Individual Project Report

Mortgage Approval Process
Augmenting Automation based on credit scores & a roadmap

Masters of Technology Intelligent Systems
Module: Machine Reasoning

Ajay Vikram Singh (A0020986B)

TABLE OF CONTENTS

Executive Summary

Mortgage approval process, that we practiced on KIE, considers various parameters for automating the decision process. Accordingly, we practised automation of rules definition in the KIE.

The class works has improvement potential to improve the application cognition – on multiple dimensions

One one such dimension, I have further augmented the system for some additional automations.

1) Credit score: Singapore credit bureau maintains a rating of individuals, 1000-2000. Where 1000 is high likelihood of default, and 2000 is low likely of default. See Ref [1]. To keep the default rate within 1% of the bank loans, i.e.credit rating of 1825and above qualify for automatic approval. Suspect credit rating score area is highlighted in red.

Score Range	Risk Grade	Probability of Default	
		Min	Max
1911-2000	AA	0.00%	0.27%
1844-1910	BB	0.27%	0.67%
1825-1843	CC	0.67%	0.88%
1813-1824	DD	0.88%	1.03%
1782-1812	EE	1.03%	1.58%
1755-1781	FF	1.58%	2.28%
1724-1754	GG	2.28%	3.46%
1000-1723	HH	3.46%	100.00%

Problem

Definition

The mortage approval process is not automated for credit scores deemed to increase default ratings.

Description

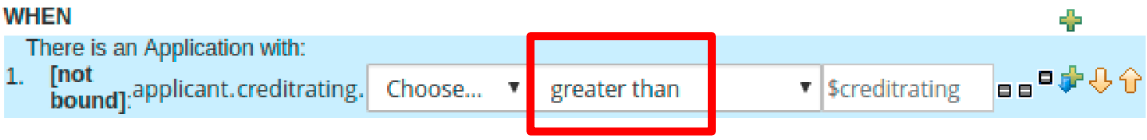
Higher default rates increase the distress on the bank. Also, higher credit and associated default rates has it's larger social consequences. The application augmentation is to help the mortgage decision maker take cognizant decision and automate errors in decisioning.

Solution

The solution lies in keeping the default rate around 1% factoring in the cost, and benefits for the mortgage lending institutions.

Accordingly, the process has to be improvised and automated to grant loans to qualified buyers if their rating scores reach a certain threshold. For our requirement of 1%, the threshold is a score of 1825 and above for granting loan. Note that the other existing rules, i.e. ownhouse and hasjob etc have to augmented, to ensure that the logic is augmenting and not breaking the existing logic automations.

