AI BASED DIABETES PRITICTION SYSTEM

Abstract Background:

Gestational diabetes mellitus (GDM) can cause adverse consequences to both mothers and their newborns.

However, pregnant women living in low- and middle-income areas or countries often fail to receive early clinical interventions at local medical facilities due to restricted availability of GDM diagnosis.

The outstanding performance of artificial intelligence (AI) in disease diagnosis in previous studies demonstrates its promising applications in GDM diagnosis.

Objective:

This study aims to investigate the implementation of a well-performing AI algorithm in GDM diagnosis in a setting, which requires fewer medical equipment and staff and to establish an app based on the AI algorithm. This study also explores possible progress if our app is widely used.

Methods:

An AI model that included 9 algorithms was trained on 12,304 pregnant outpatients with their consent who received a test for GDM in the obstetrics and gynecology department of the First Affiliated Hospital of Jinan University, a local hospital in South China, between November 2010 and October 2017.

GDM was diagnosed according to American Diabetes Association (ADA) 2011 diagnostic criteria.

Age and fasting blood glucose were chosen as critical parameters. For validation, we performed k-fold cross-validation (k=5) for the internal dataset and an external validation dataset that included 1655 cases from the Prince of Wales Hospital, the affiliated teaching hospital of the Chinese University of Hong Kong, a non-local hospital.

Introduction:

Gestational diabetes mellitus (GDM), common in pregnancy, exerts negative effects on both mothers and their newborns, including cesarean delivery, shoulder dystocia, macrosomia, neonatal hypoglycemia, post-GDM type 2 diabetes mellitus, cardiovascular disease of pregnant women, and increased risk of obesity and type 2 diabetes mellitus on the offspring [1].

However, if GDM can be diagnosed at an early stage, early interventions can be implemented to maximally reduce its adverse consequences [2,3]. Although GDM prevalence in some developing African countries is high (eg, 8.2% in Nigeria and 9.5% in Tanzania) [4], pregnant women are less likely to receive adequate health care due to the lack of skilled health workers [5].

Other factors, such as poverty, inadequate medical services, long distance to hospitals, less access to information, and culture and traditions also prevent women from seeking care during pregnancy.

Artificial intelligence (AI) has been widely used in disease diagnosis in recent years [6,7]. Several advanced AI algorithms, such as deep learning, support vector machine (SVM), and convolutional neural network, have shown comparable performance to clinicians [8]. Major advanced AI approaches yield significant discriminative performance with relatively high sensitivity, specificity, and accuracy in object-identifying tasks [9,10].

At the same time, the world has witnessed the instantaneity of reporting and the consistency of producing results by AI [11]. AI is becoming more suitable for use in clinical daily practice [12] and offers the advantage of greater accuracy and efficiency [13]. An AI-driven dietary platform has been developed for diabetes management [14], and AI tools can enhance diabetes care for individuals and societal health [15,16]. Due to the advantages above, AI is expected to be further studied and implemented in the GDM diagnosis field to maximize social and economic benefits.

A systematic review and meta-analysis on telemedicine technologies for diabetes in pregnancy conducted by our team in 2016 showed that telemedicine technologies can streamline clinical care delivery and improve maternal satisfaction [17].

We also evaluated the current state of GDM diagnosis programs by searching Scopus, Web of Science, PubMed, and Embase for studies published in English from inception up to November 17, 2019, using the keywords "gestational diabetes mellitus," "GDM," "GDM screening," "GDM detection," "GDM diagnosis," "machine learning," "artificial intelligence (AI)," and "deep learning." Although some papers applied AI on screening or early diagnosis of GDM [18,19], they only used the expert system or risk score model instead of up-to-date AI algorithms such as random forest.

Recently, a team from Israel applied top 20 contributing features such as baseline risk score and glucose challenge test results of previous pregnancy. A machine learning model based on national electronic health records reached high accuracy for GDM diagnosis [20].

