#### Introduction

In general, machine learning is a subfield of artificial intelligence that enables systems to learn and improve automatically by leveraging data without being explicitly programmed. A machine learning model is a statistical model based on this data that can be used to make decisions automatically.

Consider the following scenario: Researchers have developed a machine learning model to make automated decisions for criminal recidivism. The model can automatically decide if a criminal defendant is likely to reoffend. The model uses the following attributes in order to validate the risk of recidivism of a criminal defendant by evaluating the importance of each attribute.

Attributes	Range	Description		
sex	0, 1	0: male, 1: female		
		the age the criminal defendant is:		
aga aatagany	0 - 2	0: 25 - 45,		
age category	0 - 2	1: Less than 25,		
		2: Greater than 45		
		the race the criminal defendant is:		
		0: African-American,		
race	0 - 4	1: Caucasian,		
lace	0 - 4	2: Hispanic,		
		3: Asian,		
		4: Native American		
priors count	0 - open	number of previous criminal records (average		
priors count	end	count = 4.19)		
		risk of recidivism on a scale from 1-10,		
recidivism decile score	1 - 10	where 1-4 is "Low", 5-7 is "Medium and 8-10 is		
		"High"		
		risk of violence on a scale from 1-10,		
violence decile score	1 - 10	where 1-4 is "Low", 5-7 is "Medium and 8-10 is		
		"High"		
iuvonilo folony count	0 - open	number of felonies as a juvenile (average count =		
juvenile felony count	end	0.08)		
juvenile misdemeanor	0 - open	number of misdemeanors as a juvenile (average		
count	end	count = 0.1)		

Attributes	Range	Description		
iuvanila athar aquat	0 - open	number of other crimes as a juvenile (average		
juvenile other count	end	count = 0.13)		

Based on these attributes, the model makes a decision, e.g., "the criminal defendant is likely to reoffend" or "the criminal defendant is not likely to reoffend".

To better understand the model's decision, there are many methods that try to explain the model's inner behavior by generating **explanations**.

Below is an explanation generated by the machine learning model to assist the decision for risk of recidivsm. **Each attribute** (indicated on the left in each row) **has different contributions on the prediction** (indicated as points on the x-axis, i.e., drawn horizontally).

The color represents the value of the attribute from low to high and can be understood in the following way (please consider the **range** in the table above):

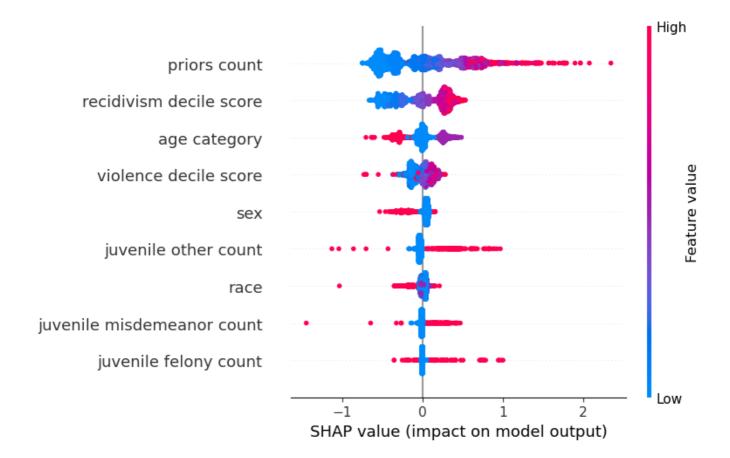
**Points in blue ->** the attribute has a **low value**, e.g., a lower value of priors count can be 0

**Points in red ->** the attribute has a **high value**, e.g., a higher value of priors count can be 20

The location of the points on the x-axis can be understood in the following way:

Points in the **negative direction** (from the middle line of the value 0 to the left side) -> **less likely to reoffend** 

Points in the **positive direction** (from the middle line of the value 0 to the right side) -> **more likely to reoffend** 



In the following, there are 50 questions in total, asking how you would categorize each criminal defendant by assessing their profile. This survey will take approximately 20 - 30 min. Thank you for taking part in this survey!

