**Medical Insurance Prediction**

## Introduction

#### Overview:

In this project for the given data set with information about clients who have earlier taken the medical insurance premium, the task is to collect insights of data, plot the attributes and finally develop a machine learning model which can predict the charges for the given input. Data consists of several attributes like age, sex, BMI etc. The charges are the class for which training is done. As this is a regression problem, here I've been using java for developing with the help of weka API. In this, I have used a machine learning algorithm for supervised learning. For this, the data is split into test and training sets with a ratio of 3:7, and models are trained on the training data. Test data is used to compute the performance of the model.

#### Purpose:

This will help people and insurance companies to know how the various conditions like age, BMI, smoking or not etc. affect the charges of the premium and help to predict the charges for given conditions. This could also be used to know which factors one can work on to reduce the charges.

## Literature Survey

#### Existing methods:

Charges vary from company to company and they have their parameters, charges which are made up of collected data. Here they use clients 'Demographics, daily habits and other medical records to calculate charges. but many don't have any solution or integrated software which can predict the charges.

### *Proposed Solution:*

Here we develop a Machine learning model which can predict the charges for given input parameters. This will not only help the companies but also the clients to determine the charges for existing parameters.

### *Dataset description:*

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age: age of primary beneficiary

sex: insurance contractor gender, female, male

BMI: Body mass index, providing an understanding of body, weights that are relatively high or low relative to height,

objective index of body weight (kg / m ^ 2) using the ratio of height to weight, ideally 18.5 to 24.9

children: Number of children covered by health insurance / Number of dependents

smoker: Smoking

region: the beneficiary's residential area in the US, northeast, southeast, southwest, northwest.

charges: Individual medical costs billed by health insurance

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|  |  |  | Task:   The effects of various parameters like age, sex etc (from given data) to determine how much these factors can account for our increase/decrease in insurance premium.       Theoretical Analysis:                         For developing the model, the hardware required is a PC working on 64bit processor with internet connection. Software requirements are Java, Eclipse for developing projects in java external Weka API. Weka is an open source code/platform for training various Machine learning algorithms ,it comes along with visualization tools.    For the project the use algorithm is Linear regression. For the testing the data is split after applying the nominal to binary filter, and attribute selection . testing is done using the 7 fold cross validation using random shuffle.    Evaluation metrics for the model- Correlation coefficient, Mean absolute error, Root mean squared error, Relative absolute error, Root relative squared error.      Flow chart               Results Following are the model evaluation metrics    1. Linear Regression       |  |  | | --- | --- | | charges= |  | | charges=257.8994\* age + | | 321.8766 \*BMI + | | 469.0228 \*children+ | | -23809.8328 \* smoker=no | |  | | prediction performance | | Correlation coefficient | 0.8643 | | Mean absolute error | 4200.6827 | | Root mean squared error | 6088.6539 | | Relative absolute error | 46.1553% | | Root relative squared error | 50.2294% | | Total Number of Instances | 1338 |  Advantages With this people can themselves know what factors are responsible for the insurance charges and can work on that factor to reduce the charges   * 1. Companies can integrate this into applications for there easier to calculate charges.    Disadvantages  * 1. Even with the good accuracy the model might not be accurate for the data containing attributes other than the trained attribute.   It cannot still predict the charges with 100 percent accuracy.   Conclusion As we can see from the output the most factors affecting the charges of a person is age, BMI and most significantly the habit of smoking. So, to reduce the charges, one must quit smoking and work on one body to improve the BMI  Machine learning can be helpful for calculating the Insurance premium charges to great accuracy. This opens the door for further extension to other fields.   Future Scope Using the trained weight and model this can be deployed in to devices for easy use.  This training procedure can be extended to many more attributes which affect the health.   References  * 1. Medical Cost Personal Datasets Kaggle   2. weka.classiflers.evaluation.output.prediction (weka-stable 3.8.5 API) (sourceforge.io)   Use weka in your java code - Weka Wiki (waikato.github.io) |  | | |  |
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### *Task:*

The effects of various parameters like age, sex etc (from given data) to

determine how much these factors can account for our increase/decrease in insurance premium.

## Theoretical Analysis:

For developing the model, the hardware required is a PC working on 64bit processor with internet connection. Software requirements are Java, Eclipse for developing projects in java external Weka API. Weka is an open source code/platform for training various Machine learning algorithms ,it comes along with visualization tools.

For the project the use algorithm is Linear regression. For the testing the data is split after applying the nominal to binary filter, and attribute selection . testing is done using the 7 fold cross validation using random shuffle.

Evaluation metrics for the model- Correlation coefficient, Mean absolute error, Root mean squared error, Relative absolute error, Root relative squared error.

**Flow chart**

#### Results

Following are the model evaluation metrics

1. *Linear Regression*

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| --- | --- |
| **charges=** |  |
| **257.8994\* age +** |
| **321.8766 \* BMI +** |
| **469.0228 \*children+** |
| **-23809.8328 \* smoker=no** |
|  |
| **prediction performance** |
| **Correlation coefficient** | **0.8643** |
| **Mean absolute error** | **4200.6827** |
| **Root mean squared error** | **6088.6539** |
| **Relative absolute error** | **46.1553%** |
| **Root relative squared error** | **50.2294%** |
| **Total Number of Instances** | **1338** |

# Advantages

With this people can themselves know what factors are responsible for the insurance charges and can work on that factor to reduce the charges

* 1. Companies can integrate this into applications for there easier to calculate charges.

# Disadvantages

* 1. Even with the good accuracy the model might not be accurate for the data containing attributes other than the trained attribute.

It cannot still predict the charges with 100 percent accuracy.

# Conclusion

As we can see from the output the most factors affecting the charges of a person is the age, bmi and most significantly the habit of smoking. So, in order to reduce the charges, one must quit smoking and work on body to improve the BMI

Machine learning can be helpful for calculating the Insurance premium charges to great accuracy. This opens the door for further extension to other fields.

# Future Scope

Using the trained weight and model this can be deployed in to devices for easy use.

This training procedure can be extended to many more attributes which affect the health.

# References

* 1. Medical Cost Personal Datasets Kaggle
  2. weka.cl assiflers.evaluation.output.prediction (weka-stable 3.8.5 API) (sourceforge.io)

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