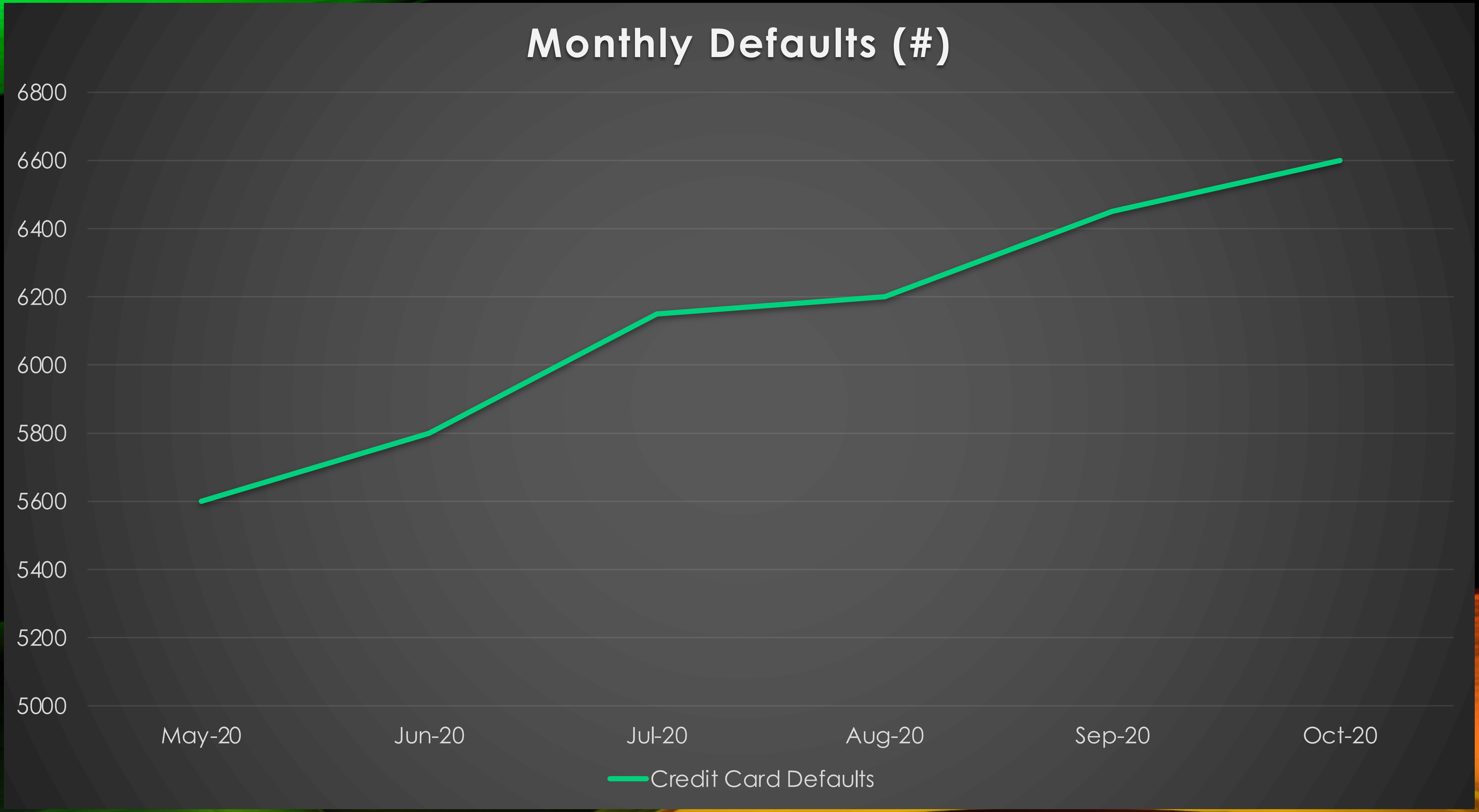
CREDIT CARD DEFAULT: A DATA SCIENCE SOLUTION

By Marcos Dominguez,
Data Scientist


Monthly Defaults (#)
6800
6600
6400
6200
6000
5800
5600
5400
5200
5000
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Credit Card Defaults