Updated Rules

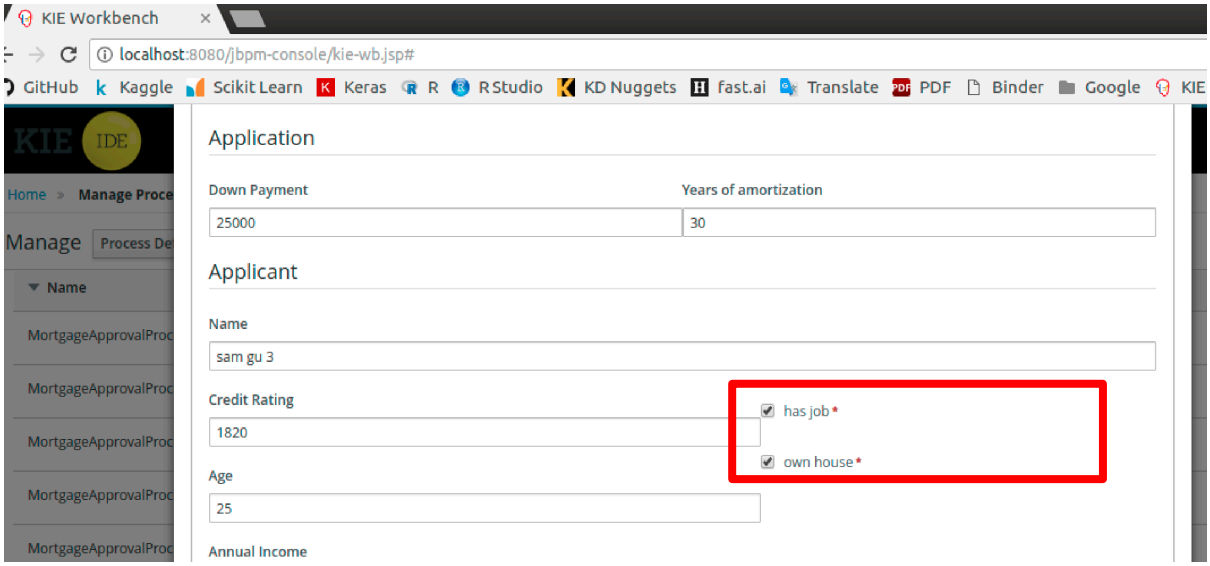


MortgageMachineReasoningDT

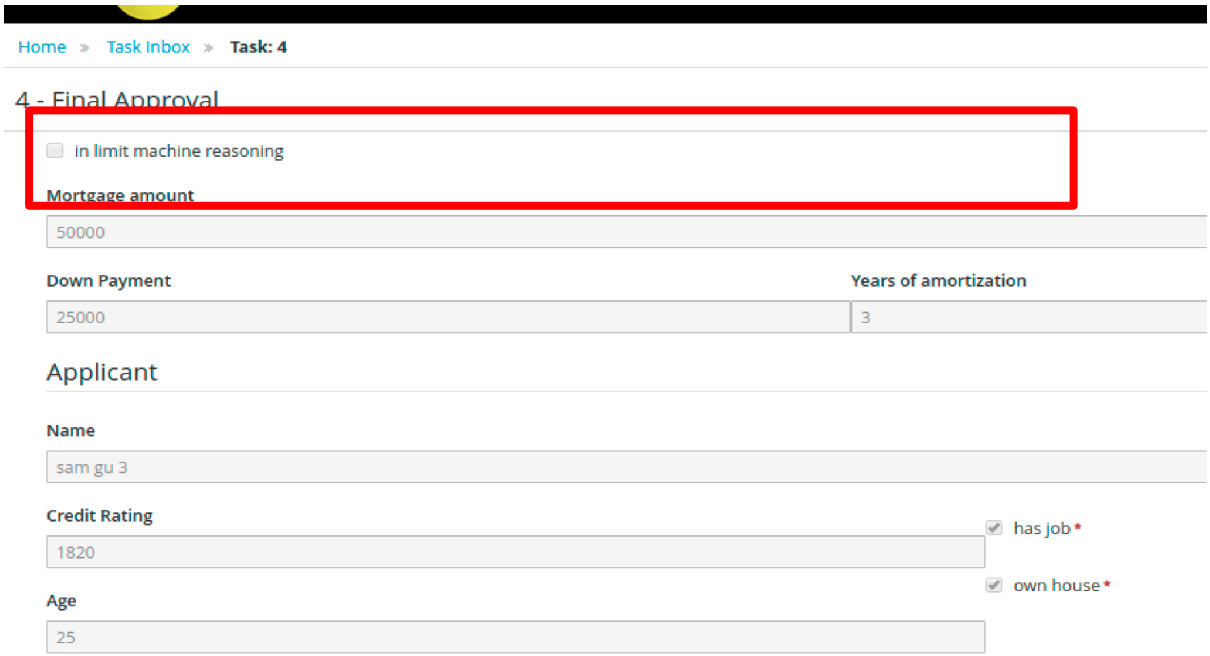
#	Description	ruleflow-group	pplicant Own Hou	Applicant has job	Applicant Age Range		plicant Credit Rati	app
			$ownHouse	$hasJob	$ageLess	$ageGE	$creditrating	Approval in Limit
1		geMachineReaso	☑	☑			1825	☑
2		geMachineReaso	☑	☐			1825	☑
3		geMachineReaso	☐	☑			1825	☑
4		geMachineReaso	☐	☐				☐

