DEFAULT OF CREDIT CARD MODELING AND VISUALIZATION

GROUP 8 :
JINGTIAN YAO
CHENFEI JIANG
MICHAEL UTOMO

CATEGORY

1. Problem Description

2 Data Preprocessing

3. Model Selection

4. Visualization

PROBLEM DESCRIPTION

The accuracy of the result of customers' credit card default payment is essential from the perspective of risk management.

We aimed at predicting customers' default payments status next month and compares the predictive accuracy among different algorithms.

We also built a Shiny App for the bank to help them with better risk management.

DATA PREPROCESSING

- Data Source : https://archive.ics.uci.edu/ml/datasets/default+of+credit+card+clients

- 23 attributes
- Amount of given credit
- Gender
- Education
- Marital Status
- Age
- History of past payment (last 6 months)
- Amount of bill statement (last 6 months)
- Amount of previous payment (last 6 months)

Divide data into training set (24,000 observations) and test et (6,000 observations)

MODEL SELECTION

1. SVM (radial basis function kernel)

- Tunning parameters: cost & gamma

range of cost: 10^(-6:2)

range of gamma: 10^(-4:4)

- Best parameters: cost = 10, gamma = 0.001

For each algorithm, use 5-folds cross validation to choose the best parameter.

MODEL SELECTION

2. Random Forest

- Tunning parameters : mtry & ntree

range of mtry : 1,2,3,4

range of ntree : 100, 200, 300, …, 1000

- Best parameters: mtry = 2, ntree = 600

For each algorithm, use 5-folds cross validation to choose the best parameter.

MODEL SELECTION

3. Xgboost

- Tunning parameters : eta & gamma & max depth

range of eta : 0.3, 0.5, 0.7

range of gamma : 0, 0.5, 1

range of max depth : 2, 3, 4, …, 10

Best parameters: eta = 0.5, gamma = 0.5, max depth = 4

For each algorithm, use 5-folds cross validation to choose the best parameter.

MODEL SELECTION

4. Logistic Regression

	Variables	Formula	Var1	Var2	Var3	Var4	Var5	Var6	Var7	Var8	Var9	Var10	AUC	P < 0.05
2474	2	Y ~ X21 + X16	X21	X16	0	0	0	0	0	0	0	0	0.5731454	0
2056	2	Y ~ X19 + X14	X19	X14	0	0	0	0	0	0	0	0	0.5820459	0
2483	2	Y ~ X21 + X17	X21	X17	0	0	0	0	0	0	0	0	0.5825252	0
2274	2	Y ~ X20 + X15	X20	X15	0	0	0	0	0	0	0	0	0.5834993	0
2367	2	Y ~ X21 + X4	X21	X4	0	0	0	0	0	0	0	0	0.5836388	0
2547	3	Y ~ X21 + X22 + X13	X21	X22	X13	0	0	0	0	0	0	0	0.5837639	0
2665	3	Y ~ X22 + X21 + X13	X22	X21	X13	0	0	0	0	0	0	0	0.5837639	0
2067	2	Y ~ X19 + X15	X19	X15	0	0	0	0	0	0	0	0	0.5841984	0
2548	3	Y ~ X21 + X22 + X15	X21	X22	X15	0	0	0	0	0	0	0	0.5846775	0
2666	3	Y ~ X22 + X21 + X15	X22	X21	X15	0	0	0	0	0	0	0	0.5846775	0
2560	3	Y ~ X21 + X23 + X13	X21	X23	X13	0	0	0	0	0	0	0	0.5849772	0

AUC: Area under the ROC curve - assessing discrimination in logistic regression

For each algorithm, use 5-folds cross validation to choose the best parameter.

MODEL SELECTION

5. Neural Network

Size : Number of units in the hidden layer (Choose 2 from 1 to 5)

Decay : parameter for weight decay (0.1)

Maxit: maximum number of iterations (200)

For each algorithm, use 5-folds cross validation to choose the best parameter.

Algorithm	Test Accuracy	Prediction Time (6000 observations)
SVM	0.779	28.75s
Random Forest	0.815	3.07s
Xgboost	0.878	0.05s
Logistic Regression	0.808	0.10s
Neural Network	0.779	4.41s

MODEL SELECTION

According to the test accuracy, Xgboost algorithm performs the best.

