A start-up company *DiagnosisML* develops four different machine learning (ML) models to predict whether a person has a high risk or low risk of developing certain **chronic diseases**, e.g., heart disease, kidney disease, diabetes, and bowel disease. These four ML models have different configurations but are all based on the **Decision Tree** algorithm.

Users need to provide their biological markers to the ML model, shown as follows:

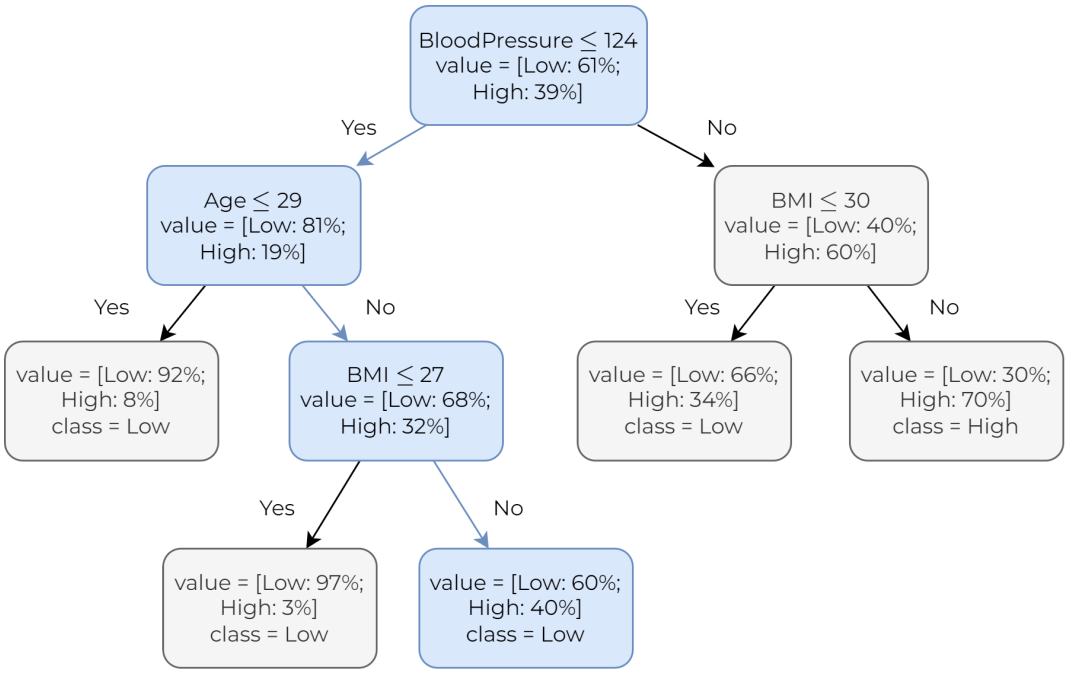
Name	Description
Glucose	Plasma glucose concentration in an oral glucose tolerance test
Blood Pressure	Diastolic blood pressure (mm Hg)
Skin Thickness	Triceps skin fold thickness (mm)
Insulin	2-hour serum insulin (mu U/ml)
BMI	A measure of body fat based on weight and height
Diabetes Pedigree Function	Diabetes likelihood based on the subject's age and their diabetic family history
Age	Age in years

In the following sessions, each ML model will provide an explanation to a user. Assume that the user is one of your friends, your role is to help your friend judge whether a statement about the provided explanation is correct or not.

This company develops an ML model – **Model H** – based on a vanilla **Decision Tree** model that predicts users' risk of having **Heart Disease**. A new user (ID-248) provides Model H with their bio-markers (Descriptions) shown as follows:

Glucose	Blood Pressure	Skin Thickness	Insulin	BMI	Diabetes Pedigree	Age
124	70	33	402	35.4	0.282	34

Model H predicts that the user (ID-248) has a **low risk** of developing Heart Disease, and provides the following ML explanation to show how Model H derives the decision for this person – it does so by following the blue trace.



Q1-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*Blood Pressure has the **most** impact (i.e., is the most important) on the prediction this user (ID-248) gets.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q1-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q2-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*Assume that all other biomarker values remain the same, increasing this person's BMI to 38 will change their result from low risk to high risk.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q2-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q3: Please indicate your agreement with the statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
This explanation is **easy to understand**	○	○	○	○	○	○	○
This explanation is **sufficiently detailed**	○	○	○	○	○	○	○