Sample Inputs & Outputs

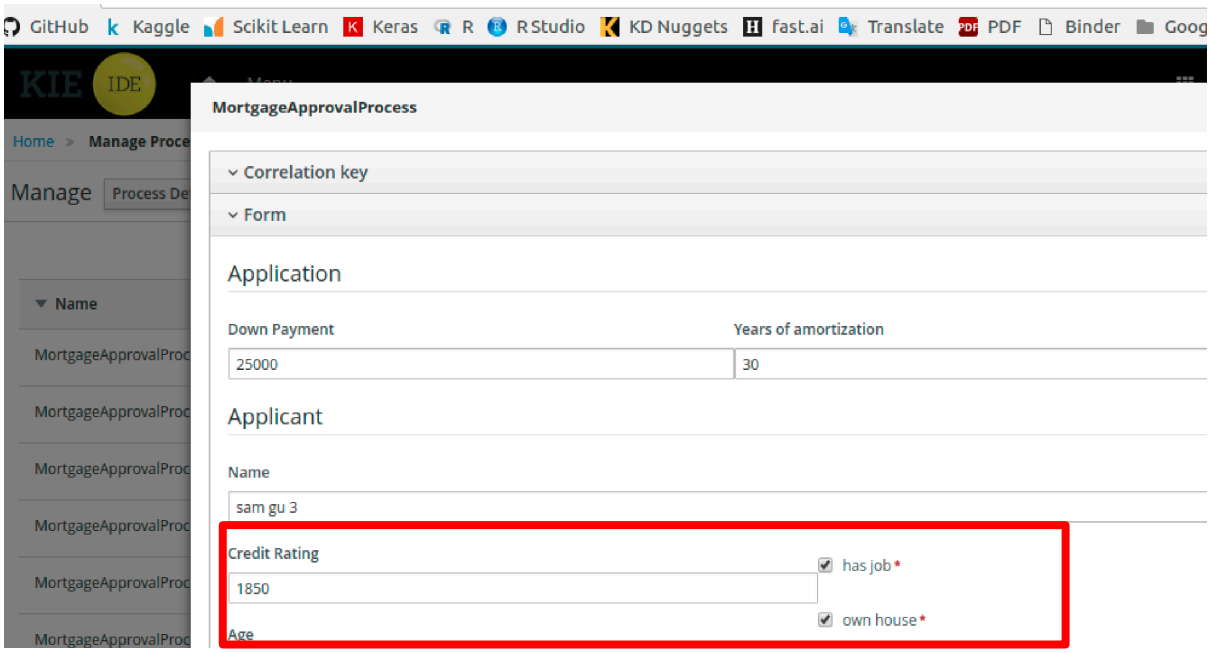
Input: Has job == True, Own House == True, Credit Rating == 1820 (<1825 for 1% default risk containment)



