Tutorial

Evaluation Study for A Visualization of Rules

Consent Form

https://docs.google.com/forms/d/e/1FAIpQLSfpAu6t41TmldE1W3aC0X4ivLihaQntmJqYjDZMkWxZco07Gg/viewform?usp=sf_link

Background

A model is trained to suggest whether a person has low or high risk of diabetes. You do not need to know how such model is trained. You can just think it as a black box.

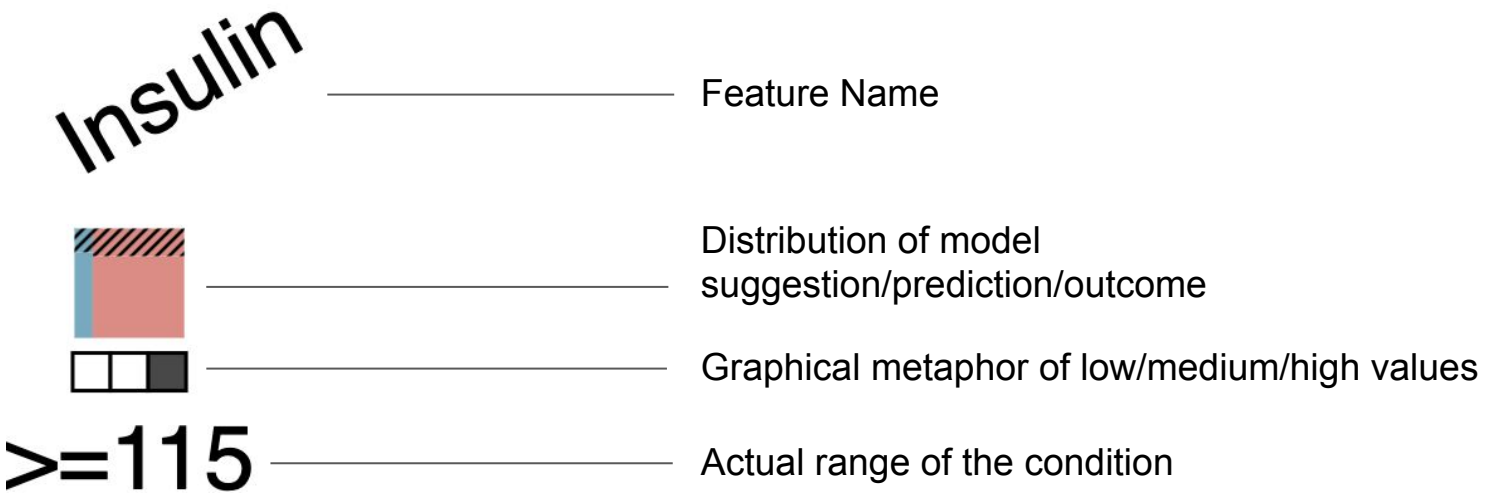
Given the lab test result of a person, this model suggests whether this person has low or high risk of diabetes.

We use an if-then rule to describe how the model make suggestions on a group of people.

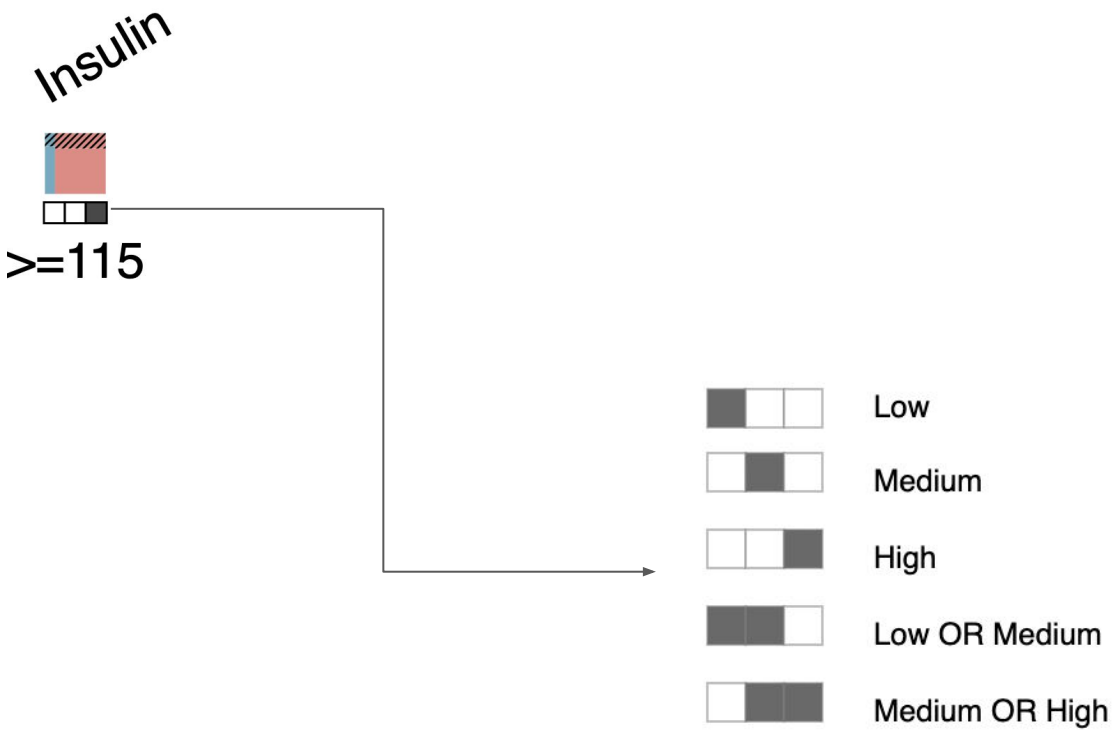
* In this study, we use “suggestion”, “outcome”, “prediction” interchangeably.