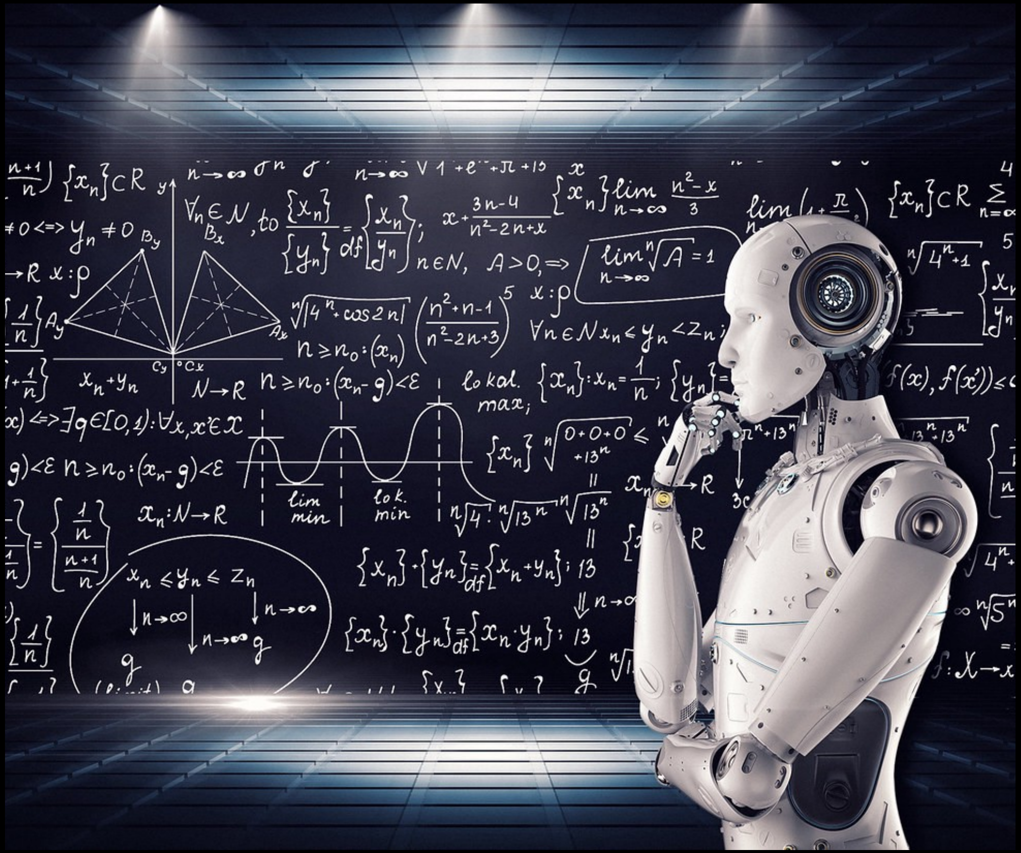

Monthly Loss ($)
-$9,500,000
-$10,000,000
-$10,500,000
-$11,000,000
-$11,500,000
-$12,000,000
-$12,500,000
-$13,000,000
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Losses to Due Defaults ($)

SOLUTION: MACHINE LEARNING MODEL

Input Data → ML Model → Default? Yes or No

FINE TUNING

- Minimize overlooking “No” predictions
  - Recall
- Cost of overlooking a “No” > Cost of overlooking a “Yes”

