

# DIABETES MELLITUS PREDICTION USING MACHINE LEARNING

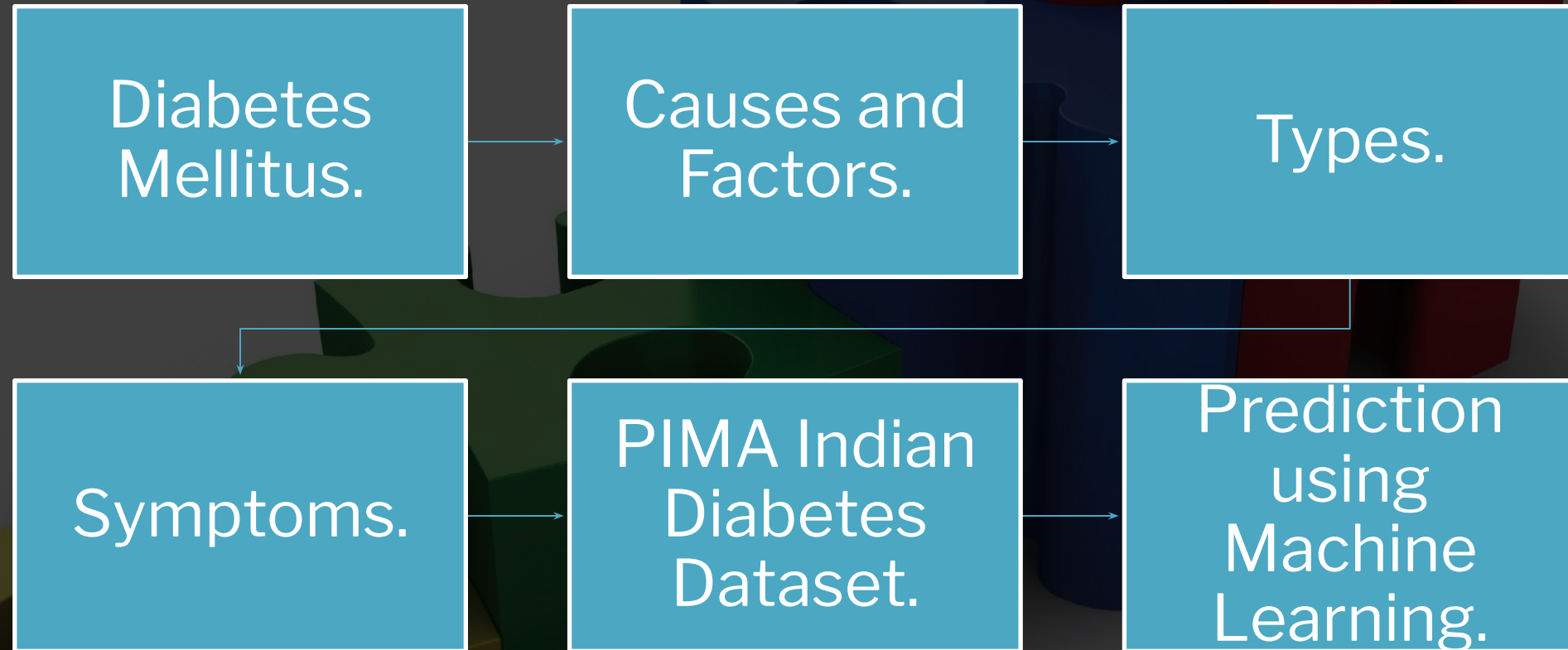
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# INTRODUCTION



# OBJECTIVE

Data Pre-processing using Machine Learning.

Developing Models for Prediction.

Selecting the best model for use.

Developing website using Python which takes the user data to predict the result.



# MACHINE LEARNING

- ◆ **Machine Learning** is the field of study that gives computers the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that which makes it more similar to humans: ***The ability to learn.***
- ◆ Supervised Learning.
- ◆ Un-Supervised Learning.
- ◆ Semi-Supervised Learning.