#### **Criminal Defendant 1**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	Caucasian
priors count	19
recidivism decile score	5
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think	that the	criminal	defendant	is n	ot lik	ely to	reoffend
---	---------	----------	----------	-----------	------	--------	--------	----------

O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 2**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	Caucasian
priors count	9
recidivism decile score	10
violence decile score	9
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

ı	think	that	the	criminal	defendant	ie	not	likalv	to	reoffend
- 1	UIIIIIK	lilal	uie	CHIIIIIIII	delellualit	15	ΠΟι	likely	ιO	reomena.

O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 3**

Attributes	Profile
sex	Male
age category	25 - 45
race	Caucasian
priors count	3
recidivism decile score	8
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0

Attributes	Profile
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 4**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Female
age category	25 - 45
race	Caucasian
priors count	3
recidivism decile score	7
violence decile score	4
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 5**

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	2

Attributes	Profile
recidivism decile score	1
violence decile score	1
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 6**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	Caucasian
priors count	13
recidivism decile score	4
violence decile score	1
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 7**

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	1
recidivism decile score	6
violence decile score	4
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	1

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 8**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Female
age category	Less than 25
race	Caucasian
priors count	5
recidivism decile score	5
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	4

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 9**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	0
recidivism decile score	7
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	1

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 10**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	African-American
priors count	33
recidivism decile score	6
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think	that the	criminal	defendant	is not	likely to	reoffend
---	---------	----------	----------	-----------	--------	-----------	----------

O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 11**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	8
recidivism decile score	8
violence decile score	4
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

$\bigcirc$	ı	think	that	the	criminal	defendant	ic	not	likely	to	reoffend
	- 1	UIIIIIK	llial	แเษ	CHIIIIIII	delellualli	. 15	HOL	IIKEIY	ιO	reonena.

O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 12**

Attributes	Profile
sex	Female
age category	Less than 25
race	Caucasian
priors count	2
recidivism decile score	10
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
	·

Attributes	Profile		
juvenile other count	0		

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 13**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Asian
priors count	0
recidivism decile score	6
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	1

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 14**

Profile
Male
25 - 45
African-American
5

Attributes	Profile
recidivism decile score	1
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 15**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	1
recidivism decile score	10
violence decile score	5
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 16**

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	1
recidivism decile score	10
violence decile score	8
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 17**

Consider a criminal defendant with the following profile:

Attributes	Profile		
sex	Female		
age category	Less than 25		
race	Caucasian		
priors count	1		
recidivism decile score	6		
violence decile score	8		
juvenile felony count	1		
juvenile misdemeanor count	1		
juvenile other count	0		

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 18**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Caucasian
priors count	1
recidivism decile score	8
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	1
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 19**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	0
recidivism decile score	1
violence decile score	1
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think that the criminal	l defendant is	not likely to	reoffend

O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 20**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	African-American
priors count	0
recidivism decile score	3
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

ı	think	that	the	criminal	defendant	ie	not	likaly	to	reoffend
- 1	uiiiik	llial	แเษ	CHIIIIIII	defendant	15	HOL	likely	ιO	reonena.

I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 21**

Attributes	Profile
sex	Male
age category	Less than 25
race	Caucasian
priors count	0
recidivism decile score	10
violence decile score	9
juvenile felony count	0
juvenile misdemeanor count	0

Attributes	Profile			
juvenile other count	0			

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 22**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Female
age category	Less than 25
race	Caucasian
priors count	3
recidivism decile score	10
violence decile score	8
juvenile felony count	0
juvenile misdemeanor count	2
juvenile other count	1

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 23**

Attributes	Profile		
sex Male			
age category	Greater than 45		
race	Caucasian		
priors count	13		

Attributes	Profile
recidivism decile score	6
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 24**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Caucasian
priors count	0
recidivism decile score	6
violence decile score	9
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 25**

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	11
recidivism decile score	10
violence decile score	8
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 26**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	Caucasian
priors count	15
recidivism decile score	9
violence decile score	6
juvenile felony count	2
juvenile misdemeanor count	0
juvenile other count	1

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 27**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Female
age category	Less than 25
race	African-American
priors count	4
recidivism decile score	8
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 28**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	4
recidivism decile score	3
violence decile score	1
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think	that the	criminal	defendant i	s not	likely to	reoffend
---	---------	----------	----------	-------------	-------	-----------	----------

