



# Health Insurance – Cost Prediction

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**Health insurance** is an insurance that covers the whole or a part of the risk of a person incurring medical expenses, spreading the risk over a large number of persons.

By estimating the overall risk of health care and health system expenses over the risk pool, an insurer can develop a routine finance structure, such as a monthly premium or payroll tax, to provide the money to pay for the health care benefits specified in the insurance agreement.

There are different types of health insurance plans, such as individual health insurance, family health insurance, critical illness insurance, etc.

A close-up photograph of a person wearing a white lab coat, likely a healthcare professional. They are holding a smartphone in their left hand and pointing their right index finger at the screen. The background is blurred, showing more of the lab coat and a hint of a cup. The image is partially covered by a white and black overlay on the right side.

# About

A close-up photograph of a person's hands holding a white rectangular sign. The person is wearing a white lab coat with a blue stethoscope around their neck. The sign has the words "HEALTH" and "INSURANCE" printed in large, bold, blue capital letters, stacked vertically. The background is slightly blurred, showing the person's torso and the lab coat.

# HEALTH INSURANCE

## Policy

A health insurance policy is:

A contract between an insurance provider and an individual or his/her sponsor. The contract can be renewable or lifelong in the case of private insurance, or be mandatory for all citizens in the case of national plans.

The type and amount of health care costs that will be covered by the health insurance provider are specified in writing, in a member contract or "Evidence of Coverage" booklet for private insurance, or in a national health policy for public insurance.

# Attributes effecting the Claiming of Insurance

- Health insurance differs from individual to individual depending on some parameters.
- There are many parameters effecting the claiming of the insurance.
- Parameters are:
  - i. Age
  - ii. Salary
  - iii. Habits
  - iv. BMI – **B**ody **M**ass **I**ndex
  - v. Region

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520



# Correlation among the attributes

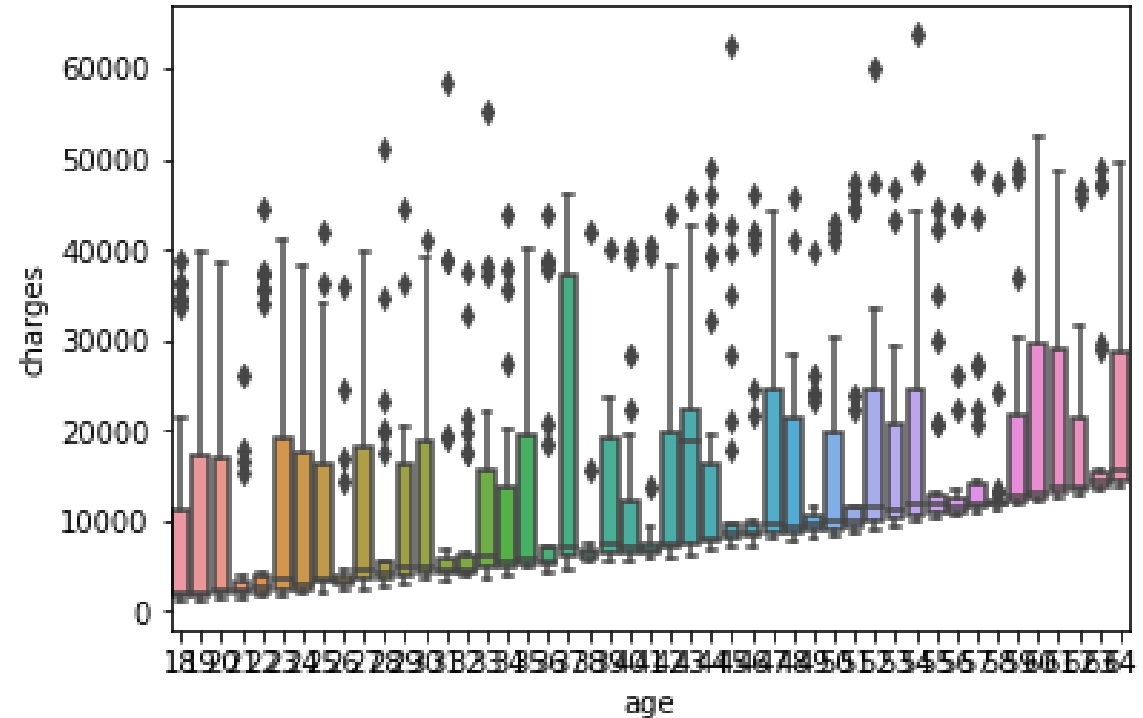
- ✓ Correlation is a mutual relationship or connection between two or more attributes.
- ✓ The best correlation is between smoker and charges, and next between age and charges.
- ✓ All the other attributes i.e., sex , BMI, children shows positive correlation.
- ✓ There is a negative correlation between region and charges, so less effect