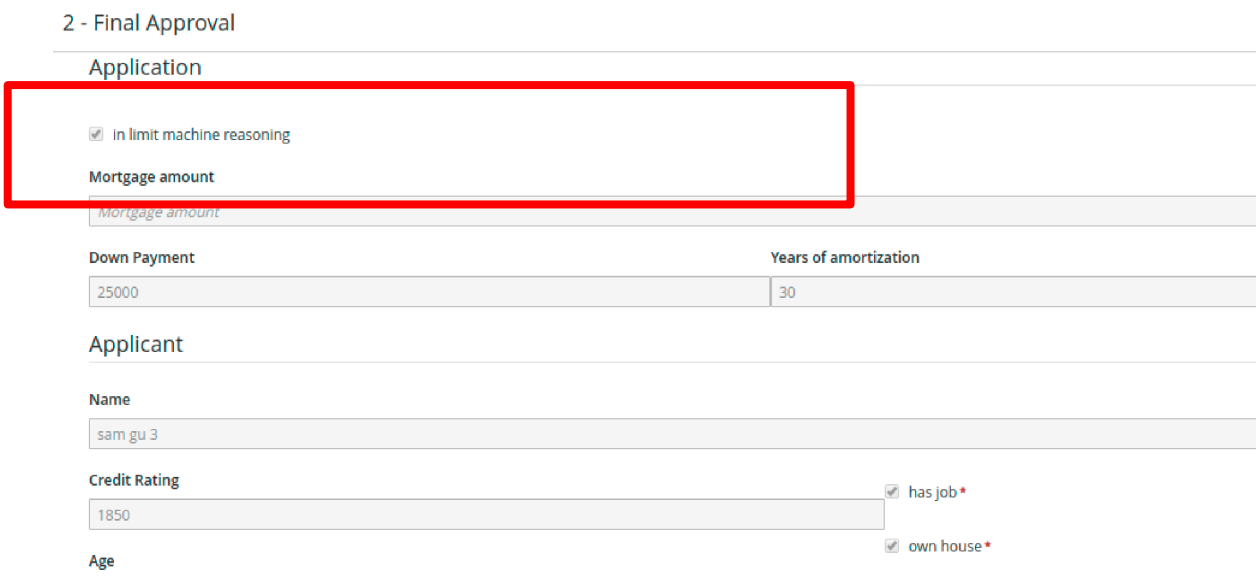
OutPut: rejected application



Input: Has job == True, Own House == True, Credit Rating == 1850 (>=1825 for 1% default risk containment)