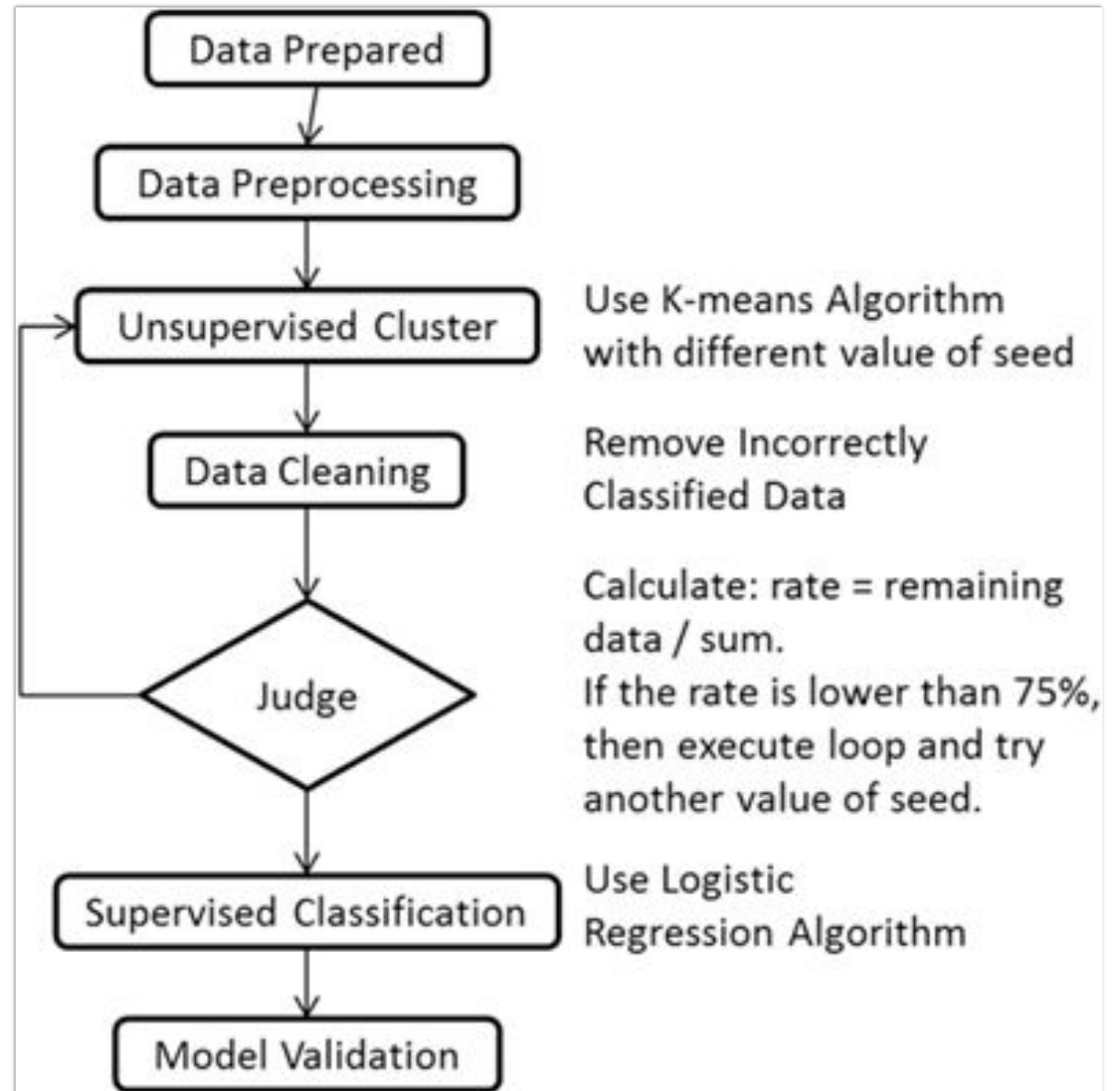
# Machine Learning Models

- ◆ K-Nearest Neighbour Classifier.
- ◆ Support Vector Classifier.
- ◆ Logistic Regression.
- ◆ Decision Tree Classifier.
- ◆ Gaussian Naïve Bayes.
- ◆ Gradient Boosting Classifier.