	age	sex	bmi	children	smoker	region	charges
age	1.000000	-0.020856	0.112052	0.042469	-0.025019	0.002127	0.534522
sex	-0.020856	1.000000	0.044714	0.017163	0.076185	0.004588	0.009533
bmi	0.112052	0.044714	1.000000	0.011228	0.002085	0.155176	0.119902
children	0.042469	0.017163	0.011228	1.000000	0.007673	0.016569	0.126132
smoker	-0.025019	0.076185	0.002085	0.007673	1.000000	-0.002181	0.663509
region	0.002127	0.004588	0.155176	0.016569	-0.002181	1.000000	-0.043780
charges	0.534522	0.009533	0.119902	0.126132	0.663509	-0.043780	1.000000

# Relation between Age and Charges

Age plays a big role in the cost of a premium for health insurance; generally, younger people have lower premiums, as they are seen as less risky and less likely to require more medical care.

- ✓ Often, the starting point for an insurance rate is based on that of an individual who is 18 years old.
- ✓ At 26 the average premium is 1.024 times the base premium, it gets increases as the age gets increased.
- ✓ If a person is 64 years old, the average health insurance premium is 3 full times what it is at the age of 21.

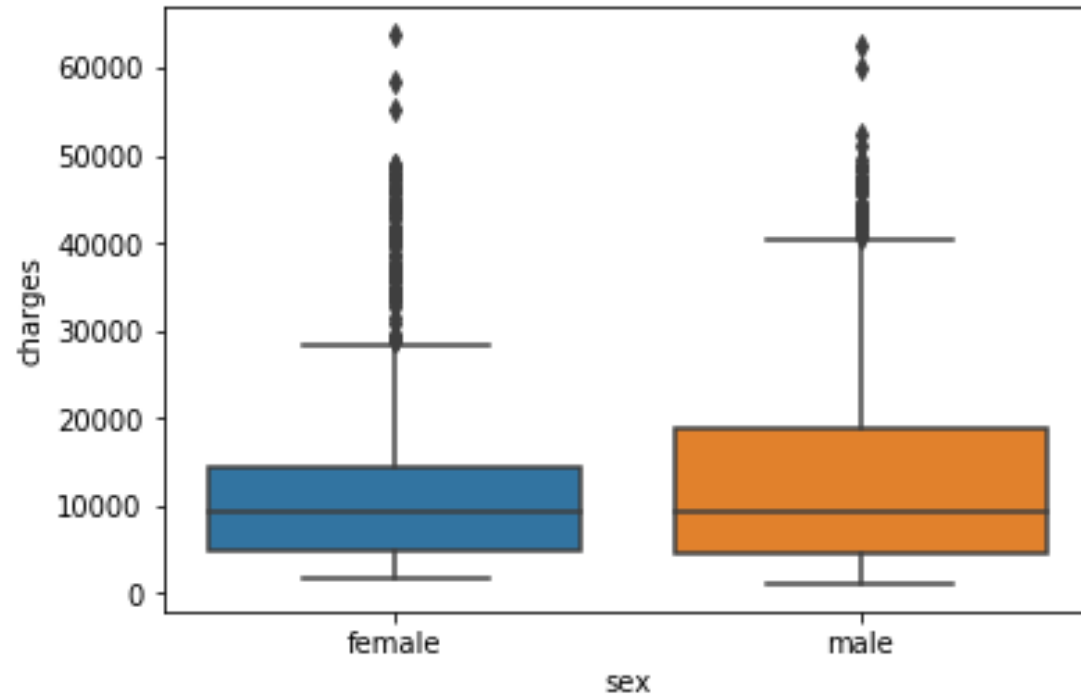


# Relation between Gender and Charges

Basing on the gender Females get less insurance than Males. Female pain is marginalized, and women are often told that their pain has psychiatric or emotional rather than physical causes.

