INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, ALLAHABAD

"Auto Insurance Prediction System"

Submitted By
Sanika Surse (IIT2016099)
Kadambari Anuranjana (IIT2016111)
Aditi Bansal (IIT2016512)
Sashank Mishra (IIT2016515)
Adarsh Agrawal (IIT2016516)
Sominee Gupta (IHM2016007)
Pradeep Gangwar (IHM2016501)
Ankit Kumar (IRM2016002)
Avinash Yadav (ITM2016004)
Anubhav Srivastava (ITM2016006)
Lekhika Dugtal (ITM2016008)
Praphull Mishra (IWM2016005)
Shreyansh Dwivedi (IWM2016501)
Saurabh Kumar (IWM2016502)

UNDER THE SUPERVISION OF
Dr. Anupam Agarwal
Assistant Professor

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, ALLAHABAD

1. Motivation

Believe it or not, car insurance rates aren't arbitrary numbers made up by auto insurance providers; they are carefully thought-out calculations. Using your personal information and company claim data, car insurance companies use their own algorithms to make an educated guess on how likely you are to file a claim - or, to put it another way, how much you could cost the insurer. The riskier you appear, the more you will pay for car insurance. The safer you seem, the less you'll pay.

Some risk factors may not be obvious, like your credit history for instance, but insurance companies have statistical data to back up the reasons they use these rating factors.

2. Objective

The main objective of this project is to make an Expert System that would help users calculate the yearly premium to be paid based on all the different factors.

Expert System Domain
Banking and Financial Sector

Rule Engine
Java Expert System Shell (JESS)

3. Introduction

What is an Expert System?

In artificial intelligence, an expert system is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, represented mainly as if–then rules rather than through conventional procedural code.

JESS

Jess is a rule engine for the Java platform that was developed by Ernest Friedman-Hill of Sandia National Labs. It is a superset of the CLIPS programming language. It was first written in late 1995. The language provides rule-based programming for the automation of an expert system, and is frequently termed as an *expert system shell*. In recent years, intelligent agent systems have also developed, which depend on a similar capability. Rather than a procedural paradigm, where a single program has a loop that is activated only one time, the declarative paradigm used by Jess continuously applies a collection of rules to a collection of facts by a process called *pattern matching*. Rules can modify the collection of facts, or they can execute any Java code.

Why use Expert System?

In this project there are a lot of different factors and each factors have varying different weights based on some conditions. Tough this program can be made using the conventional procedural languages but we have used expert system as it is quite easy and also more understandable as it does not messes things up due to various conditions or factors. Expert System and its inference system helps us process large datasets in less time.

The Expert System takes into consideration various factors in the insurance industry to predict the premium to be paid by the insured customer every year. These factors include:

- Age of policyholder
- Age of Vehicle
- Whether or not the Policyholder is Alcoholic
- Cost of Vehicle (In lakhs)
- Policyholder's Driving Skill Score (out of 10)
- Driver's Offence Points
- Average Distance travelled per day(in km)
- Traffic In Area ('Low', 'Medium', 'High')
- Gender of Policyholder
- Engine Type (Diesel or Petrol)
- Whether or not Security System is Installed
- Marital Status of Policy Holder
- Policyholder's Driving Experience (In years)
- Size of Car ('Small', 'Medium', 'Large')
- Whether or not Policyholder is a tenant

Each of the above factors have some defined percentage that determines how much that particular factor would add up in the premium calculation.

4. Explanation

Marital status does not affect your claim probability as much as your geographical location does and so carries less weight with your insurer. Each insurer also weighs the factors differently, which is why car insurance companies typically come up with different premiums for the same person. Insurers also look into their own claims data as part of this process. One provider may have fewer claims for your model vehicle, and in turn, offer a lower rate than another auto insurer.

Your car's insurance rates may increase or decrease when there is a change to any of these risk factors.

- **Location**

Insurers typically start by asking for your ZIP code because where you live is the start of most base rates. If you live in a highly populated, urban area, then congestion, accidents and insurance claims are more prevalent. Living and driving in a metro area will make your rates higher than if you live in a rural area, where having an auto accident due to these factors is less likely.

- **Age**

Younger drivers are more likely to cause an accident. Young drivers have statistically shown to be immature behind the wheel, easily distracted and to crash - a lot - so they are the riskiest category of drivers to insure.

- **Gender**

Most states allow insurers to rate on gender since crash statistics are different for males and females. Data shows males are more likely to crash - especially in the early years of driving when they are known to be more aggressive as a novice driver.
The IIHS notes that men typically drive more miles then women and engage in riskier driving behavior - such as speeding, driving when intoxicated and not using a seat belt.

