

Fairness in Algorithmic Credit Pricing

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DHH 
@dhh



The [@AppleCard](#) is such a fucking sexist program. My wife and I filed joint tax returns, live in a community-property state, and have been married for a long time. Yet Apple's black box algorithm thinks I deserve 20x the credit limit she does. No appeals work.

3:34 PM · Nov 7, 2019 · [Twitter for iPhone](#)

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INPUTS



DECISION MAKING



OUTPUT

Big Data:

- High dimensional-
more data about
you
- More observations-
more data about
other people

Income

Credit
score

Debt-to-
income
ratio

Loan
size



Algorithm / Human

Machine Learning:
Better prediction
technology

Automated Decisions:

Little or no human
discretion

Credit Price



Borrower

Simulation Exercise

- Firm uses past default data to set new prices
 - Data used to construct simulation:
 - The Home Mortgage Disclosure Act (HMDA) Data (Boston Fed)
 - Simulated default rates
1. Fit a prediction function on training data of 2000 old customers
 2. Inspect predictions on hold-out data of 2000 “new customers”

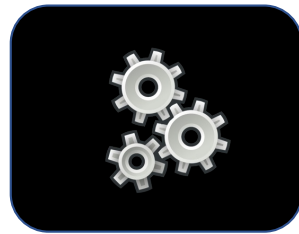
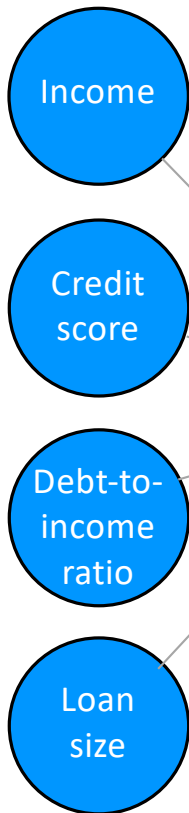
HMDA INPUTS



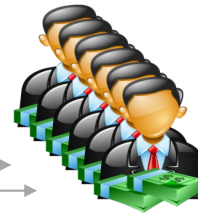
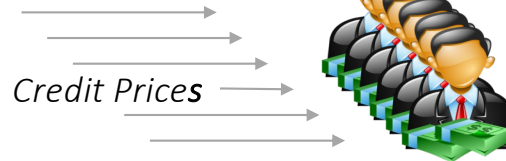
DECISION MAKING



