

An Analytical Work on Food Trend and Restaurant Business of Dhaka City using Social Media Reviews and Real Time Data Set

Thesis submitted in partial fulfilment of the requirement for the degree of

**Bachelor of Science
In
Computer Science and Engineering**

**Under the Supervision of
Mr. Moin Mostakim**

**By
Redwanul Alam Alif (12101022)**



**School of Engineering & Computer Science
Department of Computer Science & Engineering
BRAC University**

Declaration

This is to certify that the research work titled “An Analytic Framework on Food Trend of Dhaka City Using Social Media Reviews and Real Time Data Set” is submitted by Redwanul Alam Alif to the Department of Computer Science & Engineering, BRAC University in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering. I hereby declare that this thesis is based on results obtained from our own work. The materials of work found by other researchers and sources are properly acknowledged and mentioned by reference. This thesis, neither in whole nor in part, has been previously submitted to any other University or Institute for the award of any degree or diploma. I carried our research under the supervision of Mr. Moin Mostakim.

Signature of Supervisor:

Moin Mostakim
Supervisor
Department of CSE,
BRAC University

Signature of author:

Redwanul Alam Alif,
12101022

FINAL READING APPROVAL

Thesis Title: An Analytic Framework on Food Trend of Dhaka City Using Social Media Reviews and Real Time Data Set.

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This final report on our research is read and approved by the supervisor Mr. Moin Mostakim. Its format, citation and bibliographic style are consistent and acceptable. Its illustrative materials including figures, tables and charts are in place. The final manuscript is satisfactory and is ready for submission to the Department of Computer Science & Engineering, School of Engineering & Computer Science, BRAC University.

Signature of Supervisor:

Moin Mostakim
Supervisor
Department of CSE,
BRAC University

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ABSTRACT

I worked with sentiment analysis and supervised machine learning to find pattern and predict the current food trend and business. The current food trend of Dhaka city depends on the type of food, the location of the restaurants, their overall services, and the taste of the available food items. In my analysis, I have shown the public sentiment on food trend depending on two (2) major types of food: Local or Deshi and Foreign food items. I have also analyzed the food trend depending on the reviews and rating people shared on social media based on their location according to the basis of taste, price, and service. Through the graph that I achieved from the collected data, I can also analyze the food business of Dhaka city depending on the food types and location of the restaurants.

In my research I have used the data of reviews and ratings from different social media groups. Based on these reviews sorted according to locations like Dhanmondi, Banani, Gulshan, Khilgaon and Shyamoli I have analyzed the taste rating, price rating and service ratings. I was able to successfully show the food trend and restaurant business pattern of these locations based on the public reviews using necessary graphs.. This is how by applying supervised machine learning I have analyzed the public sentiment on restaurant and food trend of Dhaka city.

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LIST OF ABBREVIATION

POS: Parts of Speech

SOP: Standard Operating Procedure

SVC: Support Vector Clustering

SVM: Support Vector Machine

CHAPTER 1

1.1 INTRODUCTION

Restaurant and food business has been one of the most profitable businesses in the past few years in Bangladesh. Since then this business sector has been a topic of analysis and finding pattern of business and public sentiment on food trend. The restaurant and food business sector depends on many factors like the quality of food, price comparison and quality of service offered to the customers, which is why it is difficult to find pattern of this business sector.

Sentiment analysis is a process of finding sentiment in any kind of text media. Here in my research I have used the reviews collected from different social media sites. With the advent of internet people now have access to social media sites where they can review or share their opinion on different products, restaurants and places. For sentiment analysis, we can collect the data from reviews to find out if it is positive or negative or neutral. While the outcome can be wrong sometimes, if the sentiment score of a topic or event is aggregated from many articles or resources, this problem can be dealt with.

My research focuses on the pattern finding and predicting the food trend and business in Dhaka City. By analyzing the reviews of customers on different restaurants and food items my model can predict the food trend and business market conditions based on location of restaurants.

Machine Learning helps an artificial agent to learn and predict a result without being explicitly programmed. Using certain dataset, it can identify the patterns and tries to predict the next possible output. In my research if tried to do the sentiment analysis of food trend and business in Dhaka using different machine learning approaches.

1.2 MOTIVATION

Predicting and analyzing any particular business sector that has recently become more popular depending on certain locations has always been a topic of research. Restaurant business and the food trend of Dhaka city can be studied from the reviews given by different customers on social media sites. Analyzing the restaurant business pattern from the reviews given by people from different social site groups will help us understand the business current trend. Sentiment analysis from the public reviews help us to understand public priority and choice of food, which type of food they prefer and with what service and the price range according to their opinion. I have carried out the research based on the numeric reviews provided by members of many groups in social media site. The problem with using texts is people have different types of written opinion given on same numerical rating value for example, to some people good taste is of numerical value of 9/10 and to some people it is excellent. Therefore, we saw a lot of confusion in the text statements.

Sentiment analysis on real time data feed would enable us to see, how the restaurant business pattern is and how the food trend of people of Dhaka city influence this business.

1.3 LIMITATION OF SENTIMENT AND REVIEW DATA

When I started my research, my first immediate hurdle was to find solid data on this topic and most significantly any review data sheet taken directly from any social media group. Public review data is the most perfect and authentic data set for this thesis. Therefore, I had to directly go through the reviews from different groups in social media sites. One of the most difficult part of data collection is the text part of the reviews, which constantly varied with the numeric value of review given by the members of the groups. It was also difficult for me to get reviews directly sorted out for every region of Dhaka city, therefore I had to carry out the research for only four different commercial areas of Dhaka city where there are many significant restaurants and the reviews are found more often.

Another limitation of our thesis is the accuracy of the sentiment analysis and the

percentage of error calculation. Though with time the accuracy of sentiment analysis has risen and the pattern that we found through graphs has shown more accuracy. It would have been great if we could find the pattern for every locations of Dhaka city and for most of the food items individually.

Despite having these limitations, I was able to find pattern of the restaurant business sector for locations like Dhanmondi, Bannani and Gulshan, Khilgaon and lastly Shyamoli. There comparative analysis is also understandable using the graphs.

I have also provided the local or desi food comparison with foreign foods in terms of public priority.

1.4 RESEARCH GOALS:

Restaurant business has been a playing for many new investors in the past couple of years. This has marked the trend of different food items in our country and Dhaka city seems to be the center of it. For any particular type of business the main strategy or competition varies from one location to another. However, in case of restaurant business sector it depends on many factors like the taste, price and service quality of the foods served by the restaurants. Therefore I carried out my research on the analysis of these factors on restaurants of four different locations of Dhaka city.

My primary objective is to analyze the type of food more preferred by people these days which eventually will tell us about the type of food dominating in the restaurant business sector. Now along with this I have carried out the analysis on different locations.

In the first part of my thesis I will demonstrate the comparison between local or desi foods and foreign food items. This will be carried out in terms of rating data on taste, price and service of different food served by different restaurants of the entire Dhaka city. Then I will analyze the sentiment based on locations like dhanmondi, Banani and Gulshan, Khilagaon and lastly Shayamoli. I have carried out all these analysis in terms of taste ratings, price ratings and the service ratings as provided by customers on different social media site. This will also tell us the business strategy applied by different restaurants of different locations of Dhaka city.

CHAPTER 2

2.1 LITERATURE REVIEW

There are many research theories done on rating and reviews of many services, television shows and many products all over the world. If new business trend appears on any part of the world, it is now a research topic for analysis on different aspects of it. For an investor in order to make a mark in the market, it is very important for him to know the business strategies applied by others in that business sector and also the preference of the customer range.

Machine learning approach has always been most used research and analytic procedure for finding pattern or prediction. There are significant works on rating and analysis for finding patterns where regression was significantly used. Although there are arguments on the percentage of error or accuracy of the derived pattern, applying regression can provide us a pattern of the data set. There are also recommendations on applying linear SVM for this, but I applied regression in order to analyze all the aspects taste rating, price rating and service quality rating.

2.2 METHODOLOGICAL BIASES

There are high chances for the data to be biased and noise.

Data Bias: The data that are being used to emulate could have been hard to obtain during the actual time. These might make it data biased and not effective for real time usage. Supposedly during the festival time like Ramadan and Eid vacation the data was not collected as it was supposed be in amount.

Signal Bias: Since we are already aware of what particular events in the past had a major impact on threatening data, the algorithm could have been tweaked to reflect that. It's relatively easy to

make an algorithm pick up particular shares at the right time to make a huge change in analysis, which might perceive the algorithm being successful.

Data Noise: Some food items can be very unusual to mention and some items may have been found to be served by one particular restaurants. In all those cases there has been a gap in the data. This type of noise would be very hard to avoid. One approach to overcome this problem is to source the data from many different sources and compare.

CHAPTER 3

3.1 SENTIMENT ANALYSIS

Sentiment analysis has several approaches and often a model is based on combination of many layer of techniques to reach the conclusion.

I numerical value analysis approach we use the numerical values in order to find the pattern of the data. Here the data is sorted on categories then are given as input to the algorithm code to find out the graphs where the entire analysis is given. text processing approach a text is broken down to words, or a string of words and it does not focus on the context in the sense that this model incorporates a large dictionary of words that carry different level of sentiment. The words in the dictionary are then matched with the words and value of sentiment in the words are found. All the values are added up to reach the final sentiment valuation. But since I have directly used the numerical values the graphs I achieved are without text processing.

Grouping of data is very important when it comes to sentiment analysis. Since I have analysis done on location based data, therefore data sorting was a very initial step of my thesis that I had to do. The different factors of analysis like taste rating price rating and the service rating were to analyzed separately for every locations and also for the two major types of food local and foreign items.

CHAPTER 4

4.1 DATA

The data that we collected for this thesis is basically the ratings from the reviews of different restaurants and type of food items. The ratings are basically covered under three major factors: taste rating, price rating and the service rating for the particular food item of that particular restaurant.

The taste rating signifies the quality of the food item and also the taste preferences of the target customers which helps us to understand the sentiment of the customer in terms of food quality and taste preferences.

The price rating signifies the amount of price charged in compared to the quality of food and services as provided. If the price rating is high, it means the quality of food and the service the restaurant provide is satisfactory according to the price charged.

The service rating that we collected is basically the rating of the service that any particular restaurant of particular region provides. Here the service rating depends on many factors and along with the price charged.

I have attached some screen shots of the data sets that we use in the other segments of this chapter where the data is given in this format:

<u>Name of the Restaurant</u>	<u>Name of the Food item</u>	<u>Taste Rating</u>	<u>Price Rating</u>	<u>Service Rating</u>

Table 4.1.1 Tabular format of data set

4.2 DATA COLLECTION PROCEDURE

I have collected the data from different groups of the social media sites. I have directly gone through different review posts in these groups given by members of these groups. The data that is used in this thesis is the most recent data of the year 2016. I have taken the data from posts of the January 2016 till 25th of October 2016.

A bar chart is given below on this data flow showing the amount of data that we collected each month.

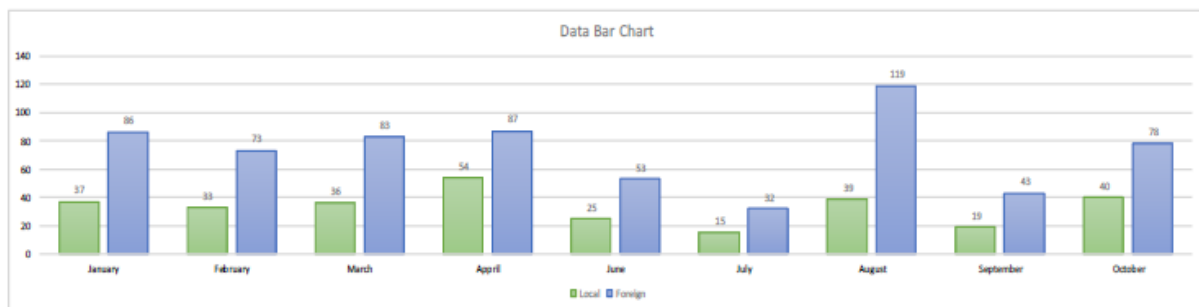


Fig:4.2.1 Data Bar chart of local and foreign foods found in different months

Here the green bar signifies the amount of data collected for local or desi food items in every month and the blue bar chart signifies the amount data collected for foreign foods in every month. On top of every bar the exact number is given below. From the chart we can clearly see the type of food more dominant in the food trend of Dhaka city.