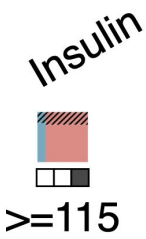
This example shows the description of a group of people whose **Insulin >= 115**

One squared node represents a condition.



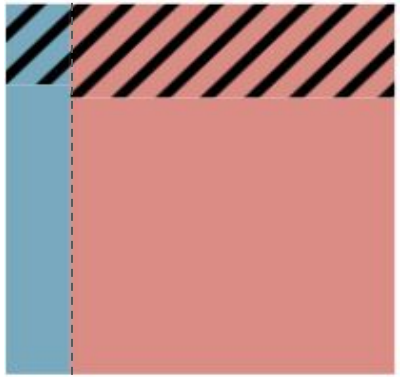
The presented condition means **Insulin = High** or **Insulin >= 115**


Insulin
>=115
Low
Medium
High
Low OR Medium
Medium OR High

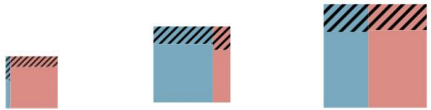


Number of people that **match the condition**, and suggested as Low Risk

Number of people that **match the condition**, and suggested as High Risk



Low risk
High risk
Incorrect Suggestion



185 people

471 people

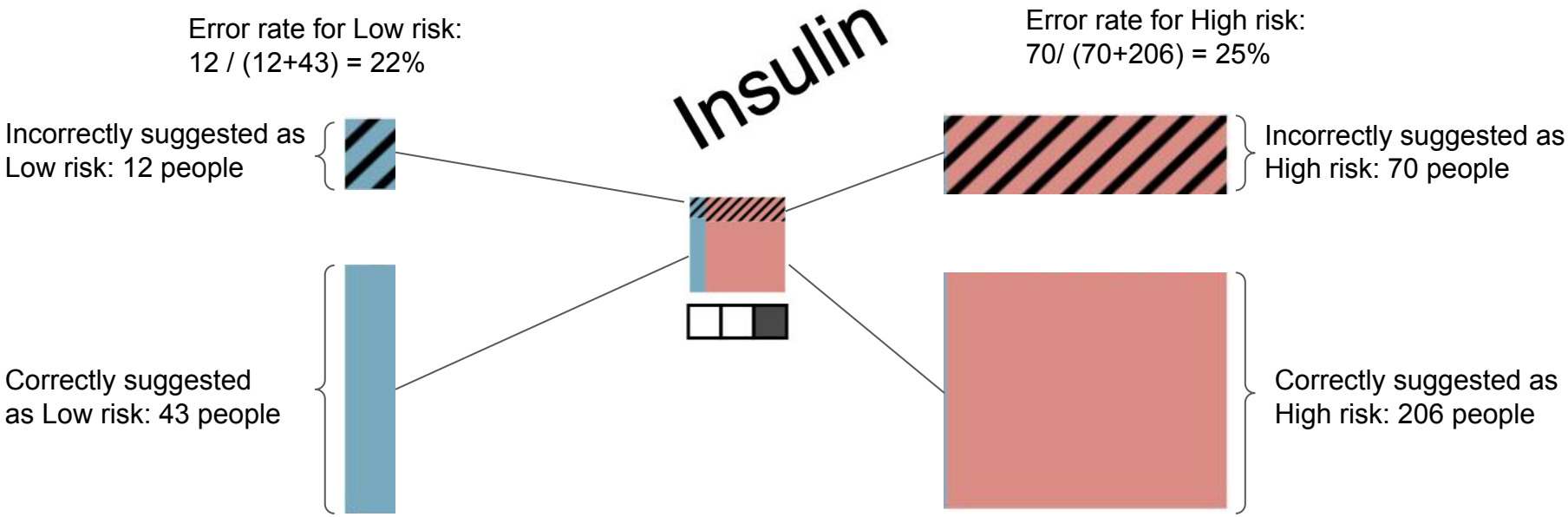
687 people

*We will only ask you to compare the sizes of a node but not to figure out the exact number they represent.

