



SUNZ 2022

Balancing Responsible AI and Profitability

October 19, 2022

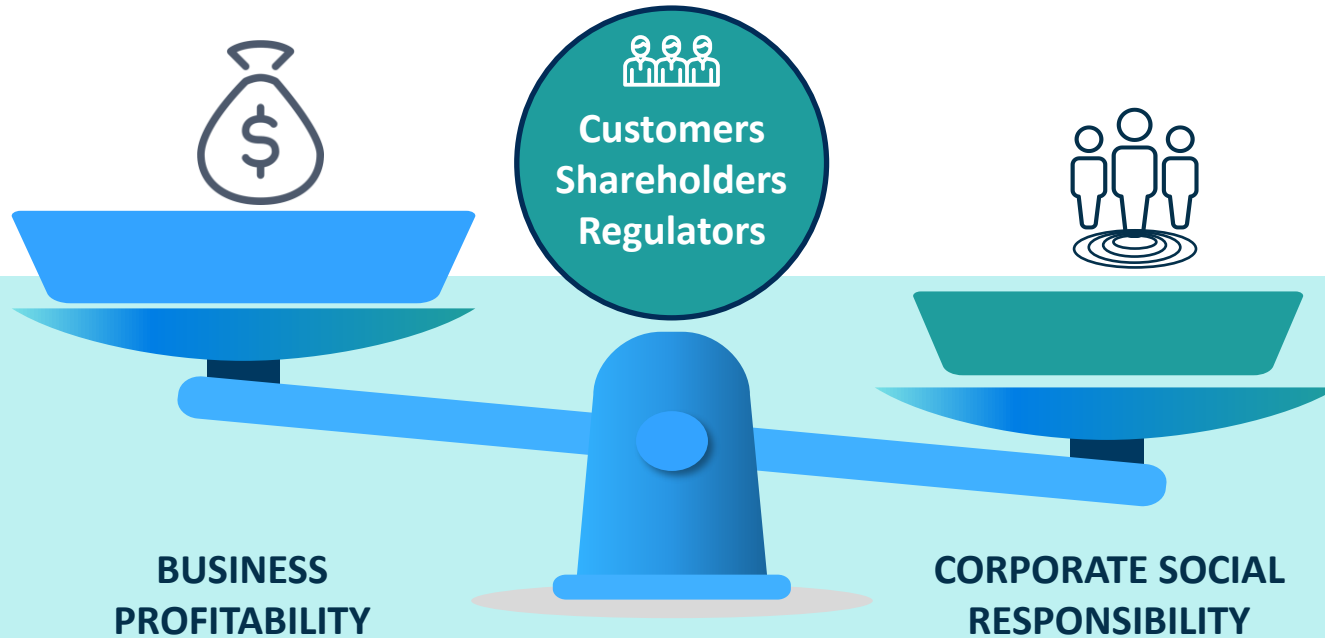
Jacky Long

SAS Global Technology Practice



CXOs Challenge with AI

Balancing Business Profitability with Corporate Social Responsibility



Tradeoffs

RESPONSIBLE AI

Social Responsibility and Economic Trade Off for *FEMALES*



Original Thresholds - *FEMALES*

APPROVE	<ul style="list-style-type: none"> * Expand customer's credit * Increase bank revenue <p>\$86.1B 134,301</p> <p>↑</p>	<ul style="list-style-type: none"> * Bank write off * Negative impact on customer credit score <p>\$4.28B 6,526</p> <p>↓</p>
	<ul style="list-style-type: none"> * Missed revenue for the bank * Missed credit opportunity for customer <p>\$25B 52,118</p> <p>↓</p>	<ul style="list-style-type: none"> * Customer avoids credit issues * Customer suffers rejection * Bank avoids losses <p>\$3.62B 7,537</p> <p>↑</p>
	PAID IN FULL	DEFAULT

Thresholds Adjusted for Bias - *FEMALES*

APPROVE	<ul style="list-style-type: none"> * Expand customer's credit * Increase bank revenue <p>\$96.9B 155,723</p> <p>↑</p>	<ul style="list-style-type: none"> * Bank write off * Negative impact on customer credit score <p>\$5.43B 8,733</p> <p>↓</p>
	<ul style="list-style-type: none"> * Missed revenue for the bank * Missed credit opportunity for customer <p>\$14.2B 30,696</p> <p>↓</p>	<ul style="list-style-type: none"> * Customer avoids credit issues * Customer suffers rejection * Bank avoids losses <p>\$2.47B 5,330</p> <p>↑</p>
	PAID IN FULL	DEFAULT



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Identifying Inequities

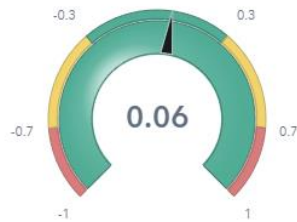
RESPONSIBLE AI Highlighting Gender Bias



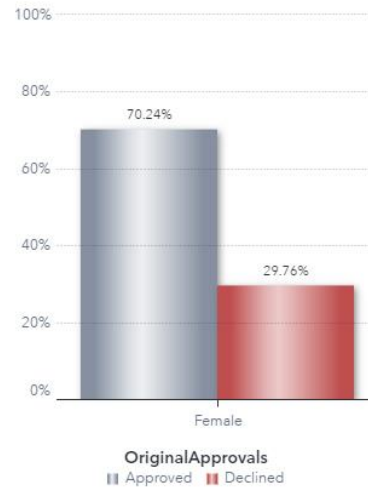
Gender Equalized Odds



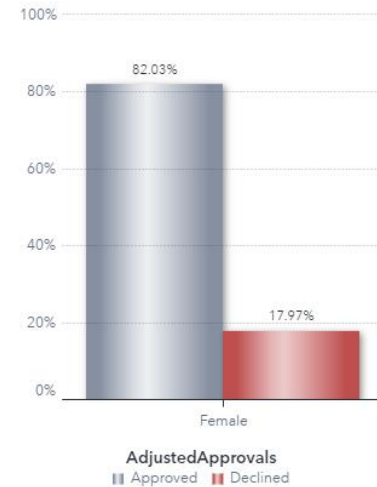
Gender Equalized Odds - adjusted for bias