# Tools and Packages

- ◆ Python
- ◆ Anaconda
- ◆ Flask
- ◆ Python Libraries : NumPy, Pandas, Sci-Kit Learn, Matplotlib

# System Design





## Best Model Selection

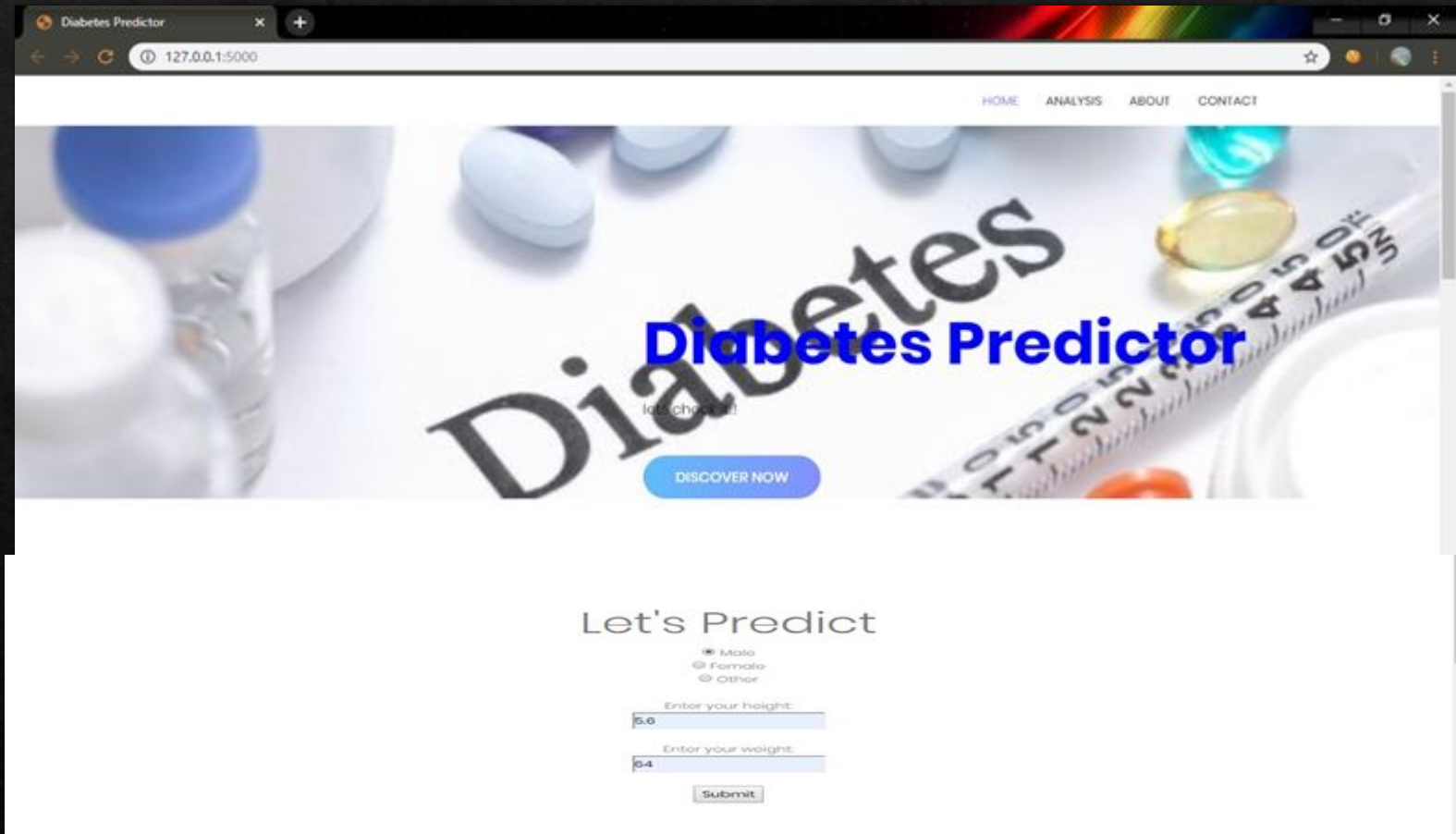
|   | Name | Score    |
|---|------|----------|
| 0 | KNN  | 0.735931 |
| 1 | SVC  | 0.670996 |
| 2 | LR   | 0.783550 |
| 3 | DT   | 0.731602 |
| 4 | GNB  | 0.800866 |
| 5 | RF   | 0.796537 |
| 6 | GB   | 0.787879 |



# Making Prediction for the user

- ◆ Developing front end of the website with python so that web application will be up to date and easily adoptable.
- ◆ This website predicts the diabetes of the person using the model we developed after Machine Learning of the Pima Indian Dataset.