Because this condition covers **more** High risk suggestions from the model, we can describe the model's behavior as:
If Insulin >= 115 (or we say Insulin = High), **then** suggest High Risk

The size of the colored rectangle represents the number of different model suggestions for the group of people with the lab test results that match the condition.

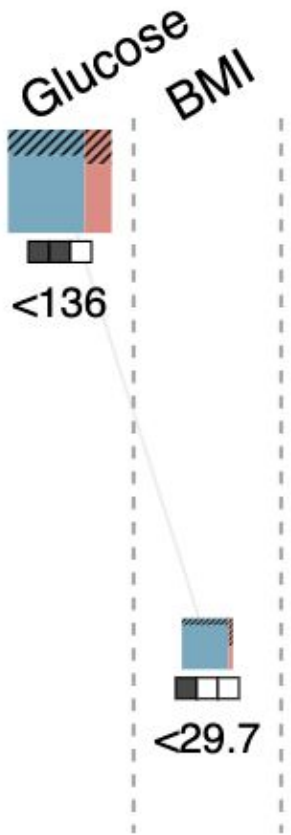
The larger the bar, the more people are given the suggestion of the corresponding colors.



A node is equivalent to a rule that contain the condition of this level and all its ancestor nodes.

Node 1:
IF Glucose=Low OR Medium
(THEN Low risk**)**

Node 2:
IF Glucose=Low OR Medium
AND BMI=Low
(THEN Low risk**)**



1) A node at the 1st layer (e.g., node 1) represents the first condition in a rule; a node at the 2nd layer (e.g., node 2) represents the **combination** of the first 2 conditions.

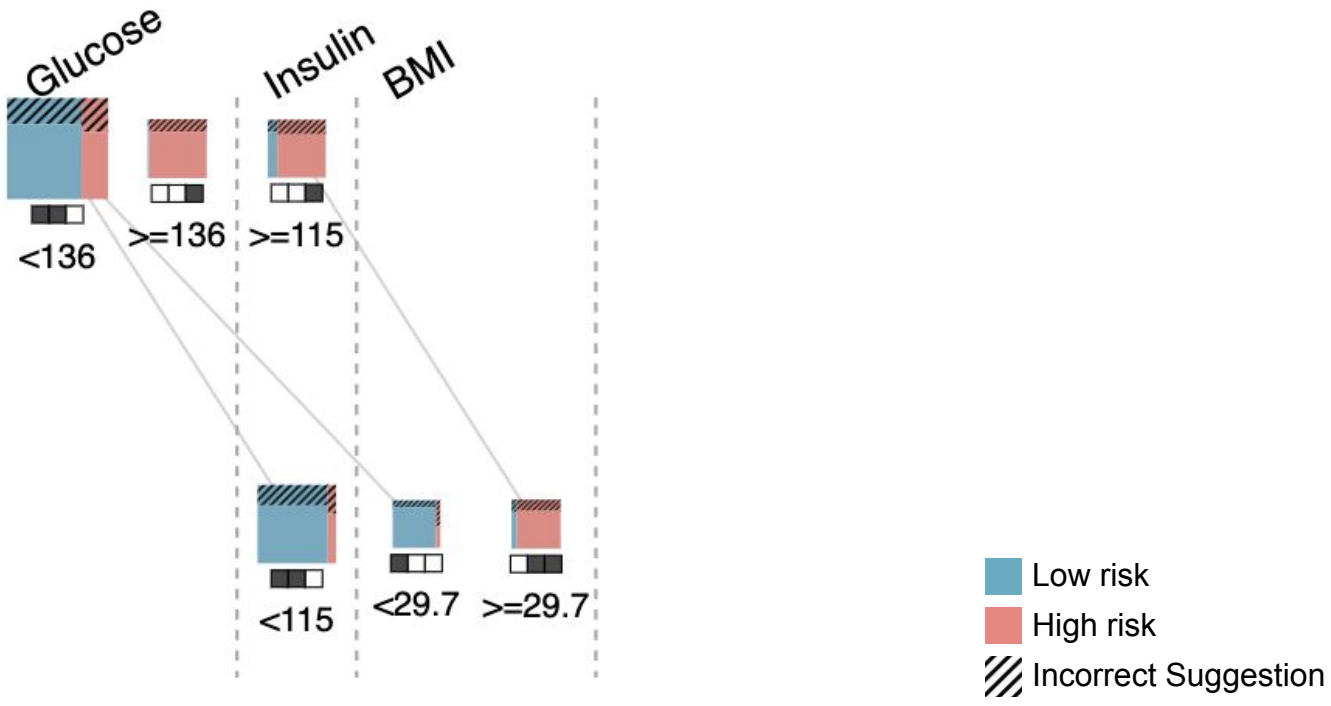
2) Always read the rule **from the top to the bottom!**