4.3 DIFFERENT SEGEMENTS OF DATA

The data set has some major segments. The data that we used is sorted on different categories. There are spate data sample for every different region that I used to carry out my thesis. Each segments of data set has been sub divide into sets of name of restaurants name of food item, taste rating, price rating, and service ratings.

A sample of the overall dta set that we used is given below:

Chef'S Cuisin	Mashroof Delight	10	9	9
Chef'S Cuisin	Mashroof Delight	10	9	9
Ghost Rizerz Cafe	Chicken Chawmeen	6	6	8
Cafe Kathmandu	Set Menu1	10	10	9
Cafe Theatre	Pasta Basta	9	9	9
Cafe Theatre	Pasta Basta	9	7	9
Pasta State	Pizza	9	8	9
Pasta State	Pizza	9	8	9
The Sweetsin Coffeess	Red Velvet Waffles	10	7	10
The Sweetsin Coffeess	Red Velvet Waffles	10	7	9
Salam'S Kitchen,Banani	Morogpolao	7	7	9
Salam'S Kitchen,Banani	Morogpolao	8	9	8
Takeout	Bbq Chicken Cheese Burger	8	8	9
Takeout	Naga Burger	8	9	9
Takeout	Bbq Chicken Cheese Burger	8	8	9

Table4.3.1 Sample of overall data set.

Here we can see the data is sorted into taste rating, price rating and service rating respectively.

Let us see another sample of data that we used for determining the pattern of the restaurant business and food trend of Dhanmondi region. Here is also how we place the sample accordingly to the taste price and service ratings.

Takeout	Naga Burger	8	9	9
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
Club Gelato	Lava Cake	8	8	8
Club Gelato	Cheese Delight	9	8	8
Club Gelato	Lava Cake	8	8	8
Alchemy	Sea Bass	10	10	8
Alchemy	Sea Bass	9	9	4
Alchemy	Sea Bass	10	10	9
Alchemy	Sea Bass	10	10	8
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
	Chicken Bbq			
Bistrovia	Pizza	8	8	7
Mexican				
Nacho	Beef	10	10	9
Mexican				
Nacho	Beef	10	10	9

Table 4.3.2: Sample data of Dhanmondi region

CHAPTER 5

5.1 ALGORITHMS

Machine Learning approach for this thesis was chosen to be the most suitable. There are many machine learning approaches which helps us find the pattern and predict the possible outcome in future. In this thesis, we have applied linear regression and has applied spline interpolation and shape preserving interpolant for the purpose of analysis. Although there are many other algorithms like decision tree ID3 and other prediction algorithms but applying linear regression helped to find pattern out of the numerical value data set. Therefore, I have used the following algorithms:

1. Linear Regression
2. Spline Interpolation
3. Shape Preserving Interpolant

5.2 LINEAR REGRESSION

Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an explanatory variable, and the other is considered to be a dependent variable. For example, a modeler might want to relate the weights of individuals to their heights using a linear regression model.

Before attempting to fit a linear model to observed data, a modeler should first determine whether or not there is a relationship between the variables of interest. This does not necessarily imply that one variable *causes* the other, but that there is some significant association between the two variables. A scatterplot can be a helpful tool in determining the strength of the relationship between two variables. If there appears to be no association between the proposed explanatory and

dependent variables (i.e., the scatterplot does not indicate any increasing or decreasing trends), then fitting a linear regression model to the data probably will not provide a useful model. A valuable numerical measure of association between two variables is the correlation coefficient, which is a value between -1 and 1 indicating the strength of the association of the observed data for the two variables.

A linear regression line has an equation of the form $Y = a + bX$, where X is the explanatory variable and Y is the dependent variable. The slope of the line is b , and a is the intercept (the value of y when $x = 0$).

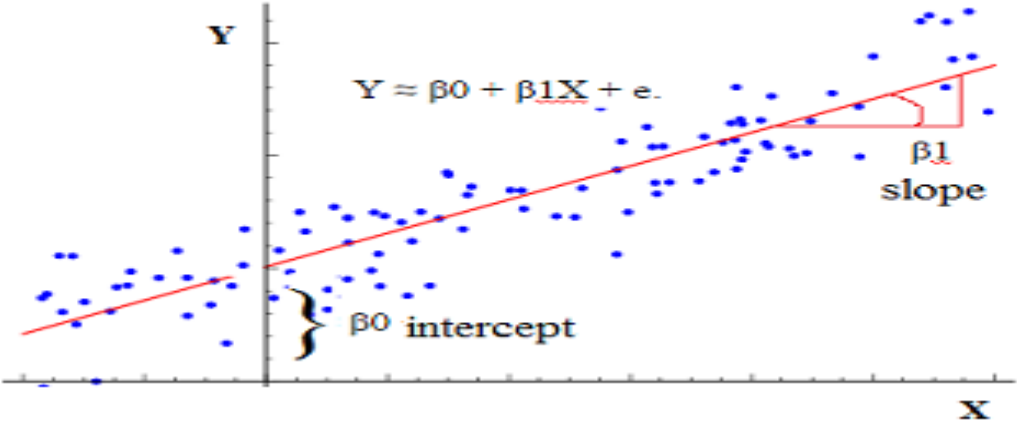


Fig 5.2.1 linear regression on sample data

Another sample showing the linear regression application with distance from every points is given below:

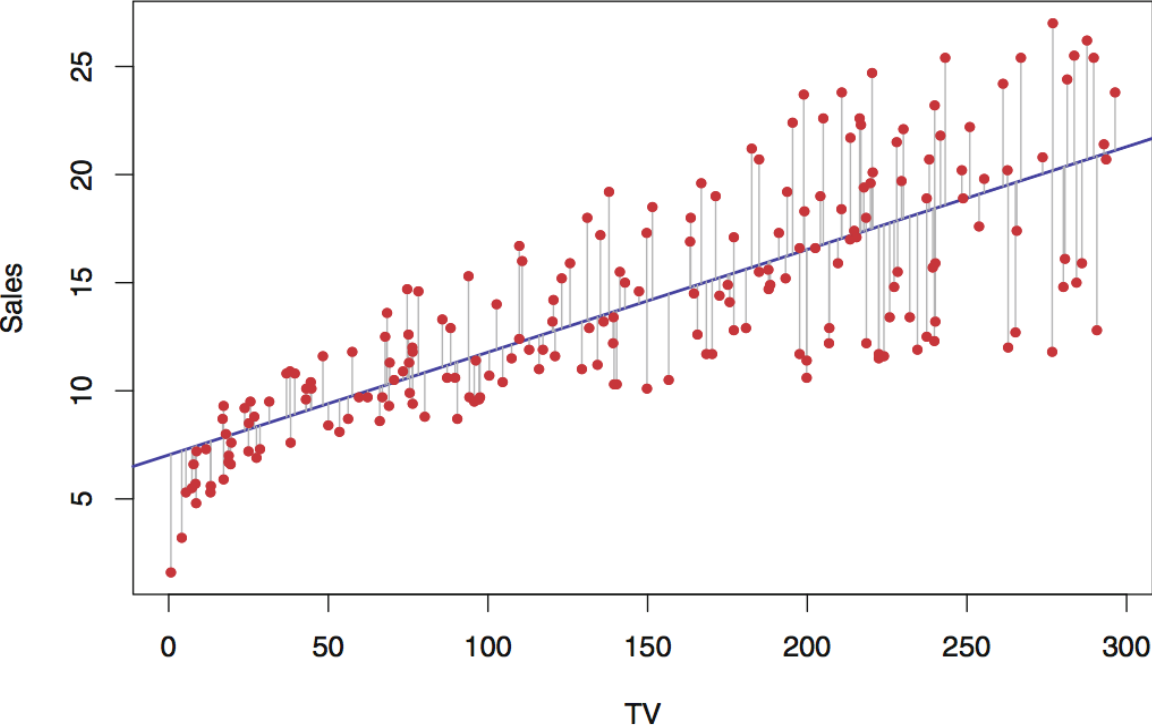


Fig 5.2.2 Linear regression line with distance from every individual points

5.3 SPLINE INTERPOLATION

Cubic spline interpolation is a fast, efficient and stable method of function interpolation. Parallel with the rational interpolation, the spline interpolation is an alternative for the polynomial interpolation.

The spline interpolation is based on the following principle. The interpolation interval is divided into small subintervals. Each of these subintervals is interpolated by using the third-degree

polynomial. The polynomial coefficients are chosen to satisfy certain conditions (these conditions depend on the interpolation method). General requirements are function continuity and, of course, passing through all given points.

The main advantages of spline interpolation are its stability and calculation simplicity. Sets of linear equations which should be solved to construct splines are very well-conditioned, therefore, the polynomial coefficients are calculated precisely. As a result, the calculation scheme stays stable even for big N . The construction of spline coefficients table is performed in $O(N)$ time, and interpolation - in $O(\log(N))$ time.

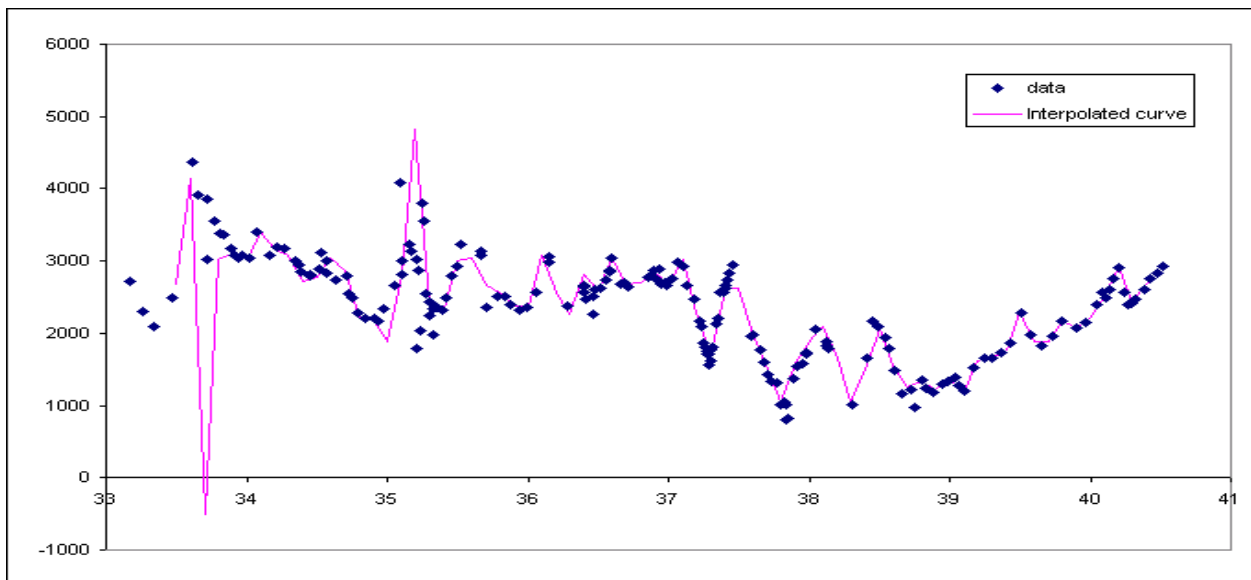


Fig 5.3.1 Spline Interpolation for any sample data

5.4 SHAPE PRESERVING INTERPOLANT(Spline)

We consider the problem of passing a curve through a finite sequence of points. We want the curve to preserve in some sense the shape of the data, i.e. the shape of the curve gained by joining the data by straight line segments (which we call the 'piecewise linear interpolant'). We do not consider the important problems of approximating the data by a curve, or of shape-

preserving interpolation by a surface. The short length of the paper forces it to be selective. So we concentrate on actual algorithms for solving the problem rather than related theory. Also we consider only algorithms where the curve is defined explicitly, not implicitly either as the zero set of a function or as the limit of a subdivision process (though there are, to our knowledge, extremely few such implicit shape-preserving schemes).

A sample of shape preserving interpolant for spline is give below.