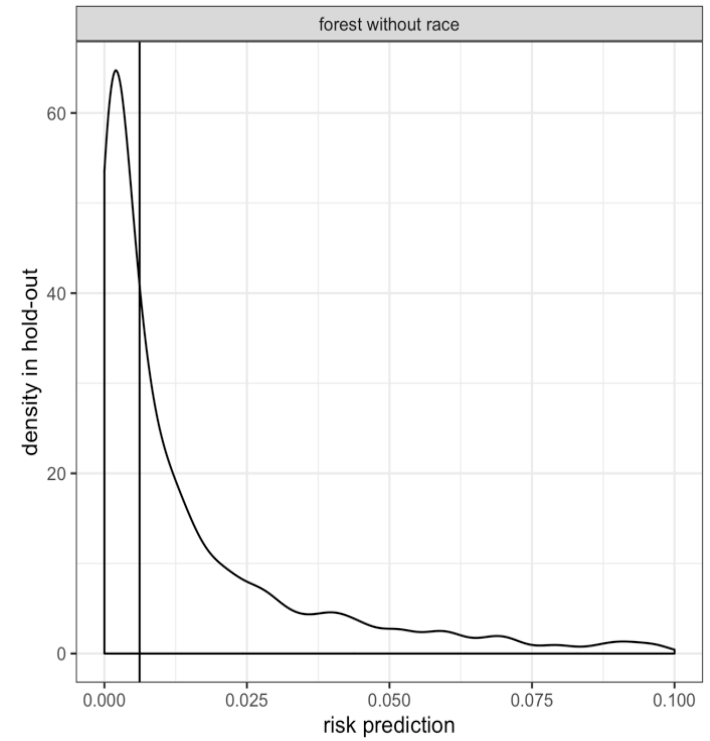
OUTPUT



Algorithm / Human



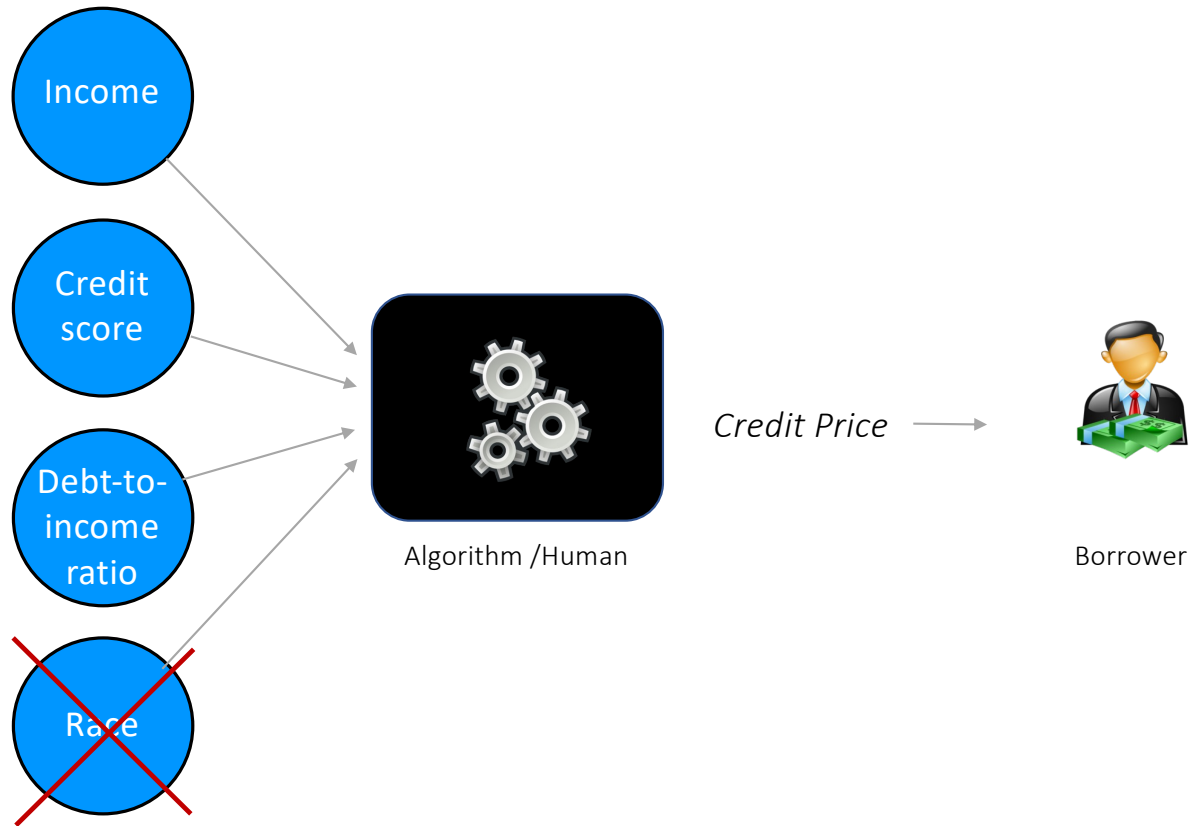
Borrowers



Three challenges

- Restricting use of protected characteristics
- Restricting use of proxies for protected characteristics
- Risks of increased personalization

Restricting protected characteristics





GS Bank Support ✓
@gsbanksupport



We hear you #AppleCard

We hear you. Your concerns are important to us and we take them seriously.

We have not and never will make decisions based on factors like gender. In fact, we do not know your gender or marital status during the Apple Card application process.

We are committed to ensuring our credit decision process is fair. Together with a third party, we reviewed our credit decision process to guard against unintended bias and outcomes.

We have not and never will make decisions based on factors like gender. In fact, we do not know your gender or marital status during the Apple Card application process.

process is not aware of your marital status at the time of the application.

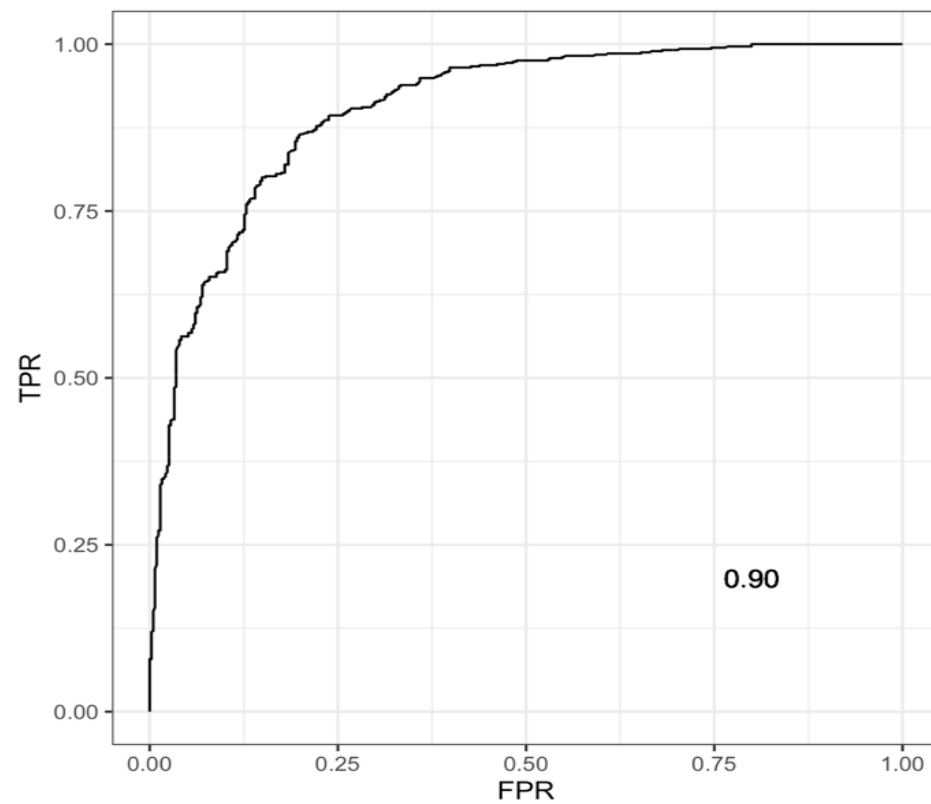
If you believe that your credit line does not adequately reflect your credit history because you may be in a similar situation, we want to hear from you. Based on additional information that we may request, we will re-evaluate your credit line.