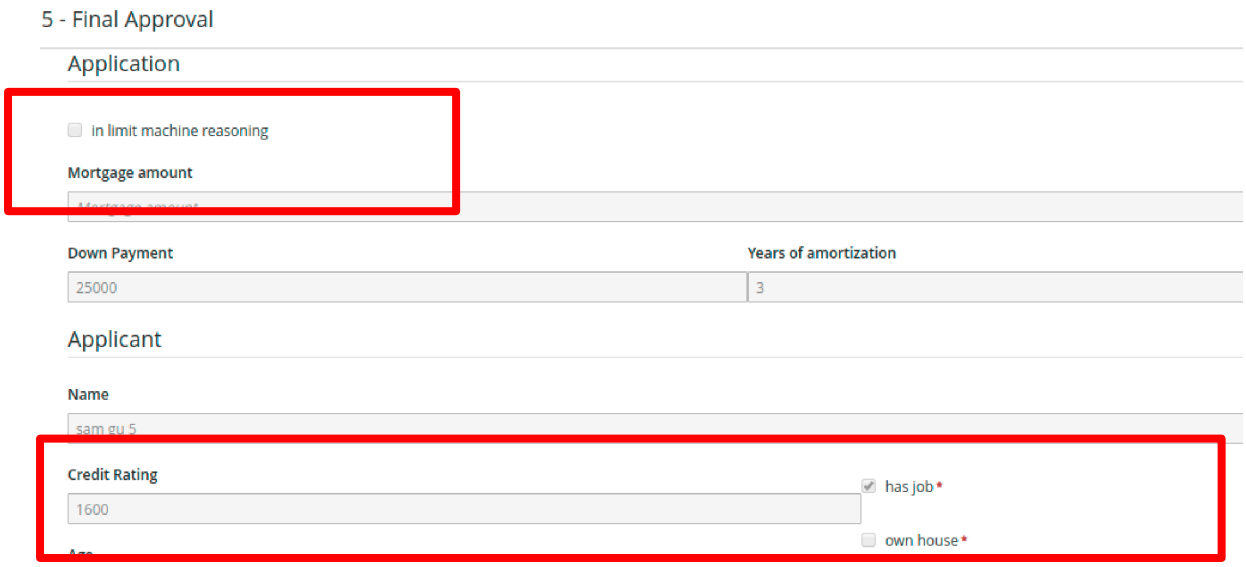


Output : approved application

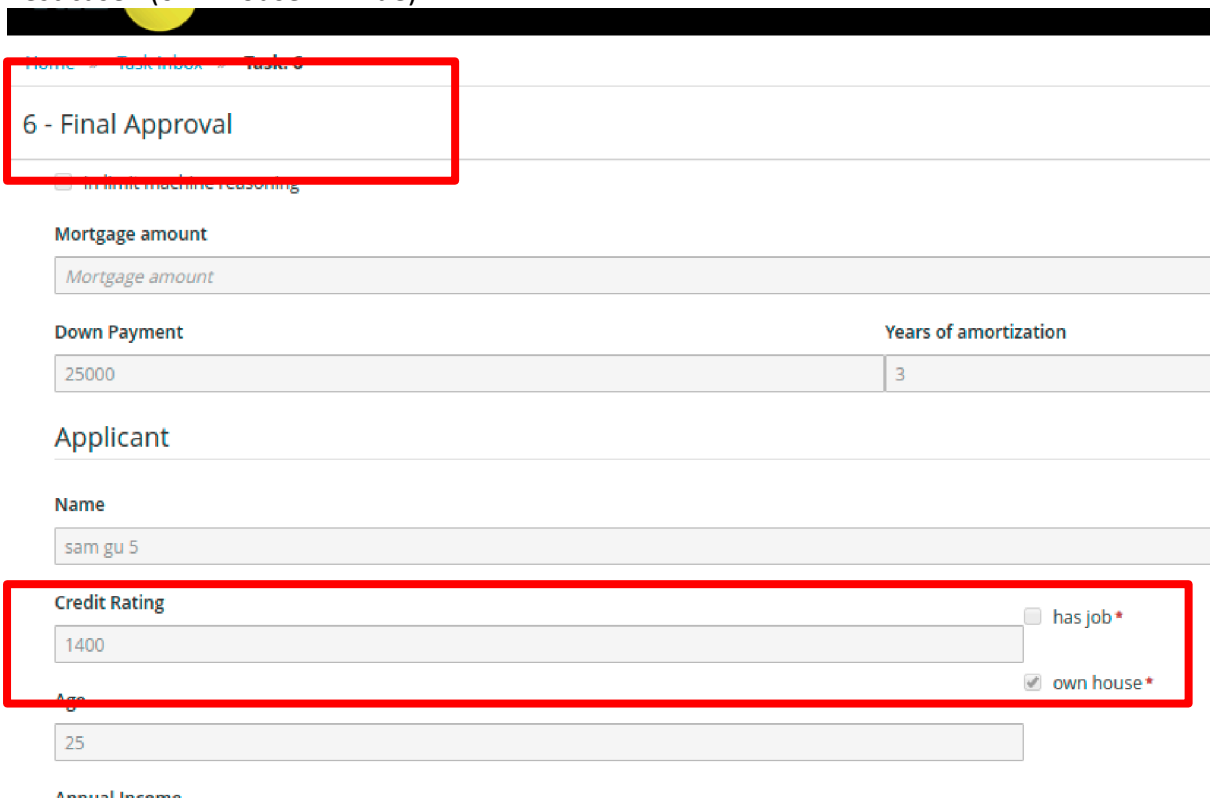


Approval failures with other partial qualifiers as well

Test case : (has job == True)



Test case : (own house == True)



Future Project Enhancements

Following future enhancements are suggested for credit rating improvisations:

1) Business: Linking Credit rating scores to a certainity factor based approach including other factors holistically. Today, we have taken a hard cut over to reject loans at scores 1824 and below. The are chances of default (1%) at better credit ratings, vice versa, there are chances of good mortgage clients being rejected with scores worse then 1825.
    a. Factors suggested to study are: educational background, net asset worth Vs mortgage sought, capital that can be pledged in escrow etc
2) Social factors: Data mining on social factors contributing to increase/decrease in default rates. Candidate topics for exploration: Education level, family status, discretionary spending, residency status in Singapore, investment profile etc.
3) Technical: Credit scores rating and associated default probabilities are dynamic. Linking Credit scores from the credit agency with our mortgage application for dynamic (though open loop) rule updates.

Score Range	Risk Grade	Probability of Default	
		Min	Max
1911-2000	AA	0.00%	0.27%
1844-1910	BB	0.27%	0.67%
1825-1843	CC	0.67%	0.88%
1813-1824	DD	0.88%	1.03%
1782-1812	EE	1.03%	1.58%
1755-1781	FF	1.58%	2.28%
1724-1754	GG	2.28%	3.46%
1000-1723	HH	3.46%	100.00%

References

[Ref 1]: Singapore credit bureau
https://www.creditbureau.com.sg/credit-score.html

Glossary

MAS: Monetary authority of Singapore