VISUALIZATION

The homepage of our app.

The app includes 5 parts:

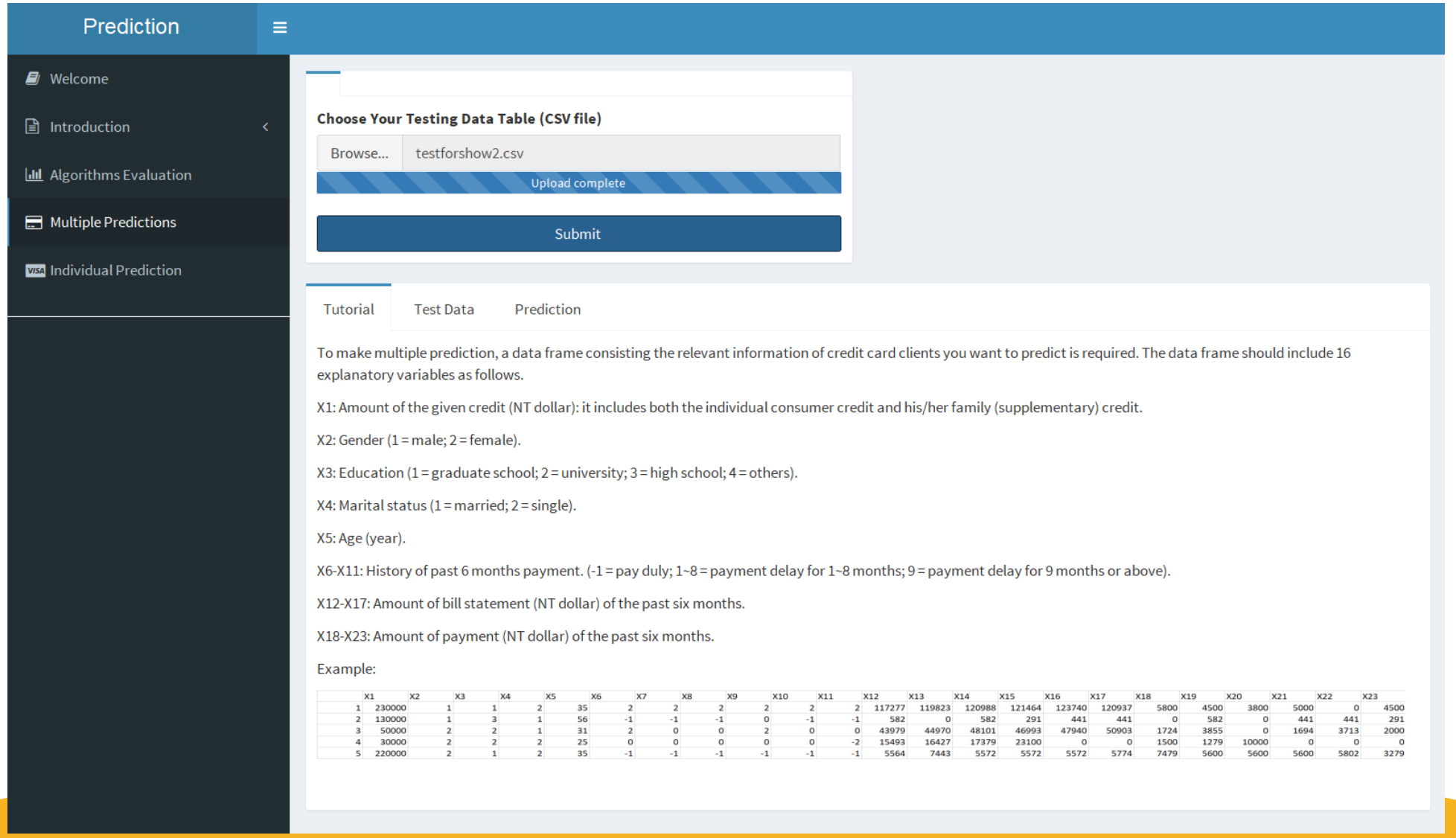
Welcome

Introduction

Algorithm Evaluation

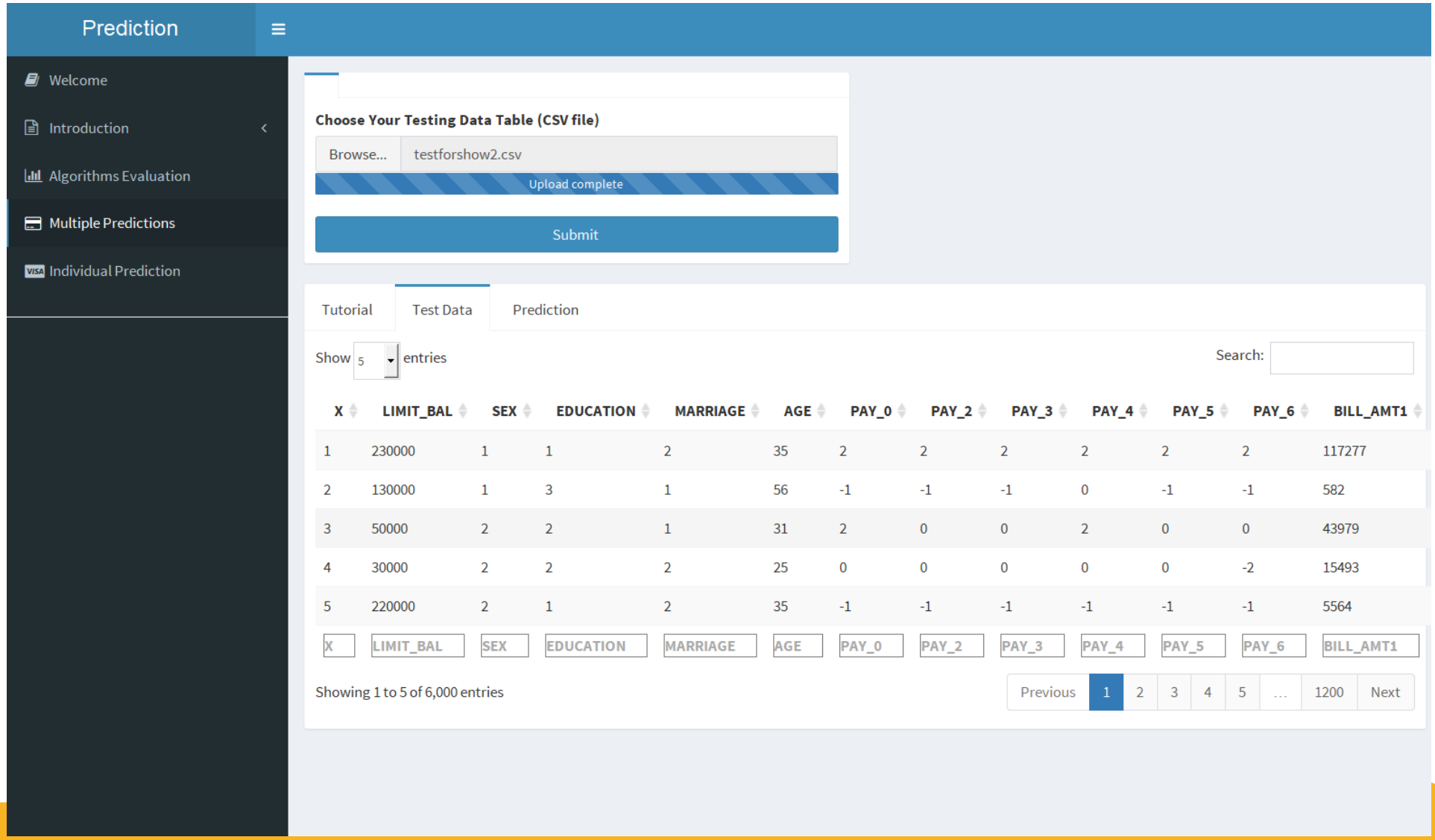
Multiple Predictions

Individual Prediction

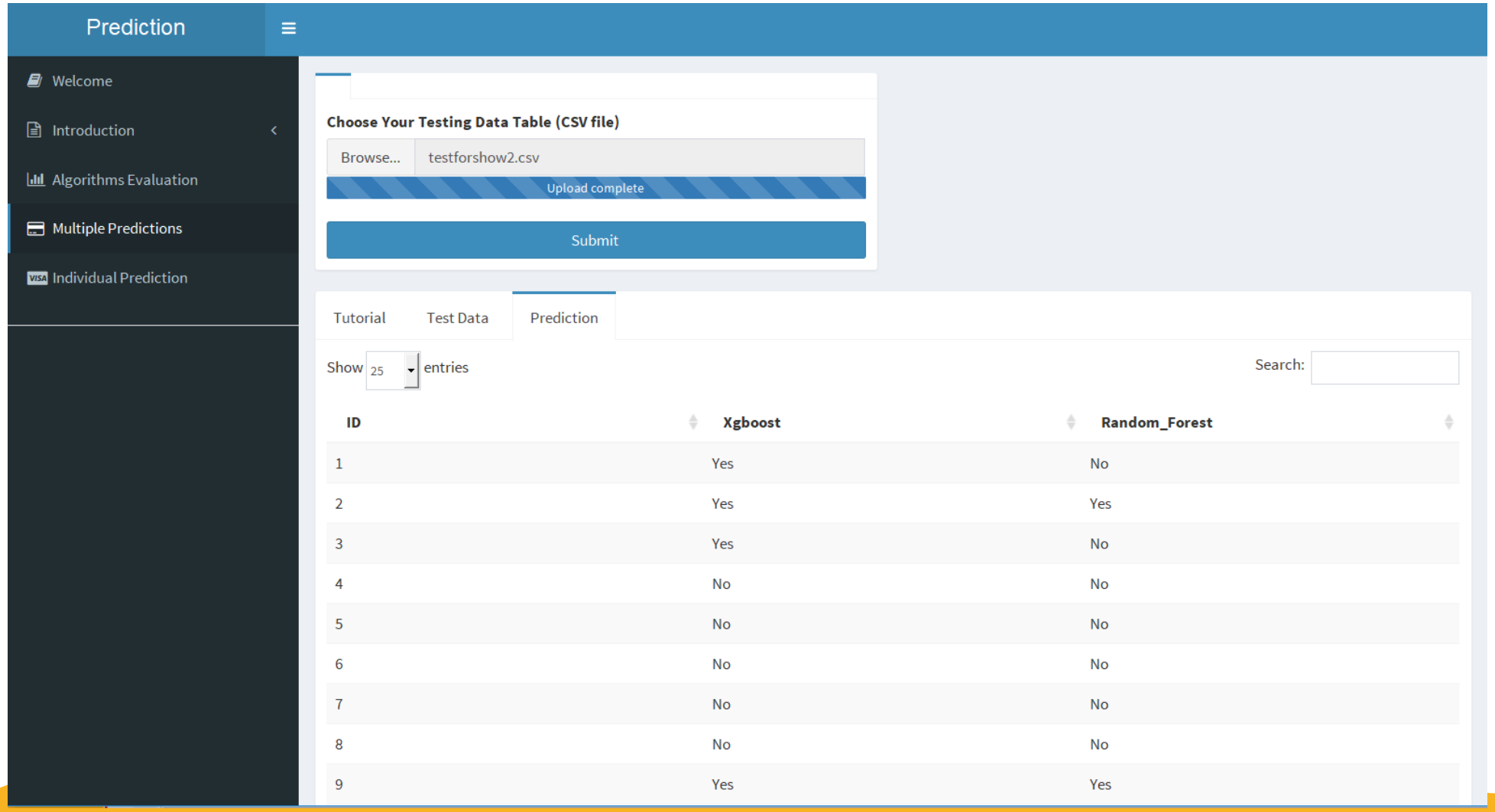


	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	X20	X21	X22	X23
1	230000	1	1	2	35	2	2	2	2	2	2	117277	119823	120988	121464	123740	120937	5800	4500	3800	5000	0	4500
2	130000	1	3	1	56	-1	-1	-1	0	-1	-1	582	0	582	291	441	441	0	582	0	441	441	291
3	50000	2	2	1	31	2	0	0	2	0	0	43979	44970	48101	46993	47940	50903	1724	3855	0	1694	3713	2000
4	30000	2	2	2	25	0	0	0	0	0	-2	15493	16427	17379	23100	0	0	1500	1279	10000	0	0	0
5	220000	2	1	2	35	-1	-1	-1	-1	-1	-1	5564	7443	5572	5572	5572	5774	7479	5600	5600	5600	5802	3279