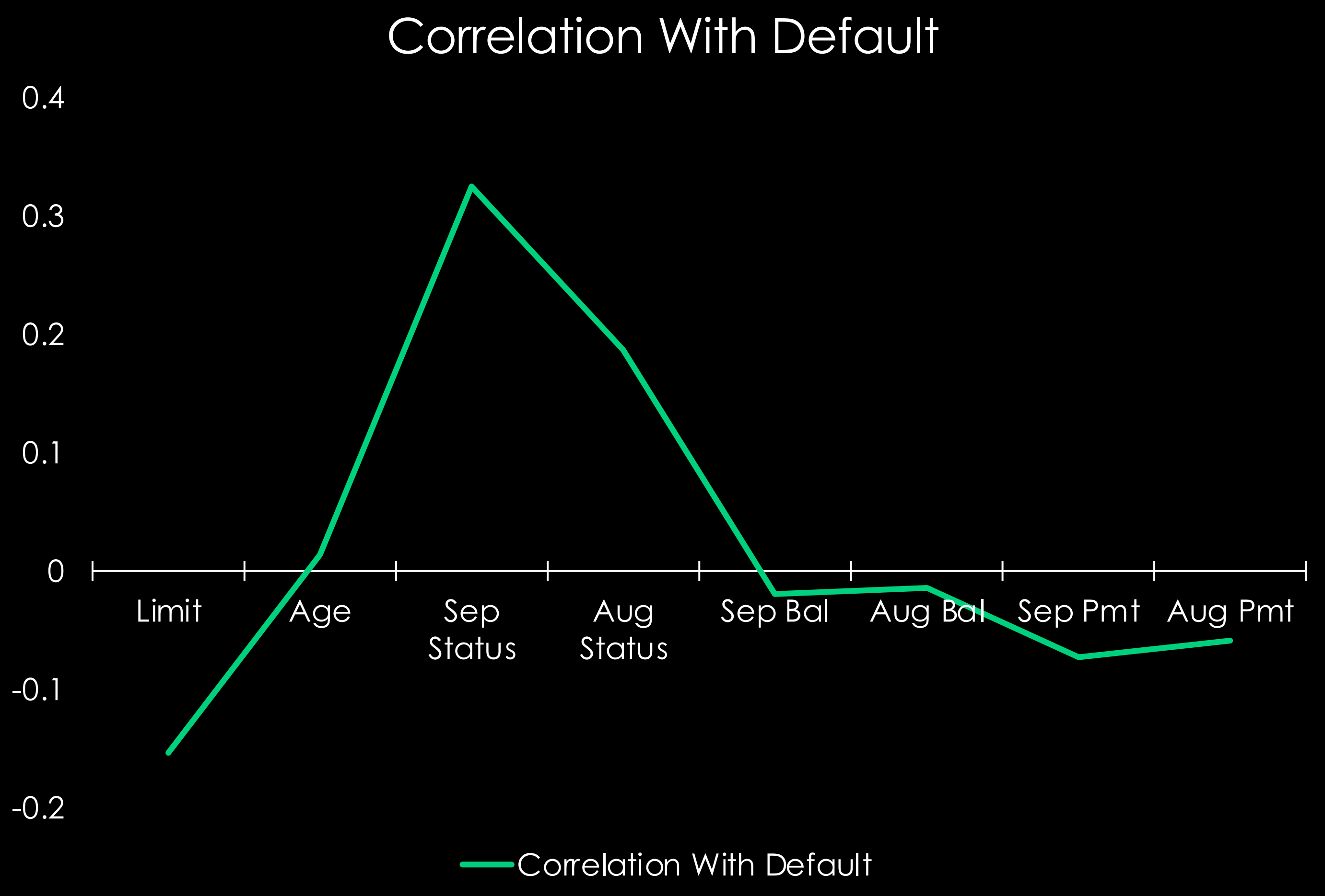


MODEL SELECTION: RANDOM FOREST

- Compared:
  - Multiple models
  - Multiple parameters
- Most accurate
- Least computationally complex

INPUT VARIABLES

- 26 variables total
  - Credit Limit
  - Payment Status
  - Monthly Payment
  - Monthly Balance
  - …and many more
- Most important:
  - Payment Status