“Many Insurers have determined that physical therapy for patients who are neither improving nor regressing is not medically necessary that encompasses may women suffering from pelvic pain who are thrashing around in the health care system without a diagnosis”

Basing on the above statement Male persons get more insurance.

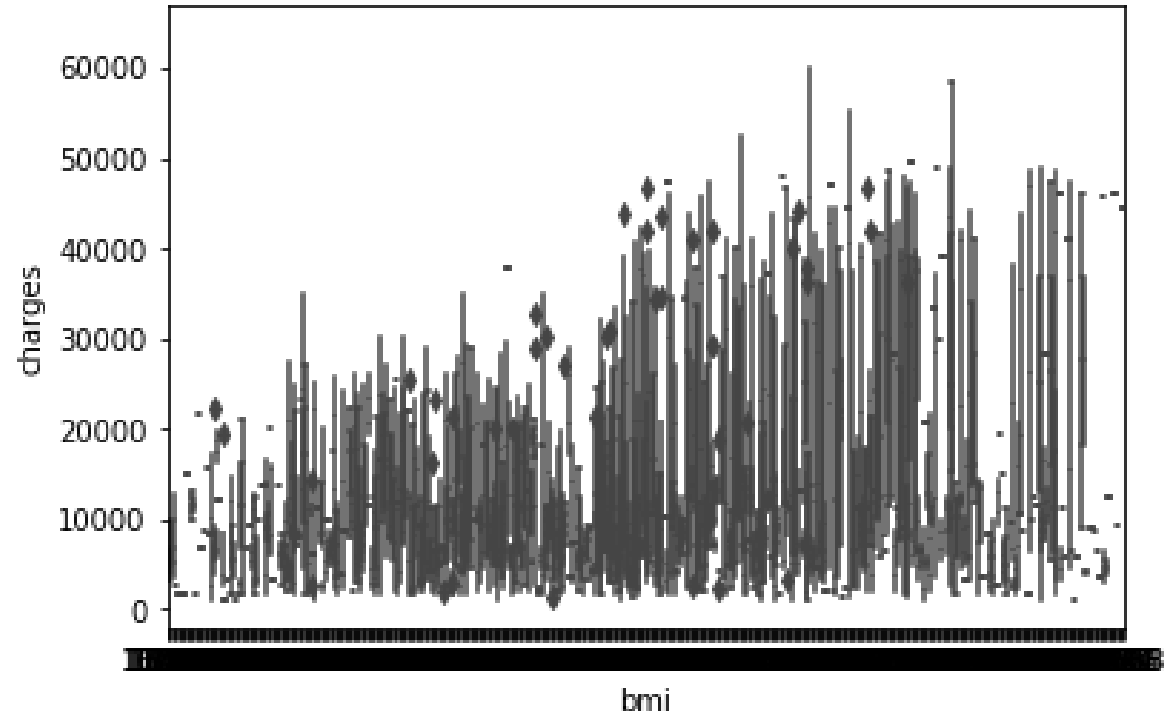


# Relation between BMI and Charges

**BMI:** Body Mass Index, is a score that estimates the amount and types of tissues that make up a person's weight.

This score is typically used to categorize people into 4 weight classes:

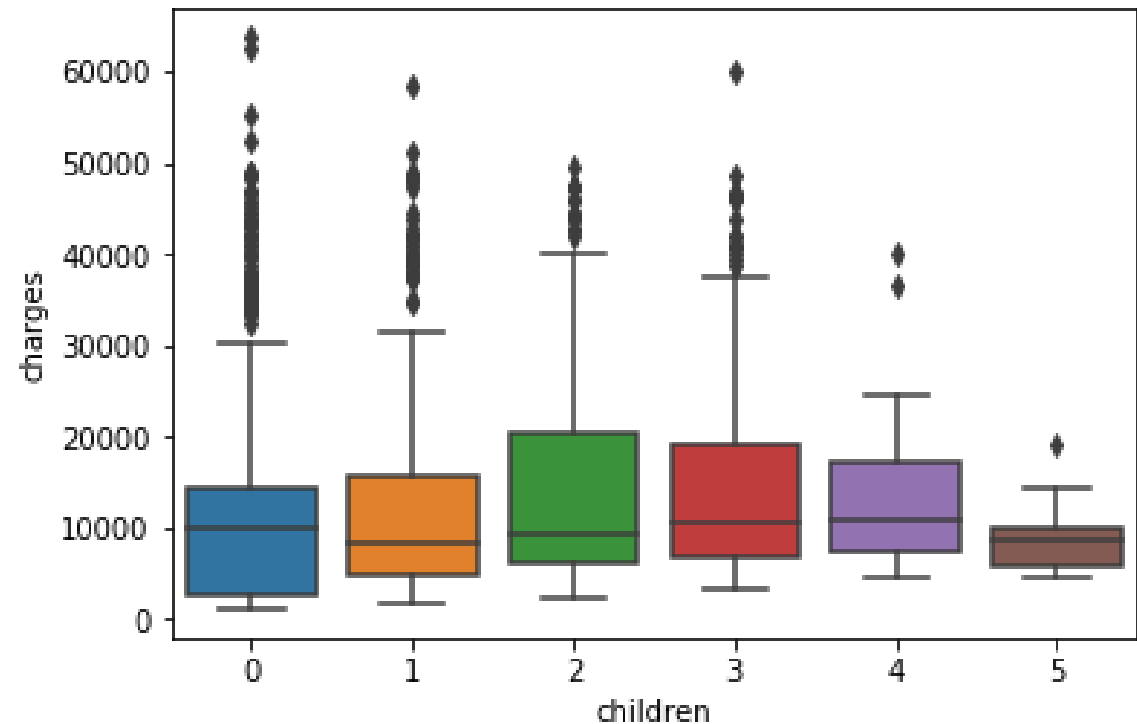
1. Underweight
  2. Normal weight
  3. Overweight
  4. Obesity
- Person with Normal Weight gets the highest insurance, then the people with under weight, then the people with overweight and least insurance is given to the people with obesity.





# Relation between Children and Charges

- ✓ The charges are dependent on number of children a person have.
- ✓ The insurer considers the number of children a person have, basing on this he will provide the insurance.

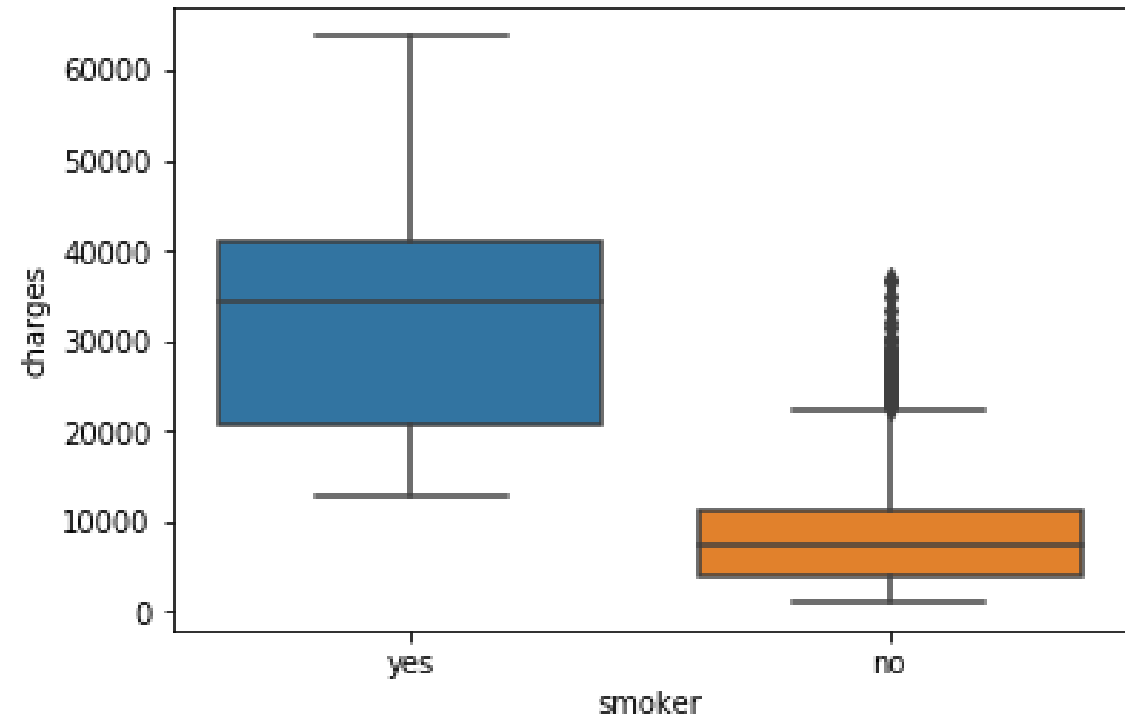


# Relation between Smokers and Charges

The premium for health insurance tend to be on the steeper side for smokers. But it isn't that high as compared to that of non-smoker's.