- **Marital Status**

Married couples have been found statistically to be less of a risk to insurance providers than their single (including those who are divorced or widowed) counterparts. Married couples have been found to be less active and safer than single drivers, resulting in fewer accidents and claims.

- **Driving Experience**

No doubt about it: inexperienced drivers pose more risk. Anyone who hasn't driven a car is automatically a higher risk to car insurance companies, whether you're 16 or 50 years of age.

- **Driving Record**

How safe of a driver you are is really important to your car insurance company because your behavior on the road directly affects your risk to an insurer. Drivers with a

clean driver's history qualify for better rates and also are eligible for a good/safe driver discount, which typically is pretty good.

Drivers who have an accident or moving violation (speeding, DUI, etc.) on their motor vehicle record are more of a risk for auto insurers, resulting in higher car insurance rates.

- **Type of car**

The type of car you drive affects your rates since the way in which one drives these types of cars differs. If an insurer's data says that drivers with your model vehicle have been in more accidents or filed more claims, then your rates will be higher. Additional factors determined from your vehicle model:

- Purchase price
- Theft rate
- Cost of repairs
- Accident rate
- Safety tests

Cars with extra safety features, such as collision-warning systems, may add to the price of insurance if the cost to repair or replace the feature is expensive. For many insurers, there isn't enough proof the added features are worth a discount.

- **Annual Mileage**

The less you drive, the less risk you have of being in an accident.

The level to which a certain factor affect the premium varies widely. Different country or different Insurance Company may have their own way of calculating the premium but almost all the companies takes into account all of these factors.

5. Implementation

a. Functions

calc_age:
Calculates weight depending upon age of policyholder.

calc_vehicle_age:
Calculates weight depending upon vehicle age (despite of use, from the day it was bought).

calc_alcoholic:
Calculates weight depending upon whether the policyholder is alcoholic or not.

calc_vehicle_cost:
Calculates weight depending upon the cost of the vehicle. Higher the price, the lower the risk, as the costly vehicles have better safety measures and durability.

calc_driving_skill_score:
Calculates weight depending upon driving score of policyholder. The lower the score, more is the risk and higher the tendency of accidents.

calc_average_distance:
Calculates weight depending upon the average distance covered by policyholder on a daily basis, as it affects the vehicle mileage.

calc_traffic:
Calculates weight depending upon surrounding area where the vehicle is travelling and headed towards. The metropolis tends to attract a higher risk than rural area.

calc_gender:
Calculates the weight depending upon the gender of policyholder, as males tend to be more aggressive drivers than females.

calc_security_system:
Calculates weight depending on whether the vehicle of policyholder has a security system.

calc_marital_status:
Calculates weight depending upon the marital status of the policyholder, as married couples have been found to be less of a risk than singles.

calc_driving_experience:
Calculates the weight depending on the driving experience of the policyholder.

Inexperienced drivers pose a greater risk.

calc_size_car:
Calculates weight depending on size of vehicle of policyholder.

calc_tenant:
Calculates weight depending upon whether the policyholder is tenant or not. Tenants usually have better rate .

calc_driver_offence_points:
Calculates the weight depending upon how offensive the driver is. Lower the offence points, better the rate.

prompt:
Prompts the user to provide inputs for different factors/

b. Rules

- Check_name
- Check_age
- Check_vehicle_age
- Check_alcoholic
- Check_vehicle_cost
- Check_driving_skill_score
- Check_driver_offence_points
- Check_tenant
- Check_average_distance
- Check_traffic
- Check_gender
- Check_engine_type
- Check_security_system
- Check_marital_status
- Check_driving_experience
- Check_sie_car