Original Approvals



Adjusted Approvals



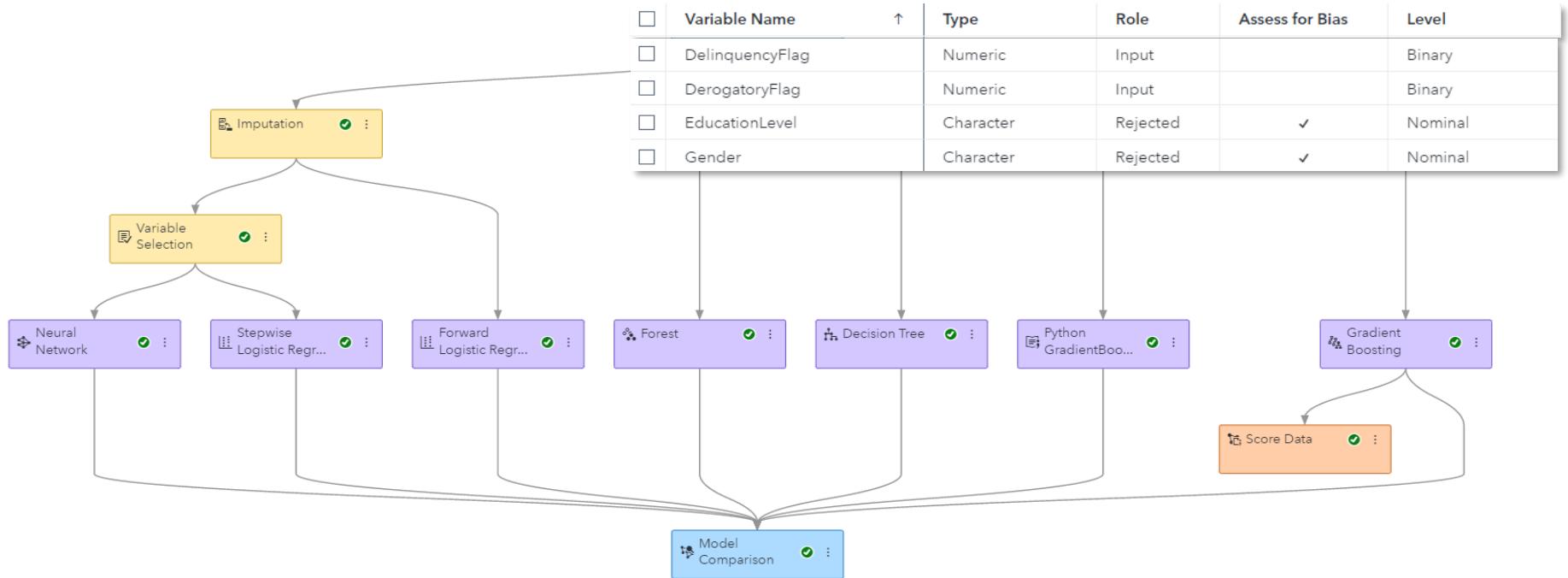
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Model Development