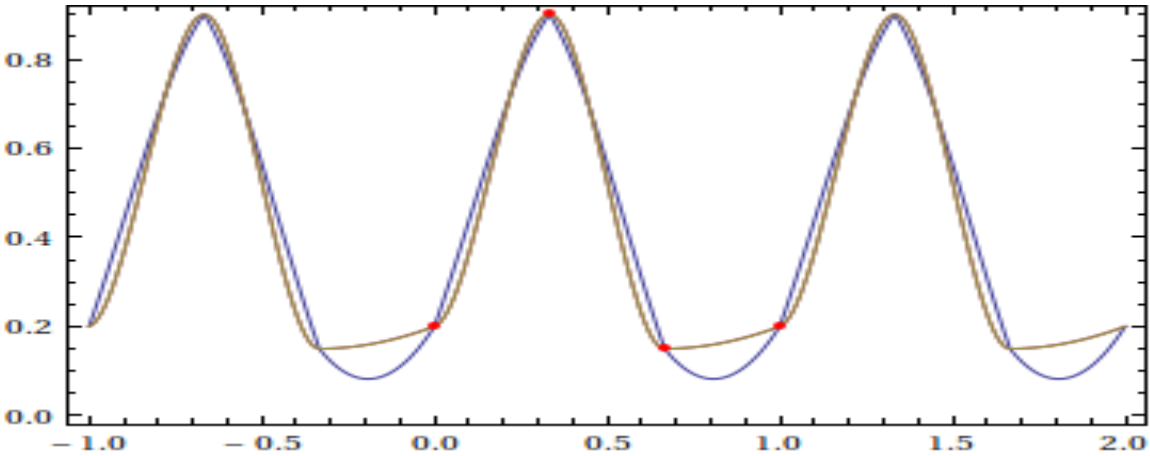


Fig 5.4.1 Shape Preserving Interpolant(Spline) for any sample data

CHAPTER 6

6.1 LOCAL FOOD

We determine the local food trend depending on certain criteria. The criteria are as follows

1. Taste Ratings
2. Price Ratings
3. Service Ratings

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.1.1 Taste Rating Local Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_L T_L - \sum N_L \sum T_L}{n\sum N_L^2 - (\sum N_L)^2}$$
$$a_0 = \bar{T}_L - a_1 \bar{N}_L$$

Here n is number of samples taken for the sample graph

N_L is serial number of the item and restaurant

T_L is the taste rating of the items of restaurant

A sample of the input taste that we applied is given below. Here only three inputs are given.

Enter Data set =22

x value: 88

y value: 9

Enter Data set =23

x value: 90

y value: 7

Enter Data set =24

x value: 93

y value: 9

Enter Data set =25

x value: 94

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$a_1 = -0.4006$

$a_0 = 28.1699$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression for this particular sample is given below.

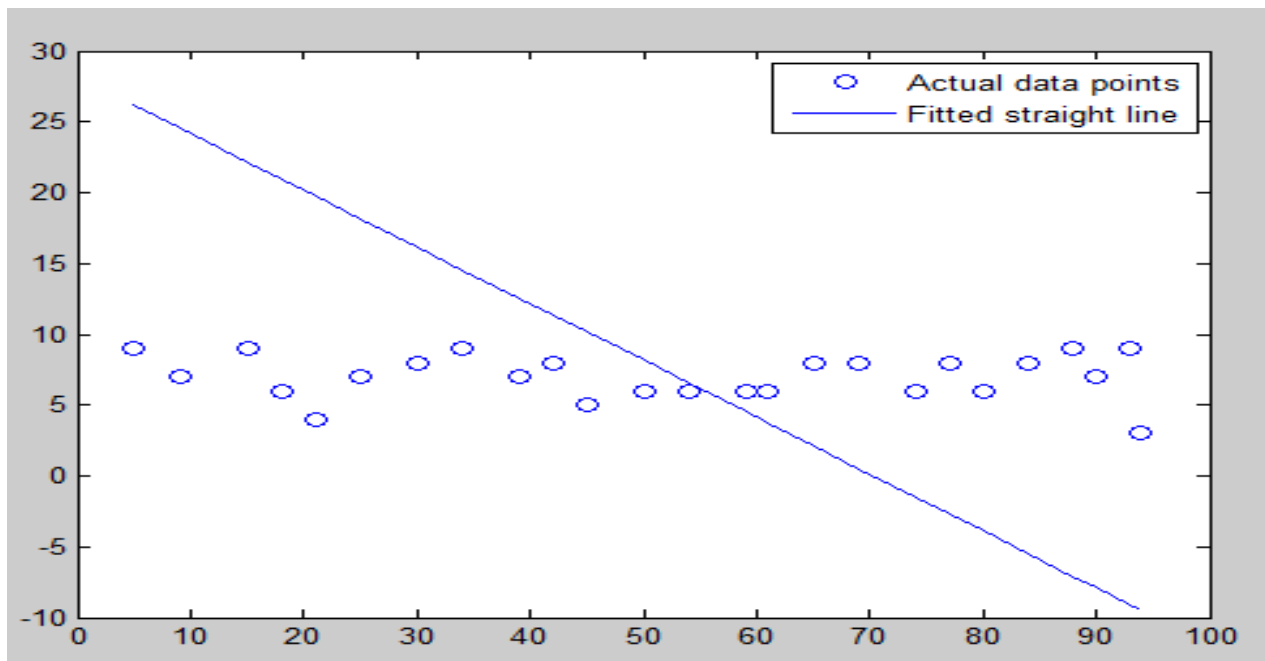


Fig 6.1.1: linear Regression graph for local food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for local food varies much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

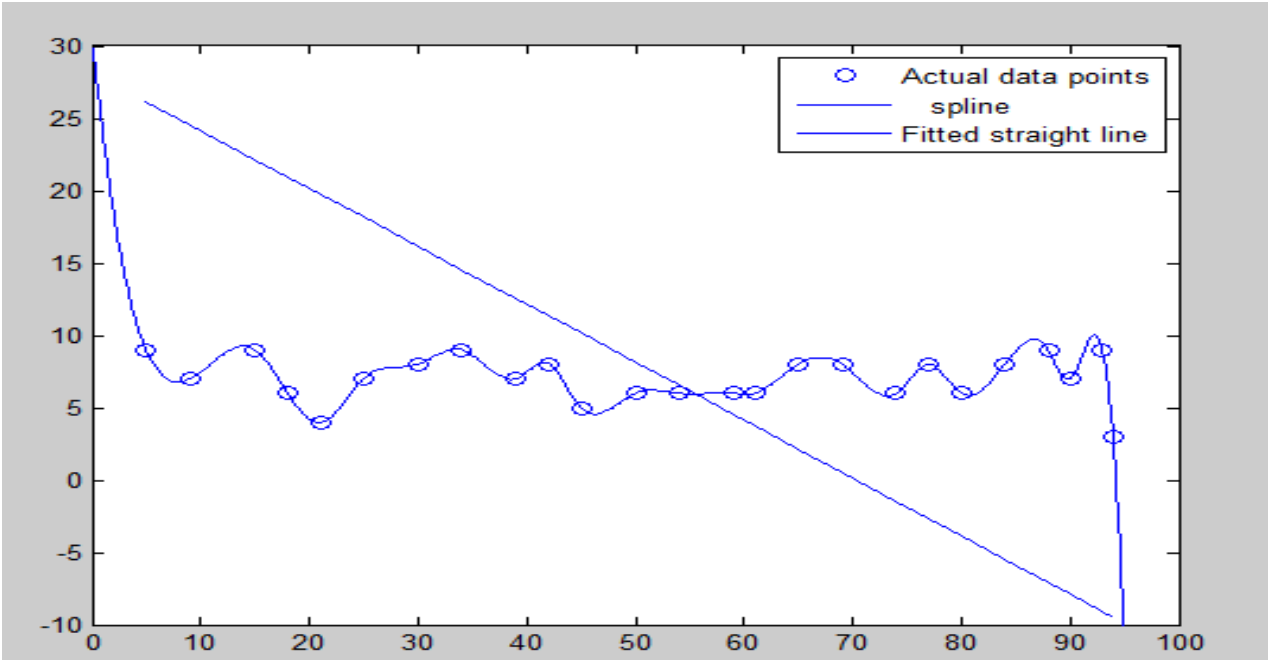


Fig 6.1.2: Spline Interpolation graph for local food taste ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis.

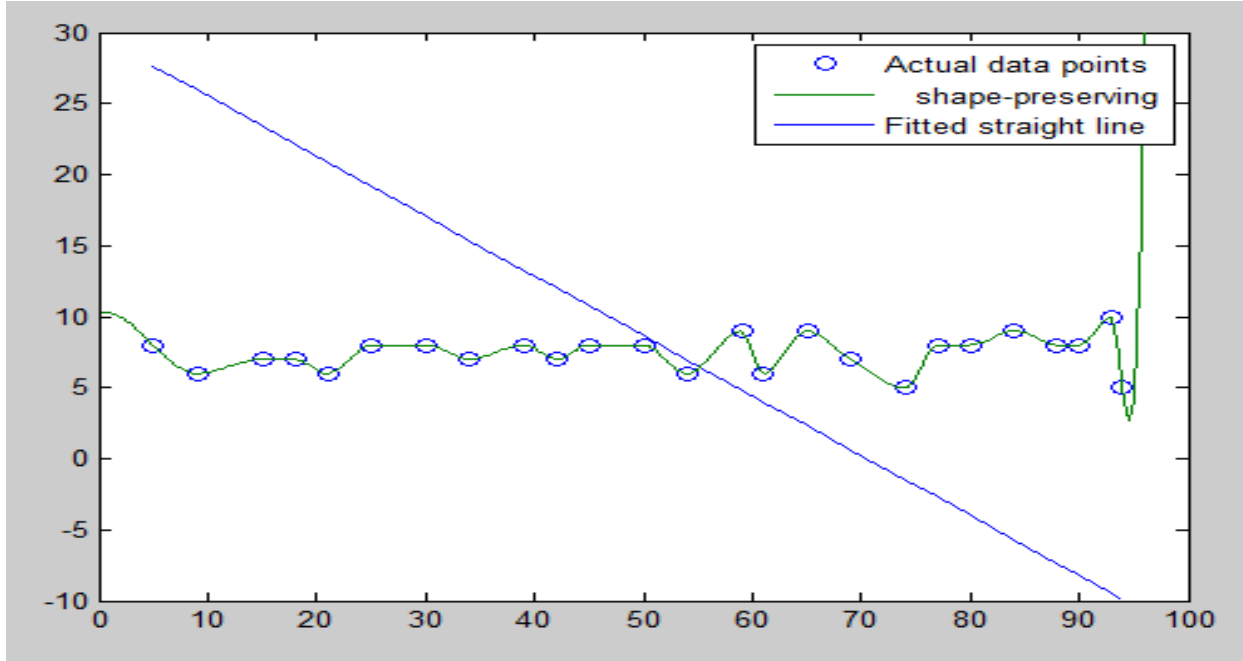


Fig 6.1.3: Shape Preserving Interpolant graph for local food taste ratings sample

The conclusion that we achieved is the taste ratings for local food is not sufficiently high.