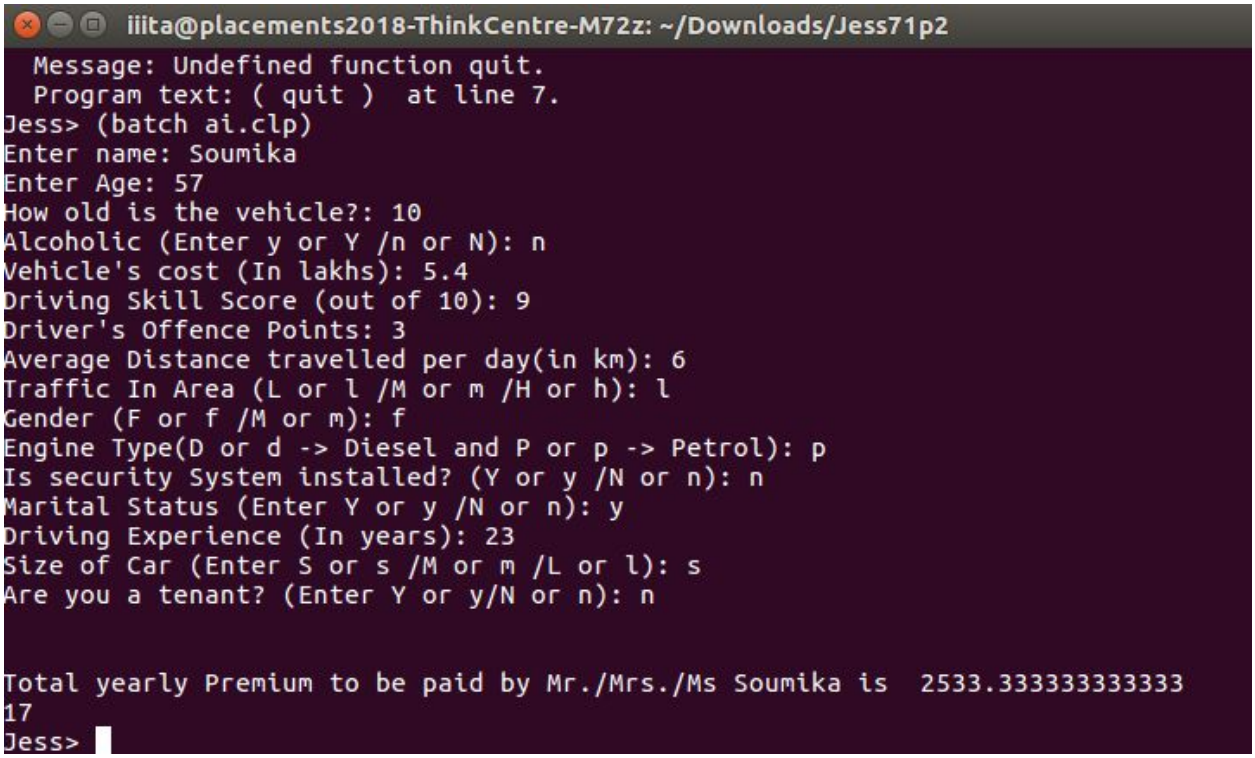
6. Screenshots

```
iiita@placements2018-ThinkCentre-M72z: ~/Downloads/Jess71p2
Total yearly Premium to be paid by Mr./Mrs./Ms Soumika is  2533.333333333333
17
Jess> (batch ai.clp)
Enter name: Ram Sharma
Enter Age: 32
How old is the vehicle?: 2
Alcoholic (Enter y or Y /n or N): y
Vehicle's cost (In lakhs): 15
Driving Skill Score (out of 10): 8
Driver's Offence Points: 9
Average Distance travelled per day(in km): 50
Traffic In Area (L or l /M or m /H or h): h
Gender (F or f /M or m): m'
Engine Type(D or d -> Diesel and P or p -> Petrol): p
Is security System installed? (Y or y /N or n): y
Marital Status (Enter Y or y /N or n): n
Driving Experience (In years): 10
Size of Car (Enter S or s /M or m /L or l): l
Are you a tenant? (Enter Y or y/N or n): n


Total yearly Premium to be paid by Mr./Mrs./Ms Ram is  4200.0
17
Jess>
```

```
iiita@placements2018-ThinkCentre-M72z: ~/Downloads/Jess71p2
batch
Jess> ai.clp
Jess> (batch ai.clp)
Enter name: Karan Kapoor
Enter Age: 25
How old is the vehicle?: 4
Alcoholic (Enter y or Y /n or N): n
Vehicle's cost (In lakhs): 10
Driving Skill Score (out of 10): 8
Driver's Offence Points: 7
Average Distance travelled per day(in km): 20
Traffic In Area (L or l /M or m /H or h): m
Gender (F or f /M or m): m
Engine Type(D or d -> Diesel and P or p -> Petrol): d
Is security System installed? (Y or y /N or n): n
Marital Status (Enter Y or y /N or n): n
Driving Experience (In years): 5
Size of Car (Enter S or s /M or m /L or l): m
Are you a tenant? (Enter Y or y/N or n): n


Total yearly Premium to be paid by Mr./Mrs./Ms Karan is  3800.0
17
Jess>
```



7. Future Scope

In the future, we could expand the project to add any more factors that might be related to the calculations of the yearly premium by the Insurance Companies. Also Each factor has some associated weight or percentage and some of the factors have a number of different weights and currently we have used some arbitrary values to show the effects of those factors. Iin future we could make those weights more meaningful or correct by using some exact data or the data which are followed by the Insurance Companies.

8. References

[1] https://www.insure.com/car-insurance/car-insurance-factors.html

[2] https://www.moneycrashers.com/factors-affect-car-insurance-rates/