

Success & Completion of Solution

We have identified the challenge of identifying and providing **timely and accurate diagnosis** of non-communicable diseases and addressing the lack of accessibility and affordability of healthcare services. Our solution, Orchid, is an **AI-powered** healthcare web and mobile application that includes NCD's diagnosis tools, an AI diet planner, mental health diagnosis, ASD Diagnosis, AI self-diagnosis & cover essential healthcare services.

Goals Evidenced, Metrics & Outcomes

The success of the solution can be evaluated using several metrics, goals, and outcomes. Some possible ones are:

- **Accuracy of AI diagnosis tools:** One of the primary goals is to provide **accurate & reliable diagnosis results** for NCD's. The goal would be to **achieve high accuracy** in predicting diseases and mental health conditions, and the outcome would be **fewer misdiagnoses** and better **healthcare outcomes** for users.

Accuracy of AI & ML Models				
Module Name	Technology	Algorithm Used	Outcome	Accuracy
Specialized Diagnosis Tools (Diabetes, CVD, Liver Disease, Brain Tumor)	sklearn	Random Forest Gradient Boosting	Risk Score, Binary Classification	90% (Average of four tools)
Mental Health Diagnosis	Tensorflow	https://tfhub.dev/google/tf2-preview/gnews-swivel-20dim/1	Mental Health Score, Suggestions, Helplines	86%
AI Self Diagnosis	sklearn	Support Vector Machine	Disease, Precautions , Medication	94%
Diet Planner	sklearn	Random Forest	Diet Supplements, Detailed Nutrition Analysis	100%
Autism Spectrum Disorder	sklearn	Random Forest	ASD Traits	95.9%

- **User engagement and satisfaction:** Another important metric is user engagement and satisfaction. The below features proven to enhance user experience and engagement. Furthermore, the Diet Planner Tool helps users achieve their **fitness goals** by providing personalized diet plans. The application provides various features such as:
 1. **User Registration**
 2. **Medical History Storage**
 3. **Medical Profile**
 4. **Health Blog**
 5. **Report/Feedback**
 6. **Book Appointment**
 7. **Validation of results**
- **Achieve high availability and scalability:** To achieve this goal **Google Cloud Platform (GCP)** is used for deployment. The application utilizes App Engine for deployment, Cloud SQL for the database, and Cloud Storage to store the AI models. This distributed and loosely coupled architecture ensures that the application is always available and can scale as needed.
- **Effectiveness of diet planner:** The effectiveness of the diet planner can be measured by the users' ability to achieve their health goals, such as weight loss, muscle gain, or improved nutrition. The goal would be to provide users with personalized diet plans, and the outcome would be improved health outcomes for users.

Cause & Effect of the Solution

The impact of the Orchid application can be seen in the significant **reduction of misdiagnosis**, especially in the case of NCDs, leading to better patient outcomes and an overall improvement in the quality of healthcare.

- The **cause of the impact** is the accurate and faster diagnosis of NCDs using specialized diagnosis tools powered by AI and ML algorithms.
- The **effect** is the reduction of misdiagnosis, leading to better patient outcomes and an overall improvement in the quality of healthcare. This is achieved through the use of state-of-the-art technologies such as **GCP, Django, Python, Flutter, and Tensorflow**.

The Orchid application can have a significant impact on the healthcare industry due to its powerful AI-based diagnosis tools and user-friendly interface. The cause of this impact is the advanced algorithms and models that power the diagnosis tools, such as **SK-Learn random forest, SVM** for the self-diagnosis tool and **TensorFlow** for the mental health diagnosis tool. Additionally, the seamless integration with **Google technologies** such as **GCP, Cloud SQL, and Cloud storage** has allowed for easy deployment and maintenance of the application, resulting in increased efficiency and scalability.

How our solution address the problem we are looking to solve:

Orchid application addresses several problems related to NCDs, mental health, and malnutrition, which are critical components of **UNSDG 2** and **UNSDG 3**. By providing early detection and prevention tools, the application helps individuals lead healthier and more fulfilling lives, and also contributes to the achievement of the United Nations Sustainable Development Goals.