Therefore, we intend to establish a GDM diagnosis tool using AI technology for women in low-resource areas. As our app targets to serve patients in resource-limited areas, it would be more practical and accessible if we can use only fasting glucose value and other patient's basic health information such as age, body weight, and height.

This study (referred to as GDM-AI study, ie, the study of AI-based diagnosis of GDM) aims to validate and rank the performance and applicability of AI algorithms in diagnosing GDM and to develop an innovative AI application for maternal health care.

This paper will also present the ideas behind our app, as well as its contributions and prospects.

home.html:
In this file, we create a simple home page in which we write a simple heading massage welcome to Diabetes prediction System and add one button to redirect to the form page which is the second page of our Diabetes prediction or redirect one page to another page we are using a form action tag which we write the function name home which we create view.py file and we added a render_templates for redirect to predict page. you can download the whole code of this project by click here.

HTML

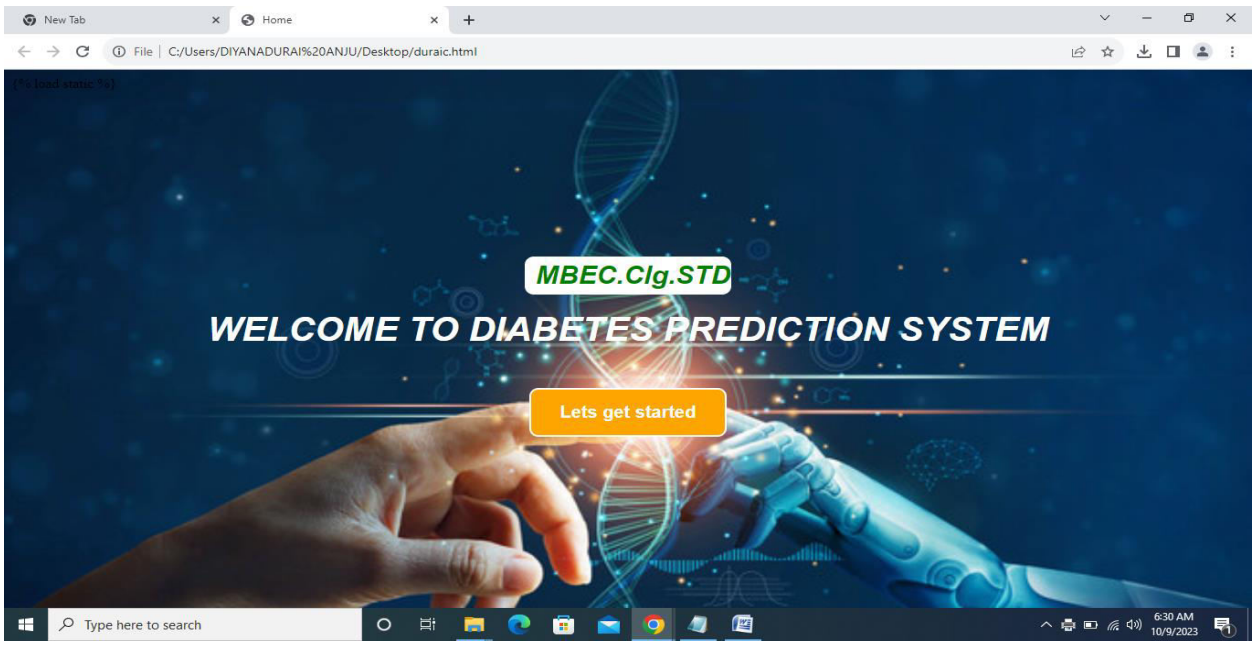
```
{% load static %}

<!DOCTYPE html>

<html lang="en">



<head>

    <meta charset="UTF-8">

    <title>Home</title>

    <style type=text/css>

        div {

            color: 'white';

        }



        h2 {

            color: white;

            font-family: arial, sans-serif;

            font-size: 40px;

            font-weight: bold;

            margin-top: 200px;

            transform: 2s;
```

```
}
body {
    background-color: black;
    background-image: url(https://i.ibb.co/PNSXdwC/img4-3.jpg);
    background-size: cover;
    background-repeat: no-repeat;
}
input {
    background-color: #FFA500;
    border: 2px;
    color: white;
    padding: 16px 32px;
    font-size: 20px;
    font-weight: bold;
    cursor: pointer;
    margin-top: 15px;
    border: 2px solid white;
   border-radius: 10px
}
input:hover{
```

```
            background-color: white;
            color: #FFA500;
            border: 2px solid #FFA500;
        }
        .gfg {
            color: green;
            background-color: white;
            padding: 6px 12px;
            width: 15%;
            border-radius: 10px;
            font-size: 30px;
        }
 </style>
</head>

<body>
    <div align='center'>

        <h2><em>
                <h1 class="gfg">MBEC CLG STD </h1>
```

```
                WELCOME TO DIABETES PREDICTION SYSTEM

            </em>

        </h2>

        <form action="predict">

            <input type="submit" value="Lets get started">

        </form>



    </div>

</body>



</html>
```