Thank you for being an Apple Card customer.

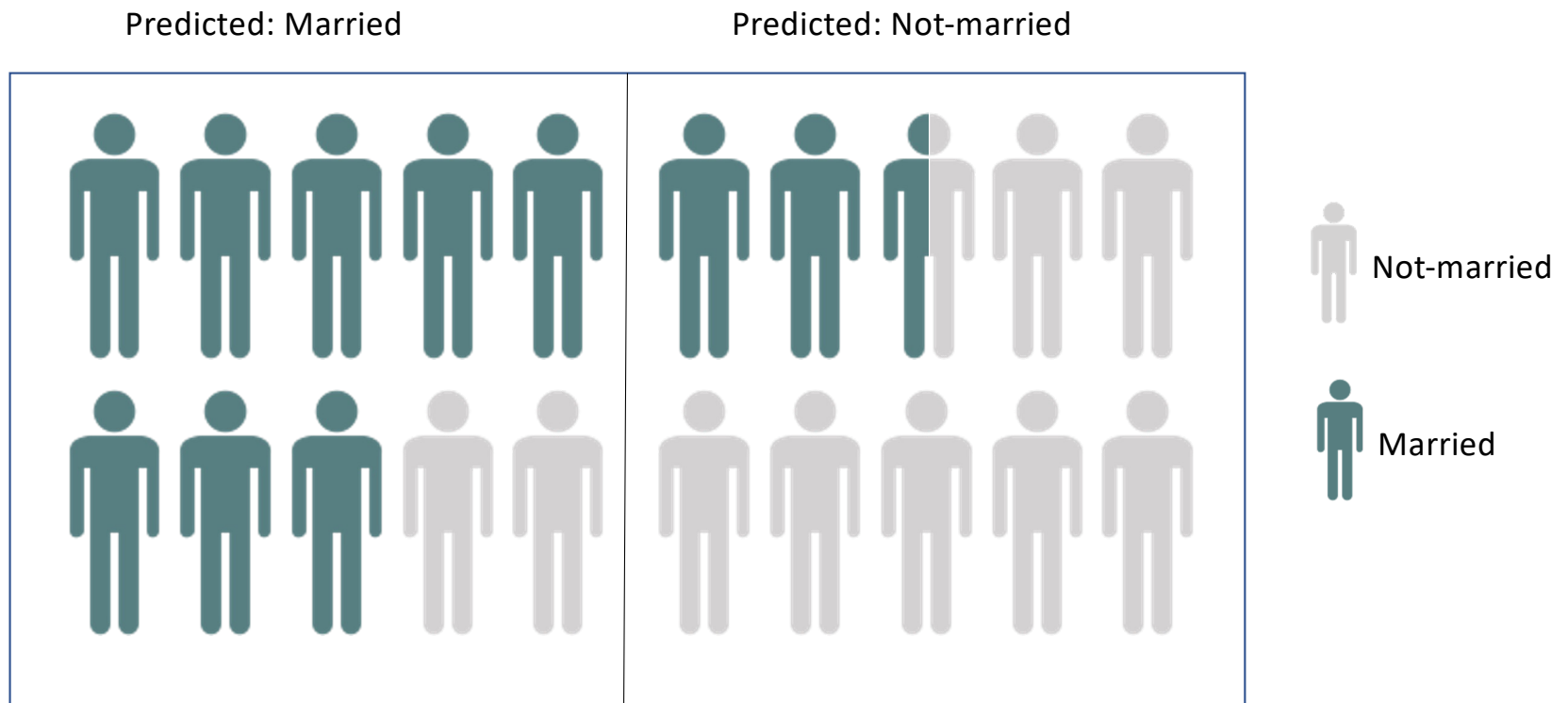
Carey Halio
Chief Executive Officer
Goldman Sachs Bank USA