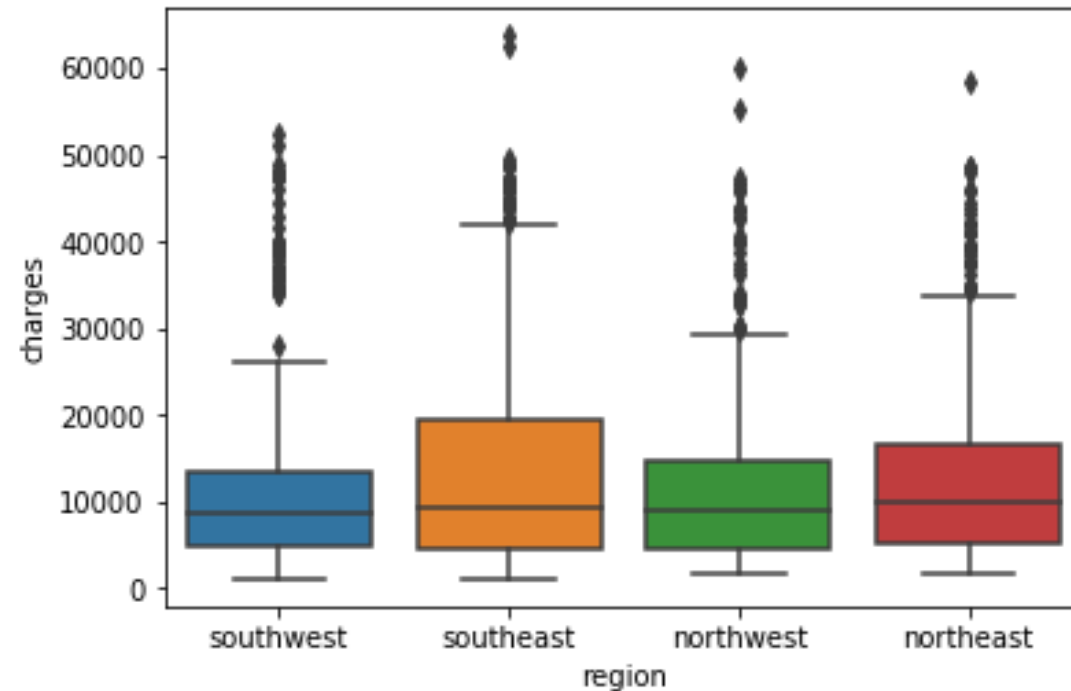
However, if the company realises your health is deteriorating owing to your smoking habits, your premiums might be increased, accordingly.

In most cases, being a smoker will automatically heighten your premium amount when compared to a non-smoker.



# Relation between Region and Charges

- ✓ The relation between the region and charges can be determined by the climatic conditions over the region.
- ✓ When the climatic conditions are adverse, the health may deteriorate so that the insurance claimed by the person will be more and vice versa.