STRATEGY

1

Use ML model to identify customers likely to default

2

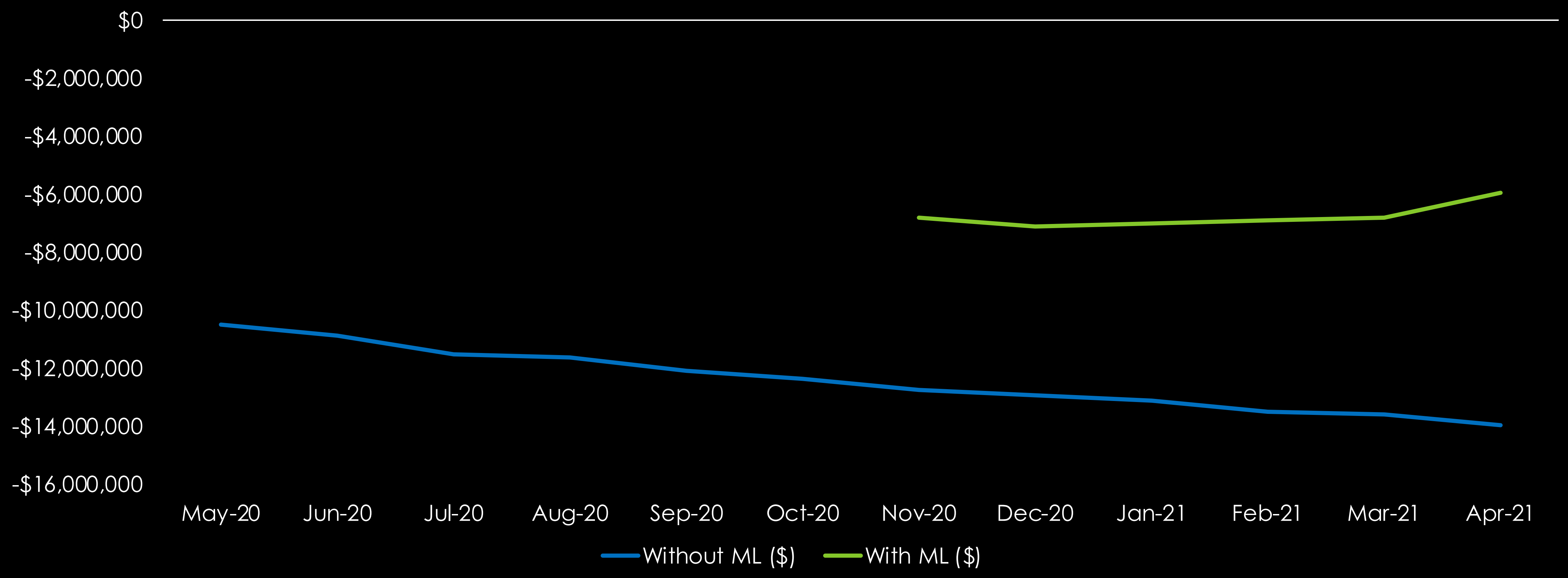
Notify relationship managers

3

Provide options:

- Forbearance
- Consolidate credit card debt

FORECAST

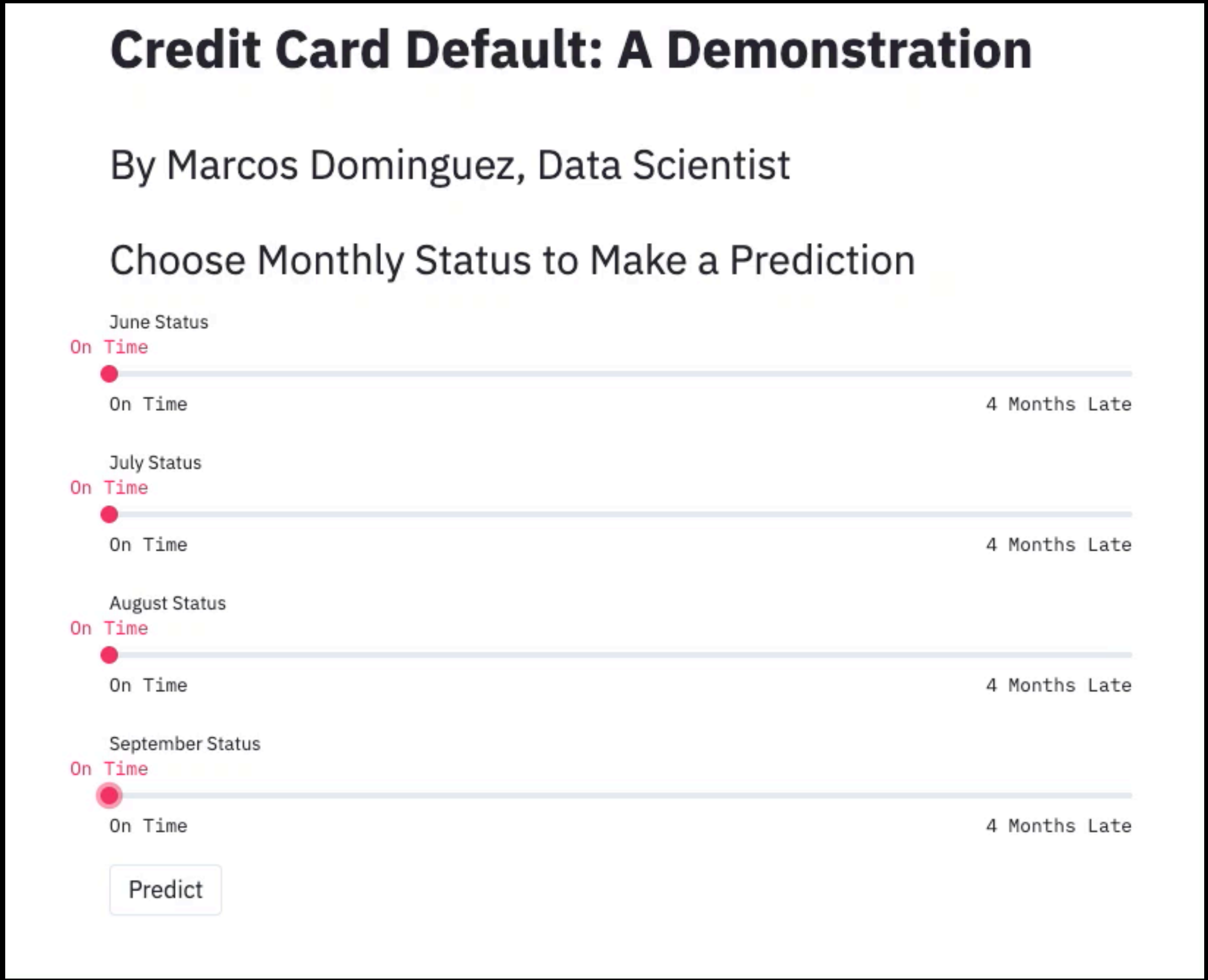


$0
-$2,000,000
-$4,000,000
-$6,000,000
-$8,000,000
-$10,000,000
-$12,000,000
-$14,000,000
-$16,000,000
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
Without ML ($)
With ML ($)

FORECAST NUMBERS

	Without ML (thousands)	With ML (thousands)
6 Month Forecast	$(79,875)	$(40,600)
Total Savings	$0	$39,275
Model Accuracy	0	55%
Defaults Prevented	0	21,950

DEMO


Credit Card Default: A Demonstration
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Choose Monthly Status to Make a Prediction
June Status
On Time
On Time
4 Months Late
July Status
On Time
On Time
4 Months Late
August Status
On Time
On Time
4 Months Late
September Status
On Time
On Time
4 Months Late
Predict

ACKNOWLEDGEMENTS

- Dataset: UCI Machine Learning Repo, ”default of credit card clients”
- Open-source tools used:
  - Scikit-learn
  - Pandas
  - Numpy
  - Matplotlib, seaborn
  - Streamlit
  - imblearn
  - ipywidgets