5:42 PM · Nov 11, 2019 · [Sprinklr Publishing](#)

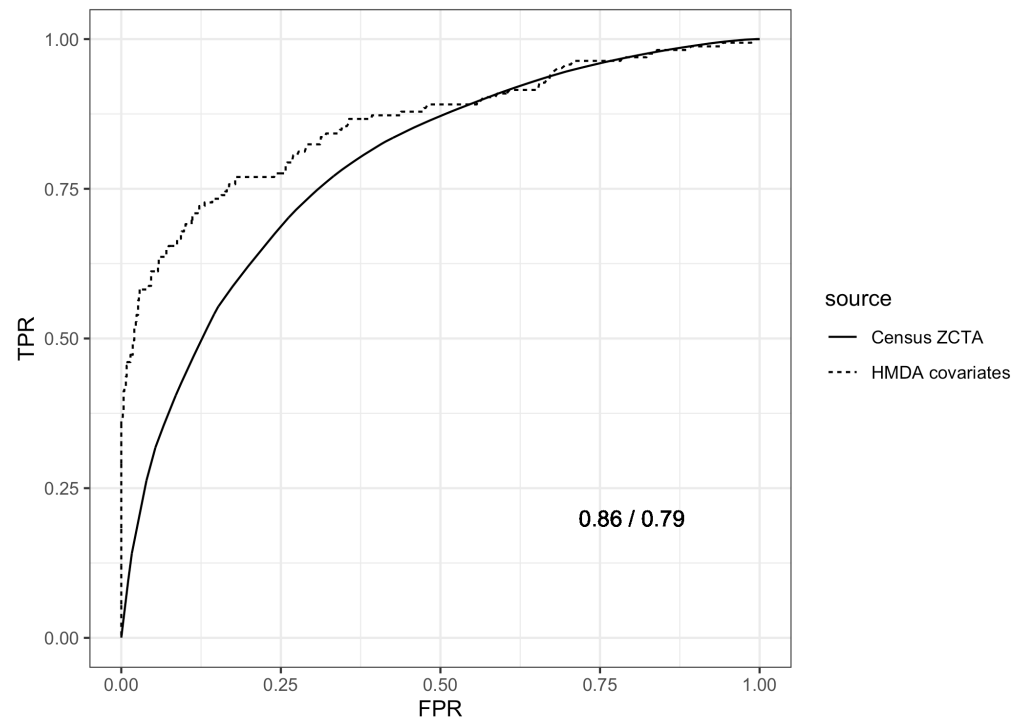
Predicting “marital status”



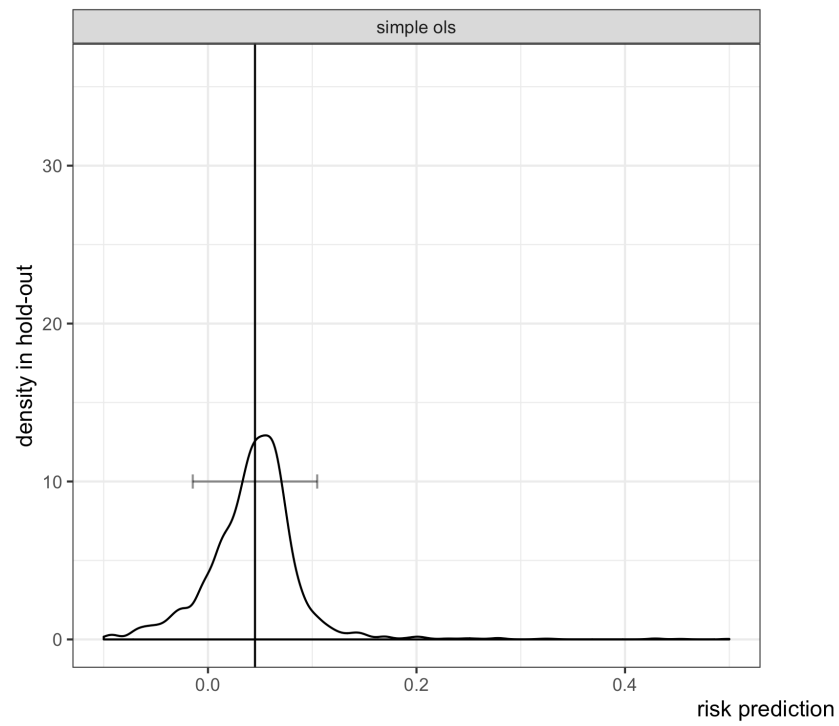
Predicting “marital status”



Restricting proxies for protected characteristics



Increased personalization



Increased personalization