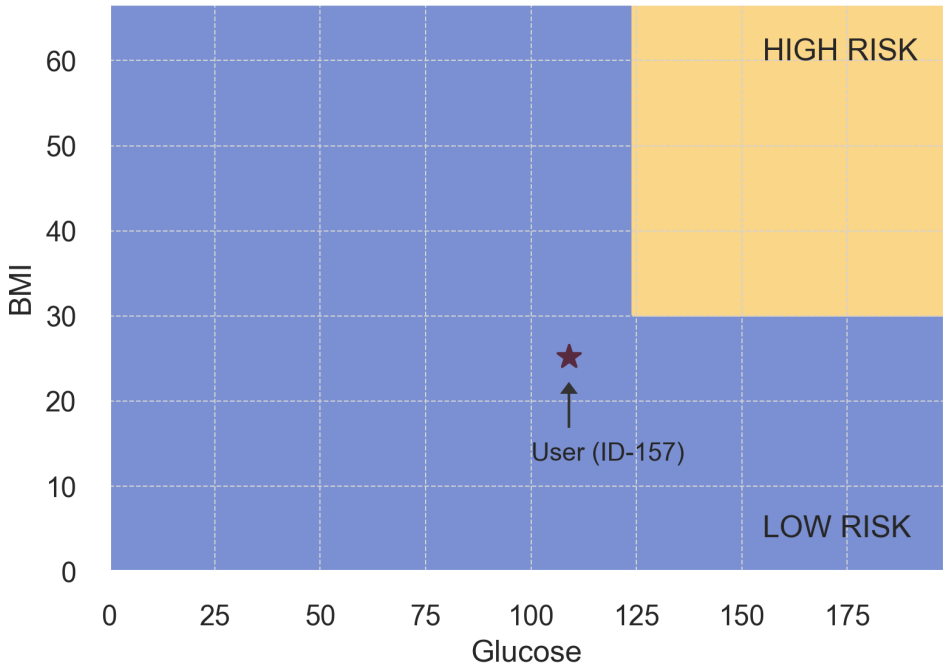
Q4: Which bio-marker is provided by this user to the ML model?

- ○ Sweat Rate
- ○ Smoking
- ○ Blood Pressure
- ○ Alcohol Consumption

This company develops an ML model – **Model K** – based on a vanilla **Decision Tree** model that predicts users' risk of having **Kidney Disease**. A new user (ID-157) provides Model K with their bio-markers (Descriptions) shown as follows:

Glucose	Blood Pressure	Skin Thickness	Insulin	BMI	Diabetes Pedigree	Age
109	56	21	135	25.2	0.833	23

Model K predicts that the user (ID-157) has a **low risk** of developing Kidney Disease, and provides the following ML explanation to the person.



Note: This ML explanation shows the prediction that the user (ID-157) gets, and how it varies in relation to the two selected factors (while keeping other factor values unchanged).

Q1-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*Assuming that all other biomarker values remain the same (including BMI), increasing this person's Glucose to 135 will change their result from low risk to high risk.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q1-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q2-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*BMI and Glucose are the **MOST** influential factors (among all 7 factors) in determining this person's result.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q2-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q3: Please indicate your agreement with the statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
This explanation is **easy to understand**	○	○	○	○	○	○	○
This explanation is **sufficiently detailed**	○	○	○	○	○	○	○

This company develops an ML model – **Model B** – based on a vanilla **Decision Tree** model that predicts users' risk of having **Bowel Disease**. A new user (ID-56) provides Model B with their bio-markers (Descriptions) shown as follows:

Glucose	Blood Pressure	Skin Thickness	Insulin	BMI	Diabetes Pedigree	Age
187	68	39	304	37.7	0.254	41

Model B predicts that the user (ID-56) has a **high risk** of developing Bowel Disease, and provides the following ML explanation to the person.

"*Had your Glucose been 150 and BMI been 29, you would have been predicted with low risk.*"

Note: This ML explanation communicates the SMALLEST possible change to this user's BMI and Glucose to obtain an opposite prediction.

Q1-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*BMI and Glucose are the **MOST** influential factors (among all 7 factors) in determining this person's result.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q1-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q2-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*If this person's BMI were 29 while all the other factors remained unchanged (including Glucose),*
the result this user gets would have changed to low risk."

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q2-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q3: Please indicate your agreement with the statements below.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
This explanation is **easy to understand**	○	○	○	○	○	○	○
This explanation is **sufficiently detailed**	○	○	○	○	○	○	○

