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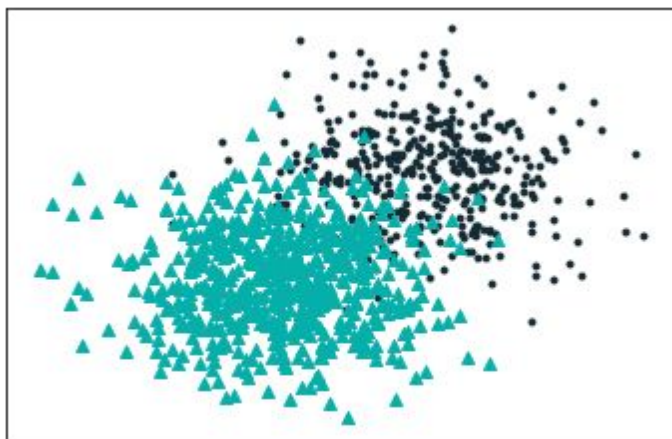
The ROI for Improving Customer Repayment Behavior

Machine Learning Overview

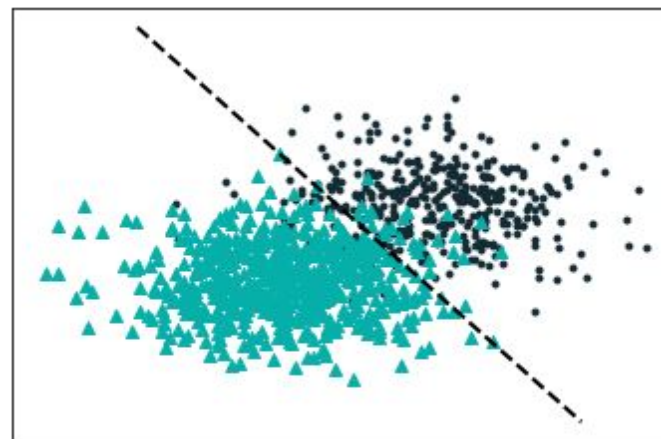
Supervised machine learning takes historical information on how input data affects one or more pieces of output data, in order to **predict** what future input data will result in. Examples include:

- Whether or not a customer will default on a loan
- Determine if a mole is benign or malignant

Historical Data



Historical Data w/ prediction line



Predicting Customer Churn

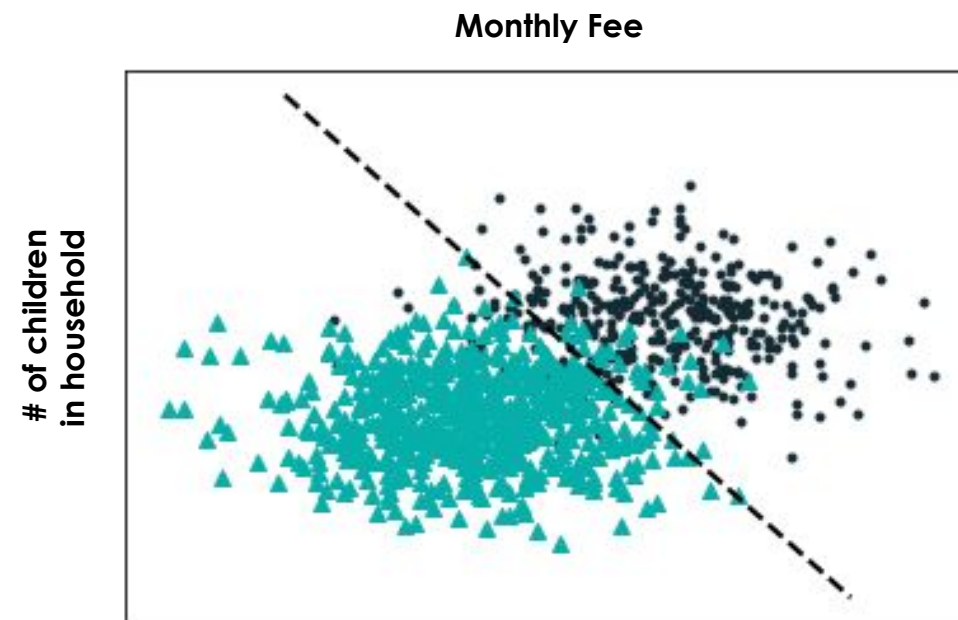
Problem: Significant costs are incurred when a customer defaults on their solar system

Solution: Use historical data and machine learning to predict which customers are likely to default on a certain product, thus allowing an adjustment to product offerings, repayment options, etc.