3) Compared with node1, node 2 covers fewer people (smaller square) and contain purer suggestions (e.g. the model more consistently suggests Low risk).

Low risk
High risk
Incorrect Suggestion

Here is an example of four independent rules:

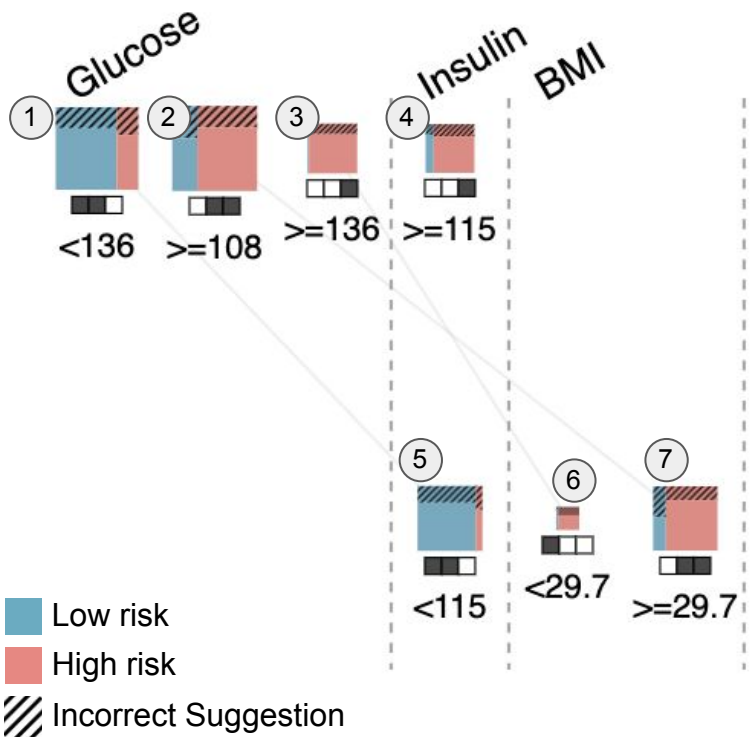
R1: IF Glucose < 136 **AND** Insulin < 115 **THEN** **Low Risk**
R2: IF Glucose < 136 **AND** BMI < 29.7 **THEN** **Low Risk**
R3: IF Glucose >= 136 **THEN** **High Risk**
R4: IF Insulin >= 115 **AND** BMI >= 29.7 **THEN** **High Risk**



Tasks

Task 1: Interpret properties of a given node

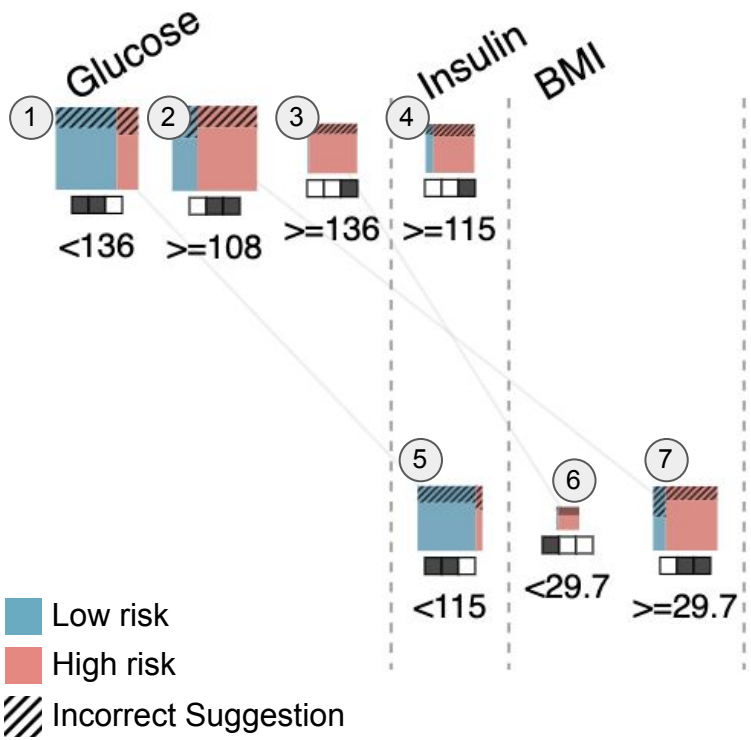
Task 1: Interpret rule of a given node



Example Question 1:

What rule does the node 7 represent?