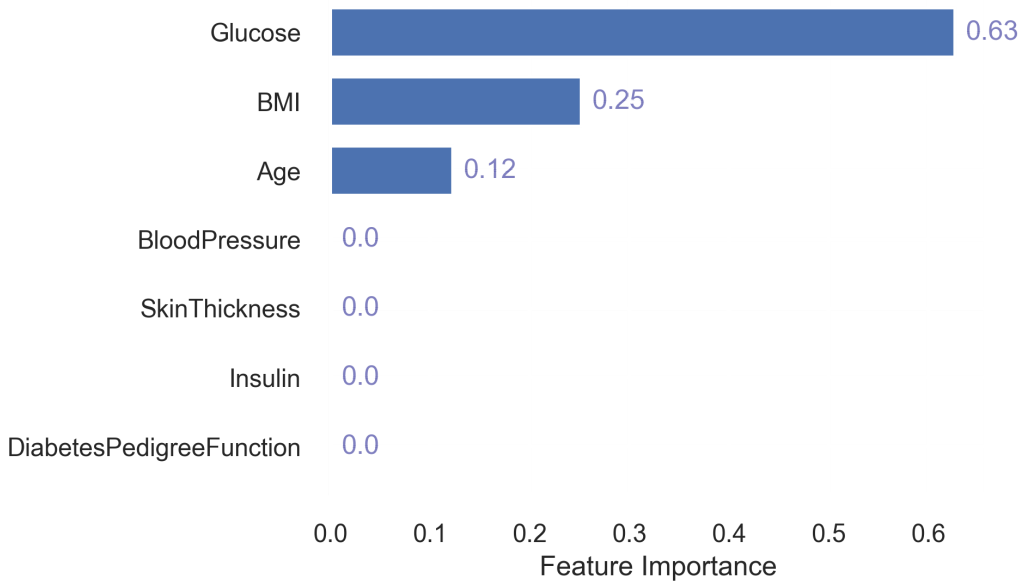
Q4: Which bio-marker is provided by this user to the ML model?

- ○ Insulin
- ○ Air Pollution
- ○ Smoking
- ○ Vitamin Supplements

This company develops an ML model – **Model D** – based on a vanilla **Decision Tree** model that predicts users' risk of having **Diabetes**. A new user (ID-24) provides Model D with their bio-markers (Descriptions) shown as follows:

Glucose	Blood Pressure	Skin Thickness	Insulin	BMI	Diabetes Pedigree	Age
143	94	33	146	36.6	0.254	51

Model D predicts that the user (ID-24) has a **high risk** of developing Diabetes. The following explanation has been provided to show the overall importance of different bio-markers according to the model.



Note: This explanation shows how important each bio-marker is overall according to Model D. The higher the value, the more important the corresponding factor is.

Q1-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*The level of Insulin influences Model D's prediction for this user (ID-24) and all other users.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q1-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

Q2-1: Based on your understanding of the provided explanation, do you think the following statement is true/false/cannot infer?

"*According to Model D, increasing one's BMI and Age will increase the predicted risk of having Diabetes.*"

- ◯ True
- ◯ False
- ◯ Cannot infer from the explanation

Q2-2: How **confident** are you in your previous answer?

Not Confident — Very Confident

0 25 50 75 100

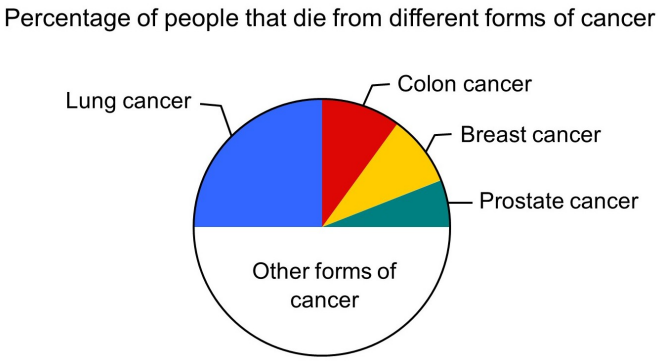
Q3: The diagnosis of what disease is Model D intended for?

- Diabetes
- Deafness
- Dental Care
- Digestive Disease

Q4: Please indicate your agreement with the statements below.

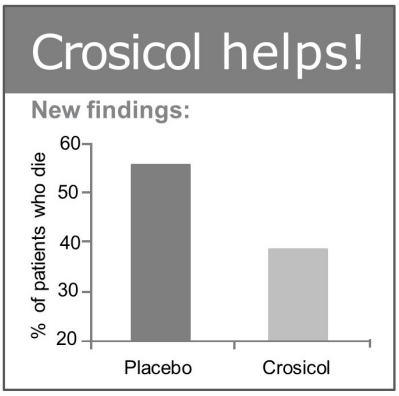
	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
This explanation is **easy to understand**							
This explanation is **sufficiently detailed**							

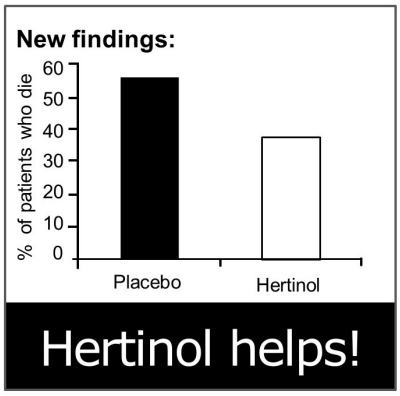
Q1: Here is some information about different forms of cancer:



Approximately what percentage of people who die from cancer die from colon cancer, breast cancer, and prostate cancer taken together?