6.1.2 Price Rating Local Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_L P_L - \sum N_L \sum P_L}{n\sum S_L^2 - (\sum N_L)^2}$$

$$a_0 = \bar{P}_L - a_1 \bar{N}_L$$

Here n is number of samples taken for the sample graph

N_L is serial number of the item and restaurant

P_L is the taste rating of the items of restaurant

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

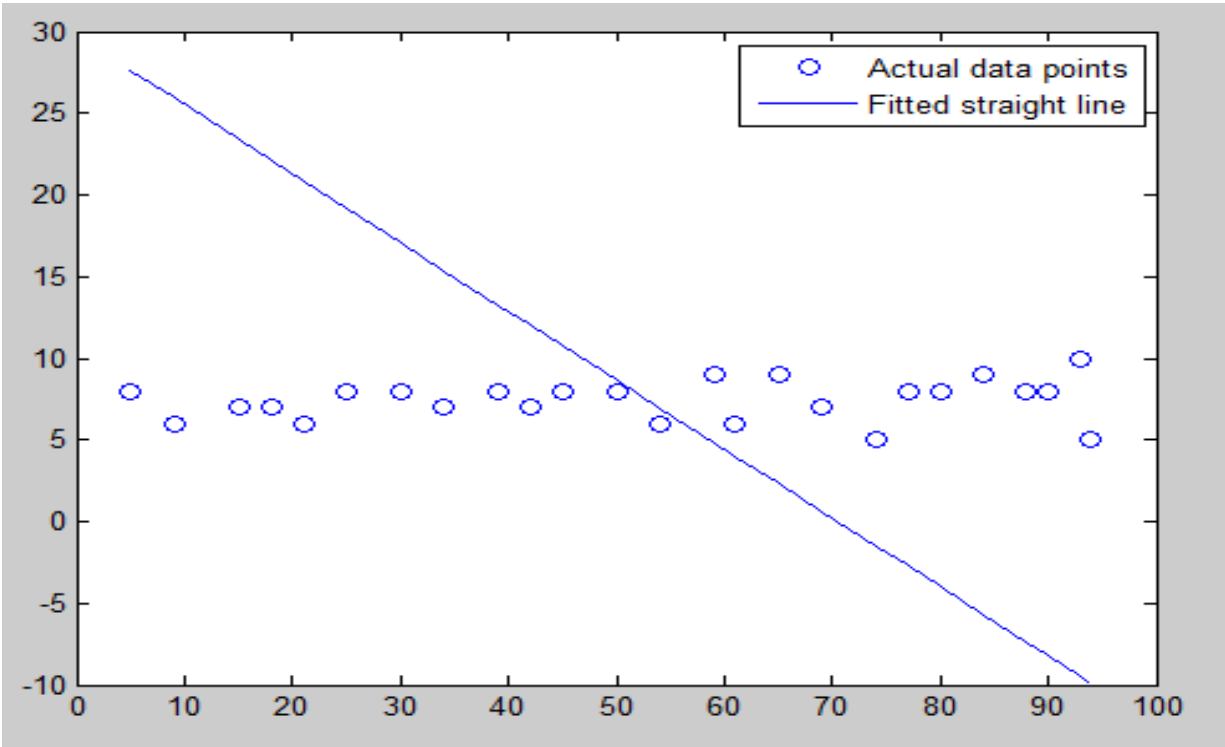


Fig 6.1.4: linear Regression graph for local food price ratings sample

From the graph sample, we see that the pattern of Price ratings for local food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

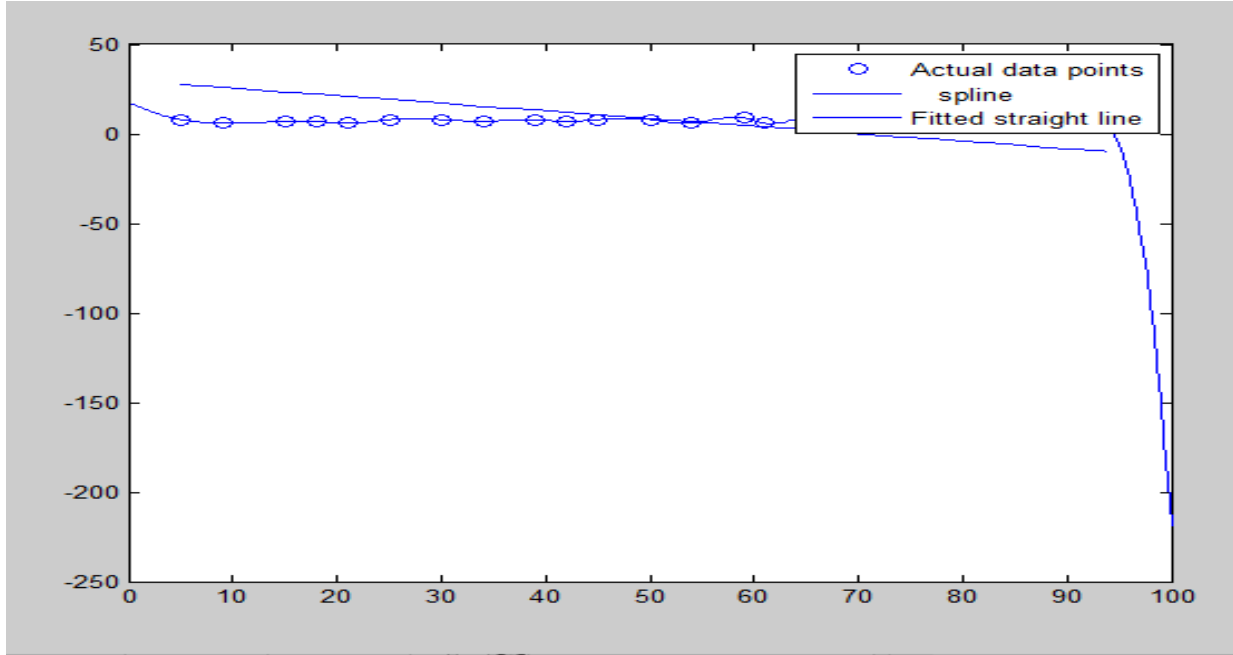


Fig 6.1.5: Spline Interpolation graph for local food price ratings sample

From the graph comparison of price ratings, we can see that the price range of local foods does not vary much from restaurant to restaurant. This indicates that the price of local foods is more or less limited to a certain range.

The straight line obtained from the linear regression algorithm seems more tending towards the horizon.

6.1.3 Service Rating Local Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$a_1 = \frac{n\sum N_L S_L - \sum N_L \sum S_L}{n\sum N_L^2 - (\sum N_L)^2}$$

$$a_0 = \bar{S}_L - a_1 \bar{N}_L$$

Here n is number of samples taken for the sample graph

N_L is serial number of the item and restaurant

S_L is the taste rating of the items of restaurant

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

x value: 30

y value: 10

Enter Data set =8

x value: 34

y value: 7

Enter Data set =9

x value: 39

y value: 9

Enter Data set =11

x value: 45

y value: 8

Enter Data set =12

x value: 50

y value: 7

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$a_1 = -0.3729$

$a_0 = 26.6484$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the service ratings for this particular sample is given below.

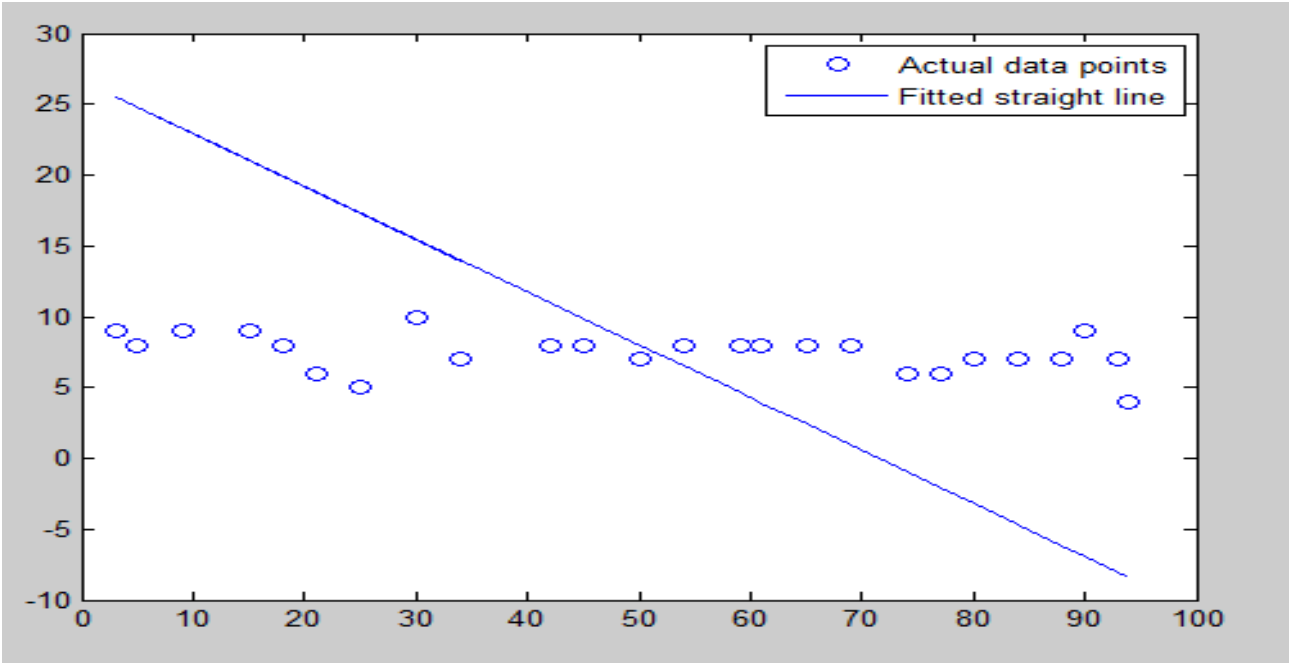


Fig 6.1.6: linear Regression graph for local food service ratings sample

From the graph sample, we see that the pattern of Service ratings for local food does vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

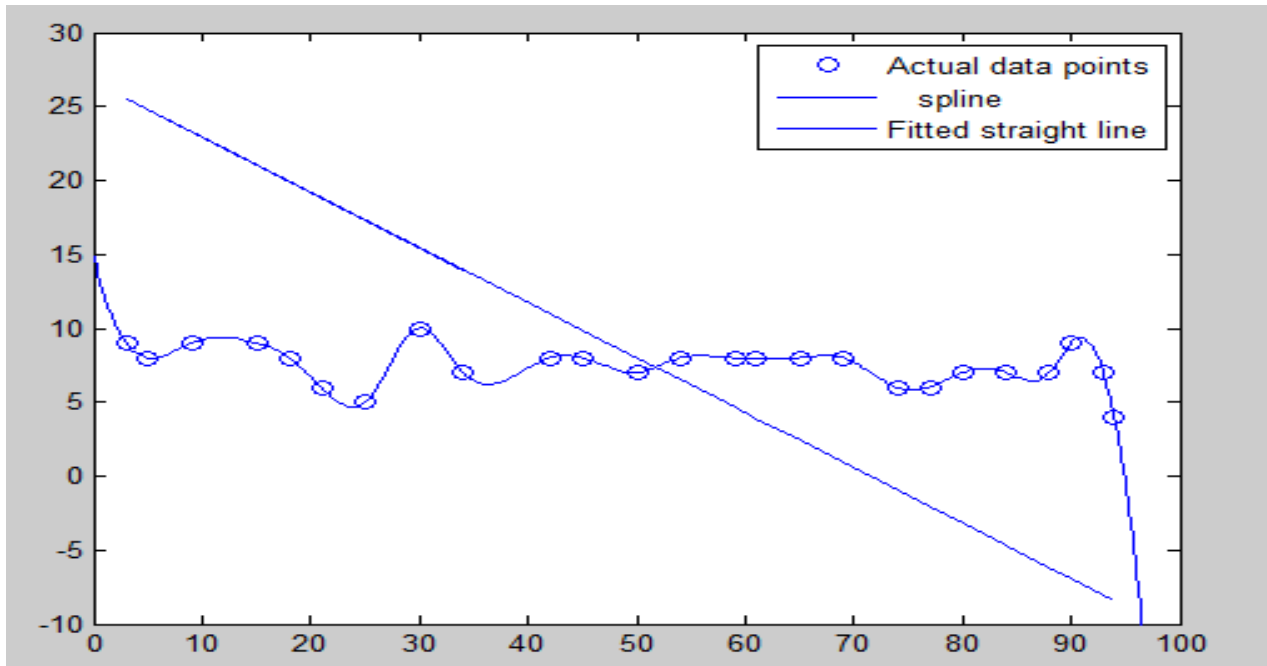


Fig 6.1.7: Spline Interpolation graph for local food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern on this from another algorithm

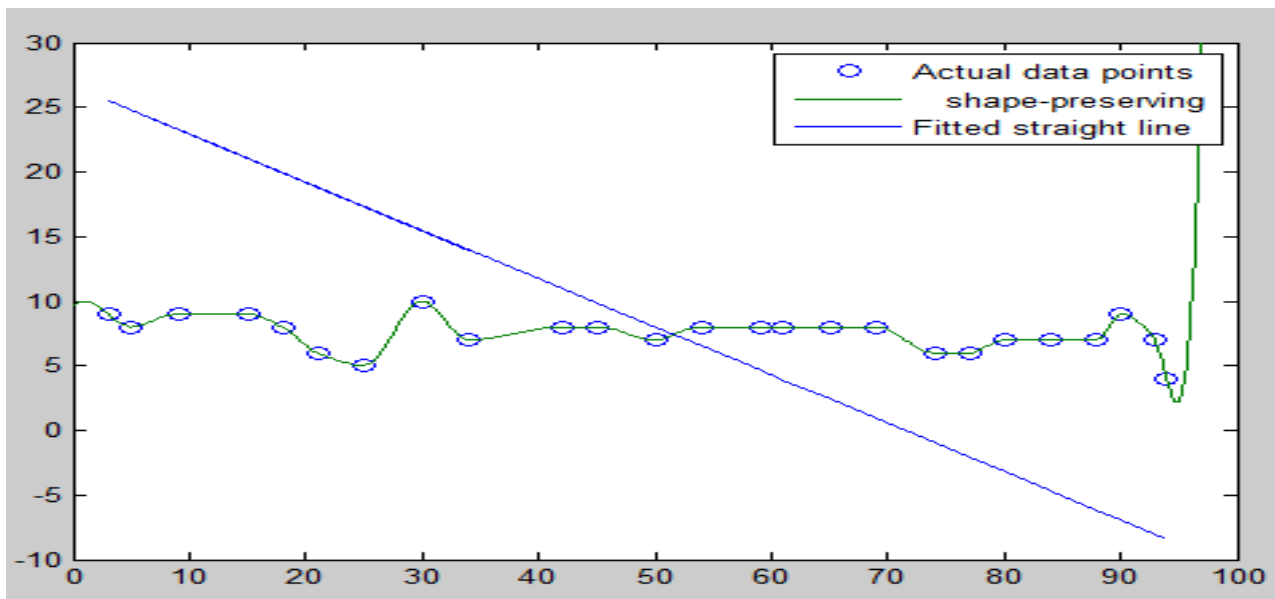


Fig 6.1.8: Shape Preserving Interpolant graph for local food service ratings sample

From the analysis, we can see that the service rating pattern for most of the restaurants serving local foods is not much high, this also means people are less satisfied with local food ambience.