Using Model Studio Pipelines






Model Development




Data






Create Threshold Metrics Table






Data



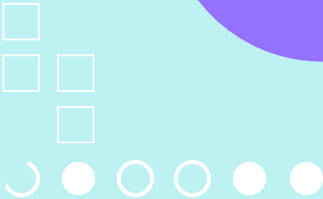


Create Accuracy Prediction Matrix



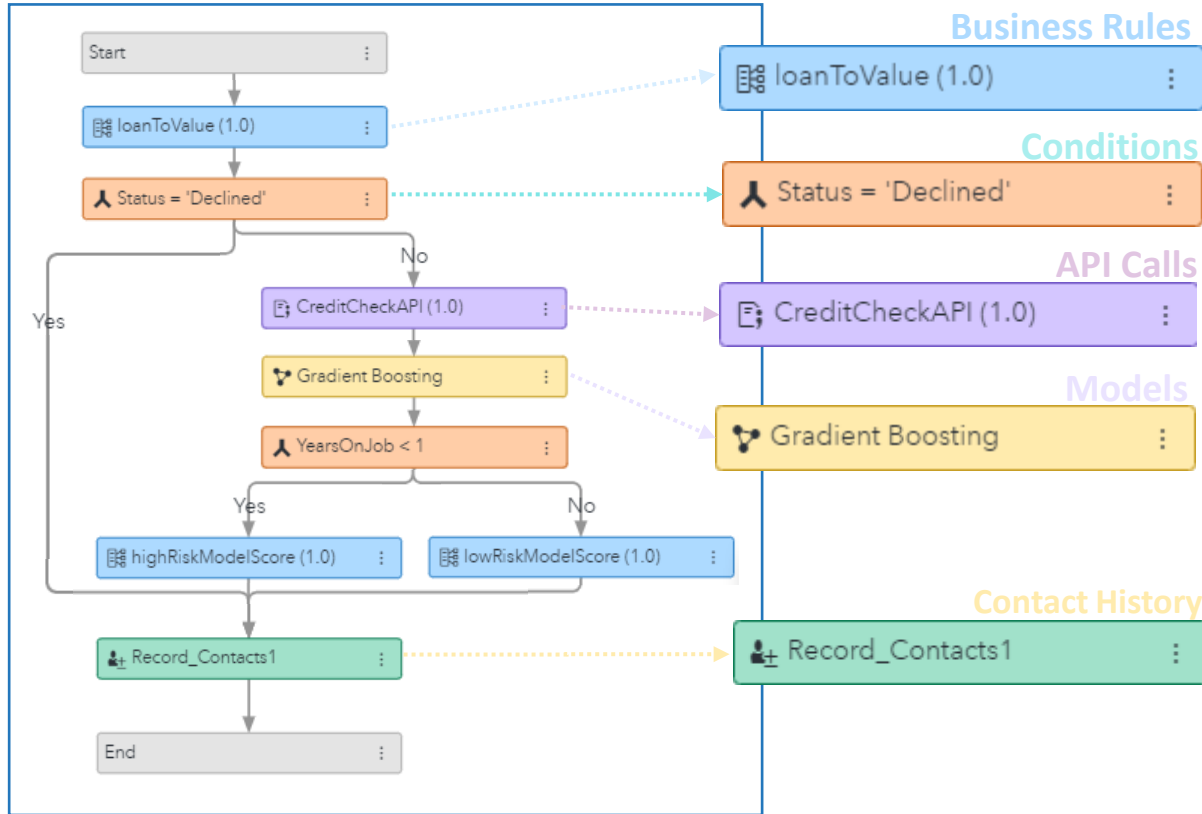
Data



Create Responsible Prediction Matrix

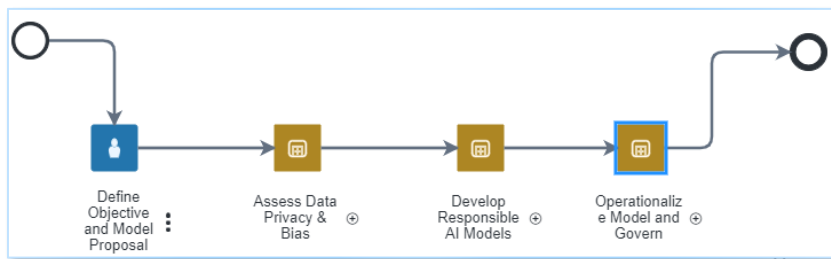


Decisioning



Workflow

Orchestrate the ModelOps Process



Participants

Listed in this data object:

Listed in this table:

Potential owner user or group

Excluded owner user or group

Action

Action type:

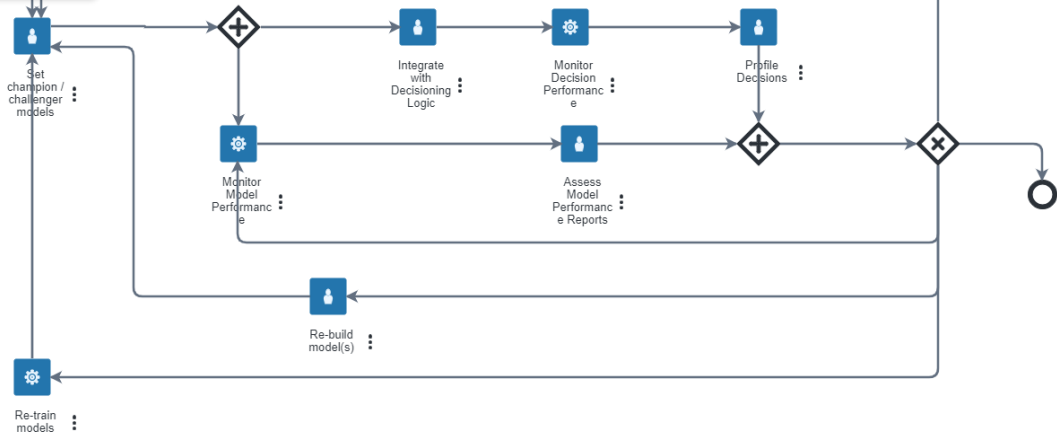
Invoke REST web service

Invoke web service

Send email

Send notification

Send group notification



Near Real Time Monitoring

Track Model Accuracy over Time

RESPONSIBLE AI

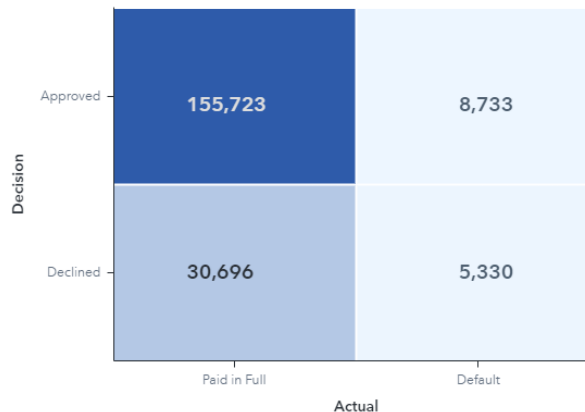
Performance Estimates



Performance Metrics

Metric	Value	Std Deviation
Accuracy	0.6581	0.0593
Average Squared Error	0.2172	0.0058
Balanced Accuracy	0.6567	0.0565
F1 Score	0.6601	0.2254
False Discovery Rate	0.3438	0.1350
False Positive Rate	0.3478	0.3743
Log Loss	0.6240	0.0127
Misclassification Rate	0.3419	0.0593
Precision	0.6563	0.1432
Recall	0.6640	0.3565
ROC Score	0.3162	0.1107
Specificity	0.6522	0.3583

Confusion Matrix



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Near Real Time Monitoring

Track Business Outcomes over Time



Near Real Time Monitoring

Track Model Fairness over Time

RESPONSIBLE AI

Are we meeting our Fairness Objectives?



Gender

Fairness Metric	▲ Measure	Std. Deviation
AUC Parity	0.0378	0.0283
Calibration by Group	0.0359	0.0256
Demographic Parity	0.0867	0.0187
Disparate Impact	-0.8934	0.0224
Equal Opportunity	0.0746	0.0172
Equalized Odds	0.0649	0.0245
False Discovery Rate Parity	-0.0175	0.0204
False Negative Rate Parity	-0.0402	0.0172
False Omission Rate Parity	0.0313	0.0486
False Positive Rate Parity	0.0730	0.0495
Log-loss Parity	-0.0238	0.0168
Mutual Information Independence	-0.0021	0.0027
Mutual Information Separation	-0.1586	0.0127
Mutual Information Sufficiency	0.0002	0.0012
Negative Equalized Odds	-0.0160	0.0245
Negative Predictive Parity	0.0659	0.0486