# Web Application



The screenshot shows a web browser window with the title 'Diabetes Predictor' and the address '127.0.0.1:5000'. The page features a header with navigation links: HOME, ANALYSIS, ABOUT, and CONTACT. The main banner image shows medical supplies (bottle, pills, syringe) with the word 'Diabetes' and the text 'Diabetes Predictor' overlaid in blue. A 'DISCOVER NOW' button is present. Below the banner, the section 'Let's Predict' contains a form with radio buttons for gender (Male, Female, Other), input fields for height (5.6) and weight (54), and a 'Submit' button.

Diabetes Predictor

HOME ANALYSIS ABOUT CONTACT

Diabetes Predictor

DISCOVER NOW

Let's Predict

☒ Male  
☐ Female  
☐ Other

Enter your height: 5.6

Enter your weight: 54

Submit



# Core Attributes

- ◆ In this page you need the core attribute values like glucose, blood pressure, skin thickness, insulin, diabetes predigree function, age



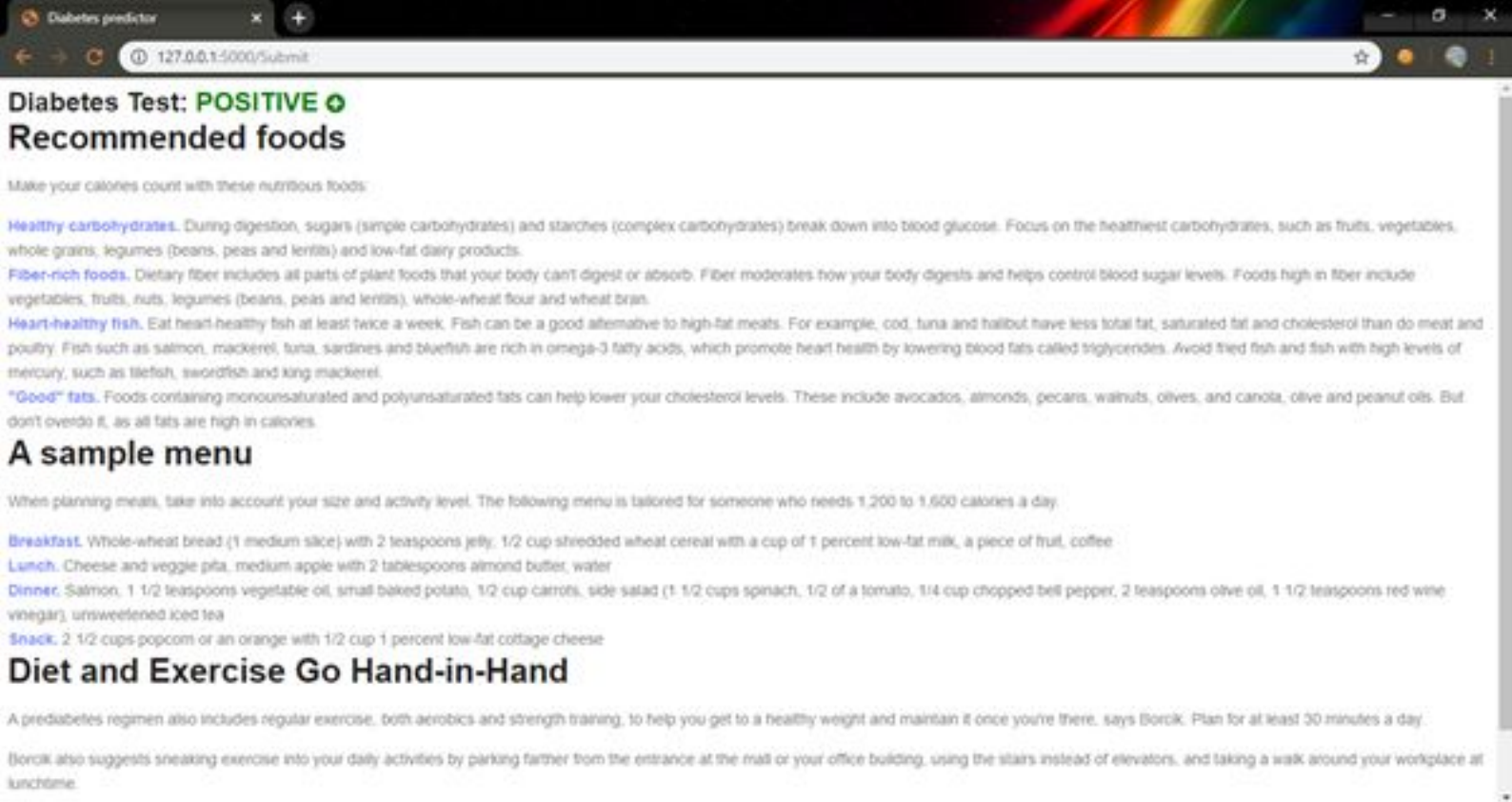
The screenshot shows a web browser window with a single tab titled '0/submit'. The page content is titled 'Diabetics Predictor' in red text. Below the title, there are six input fields, each with a label and a value: 'Glucose' with '200', 'BloodPressure' with '72', 'SkinThickness' with '32', 'Insulin' with '300', 'DiabetesPredigreeFunction' with '0.588', and 'Age' with '39'. At the bottom of the form is a 'Submit' button.