6.2 Foreign FOOD

We determine the Foreign food trend depending on certain criteria. The criteria are as follows 1. Taste Ratings of Foreign Foods in restaurants

2. Price Ratings of Foreign Foods in restaurants

3. Service Ratings of Foreign Foods in restaurants

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.2.1 Taste Rating of Foreign Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_F T_F - \sum N_F \sum T_F}{n\sum N_F^2 - (\sum N_F)^2}$$

$$a_0 = \bar{T}_F - a_1 \bar{N}_F$$

Here n is number of samples taken for the sample graph

N_F is serial number of the item and restaurant

T_F is the taste rating of the items of restaurant

A sample of the input taste that we applied is given below. Here only three inputs are given.

Enter Data set =14

x value: 59

y value: 6

Enter Data set =15

x value: 61

y value: 5

Enter Data set =16

x value: 65

y value: 9

Enter Data set =23

x value: 90

y value: 10

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$a_1 = -0.4397$

$a_0 = 31.1541$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression for this particular sample is given below.

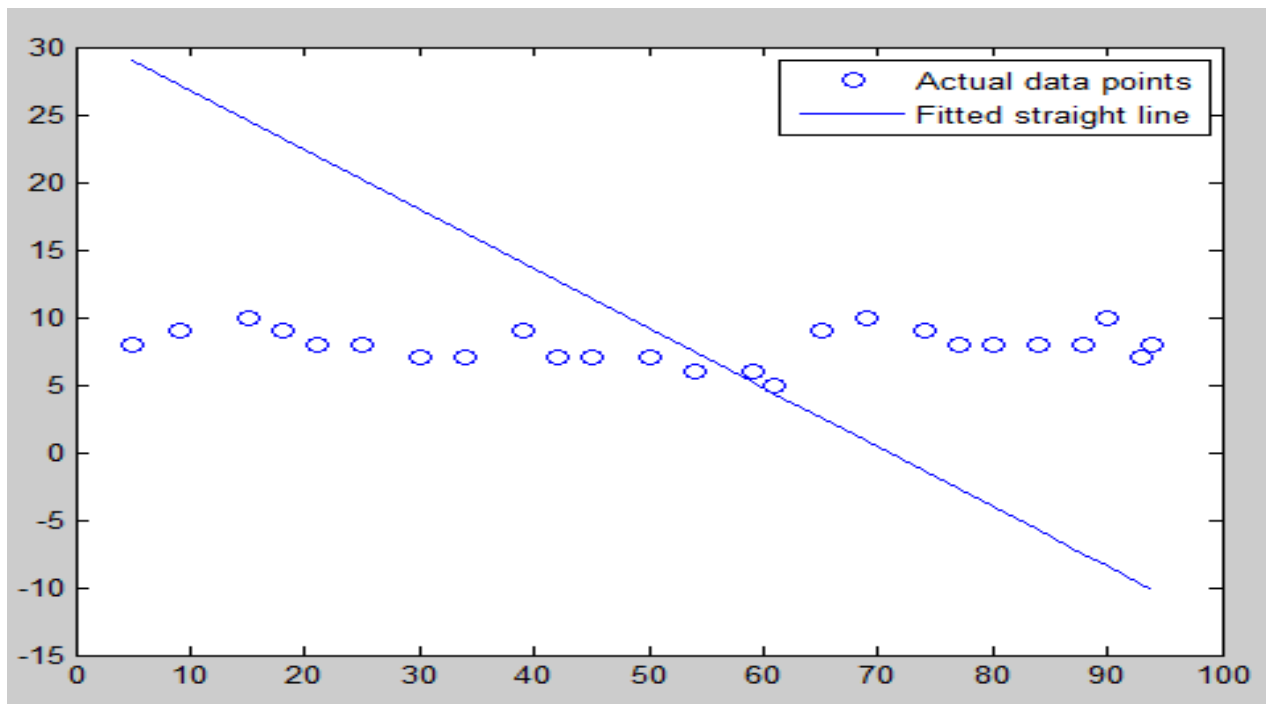


Fig 6.2.1: linear Regression graph for foreign food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for local food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

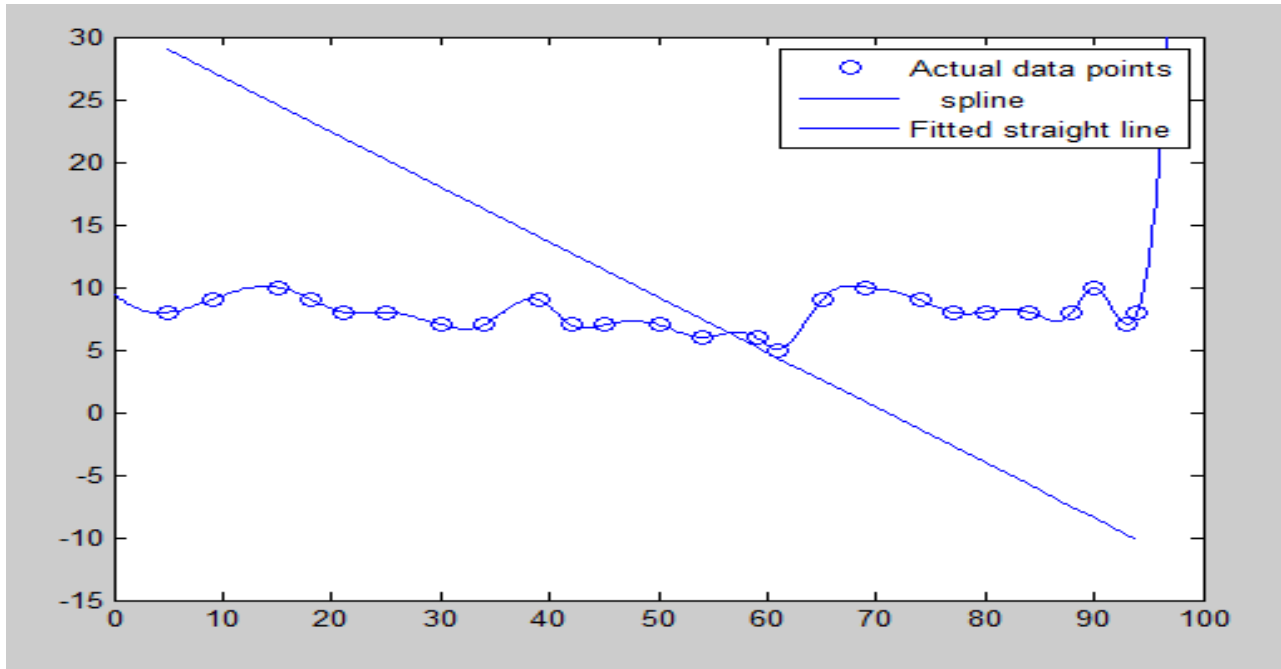


Fig 6.2.2: Spline Interpolation graph for foreign food taste ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis to see the rating pattern.

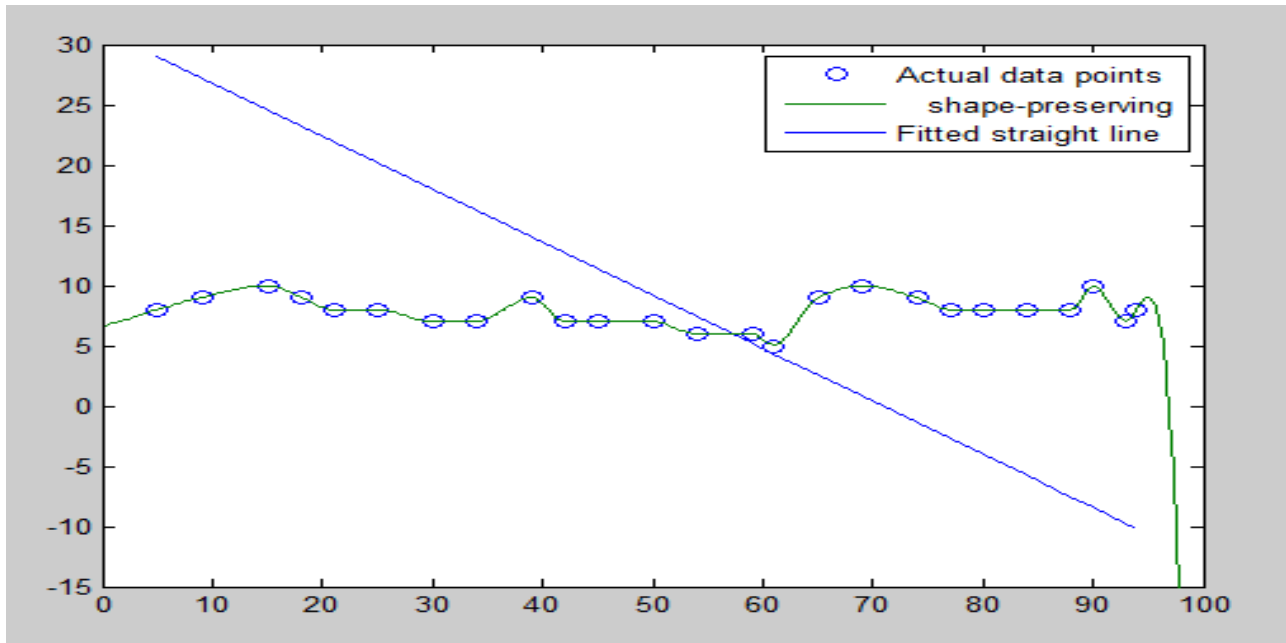


Fig 6.2.3: Shape Preserving Interpolant graph for foreign food taste ratings sample

The conclusion that we achieved is the taste ratings for foreign food is not sufficiently high and also there are many variations.

6.2.2 Price Rating Foreign Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_F P_F - \sum N_F \sum P_F}{n\sum S_F^2 - (\sum N_F)^2}$$
$$a_0 = \bar{P}_F - a_1 \bar{N}_F$$

Here n is number of samples taken for the sample graph

N_F is serial number of the item and restaurant

P_F is the taste rating of the items of restaurant

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input taste that we applied is given below. Here only three inputs are given.