Marital Status

Fairness Metric	▲ Measure	Std. Deviation
AUC Parity	0.0345	0.0284
Calibration by Group	0.0193	0.0323
Demographic Parity	0.0831	0.0151
Disparate Impact	-0.8983	0.0180
Equal Opportunity	0.0793	0.0186
Equalized Odds	0.0701	0.0176
False Discovery Rate Parity	0.0022	0.0209
False Negative Rate Parity	-0.0421	0.0186
False Omission Rate Parity	0.0126	0.0572
False Positive Rate Parity	0.0825	0.0384
Log-loss Parity	-0.0070	0.0190
Mutual Information Independence	-0.0028	0.0021
Mutual Information Separation	-0.1700	0.0125
Mutual Information Sufficiency	0.0003	0.0007
Negative Equalized Odds	-0.0348	0.0176
Negative Predictive Parity	0.1019	0.0572



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Near Real Time Monitoring

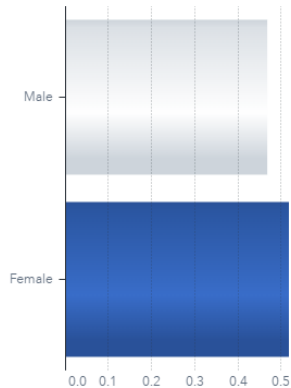
Track Model Fairness over Time

RESPONSIBLE AI

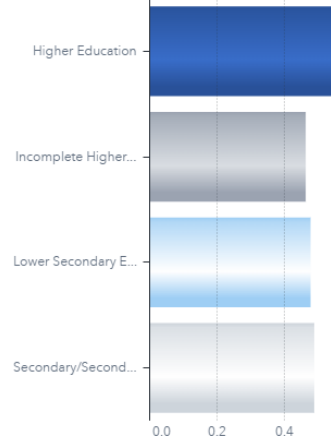
Potential Prediction Bias



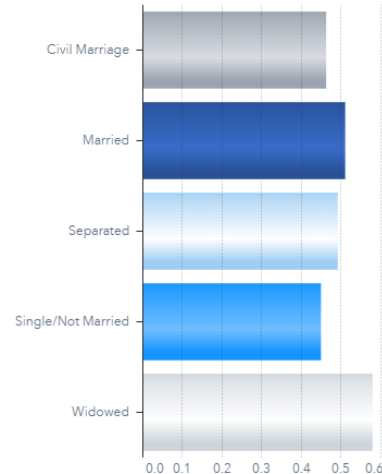
Average Prediction by Gender



Average Prediction by Education



Average Prediction by Marital Status



Prediction bias represents how much greater the model's probability to predict the event is for one group over another on average. The bars in this plot represent the target event's average predicted probability for each level of the sensitive attributes (Education Level/Gender/Marital Status) for the TEST partition.

Large differences in bar size indicate that the model predicts the event at considerably different rates for different levels of the attribute, and you should be aware of this before using your model.

You can view the maximum prediction difference between levels of each Assess for Bias variable in the Prediction Bias Parity plot.



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Near Real Time Monitoring

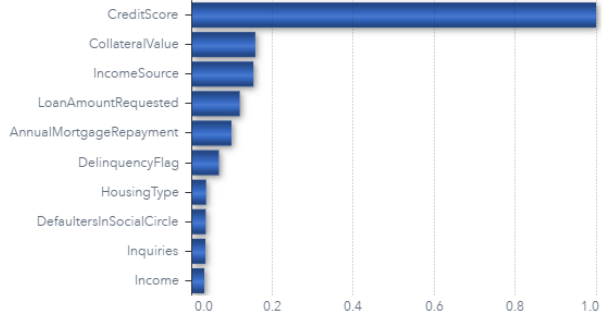
Track Explainability over Time

RESPONSIBLE AI

How Important is each Input Variable?

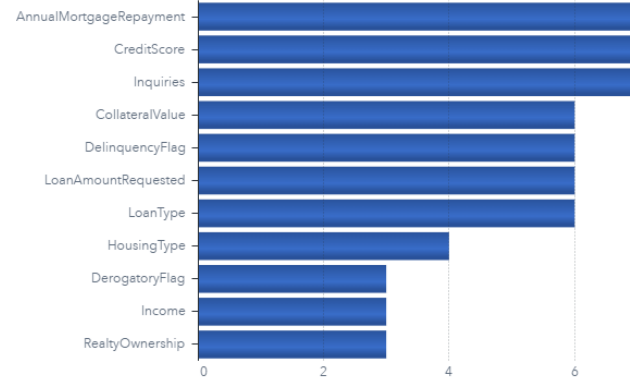


Relative Importance by Variable



This plot shows the 10 most important variables, as determined by the relative importance calculated using the actual model. The most important input for this model is CreditScore. The input CollateralValues has a relative importance of 0.158, for example, which means it is 0.16 times as important as CreditScore.

Number of Models that use the Variable



This plot shows the number of times that an input was deemed an important variable for any model that was used in Pipeline Comparison, including the pipeline champions and challenger models. Variable importance is calculated using a surrogate model, a one-level decision tree for each input where the target is the predicted class or value. Inputs with a positive importance value are determined to be important. The most important inputs across the champion and challenger models for this project appear at the top of the plot.