O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 29**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	0
recidivism decile score	10
violence decile score	10
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

O	I think that th	e criminal	defendant is	not likely	y to reoffend
---	-----------------	------------	--------------	------------	---------------

O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 30**

Attributes	Profile
sex	Male
age category	Greater than 45
race	Caucasian
priors count	2
recidivism decile score	4
violence decile score	1
juvenile felony count	0
juvenile misdemeanor count	0

Attributes	Profile
juvenile other count	1

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 31**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	African-American
priors count	38
recidivism decile score	7
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 32**

Attributes	Profile
sex	Male
age category	25 - 45
race	Hispanic
priors count	9

Attributes	Profile
recidivism decile score	9
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 33**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	Caucasian
priors count	9
recidivism decile score	9
violence decile score	4
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 34**

Attributes	Profile
sex	Male
age category	Less than 25
race	Hispanic
priors count	6
recidivism decile score	10
violence decile score	9
juvenile felony count	1
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 35**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	Caucasian
priors count	35
recidivism decile score	9
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 36**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	4
recidivism decile score	2
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 37**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	1
recidivism decile score	3
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think	that the	criminal	defendant	is not	likely to	reoffend
---	---------	----------	----------	-----------	--------	-----------	----------

O I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 38**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Female
age category	Greater than 45
race	African-American
priors count	10
recidivism decile score	10
violence decile score	6
juvenile felony count	1
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

O	1	think	that	the	criminal	defendant	is	not	likely	to	reoffend
---	---	-------	------	-----	----------	-----------	----	-----	--------	----	----------

I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 39**

Attributes	Profile
sex	Female
age category	25 - 45
race	African-American
priors count	5
recidivism decile score	10
violence decile score	5
juvenile felony count	1
juvenile misdemeanor count	0

Attributes	Profile
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 40**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Greater than 45
race	African-American
priors count	15
recidivism decile score	1
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

### **Criminal Defendant 41**

Attributes	Profile
sex	Female
age category	Less than 25
race	African-American
priors count	3

Attributes	Profile				
recidivism decile score	8				
violence decile score	7				
juvenile felony count	0				
juvenile misdemeanor count	0				
juvenile other count	0				

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

# **Criminal Defendant 42**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	0
recidivism decile score	6
violence decile score	7
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 43**

Attributes	Profile
sex	Female
age category	Less than 25
race	African-American
priors count	2
recidivism decile score	8
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 44**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Asian
priors count	4
recidivism decile score	6
violence decile score	4
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 45**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	Caucasian
priors count	5
recidivism decile score	10
violence decile score	5
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 46**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	5
recidivism decile score	2
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

0	I think	that the	criminal	defendant	is n	ot like	ely to	reoffend
---	---------	----------	----------	-----------	------	---------	--------	----------

O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 47**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Caucasian
priors count	0
recidivism decile score	6
violence decile score	6
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	1

How would you categorize this criminal defendant?

I tk	nink	that	the	criminal	defendan	t ic	not	likalv	to	reoffend
I U	IIIIIK	llial	แเษ	CHIIIIIII	delelluali	LIS	HOL	likely	ιO	reomena

O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 48**

Attributes	Profile					
sex	Female					
age category	25 - 45					
race	African-American					
priors count	17					
recidivism decile score	10					
violence decile score	7					
juvenile felony count	3					
juvenile misdemeanor count	0					

Attributes	Profile
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- I think that the criminal defendant is likely to reoffend.

#### **Criminal Defendant 49**

Consider a criminal defendant with the following profile:

Attributes	Profile
sex	Male
age category	Less than 25
race	Caucasian
priors count	0
recidivism decile score	9
violence decile score	8
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

How would you categorize this criminal defendant?

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

## **Criminal Defendant 50**

Attributes	Profile
sex	Male
age category	25 - 45
race	African-American
priors count	4

Attributes	Profile
recidivism decile score	3
violence decile score	2
juvenile felony count	0
juvenile misdemeanor count	0
juvenile other count	0

- O I think that the criminal defendant is not likely to reoffend.
- O I think that the criminal defendant is likely to reoffend.

Powered by Qualtrics