Q2: In a magazine you see two advertisements, one on page 5 and another on page 12. Each is for a different drug for treating heart disease, and each includes a graph showing the effectiveness of the drug compared to a placebo (sugar pill).

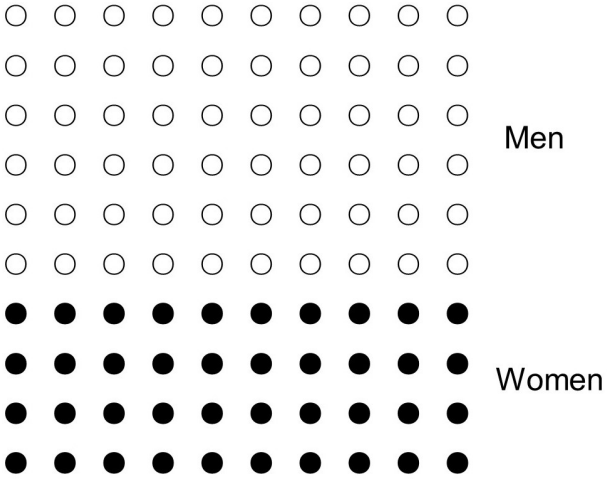




Compared to the placebo, which treatment leads to a larger decrease in the percentage of patients who die?

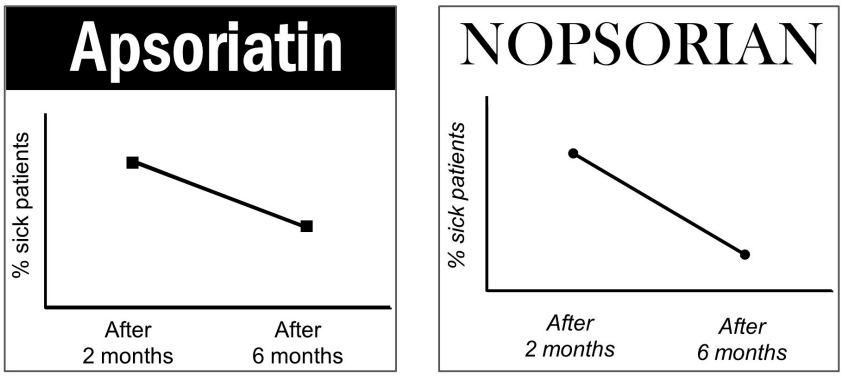
- Crosicol
- Hertinol
- They are equal
- Can't say

Q3: The following figure shows the number of men and women among patients with disease X. The total number of circles is 100.



How many more men than women are there among 100 patients with disease X?

Q4: In the newspaper you see two advertisements, one on page 15 and another on page 17. Each is for a different treatment of psoriasis, and each includes a graph showing the effectiveness of the treatment over time.



Which of the treatments contributes to a larger decrease in the percentage of sick patients?

- Apsoriatin
- Nopsorian
- They are equal
- Can't say

How old are you?

- ◯ Under 18
- ◯ 18-24 years old
- ◯ 25-34 years old
- ◯ 35-44 years old
- ◯ 45-54 years old
- ◯ 55-64 years old
- ◯ 65+ years old

How do you describe yourself?

- ◯ Male
- ◯ Female
- ◯ Non-binary / third gender
- ◯ Prefer to self-describe

[ ]

- ◯ Prefer not to say

How do you describe your English proficiency level?

- ◯ Beginner
- ◯ Pre-Intermediate
- ◯ Intermediate
- ◯ Upper-Intermediate
- ◯ Advanced
- ◯ Mastery

What is the highest level of education you have completed?

- ◯ Less than high school degree
- ◯ High school graduate (high school diploma or equivalent including GED)
- ◯ College degree
- ◯ Bachelor's degree
- ◯ Graduate or professional degree (MA, MS, MBA, PhD, JD, MD, DDS etc.)
- ◯ Prefer not to say

Is your education or employment related to STEM (science, technology, engineering and mathematics) field?

- ◯ Yes, my education and/or employment is related to STEM field
- ◯ No

How much knowledge of machine learning (ML) algorithms do you have?

- ◯ No knowledge
- ◯ Negligible knowledge: I know basic concepts in ML, but have never applied them
- ◯ Some knowledge: I have used ML algorithms before
- ◯ Moderate knowledge: I apply ML algorithms somewhat frequently in my work or leisure
- ◯ Extensive knowledge: I apply ML algorithms very frequently or create ML algorithms

Have you ever participated in user studies about transparency / explainability / interpretability in artificial intelligence or machine learning, and if so, what's the estimated number of such studies?

- ◯ None (0)
- ◯ A few (roughly 1-5)
- ◯ A fair amount (around 6-15)
- ◯ A lot (probably more than 15)