Example: Predicting customer churn with only **two** input features (NOTE not real data)

● defaulted

▲ paid

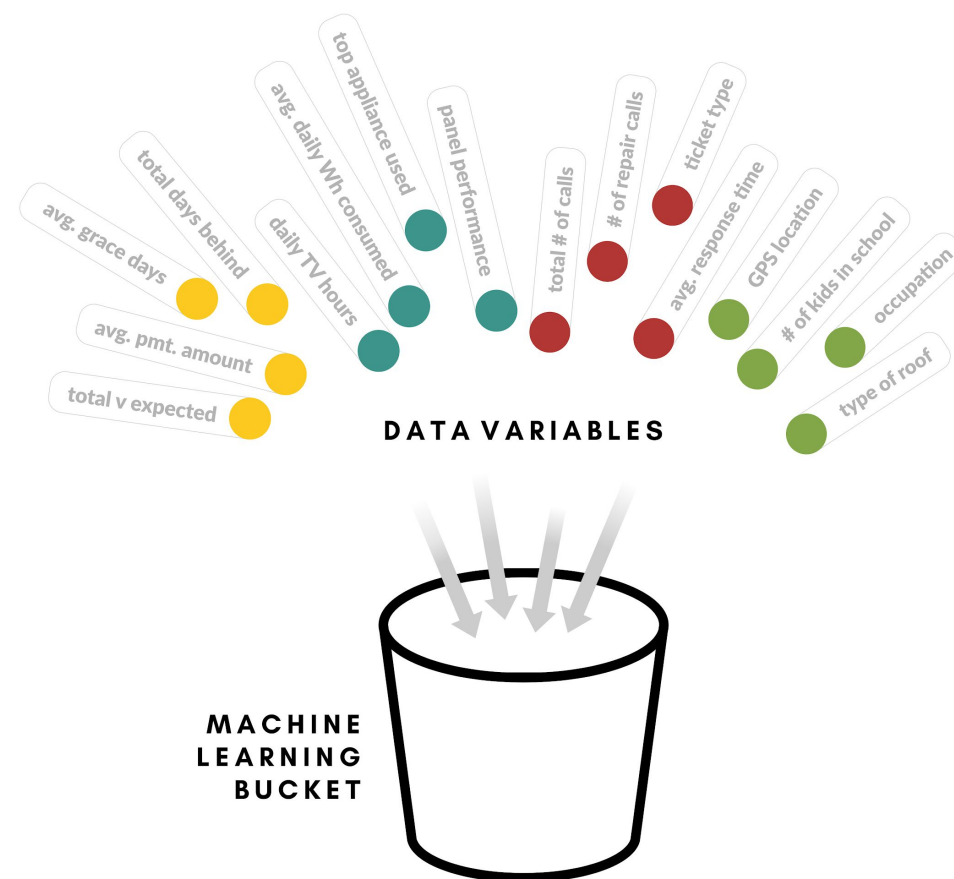


Predicting Customer Churn

In reality, companies have dozens (sometimes hundreds) of features.

Machine learning can help:

- Determine **which variables are important**
- **Adjust predictions** based on business needs (e.g., what constitutes a default)
- Identify potential clients who may benefit from a **different product**



Examples of a features set for churn prediction

Predicting Customer Churn: **Action**



Javi

- 12+ months active
- Never ran out of credit more than 2 days
- Typically pays 3+ months at a time
- Tagged as high 80% probability to churn
- Risk of being a “first time churner”

**High priority Agent Visit +
Personal phone calls**



Jacob

- 9 months active
- Frequently goes 15+ days between pmts
- Typically pays 2-3 days at a time
- Tagged as high 70% probability to churn
- Might be tagged as “repeat churner”

Robo calls and SMS



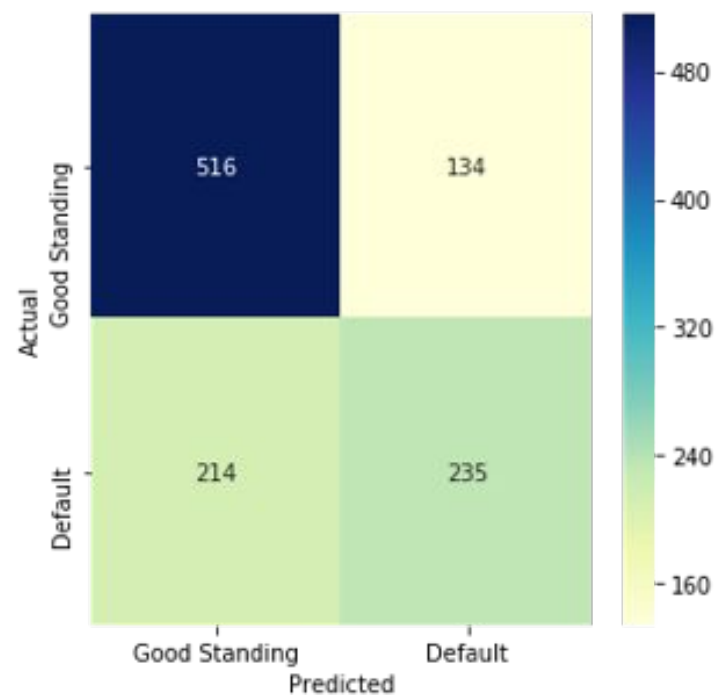
Abi

- 2.5 years active
- Only missed 8 days total in life
- Typically pays monthly
- Tagged as 12% probability to churn
- Might be tagged as “Regular payer”