# Supervised Learning

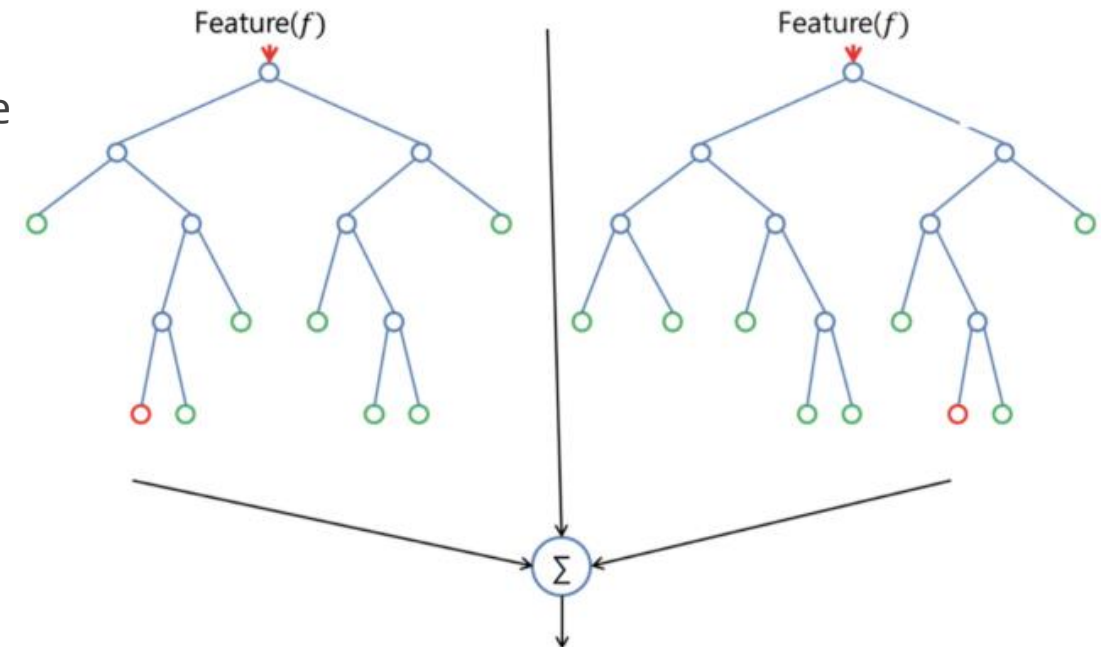
- ✓ **Supervised Learning**, indicates the presence of a supervisor as a teacher.
- ✓ Basically supervised learning is a learning in which we teach or train the machine using data which is well labeled that means some data is already tagged with the correct answer.
- ✓ After that, the machine is provided with a new set of examples (data) so that supervised learning algorithm analyses the training data (set of training examples) and produces a correct outcome from labeled data.
- ✓ Supervised Learning is of two types:
  1. Classification
  2. Regression
- ✓ For Predicting the Health Insurance we have used Regression because the given dataset cannot be categorised.
- ✓ Regression techniques:
  1. Linear Regression
  2. Multi Linear Regression
  3. Polynomial Regression
  4. Logistic Regression
  5. Random Forest Regression
- ✓ Random Forest Regression is predicting the best performance for the testing data for the fitted model.

# Random Forest Regression

- ✓ Random Forest is a supervised learning algorithm.
- ✓ It is one of the most used algorithms, because it's simplicity and the fact that it can be used for both classification and regression problems, which form the majority of current machine learning systems.
- ✓ Random Forest builds multiple decision trees and merges them together to get a more accurate and stable prediction.
- ✓ The Random Forest model is a type of additive model that makes predictions by combining decisions from a sequence of base models. More formally we can write this class of models as

$$g(x) = f_0(x) + f_1(x) + f_2(x) + \dots$$

- Where the final model  $g$  is the sum of simple base models  $f_i$



# User Interface for Cost Prediction

## Input:

To predict the insurance that can be claimed by the person, we need input attributes.

Input attributes are:

1. Age
2. Sex
3. BMI
4. Children
5. Smoker
6. Region

## Output:

The output is the cost predicted based on the input values, that how much a person can claim from the insurance.

Health\_Insurance

### Cost Prediction

Required Details

age

sex

bmi

children

smoker

region

**SUBMIT** **CANCEL**

Prediction **1280.92**



# Conclusion

- ✓ **Health insurance** is that it covers the whole or a part of the risk of a person incurring medical expenses .
- ✓ Health insurance provides people with a much needed financial backup at times of medical emergencies.
- ✓ There are different types of health insurance plans, such as individual health insurance, family health insurance, critical illness insurance, etc.
- ✓ The preferred approach to **Health Insurance - Cost Prediction** is cost prediction using supervised learning methods, in supervised learning we have used Regression techniques as the dataset cannot be categorized.
- ✓ We can use many Regression techniques, in which “**Random Forest Regression**” technique has given the “**Highest Performance**”.
- ✓ When the attributes in the dataset are been correlated with the **target attribute** i.e., **Charges**, the attributes age and smoker are effecting more on the performance of the model than the other attributes in the dataset.



# Thank You

Coding Strikers