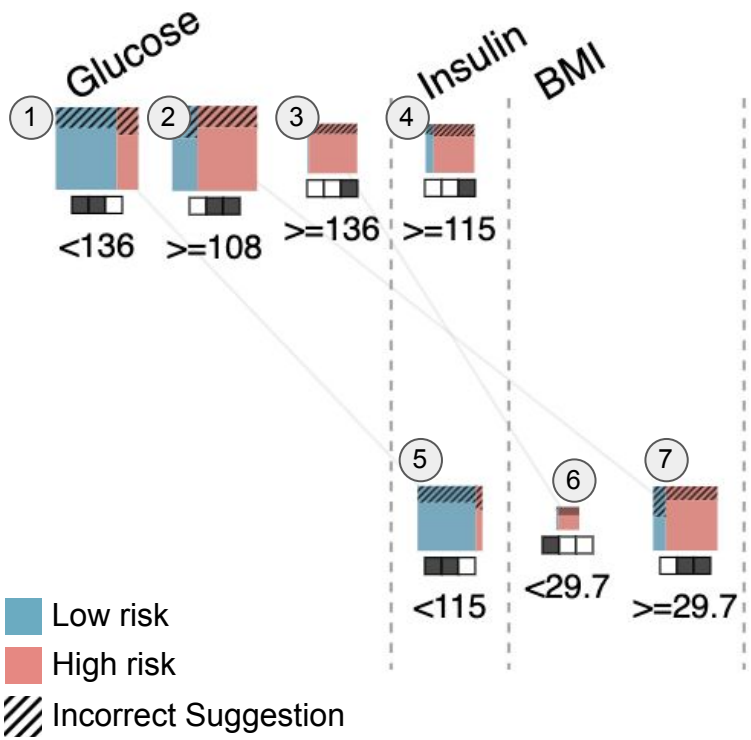
Task 1: Interpret suggestion of a given node



Example Question 2:

What is the most probable outcome/prediction of the model for people that match the rule represented in node 5?

Task 1: Interpret size of a given node



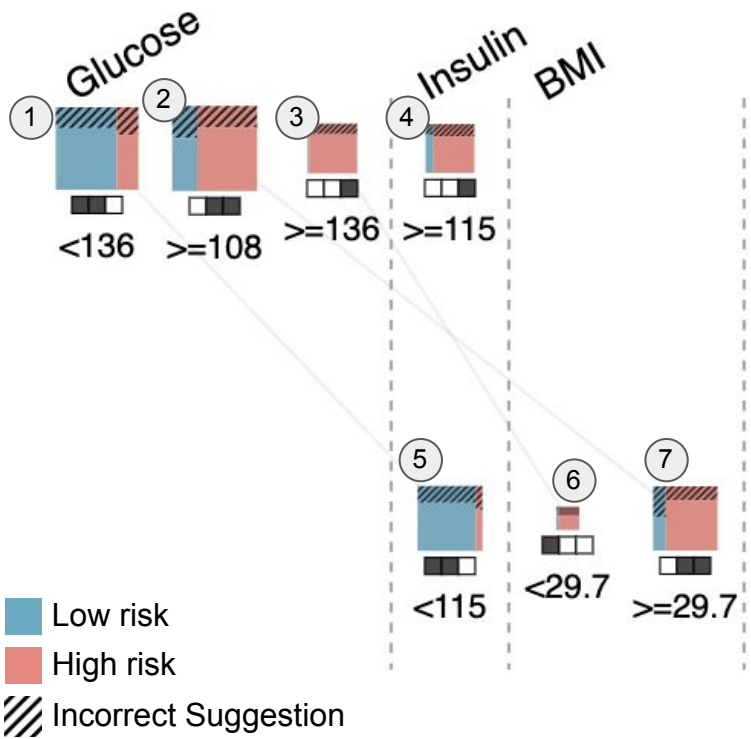
Example Question 3:

Which of the following nodes covers the most people?

- Node 2
- Node 6
- Node 7

* covers the most people means that the rule represented by the node can match the most number of people.