OUTPUT:



predict.html:
In this file, we created a simple form in which we need to fill in some input like health details like pregnancy, age, BMI, and many other details which is a form required for predicting diabetes in person and also we added a predict button when we click on button it will show the result as a flash message on same display screen like person have diabetes or not flash massage for perform all operations in our prediction system we created a two function predict and result through which we connected all the files separated and display result.

- HTML

```
{%load static%}

<!DOCTYPE html>

<html lang="en">



<head>

    <meta charset="UTF=8">

    <title> Prediction page</title>

    <style>

        td {

            font-size: 17px;

        }



        body {

            background-color: black;
```

```
        background-image: url(https://i.ibb.co/jZvBMgg/img4-4.jpg);
        background-size: cover;
        background-repeat: no-repeat;
    }
    .main {
        top: 80px;
        left: 110px;
        width: 550px;
        margin-left: 7%;
        background-color: white;
        border-radius: 15px;
        height: 110vh;
        align-items: center
    }
    .main:hover {
        box-shadow: 50px 0px 20px 0px rgba(0, 0, 0, 0.2);
    }
    h1 {
        font-family: Times New Roman;
        margin: 20px, 0;
```

```
        color: #F6465B;
        font-size: 30px;
        font-weight: bold;
        animation-delay: 3.5s;
    }
    input[type=submit] {
        background-color: #FFA500;
        border: 2px;
        color: white;
        font-size: 15px;
        font-weight: bold;
        padding: 10px 16px;
        cursor: pointer;
        margin-top: 15px;
        border-radius: 10px;
    }
    input {
        padding: 20px, 0;
        margin: 20px, 0;
    }
```

