor accuracy of the biomarker concentration in blood samples, being independent of environmental settings. Targeting precision.

Limitations of the Present

- Patients visit the doctors when a sickness is developed for a while and its too inconvenient to just live with the pain and discomfort.
- After the initial visit to the hospital will the doctor request tests and blood samples to explore all the possible reasons for the symptoms.
- Laboratory analysis is expensive and impractical, for accurate analysis, large and extremely expensive equipment is required making them impractical for disease prevention.
- Regular analysis in such labs is time consuming and are not cost effective unless there is already a problem to be fixed and the person is already in distress.
- Doctors can only start investigations when the patient is already sick. They must follow protocols until the symptoms fade even if treatment itself has negative effects on the patient.





Our Solution

Part (I) Model training

- ***Data Collection***

  In a clinical setting to establish a clinical trial and measure their inflammation and treatment data with the resulting outcomes.

  Regular users: Using daily test strips for assessment of "normal" body response to environmental events and combining the event with changes in inflammation.

  Collect basic data for the early clients and establish individual baselines for each.

- ***Train a model*** that can actively predict the inflammation response based on established data.
- ***System integration*** with a portable chip-reader for local data analysis and Bluetooth sign-in system for logging the data on a personal account.
- ***Routine sample testing.*** Select random clients and analyze their sensor data with user interview, what lifestyle changes did they observe and process their samples in a laboratory setting for bias evaluation

Part (II) Individual data collection

Professor Ron Goetzel "Instead of debating whether prevention or treatment saves money, we should determine the most cost-effective ways to improve population health."

We believe the best cost-effective way would be to follow people long before they become patients by:

- ***Blood data collection***. A novel sensor base on molecularly imprinting technique on a graphene sensing layer, a novel and robust device that can actively and with high precision analyze multiple blood biomarkers, using the multiple array electrodes it can perform simultaneous multiple analyses and is cheap to produce, and convenient to use regularly.
- ***Genetic data***, consideration of your personal genetic fingerprint to consider some more probable health issues, like diabetes, cancers, autoimmune diseases, etc. that can actively predict the inflammation response based on established data.
- ***Lifestyle monitoring***. by aggregating such data as step counts, blood pressure and geographic location, we can predict the air quality, physical fitness and stress related physical developments during the day. All available data will be used in the individualized prediction model to better understand each individual habits and make forecasts on future health effects with significant accuracy.
- ***Personal questionnaire and diary***. Each morning and evening a set of lifestyle and mood questions will be presented, to assess your daily baselevel and satisfaction with life choices. In the evening, a diary will be accesses in a oral mode to record your feelings and experiences for the day, indicating the stress/satisfaction levels and anxiety related patterns that could further impede your health.
- ***Mindfulness and meditation*** will be a feature of the app, that would provide resources and advice for guided mindfulness exercises to promote mental health.

How our solution will fix it

- **Make patients more conscious of their life choices, the influence of habits and diets on long term wellbeing.**
- **Having a simple phone-attached device to record daily blood samples and cheap tests will eliminate the long commutes to and lines in hospitals.**
- **Train a personalized algorithm to predict changes in the body before its noticeable externally.**
- **Predict health outcomes for multiple life-threatening events before they take place. Predicting a heart attack, aneurism, or sepsis up to 48h before.**
- **Automatically contact the hospital in case of immediate health risks, booking a visit and requesting you to share data with clinicians.**
- **Only share the data with the doctors once a risk estimation is done, considered necessary and after your approval.**

Vision of better future

- Single blood test kit in every home for regular tests of all adult family members.
- Individuals accessing their private data to see graphs and corelations between diets, activities and life events with body responses.
- Cancers will no longer exist as all tumors will be treated before turning to cancers.
- People becoming more conscious of life style importance on health. Long term exposures to bad air or processed food.
- Heart attacks, strokes, appendicitis and other medical events will be prevented and conditions treated in hospitals.

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