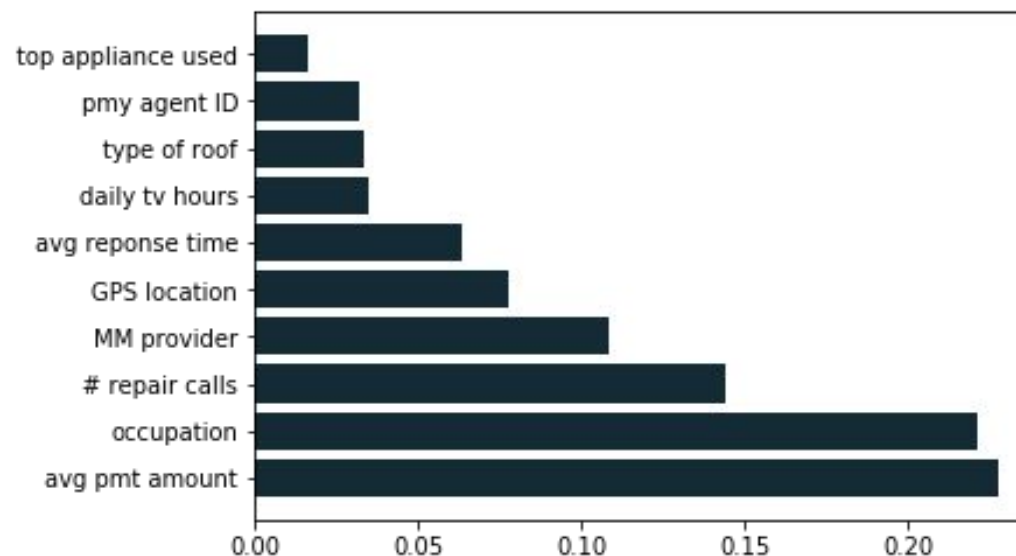
Do nothing

Predicting Customer Churn: Visualizations

Confusion Matrix: How “well” did the model perform



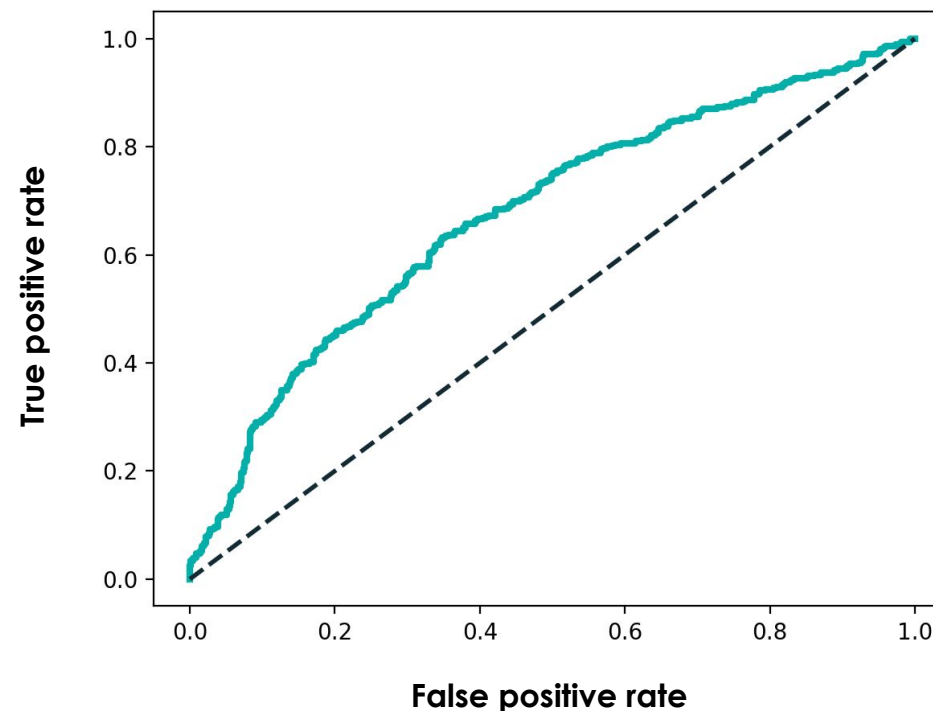
Feature Importances: Which features contribute most to default or on time payment?