Enter Data set =14

x value: 59

y value: 6

Enter Data set =15

x value: 61

y value: 7

Enter Data set =16

x value: 65

y value: 8

Enter Data set =17

x value: 69

y value: 9

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$$a_1 = -0.4502$$

$$a_0 = 31.7871$$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

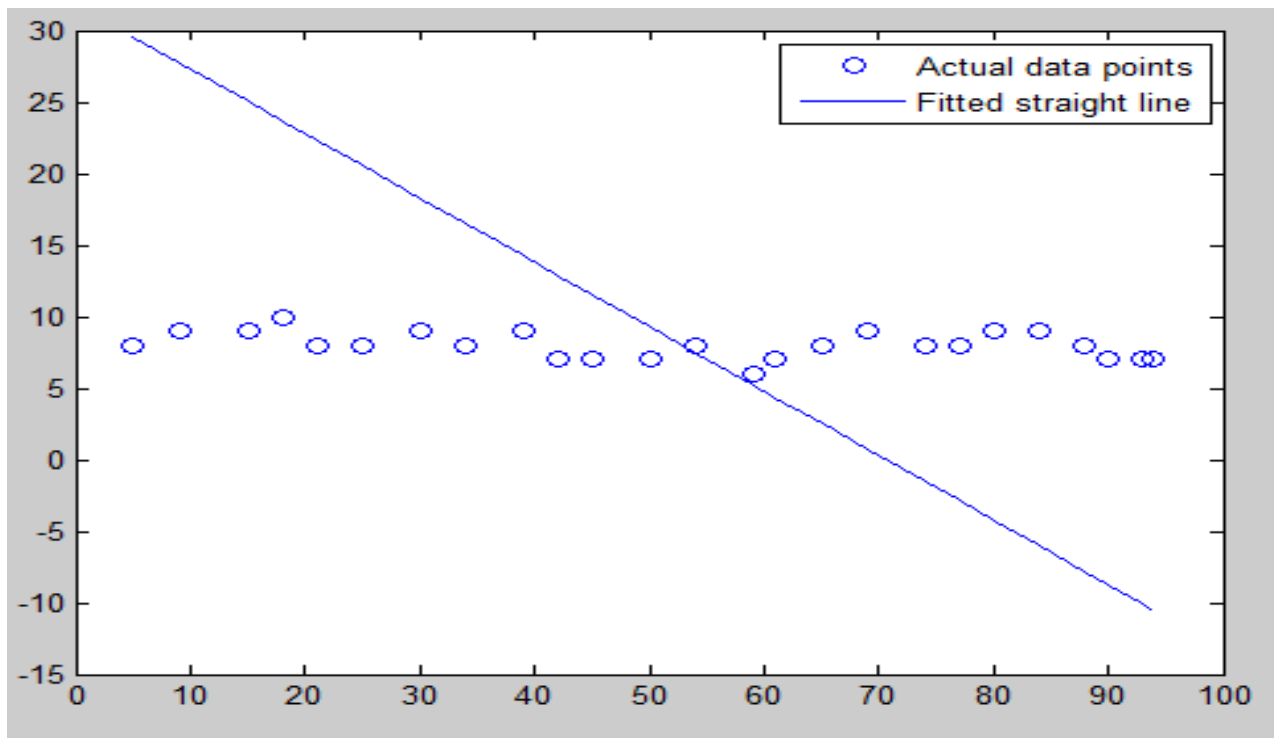


Fig 6.2.4: linear Regression graph for foreign food price ratings sample

From the graph sample, we see that the pattern of Price ratings for foreign food does not vary much for different restaurants. This also means the price range is up to a certain level

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

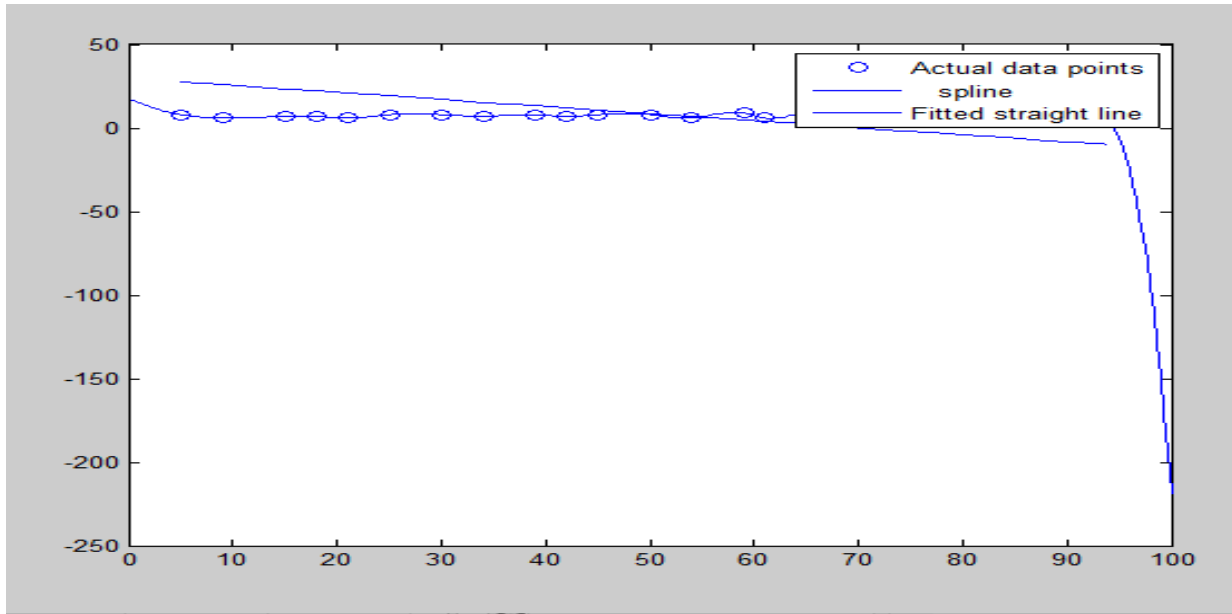


Fig 6.2.5: Spline Interpolation graph for foreign food price ratings sample

From the graph comparison of price ratings, we can see that the price range of foreign foods does not vary much from restaurant to restaurant. This indicates that the price of local foods is more or less limited to a certain range.

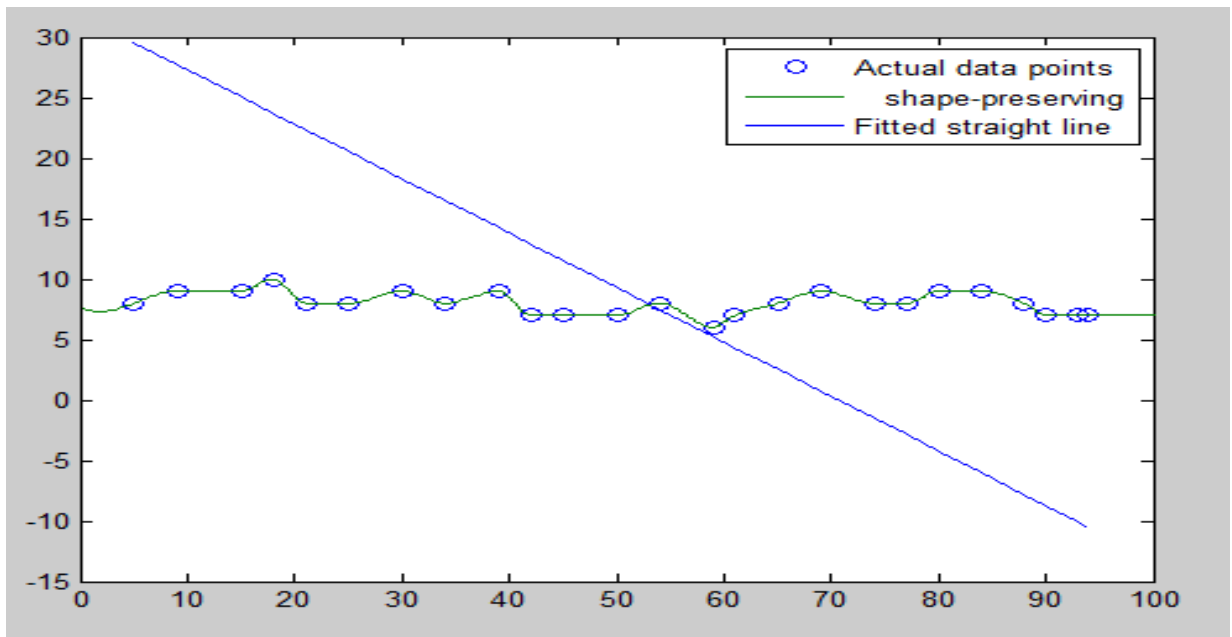


Fig 6.2.6: Shape Preserving Interpolant graph for foreign food price ratings

6.2.3 Service Rating Foreign Food

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$a_1 = \frac{n\sum N_F S_F - \sum N_F \sum S_F}{n\sum N_F^2 - (\sum N_F)^2}$$

$$a_0 = \bar{S}_F - a_1 \bar{N}_F$$

Here n is number of samples taken for the sample graph

N_F is serial number of the item and restaurant

S_F is the taste rating of the items of restaurant

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

Enter Data set =13

x value: 54

y value: 9

Enter Data set =14

x value: 59

y value: 8

Enter Data set =15

x value: 61

y value: 7

Enter Data set =16

x value: 65

y value: 4

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$$a_1 = -0.4563$$

$$a_0 = 32.2721$$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the service ratings for this particular sample is given below.

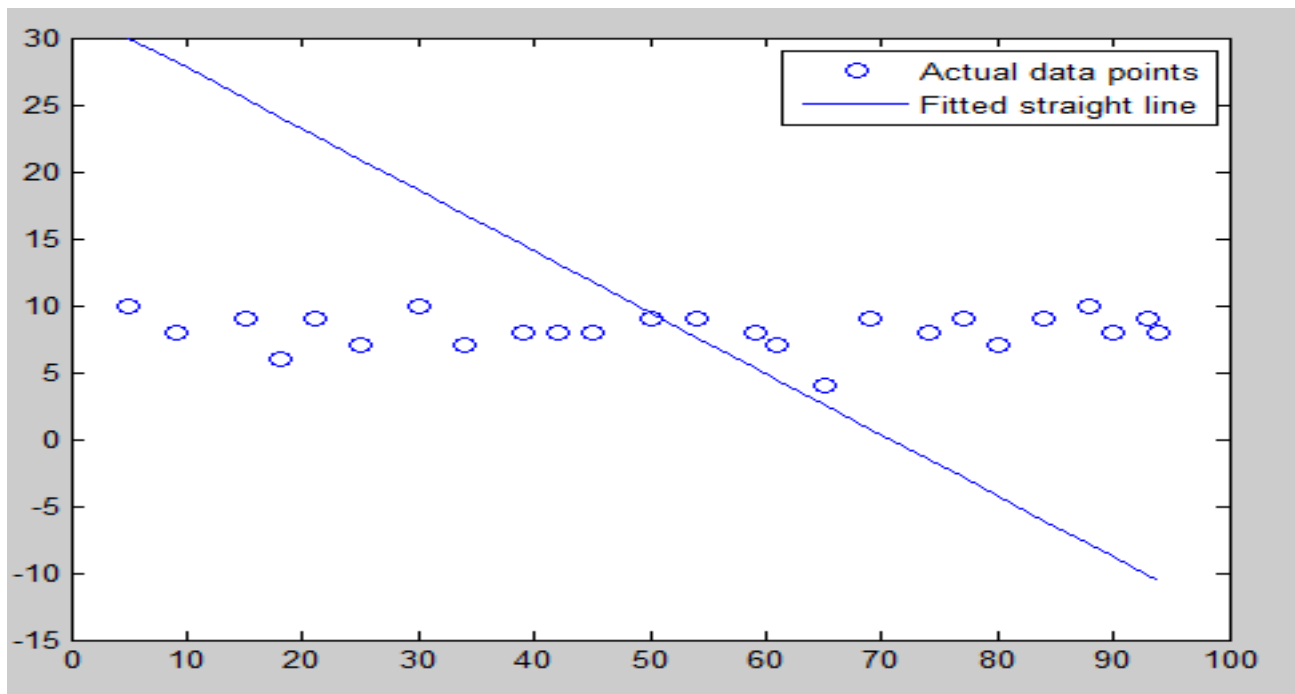


Fig 6.2.7: linear Regression graph for local food service ratings sample

From the graph sample, we see that the pattern of Service ratings for Foreign food does vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