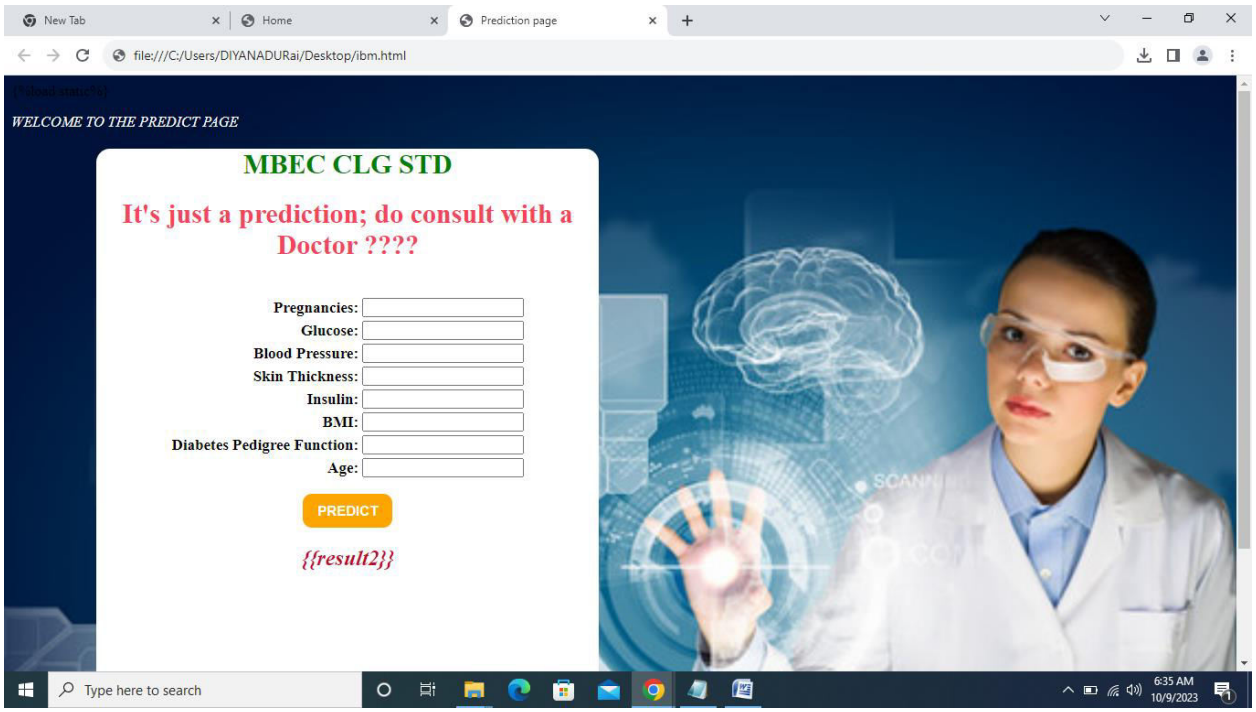
```
        p {
            color: #ffffff;
        }
        .row em {
            color: #BF0A30;
        }
        .gfg {
            color: green;
            font-size: 30px;
        }
    </style>
</head
<body>
    <p><em>WELCOME TO THE PREDICT PAGE</em></P>
    <div align='center' class="main">
        <h1 class="gfg">MBEC CLG STD </h1>
        <h1>It's just a prediction; do consult with a Doctor ????</h1> <br />
        <form action="result">
            <table>
```

```
<tr>
    <td align="right"> <strong>Pregnancies:</strong> </td>
    <td align="left"><input type="text" name="n1"></td>
</tr>
<tr>
    <td align="right"> <strong>Glucose:</strong> </td>
    <td align="left"><input type="text" name="n2"></td>
</tr>
<tr>
    <td align="right"> <strong>Blood Pressure:</strong> </td>
    <td align="left"><input type="text" name="n3"></td>
</tr>
<tr>
    <td align="right"> <strong>Skin Thickness:</strong> </td>
    <td align="left"><input type="text" name="n4"></td>
</tr>
<tr>
    <td align="right"> <strong>Insulin:</strong> </td>
    <td align="left"><input type="text" name="n5"></td>
</tr>
```

```
                <tr>
                    <td align="right"> <strong>BMI:</strong> </td>
                    <td align="left"><input type="text" name="n6"></td>
                </tr>
                <tr>
                    <td align="right"><strong>Diabetes Pedigree Function:</strong> </td>
                    <td align="left"><input type="text" name="n7"></td>
                </tr>
                <tr>
                    <td align="right"> <strong>Age:</strong> </td>
                    <td align="left"><input type="text" name="n8"></td>
                </tr>
            </table>
            <input type="submit" value="PREDICT">
        </form>
        <div class="row">
            <h2><em>{{result2}}</em></h2>
        </div>
    </div>
</body>
```

```
</html>
```

Output:



Report:

All the above instruction are installed and executed successfully.

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