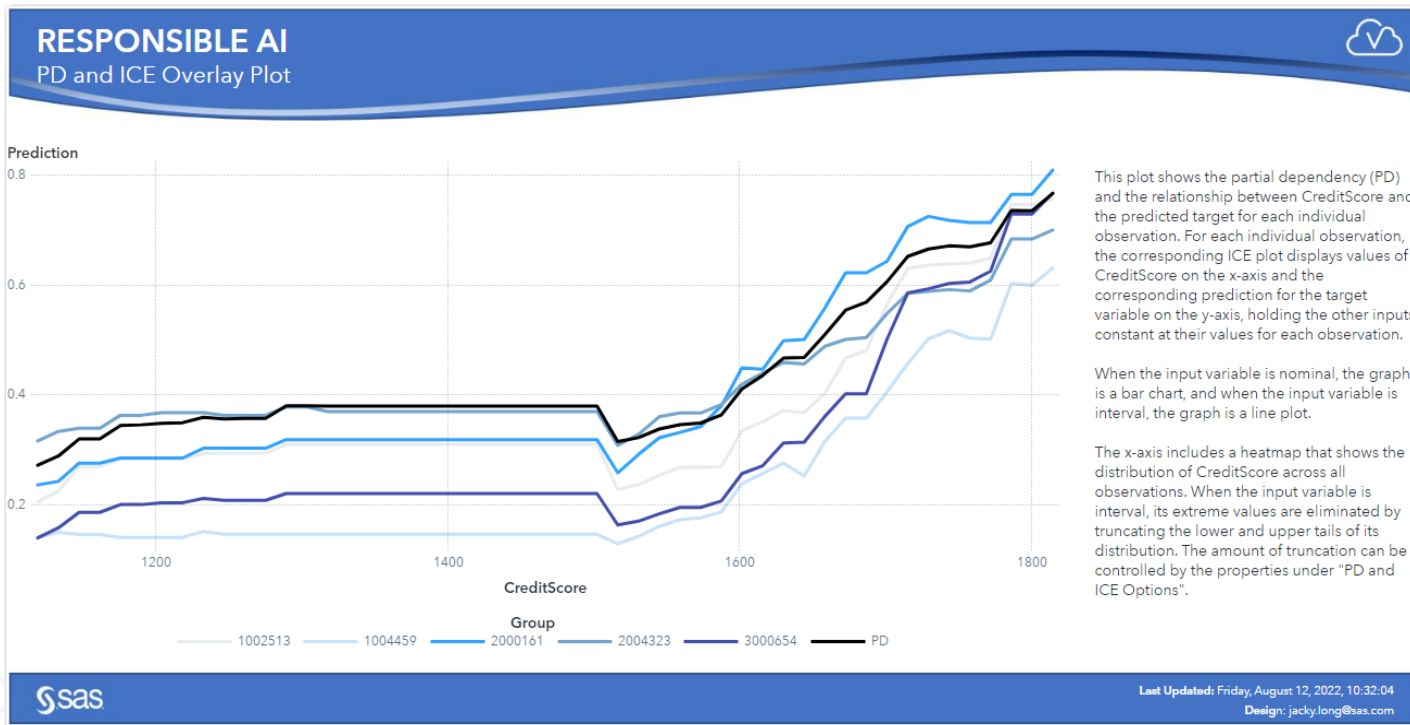
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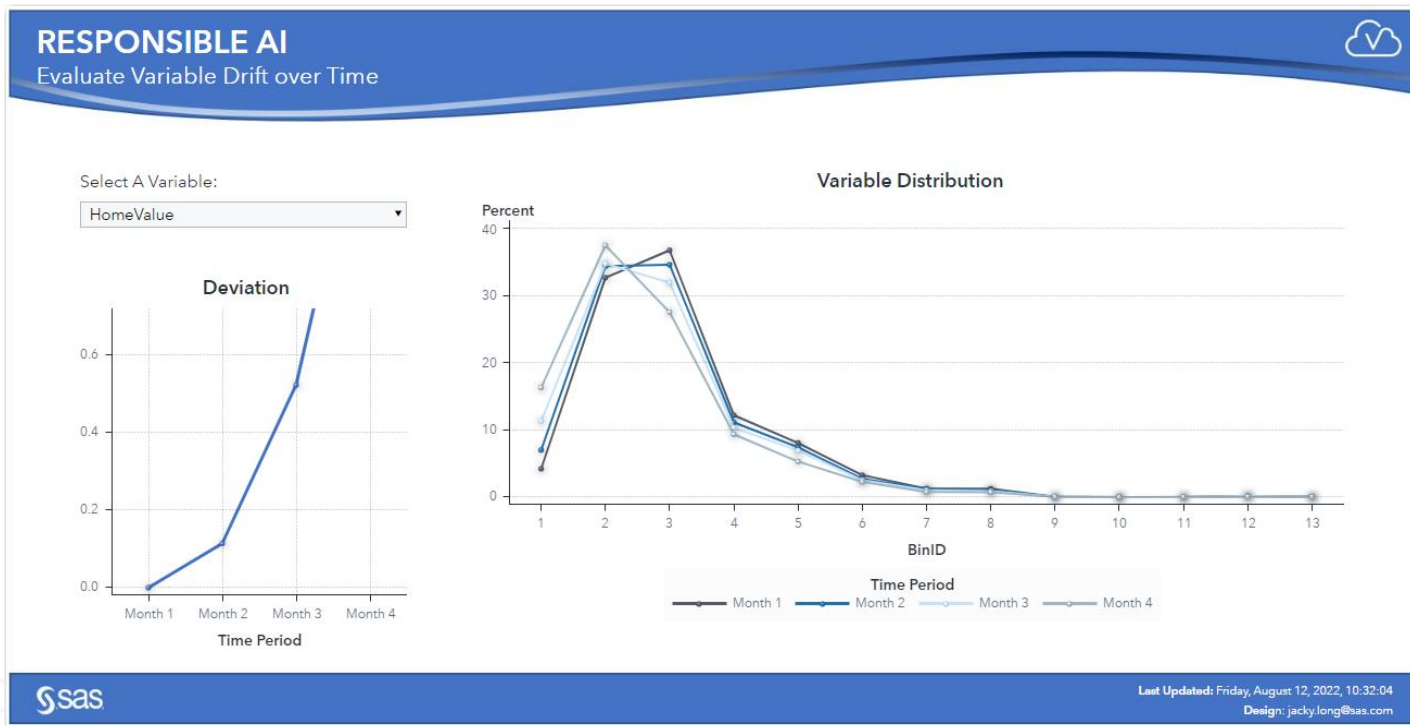
Near Real Time Monitoring