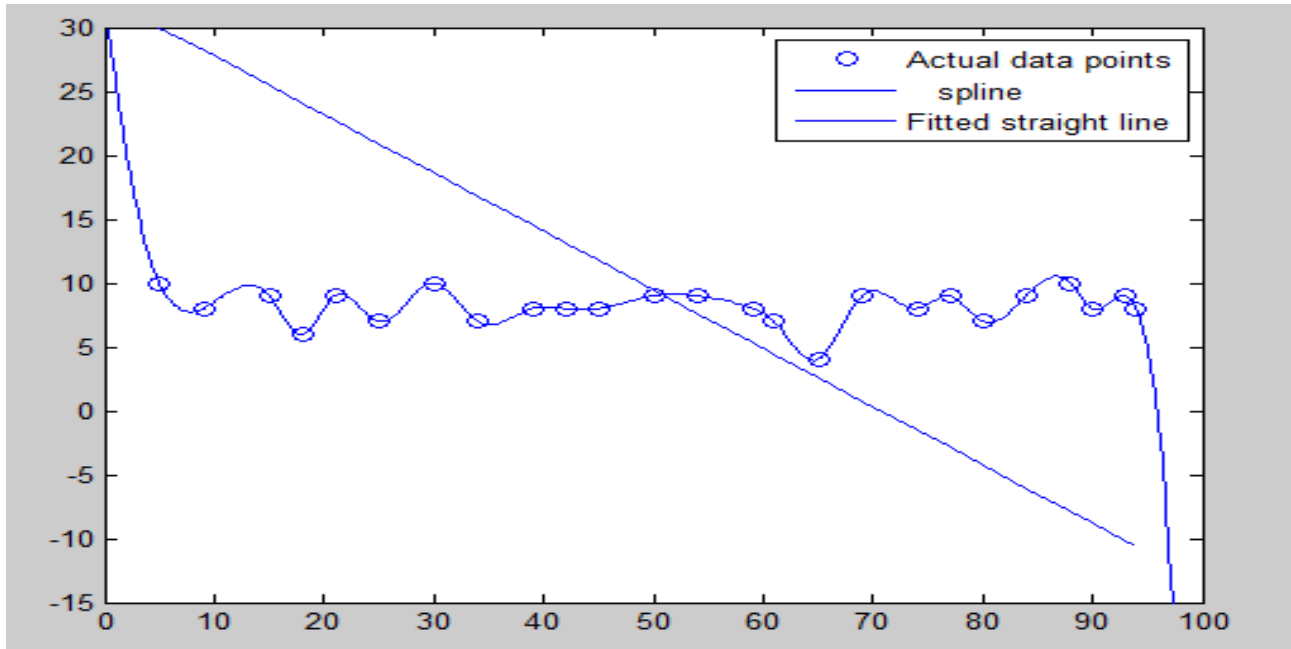


Fig 6.2.8: Spline Interpolation graph for foreign food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern on this from another algorithm

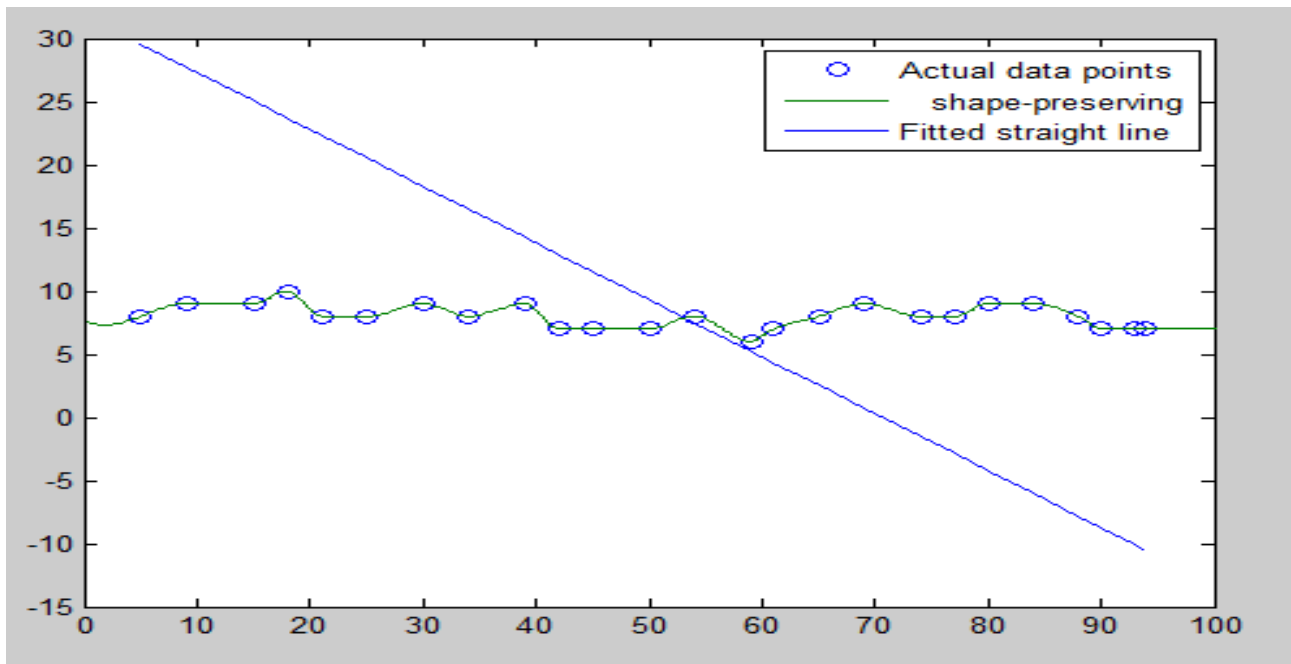


Fig 6.2.9: Shape Preserving Interpolant graph for foreign food service ratings sample

From the analysis, we can see that the service rating pattern for most of the restaurants serving is more or less high, this also means people are more satisfied with foreign food ambience.

6.3 AREA -1: DHANMONDI

We determine the food trend of Dhanmondi area depending on certain criteria. The criteria are as follows

1. Taste Ratings of Dhanmondi area restaurant
2. Price Ratings of Dhanmondi area restaurants
3. Service Ratings of Dhanmondi area restaurants

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.3.1 Taste Ratings: Dhanmondi Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_D T_D - \sum N_D \sum T_D}{n\sum N_D^2 - (\sum N_D)^2}$$
$$a_0 = \bar{T}_D - a_1 \bar{N}_D$$

Here n is number of samples taken for the sample graph

N_D is serial number of the item and restaurant

T_D is the taste rating of the items of restaurants

The graph that we got from applying linear regression for this particular sample is given next page.

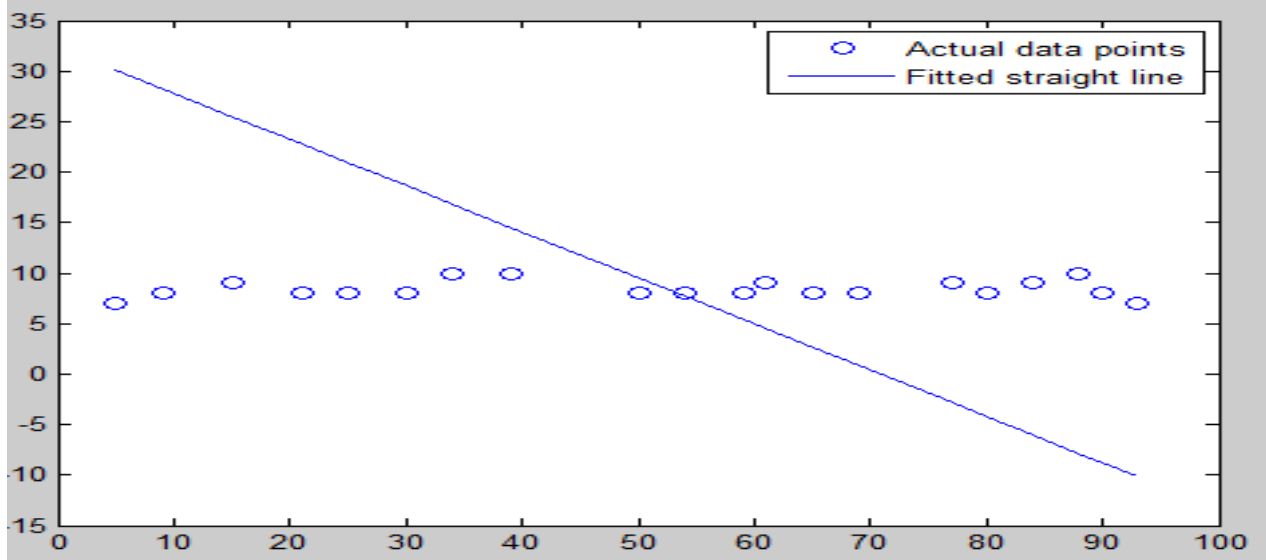


Fig 6.3.1: linear Regression graph for Dhanmondi area food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for Dhanmondi area food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

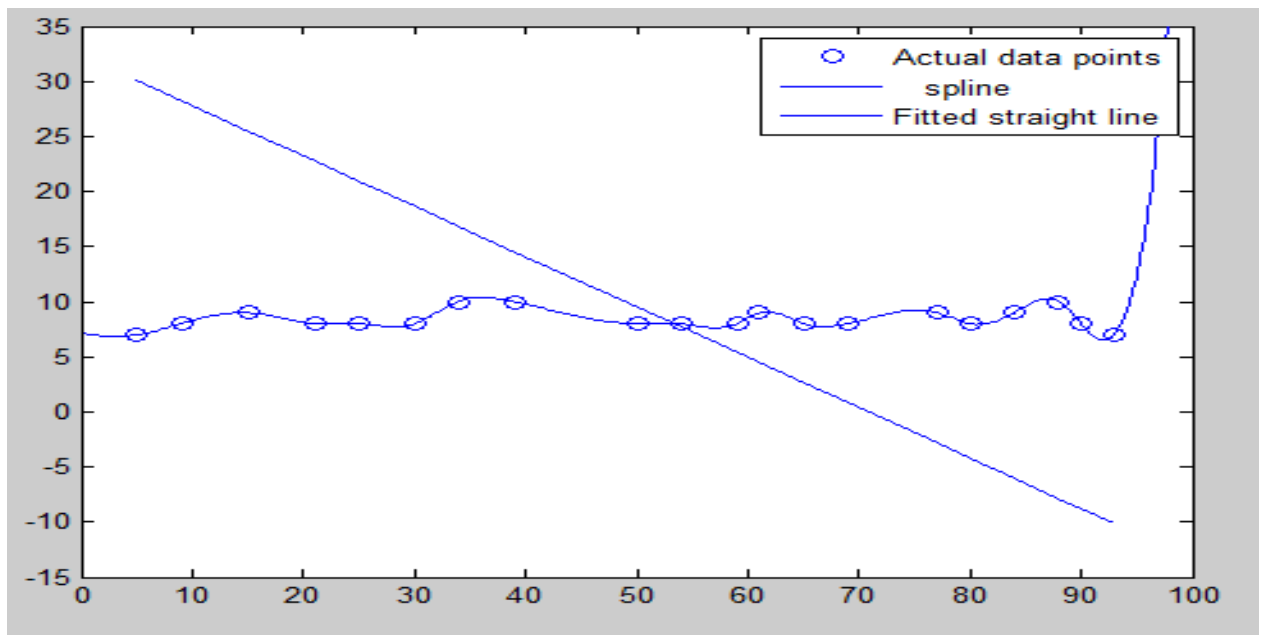


Fig 6.3.2: Spline Interpolation graph for Dhanmondi area food taste ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis.

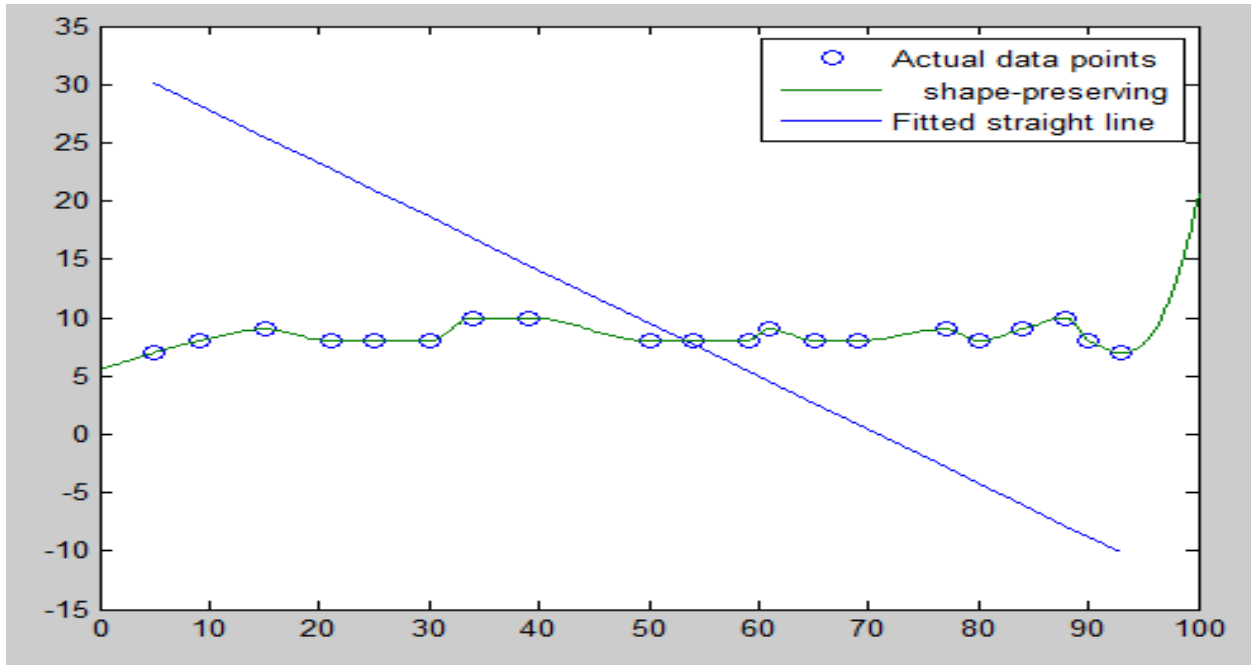


Fig 6.3.3: Shape Preserving Interpolant graph for Dhanmondi area food taste ratings sample

The conclusion that we achieved is the taste ratings for Dhanmondi area’s restaurants food is high and the rating of most restaurants are more or less similar pattern. The graph shows that the food served by the restaurants of Dhanmondi area satisfy the customers. Therefore the business strategy depends on the price they offer to the customers.