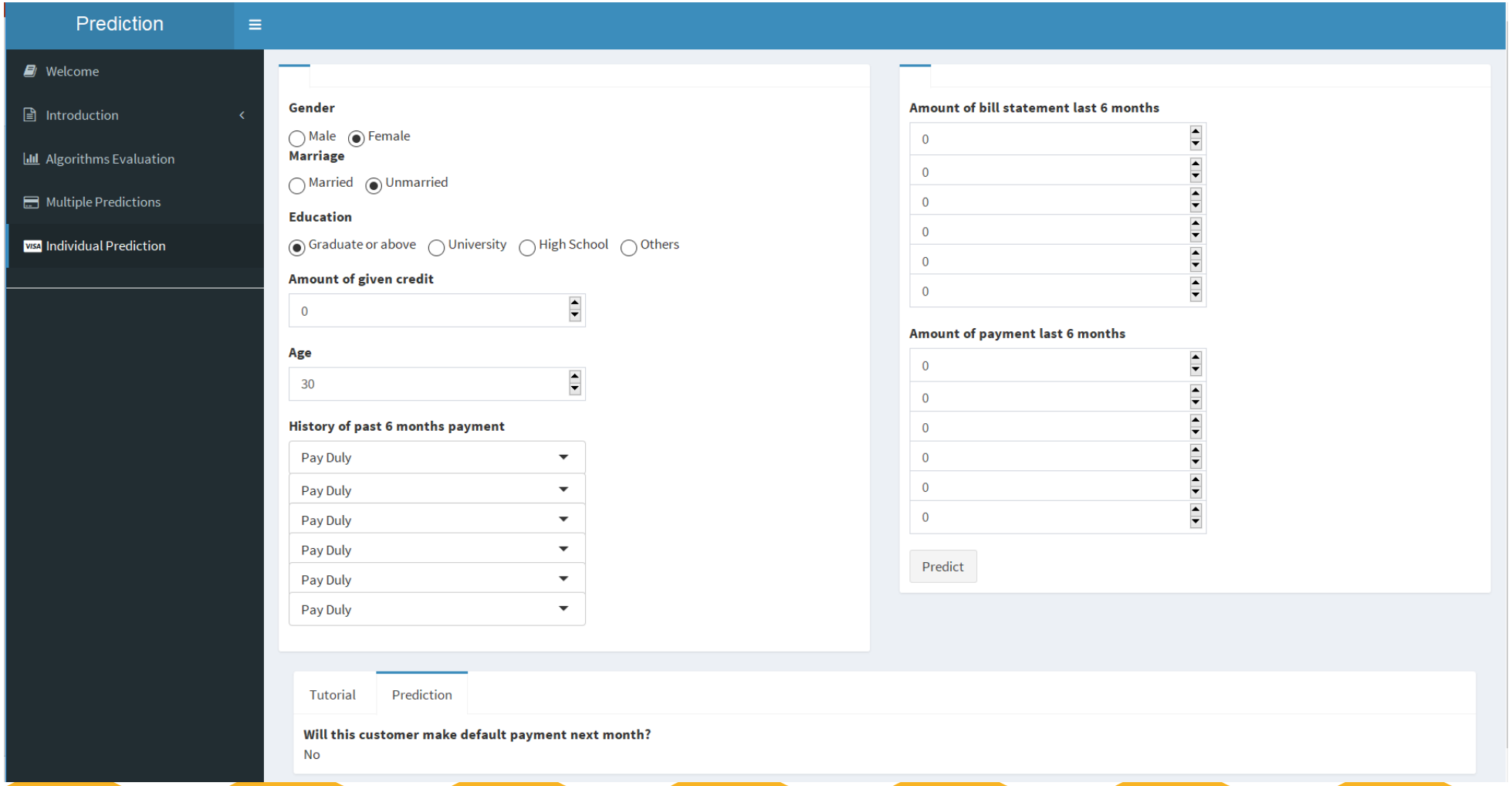
VISUALIZATION



VISUALIZATION



VISUALIZATION



VISUALIZATION

https://lanceyjtcolumbia.shinyapps.io/default_payment/

FUTURE PLAN

- Add "Model Training" feature in our app.

Idea: Allow user to upload their own training dataset, and we can train a new model for the user based on the data user given.

Q & A

THANK YOU