Track Explainability over Time



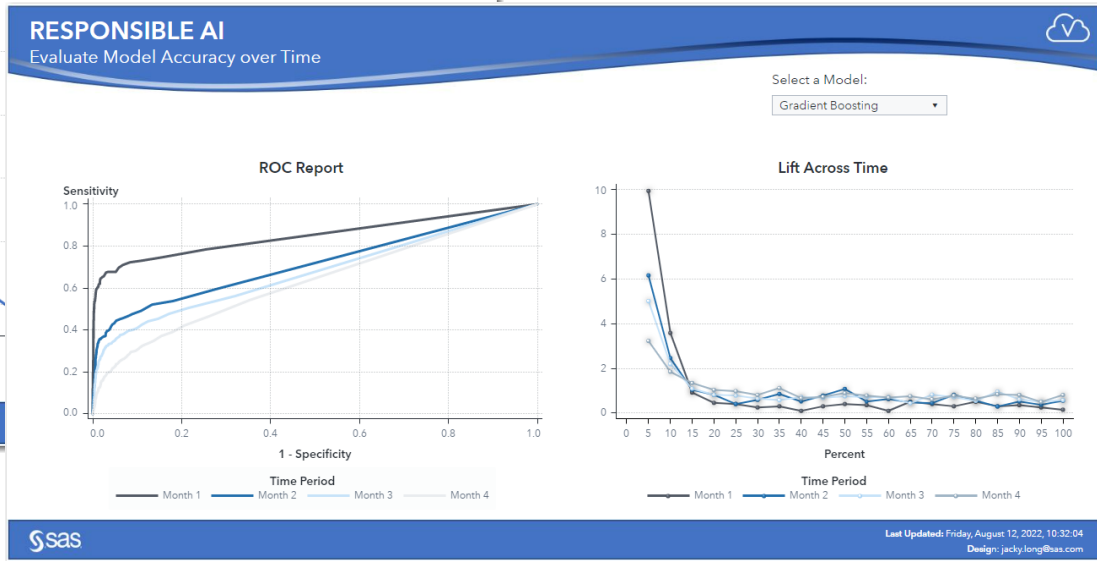
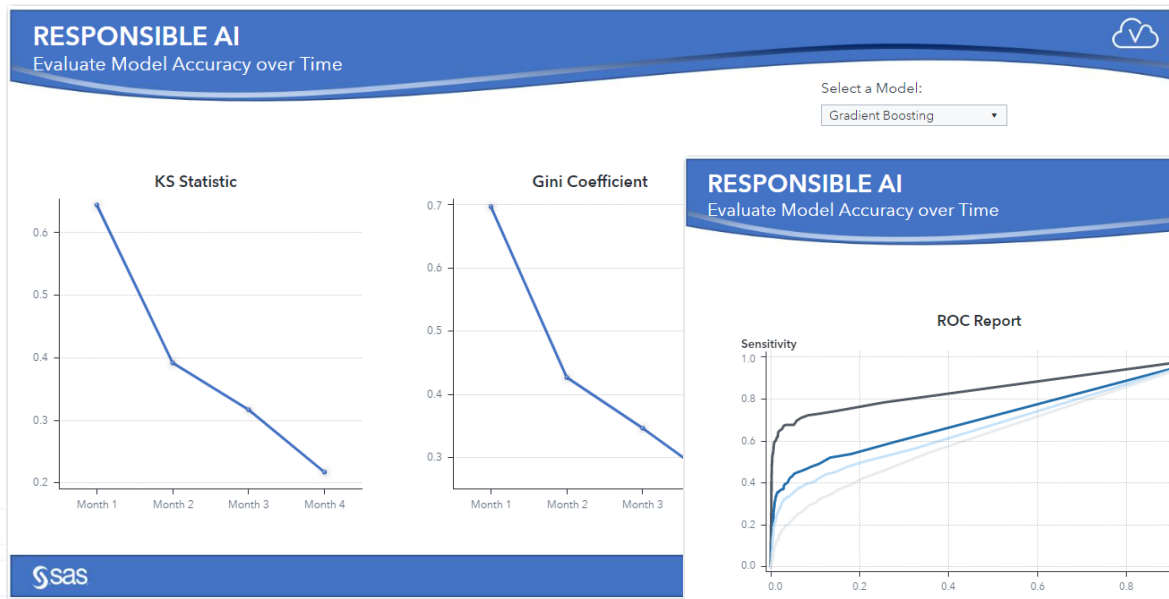
Near Real Time Monitoring