Task 1: Interpret errors of a given node

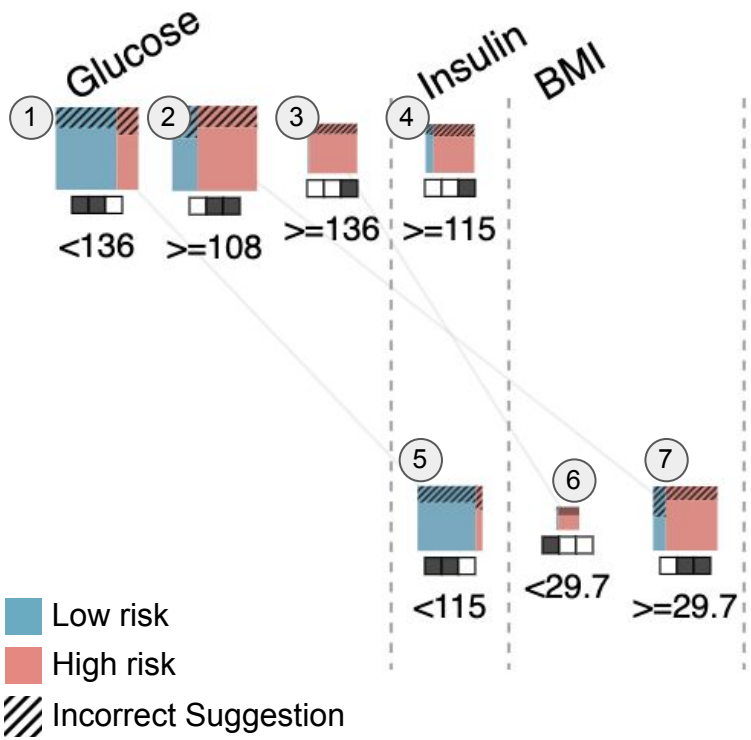


Example Question 4:

Which suggestion has higher error rate with node 2?

Task 2: Find a node with given properties

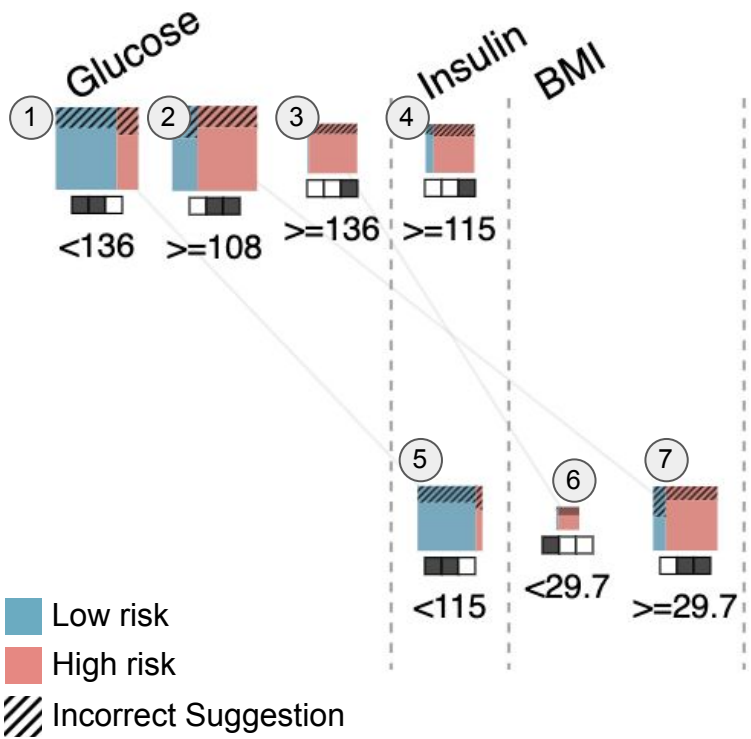
Task 2: Find a node with given suggestion



Example Question 1:

Please choose a node that suggests High Risk?