| Attribute                 | Value |
|---------------------------|-------|
| Glucose                   | 200   |
| BloodPressure             | 72    |
| SkinThickness             | 32    |
| Insulin                   | 300   |
| DiabetesPredigreeFunction | 0.588 |
| Age                       | 39    |



# Positive Outcomes

- ◆ If the patient gets **POSITIVE** in result that means he is suffering from **DIABETES**. So he need to take care of his health by taking recommended nutritious food.



The screenshot shows a web browser window with the address bar displaying '127.0.0.1:5000/Submit'. The page title is 'Diabetes predictor'. The main heading is 'Diabetes Test: **POSITIVE**' with a green checkmark icon. Below this is a section titled 'Recommended foods' with the subtext 'Make your calories count with these nutritious foods:'. The text provides detailed advice on healthy carbohydrates, fiber-rich foods, heart-healthy fish, and 'Good' fats. It also includes a section titled 'A sample menu' with a subtext 'When planning meals, take into account your size and activity level. The following menu is tailored for someone who needs 1,200 to 1,600 calories a day.' The menu lists breakfast, lunch, dinner, and a snack. Finally, there is a section titled 'Diet and Exercise Go Hand-in-Hand' with a subtext 'A prediabetes regimen also includes regular exercise, both aerobics and strength training, to help you get to a healthy weight and maintain it once you're there, says Borcik. Plan for at least 30 minutes a day.' and a paragraph about sneaking exercise into daily activities.

**Diabetes predictor**

127.0.0.1:5000/Submit

## Diabetes Test: **POSITIVE**

### Recommended foods

Make your calories count with these nutritious foods:

**Healthy carbohydrates.** During digestion, sugars (simple carbohydrates) and starches (complex carbohydrates) break down into blood glucose. Focus on the healthiest carbohydrates, such as fruits, vegetables, whole grains, legumes (beans, peas and lentils) and low-fat dairy products.

**Fiber-rich foods.** Dietary fiber includes all parts of plant foods that your body can't digest or absorb. Fiber moderates how your body digests and helps control blood sugar levels. Foods high in fiber include vegetables, fruits, nuts, legumes (beans, peas and lentils), whole-wheat flour and wheat bran.

**Heart-healthy fish.** Eat heart-healthy fish at least twice a week. Fish can be a good alternative to high-fat meats. For example, cod, tuna and halibut have less total fat, saturated fat and cholesterol than do meat and poultry. Fish such as salmon, mackerel, tuna, sardines and bluefish are rich in omega-3 fatty acids, which promote heart health by lowering blood fats called triglycerides. Avoid fried fish and fish with high levels of mercury, such as tilefish, swordfish and king mackerel.

**"Good" fats.** Foods containing monounsaturated and polyunsaturated fats can help lower your cholesterol levels. These include avocados, almonds, pecans, walnuts, olives, and canola, olive and peanut oils. But don't overdo it, as all fats are high in calories.

### A sample menu

When planning meals, take into account your size and activity level. The following menu is tailored for someone who needs 1,200 to 1,600 calories a day.