Track Variable Drift over Time



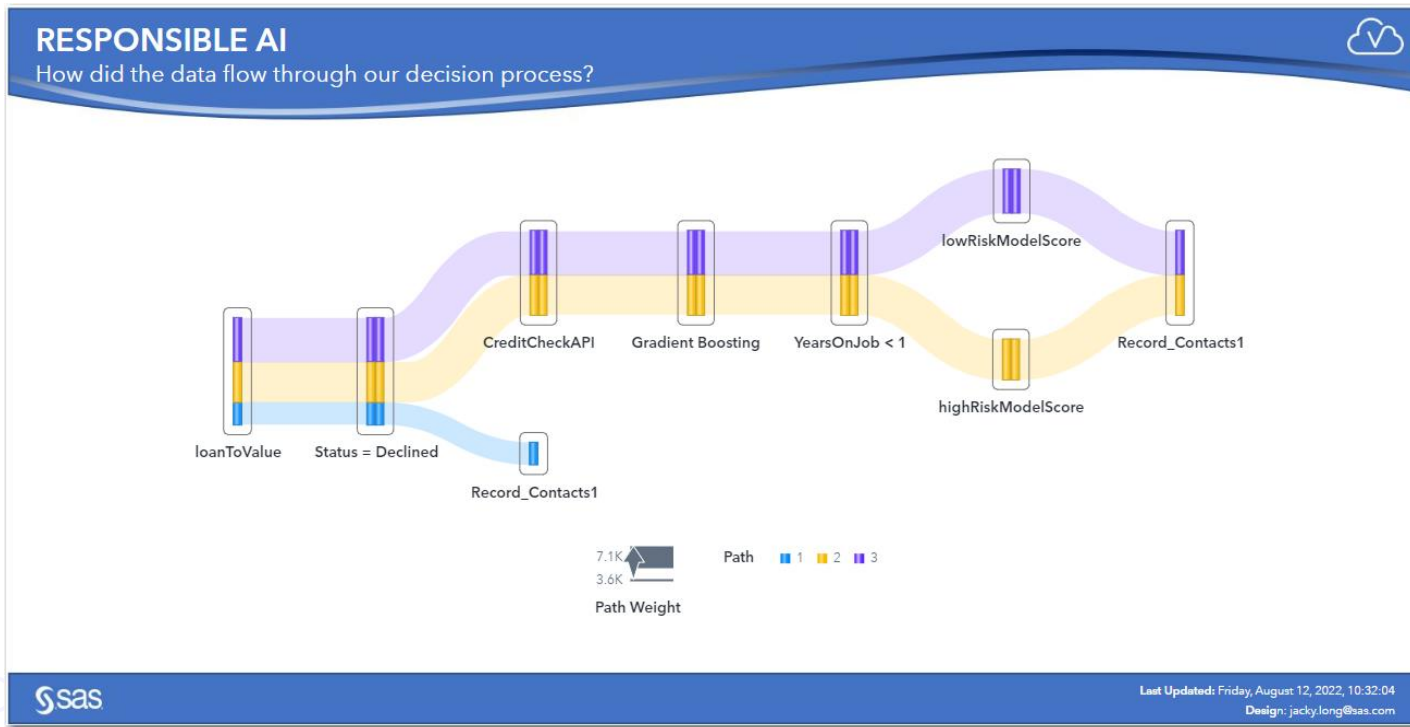
Near Real Time Monitoring

Track Model Drift over Time



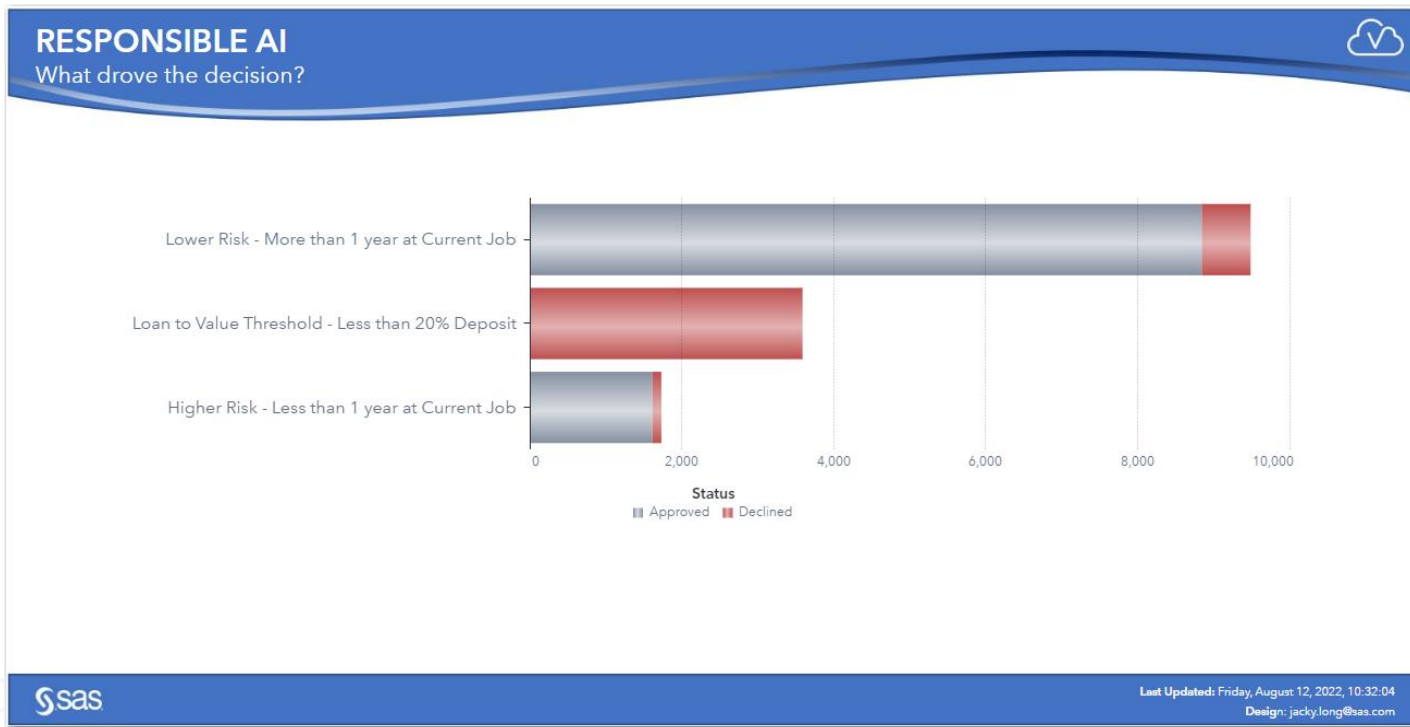
Near Real Time Monitoring

Track Decisions/Explainability over Time



Near Real Time Monitoring

Track Decisions/Explainability over Time



Near Real Time Monitoring

Track Decisions over Time

RESPONSIBLE AI

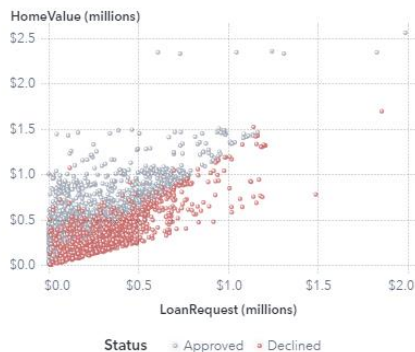
Review Approval Rate and Initial Deposit



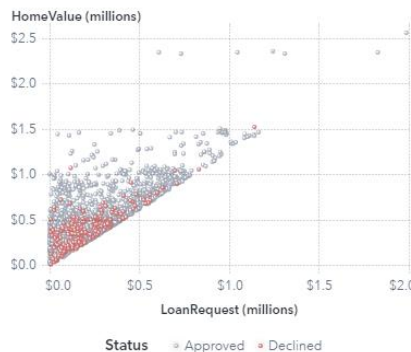
Select a Time Period:

Month1 Month2 **Month3** Month4

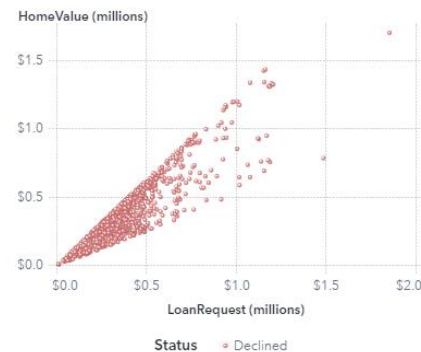
Overall Approval Rate



Approval Rate with at least 20% Deposit



Declined - Initial Deposit less than 20%



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Near Real Time Monitoring

Track Decisions over Time

RESPONSIBLE AI

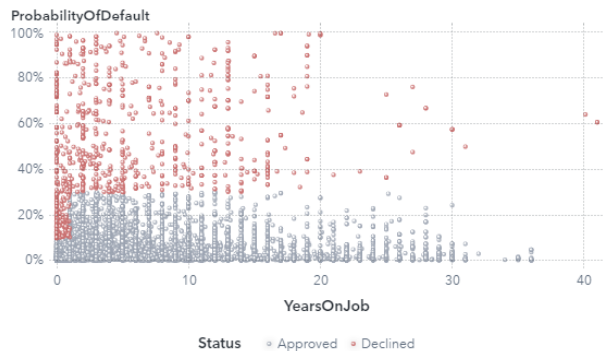
Review Approval Rate and Time in Current Job



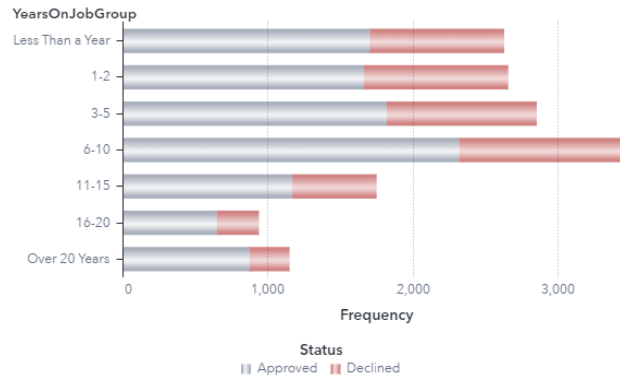
Select a Time Period:

Month1 Month2 **Month3** Month4

Overall Approval Rate



Approval by Job Length

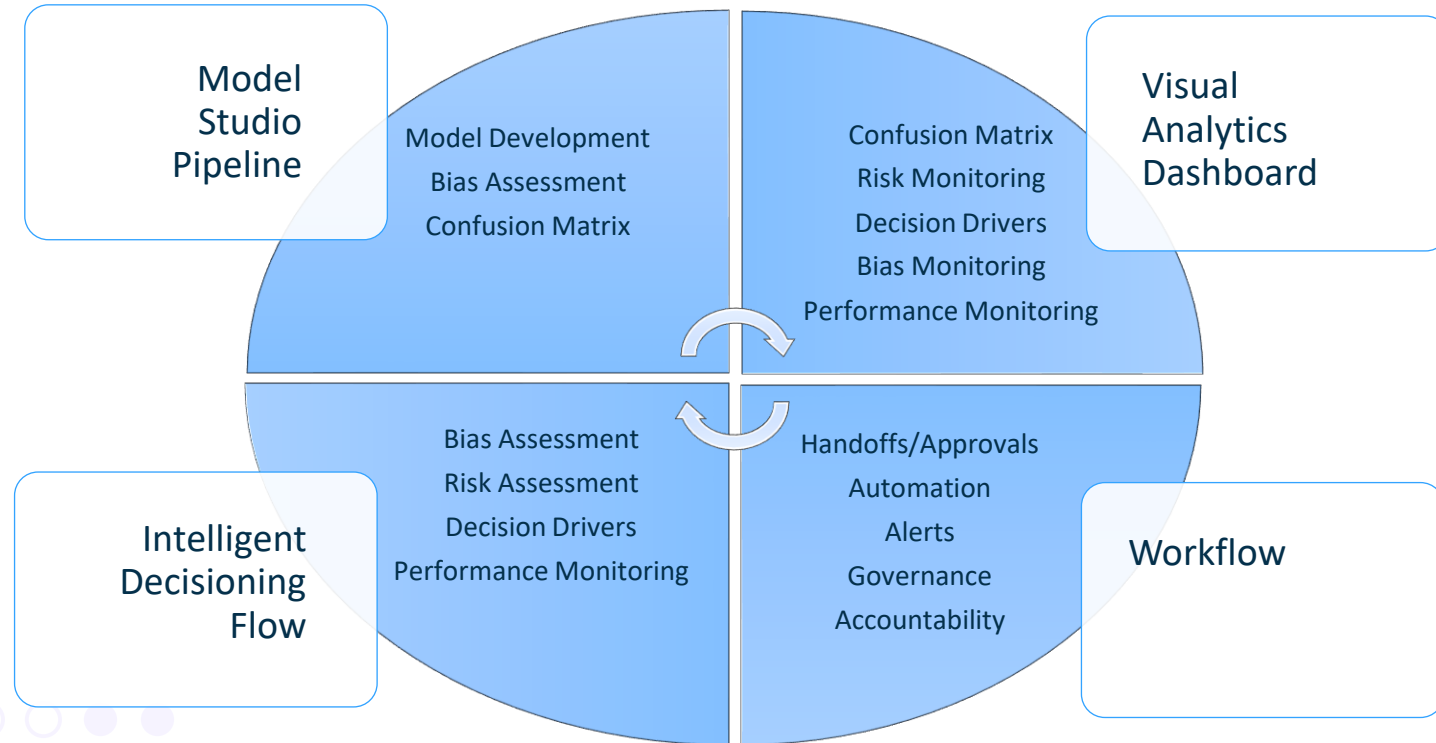


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VIYA Platform Contributions



Analytics Life Cycle with Multiple Personas

Balancing Business Profitability with Corporate Social Responsibility



Goal	Minimize Data Bias	Accurate & Fair AI Models	Maximize Business Value	Govern Ethical use of AI	Access to services with minimal harm
Benefits	Intuitively blend bias detection in data preparation for modeling	Develop models and evaluate model accuracy & bias over time	Understand \$\$ impact of model profitability and corporate social responsibility	Empower accountability and transparency Seamlessly augment Human in AI-Augmented Decisioning	Better protect from potential harm



Questions?

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