Optimizing for ROI

It is crucial that machine learning models take into account business considerations early, because **different types of mistakes have different costs.**

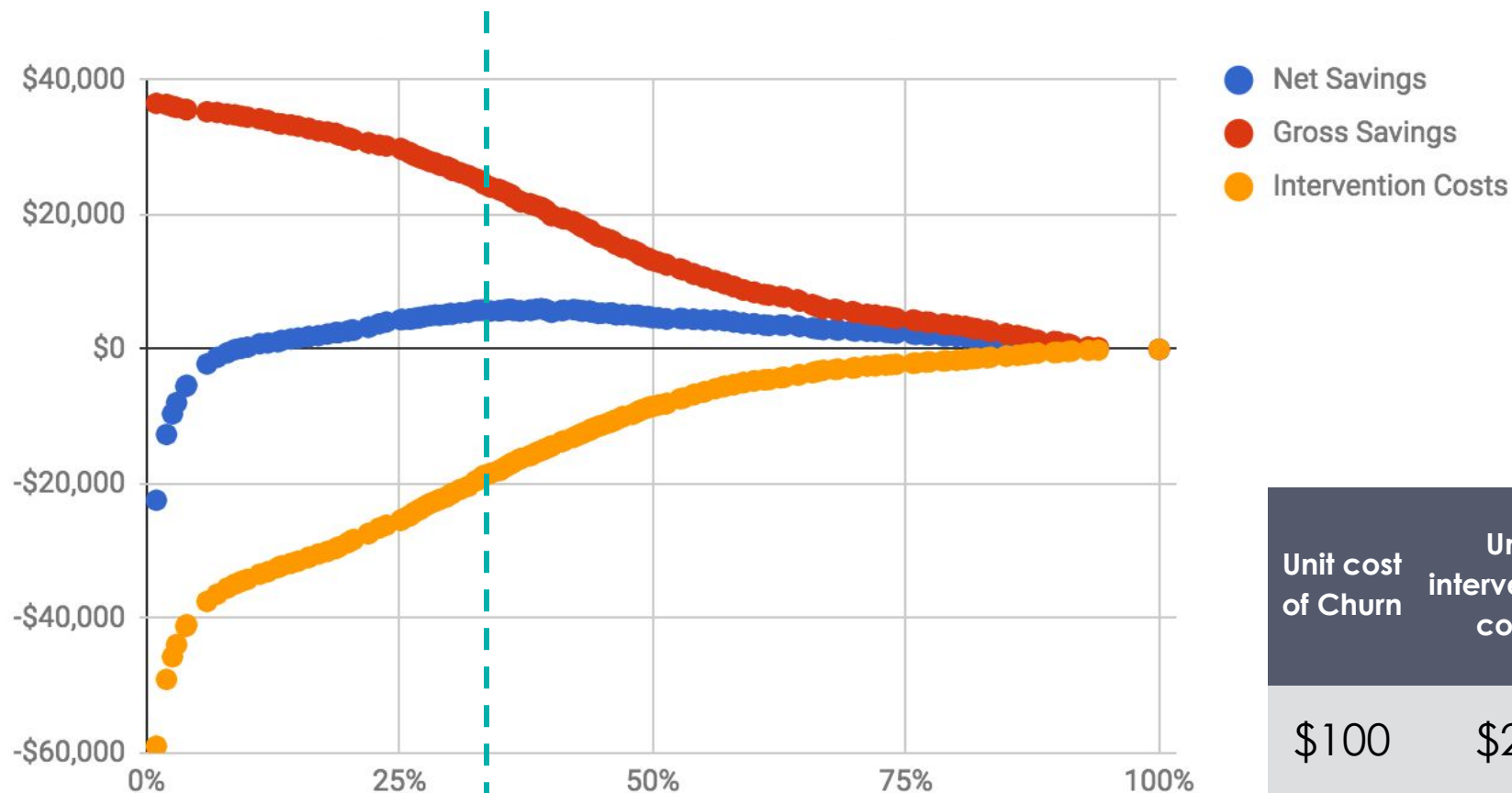
Companies have different costs associated with false positives (unexpected defaults) than with false negatives (good clients that are turned away)



ROC curve: Shows model trade-offs between false positives and false negatives

Optimizing for ROI: A Calculator

Net churn saving for different sensitivity thresholds



Unit cost of Churn	Unit intervention costs	Effectiveness of Intervention	Optimal Threshold
\$100	\$20	50%	39%

Key Takeaways

1. Machine learning for churn prediction is an **increasingly effective method for vetting potential customers**
2. These algorithms can be used to determine whether or not to initially engage with a client, which product offering will be most appropriate, if more information is needed to determine next steps, and a host of other use-cases
3. The **ROI of the machine learning use-case** must be considered from the model's conception for the benefits of the model to be realized

Thank **you!**

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