- The NCDs, such as CVD, diabetes, and brain tumors, have become a significant health challenge globally. Orchid provides diagnosis tools for these diseases, which are powered by **SKLearn random forest algorithms** using both classification and regression algorithms. These tools help in the **early detection and prevention of NCDs**.
- Mental health is another area that the Orchid addresses. The Orchid provides a mental health diagnosis tool that is powered by **Tensorflow** and processes using **natural language processing (NLP)**. The tool presents users with a mental health score ranging from 0 to 100 based on their answers to a few questions. If the score is low, users are presented with a set of helplines and suggestions. This tool helps in early detection and prevention of mental health issues and ensures that individuals **receive timely and appropriate support**.
- Malnutrition is another significant problem that the Orchid addresses. The Orchid provides a diet planner tool that helps individuals plan their diets. The tool calculates the user's body mass index (BMI) and feeds the data into an ML model that fetches the user's diet category from **Google Cloud SQL database**. The tool also filters the results based on user customization, such as veg/non-veg or diabetic. This tool helps individuals maintain a healthy diet and **reduces the risk of malnutrition**.
- Orchid addresses the problem of Autism Spectrum Disorder (ASD) diagnosis by utilizing a machine learning tool based on the random forest algorithm. This tool aims to identify ASD traits in individuals, particularly toddlers, allowing for early detection and intervention. ASD is a developmental disorder that affects communication, social interaction, and behavior. Early diagnosis of ASD is crucial because it enables early intervention and treatment, which can significantly improve outcomes for individuals with ASD.
- AI self-diagnosis tool powered by SVM, provide sense of the diseases based on the symptoms provided. Also other aspects of the application like validation of results, booking appointments with experts & many other features contributes to achieve UN SDG Goals.

Mapping Specific UN SDG Indicators with Orchid

Target	Target Name	Orchid Solution
3.4.1	Mortality rate attributed to Non-Communicable Diseases (NCD)	Orchid's NCD diagnosis tool utilizes machine learning algorithms to predict the occurrence of NCDs, enabling early detection and accurate diagnosis.
2.1.1	Prevalence of undernourishment	Orchid's personalized nutrition tool generates customized diet plans to address undernourishment and promote optimal health.
2.2	End all forms of malnutrition	Orchid's personalized nutrition feature helps combat various forms of malnutrition by providing tailored diet plans based on individual needs.
3.4.1	Promote mental health & well-being	Orchid's mental health tool utilizes TensorFlow to generate comprehensive mental health scores and offers suggestions for support and helpline information.
3.4.1	Early detection of Autism Spectrum Disorder (ASD) in toddlers	Orchid's ASD diagnosis tool uses machine learning to predict ASD traits in children aged 1 to 3, aiding in early detection and intervention.
3.8.1	Coverage of essential health services	<ul style="list-style-type: none">• Orchid provides essential health services through features like medical profile maintenance, diagnosis history analysis, appointment booking, and more.• Secured Authentication: Orchid ensures secure registration and login functionalities using Google Cloud SQL database and Django's SHA-256 hashing algorithm.• Error Reporting: Orchid allows users to report bugs and issues, ensuring continuous improvement and a seamless user experience.

Testing Reports

Category	Link
Manual Testing Data	https://docs.google.com/spreadsheets/d/1tfTn-JF8IUZcObC_qGJynwqg58dkQUUN/edit?usp=share_link&ouid=112200924299696580791&rtf=tpof=true&sd=true
Beta Testing (User Reviews-Videos)	https://drive.google.com/drive/folders/1jQDIFj9YWmxbWZyljkTGJmPIUO-yVAbG?usp=share_link
Beta Testing (User Reviews – Google Forms)	https://docs.google.com/spreadsheets/d/1cm_Az-77HaBIQMwY_FtcI9PZ_J_mFAhMGqB9m1ttHxg/edit?usp=sharing