**Breakfast.** Whole-wheat bread (1 medium slice) with 2 teaspoons jelly, 1/2 cup shredded wheat cereal with a cup of 1 percent low-fat milk, a piece of fruit, coffee

**Lunch.** Cheese and veggie pita, medium apple with 2 tablespoons almond butter, water

**Dinner.** Salmon, 1 1/2 teaspoons vegetable oil, small baked potato, 1/2 cup carrots, side salad (1 1/2 cups spinach, 1/2 of a tomato, 1/4 cup chopped bell pepper, 2 teaspoons olive oil, 1 1/2 teaspoons red wine vinegar), unsweetened iced tea

**Snack.** 2 1/2 cups popcorn or an orange with 1/2 cup 1 percent low-fat cottage cheese

### Diet and Exercise Go Hand-in-Hand

A prediabetes regimen also includes regular exercise, both aerobics and strength training, to help you get to a healthy weight and maintain it once you're there, says Borcik. Plan for at least 30 minutes a day.

Borcik also suggests sneaking exercise into your daily activities by parking farther from the entrance at the mall or your office building, using the stairs instead of elevators, and taking a walk around your workplace at lunchtime.

# Negative Outcomes

- ◆ If the Patient result is **NEGATIVE** then he is not suffering but the Patient can know how much chance is there that he can be attacked by **DIABETES**.

Diabetes predictor

127.0.0.1:5000/Submit

**Diabetes Test: NEGATIVE**

**Predicted Diabetes Percentage: 0.8**

**7 Golden Rules to Prevent Diabetes**

Here are seven sound diet principles that can keep your blood sugars from creeping upward, among other health benefits.

**Skip the sugary drinks.** No sweet tea. No juice. No soda. No sweetened lemonade. No mocha latte coffee creations. "My number one recommendation to people is: Don't drink your sugar," Borcik says. Sugary drinks provide nothing more than empty calories, and they won't help you feel full. "All the sugary drinks out there are a real risk factor for obesity," she stresses.

**Pull back on portions.** You still can eat many of the foods you like, just have smaller amounts of them, Borcik says, adding that this is especially true for starchy foods like white rice, white potatoes, and pasta. Cut out high-calorie, junky snacks, and save your decadent desserts for special occasions. Remember that even healthy foods can lead to weight gain if you eat too much of them, and being overweight is a primary risk factor for type 2 diabetes.

**Fill up on fiber.** Eat plenty of high-fiber foods, including vegetables, fruits, beans, and whole grains. Fiber helps you feel fuller longer and can help you eat less to avoid weight gain. At least half your plate should be fruits and vegetables that have been steamed or sautéed in healthy fats. Those veggies can be fresh, frozen, or canned. Just skip the canned vegetables with added salt.

**Be choosy about fats.** Your diet should have some fat, but opt for the healthiest sources: olive and vegetable oils, nuts, seeds, and avocado. Buy low-fat or fat-free dairy products such as reduced-fat cheeses, non-fat or low-fat yogurt, and skim milk.

**Drink alcohol only in moderation.** Men should have no more than two drinks a day, women no more than one. A drink is 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits of 80-proof.

**Choose lean meats.** To easily identify lean red meats, look for cuts that have the word "round" or "loin" in their name, such as top round or pork loin. Even with these better-for-you picks, trim all visible fat. Opt for white-meat chicken or turkey without the skin. Adding fish to your diet two to three times a week is part of a diet that can help diabetes prevention. Bake, broil, roast, grill, or sauté rather than fry to keep it lean, Borcik says.

**Stay hydrated.** Drink plenty of water. People often mistake thirst for hunger, which can lead to overeating and weight gain. "You feel better when you're hydrated," Borcik says. "Staying hydrated helps to lower your blood sugar, which you should do anyway."

**Diet and Exercise Go Hand-in-Hand**

A prediabetes regimen also includes regular exercise, both aerobics and strength training, to help you get to a healthy weight and maintain it once you're there, says Borcik. Plan for at least 30 minutes a day.

# Conclusion

- ◆ In this project we have discussed how Machine Learning is useful.
- ◆ Machine Learning Models.
- ◆ Machine Learning Procedure.
- ◆ How to use this model to predict the future outcomes.
- ◆ Applications in different fields.