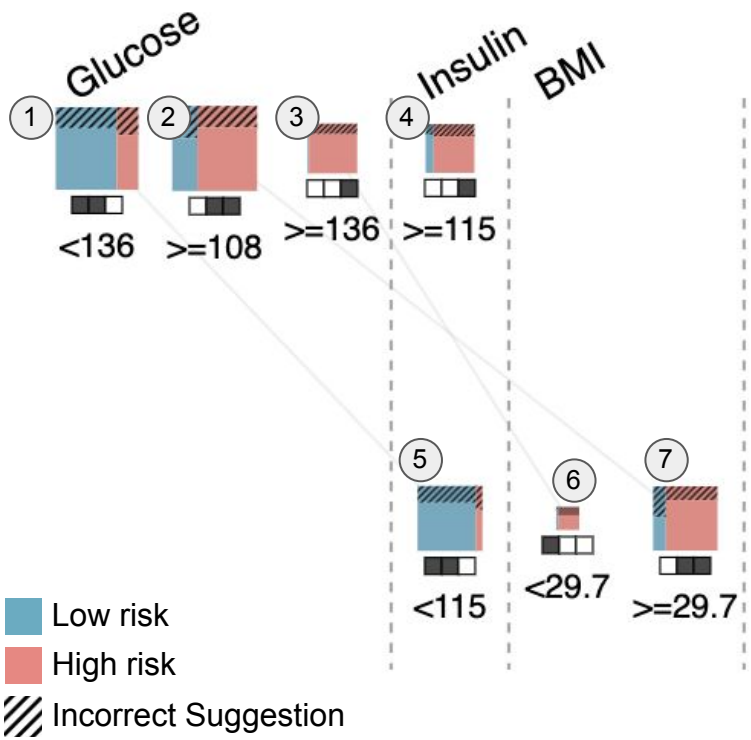
Task 2: Find a node with given feature name



Example Question 2:

Please choose a node that contains a condition with BMI.

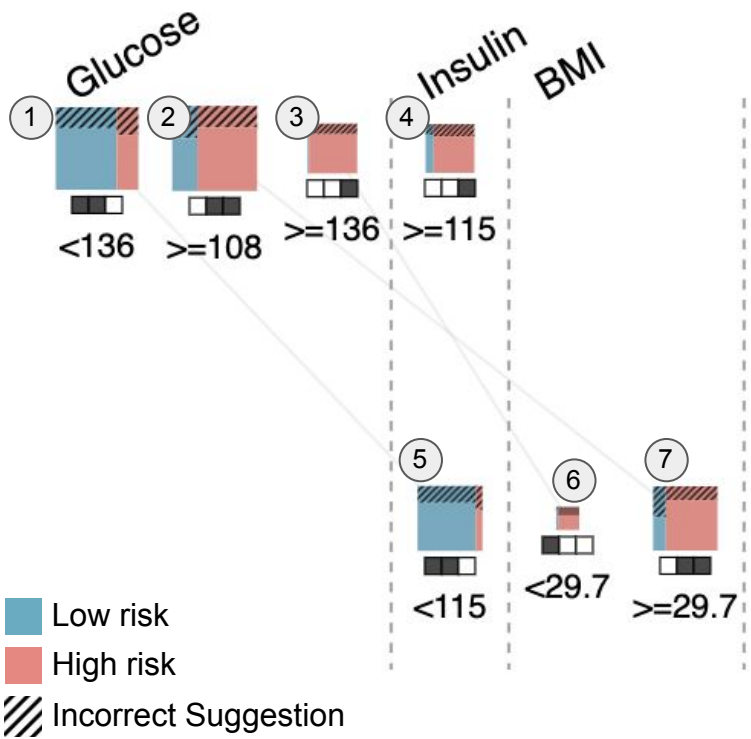
Task 2: Find a node with given feature name and given suggestion



Example Question 3:

Choose a node that contains the a condition with Glucose and suggests High risk.

Task 2: Find a node with given condition(s)

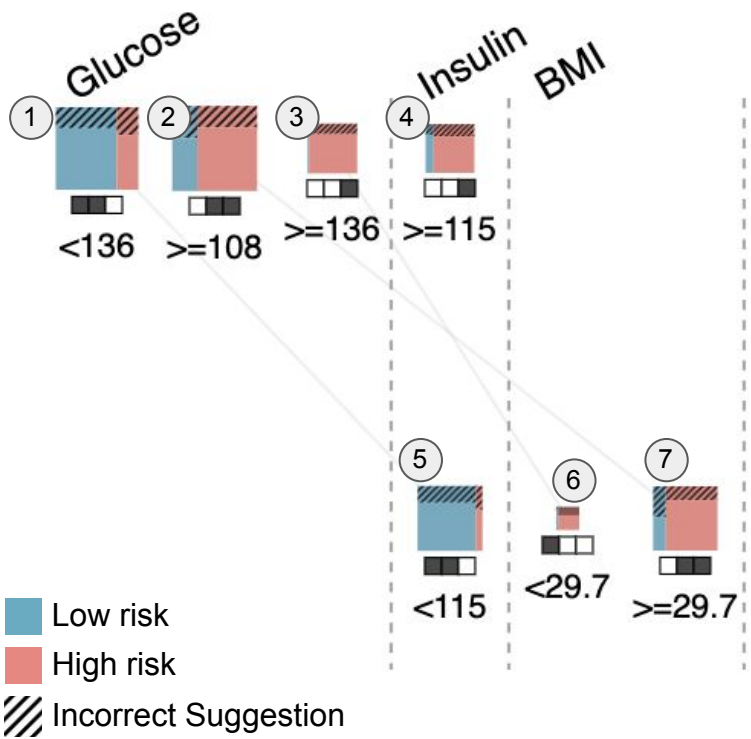


Example Question 4:

Which node presents the rule of

Glucose < 136 AND Insulin < 115

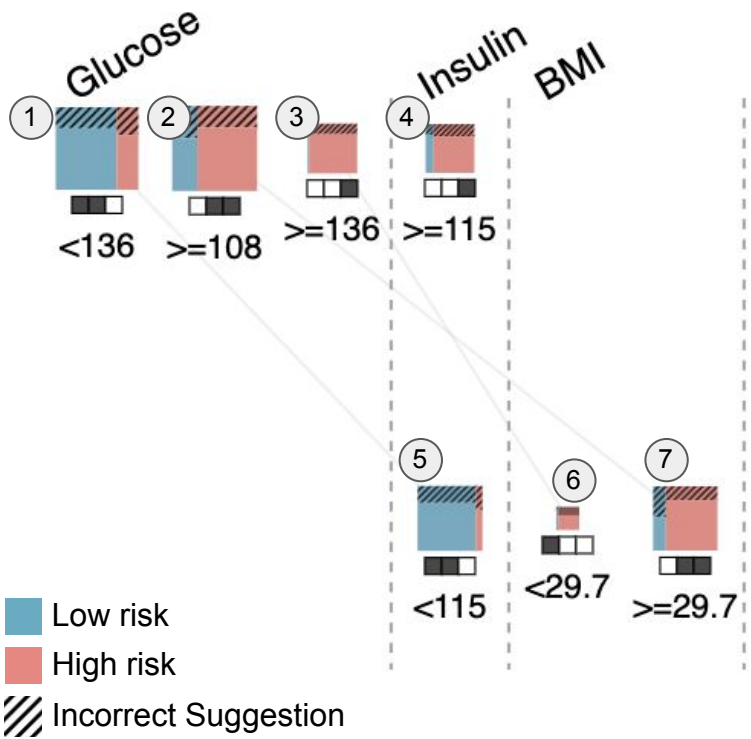
Task 2: Find a node with largest/least size



Example Question 5:

Which node covers the least people?

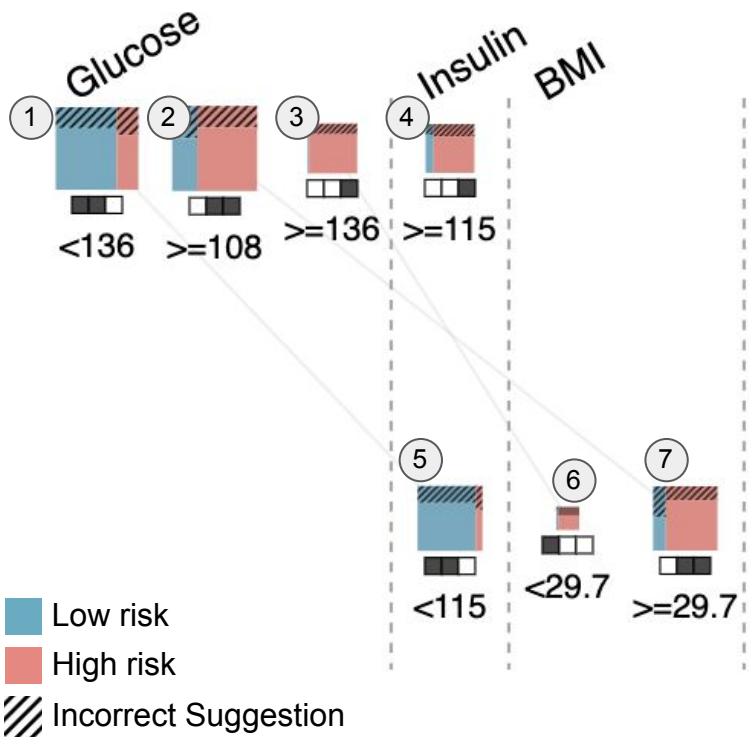
Task 2: Find a node with errors



Example Question 6:

Find a node whose low-risk suggestions have a higher error rate than high-risk suggestions

Task 2: Find a node with errors



Example Question 7:

Find a node that presents

Glucose = High And BMI = Low