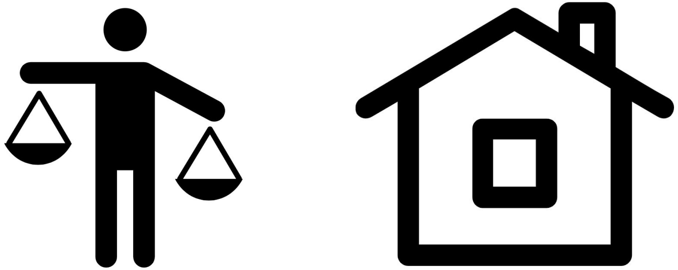
How Capable is an Applicant of Repaying a Loan?

Home Credit Default Risk Results

Laura Cattaneo, Callie Page, Max Traub, Cathy Zheng

Roadmap

1. **Prediction Problem**
   a. **Company & Customer perspectives**
2. Analysis Overview
   a. Data sources
   b. Model results
3. Conclusion



How Capable is an Applicant of Repaying a Loan?

Higher risk applicants with poor credit history **adds risk to the company**

	Member can pay	Member will have difficulty paying
Model approves mortgage	$4,548	-$26,895
Model denies mortgage	-$1,000	$0

Sources:

1. Goodman, L., & Zhu, J. (2015, February). *Loss Severity on Residential Mortgages* [PDF]. Washington, DC: Urban Institute.
2. Olick, D. (2020, September 10). Mortgage lenders just saw record profit, and expect to do better in the next quarter. Retrieved from https://www.cnbc.com/2020/09/10/mortgage-lenders-just-saw-record-profit-and-expect-to-do-better-in-the-next-quarter.html

How Capable is an Applicant of Repaying a Loan?

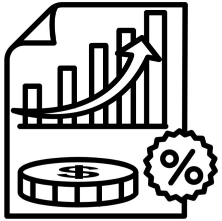
Individuals with poor credit history **also face higher risk**

Source: https://files.consumerfinance.gov/f/documents/201612_cfpb_credit_invisible_policy_report.pdf

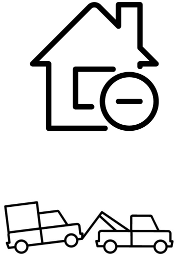
Individuals face increased risk of falling to predatory lenders

Unfair and abusive lenders profit from loan terms

High late fees



Penalty interest



Collateral

Source: https://studentloanhero.com/featured/predatory-lending-warning-signs/

Almost 1 in 9 Americans struggle to get a home loan

26 million	+	10 million	=	36 million
Are credit **invisible** [1]		Have insufficient credit to get a loan [1]		Struggle to get a home loan

Source: 1. https://files.consumerfinance.gov/f/documents/201612_cfpb_credit_invisible_policy_report.pdf

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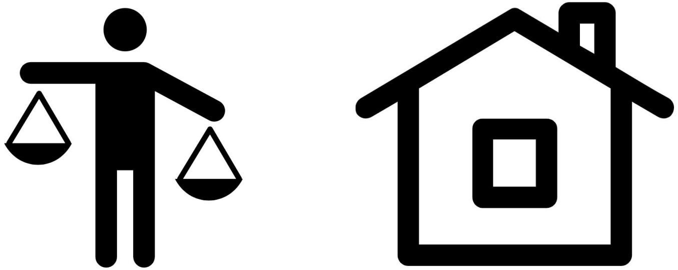

We use alternative data to predict repayment abilities

8 datasets

#1, 2 Application Train and Test

- ➔ Main table including the target variable (whether or not the client has payment difficulties)

#3 Bureau Data

- ➔ Data on previous loans a client received

#4 Bureau Balance Data

- ➔ Monthly balance of credits in the Bureau
- ➔ Gives insight into client's behavior

We use alternative data to predict repayment abilities

8 datasets

#5 Previous Application

➔ Client's previous loan applications with Home Credit

#6 Cash Balance

➔ Client's loan repayment history

#7 Instalments Payments

➔ Payment data for each instalment of credit

#8 Credit Card Balance

➔ Monthly balance of credit card loans

We engineer more powerful new variables

220 Original Variables

Recent Monthly Credit Payments
New Credit to Income Ratio
Current Credit Down Payment

⋮

1054 additional variables

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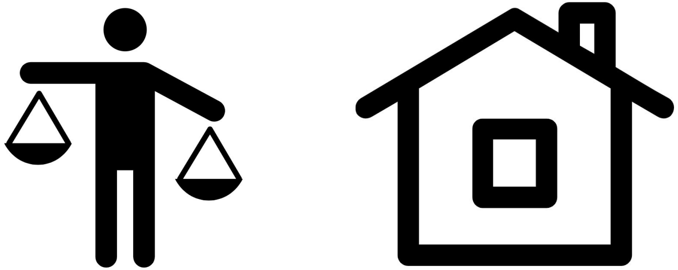

We try various models to maximize predictive power

Algorithm	Recall
Logistic Regression	0.002
SVM	0.052
k-NN	0.062
Decision Tree	0.125
LightGBM	**0.452**

The best performer was:

LightGBM

We return to the incurred risk associated with incorrect predictions

	Member can pay	Member will have difficulty paying
Model approves mortgage	$4,548	-$26,895
Model denies mortgage	-$1,000	$0

Model Limits Cost of Mortgage Defaults

Expected Value = Costs or Benefit of Outcome × Likelihood of Outcome

Costs or Benefit of Outcome

$4,548	-$26,895
-$1,000	$0

X

Likelihood of Outcome

91.6%	7.7%
0.3%	0.4%

Model Limits Cost of Mortgage Defaults

Type of Classifier	Expected Value Per Customer	Improvement with Model
Best Model	$2,078.82	--
Give Everyone a Mortgage	$1,990.75	4.4%

If **100,000** customers are served annually by Home Credit, the additional profit each year would be **over $8.8 million gain**

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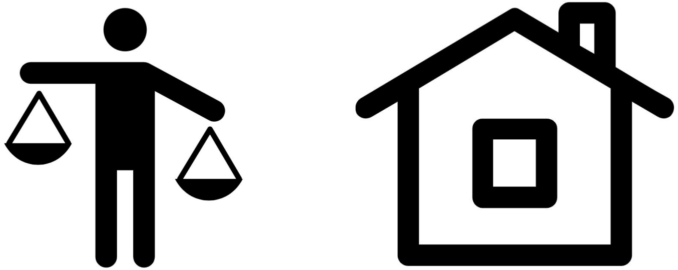
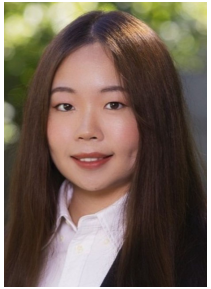


We drive profit and open doors for people with less opportunity

$8.8 Million

Help people who are usually not able
to enter the credit market do so

Thank you for your attention. Questions?



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For more technical details, check out our **GitHub**