6.3.2 Price Rating: Dhanmondi Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$a_1 = \frac{n\sum N_D P_D - \sum N_D \sum P_D}{n\sum S_D^2 - (\sum N_D)^2}$$

$$a_0 = \bar{P}_D - a_1 \bar{N}_D$$

Here n is number of samples taken for the sample graph

N_D is serial number of the item and restaurant of Dhanmondi area

P_D is the price rating of the items of restaurant of Dhanmondi area

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input price that we applied is given below. Here only three inputs are given.

Enter Data set =16

x value: 80

y value: 8

Enter Data set =17

x value: 84

y value: 8

Enter Data set =18

x value: 88

y value: 7

Enter Data set =19

x value: 90

y value: 7

Enter Data set =20

x value: 93

y value: 8

y value: 10

The output of the co-efficient that we got from applying the algorithm is given below.

Here a_1 and a_0 are the coefficient that are derived from the algorithm.

$a_1 = -0.4397$

$a_0 = 31.1541$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

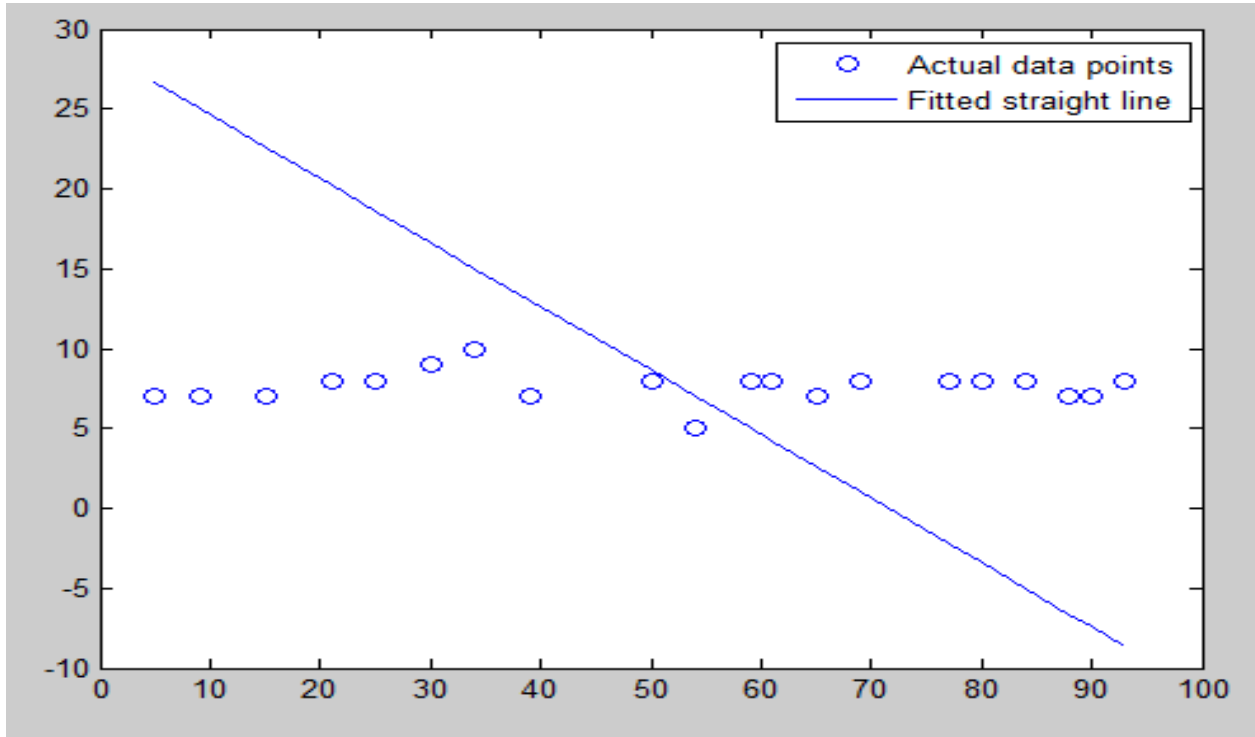


Fig 6.3.4: linear Regression graph for Dhanmondi area restaurant food price ratings sample

From the graph sample, we see that the pattern of Price ratings for Dhanmondi area restaurant food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

We then analyze the graph from spline interpolation algorithm which is given on the next page along with comparison with linear regression.

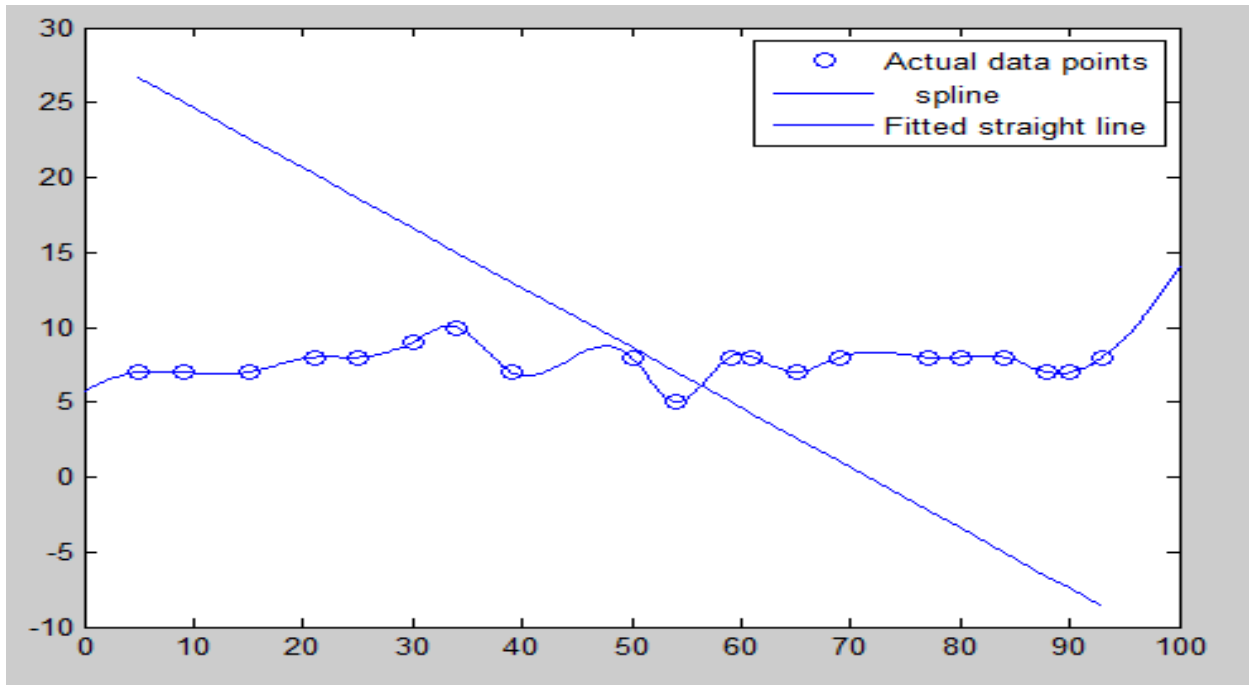


Fig 6.3.5: Spline Interpolation graph for Dhanmondi area restaurant food price ratings sample

From the graph comparison of price ratings, we can see that the price range of local foods does not vary much from restaurant to restaurant. This indicates that the price of Dhanmondi area foods are more or less limited to a certain range. We will now analyze using shape preserving interpolant through which we can see how the graph behaves as progresses preserving the shape of the graph.

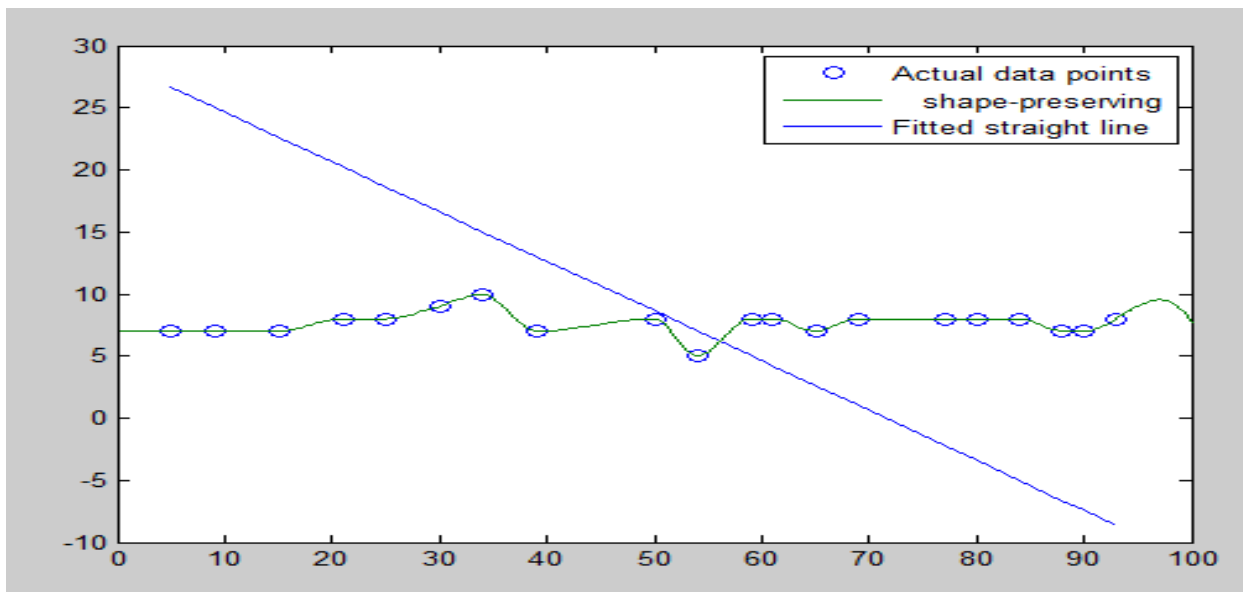


Fig 6.3.6: Shape Preserving Interpolant graph for Dhanmondi area restaurant food price ratings sample

From the analysis, we find that most of the ratings are more or less similar and the curve has similarities with the curve generated from spline. Applying linear regression graph does not serve much in case of detecting pattern.

We do not see much similarities between the graphs of taste rating and price ratings of foods of the Dhanmondi region. We see that the taste ratings are high whereas the price ratings varied much.

6.3.3 Service Rating: Dhanmondi Area Restaurants

We have already seen the taste ratings and price ratings, so the only thing that we are left with is the service rating graph of DhanonDI area. We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$d_1 = \frac{n\sum N_D S_D - \sum N_D \sum S_D}{n\sum N_D^2 - (\sum N_D)^2}$$

$$d_0 = \bar{S}_D - a_i \bar{N}_D$$

Here n is number of samples taken for the sample graph

N_D is serial number of the item and restaurant

S_D is the service rating of the items of restaurant

Applying the linear regression algorithm initially we will look for a pattern. We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

Enter Data set =11

x value: 59

y value: 6

Enter Data set =12

x value: 61, y value: 5

Enter Data set =13

x value: 65

y value: 8

Enter Data set =14

x value: 69

y value: 10

Enter Data set =15

x value: 77

y value: 7

The output of the co-efficient that we got from applying the algorithm is given below. Here $d1$ and $d0$ are the coefficient that are derived from the algorithm.

$d1 = -0.4249$

$d0 = 30.3665$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant..

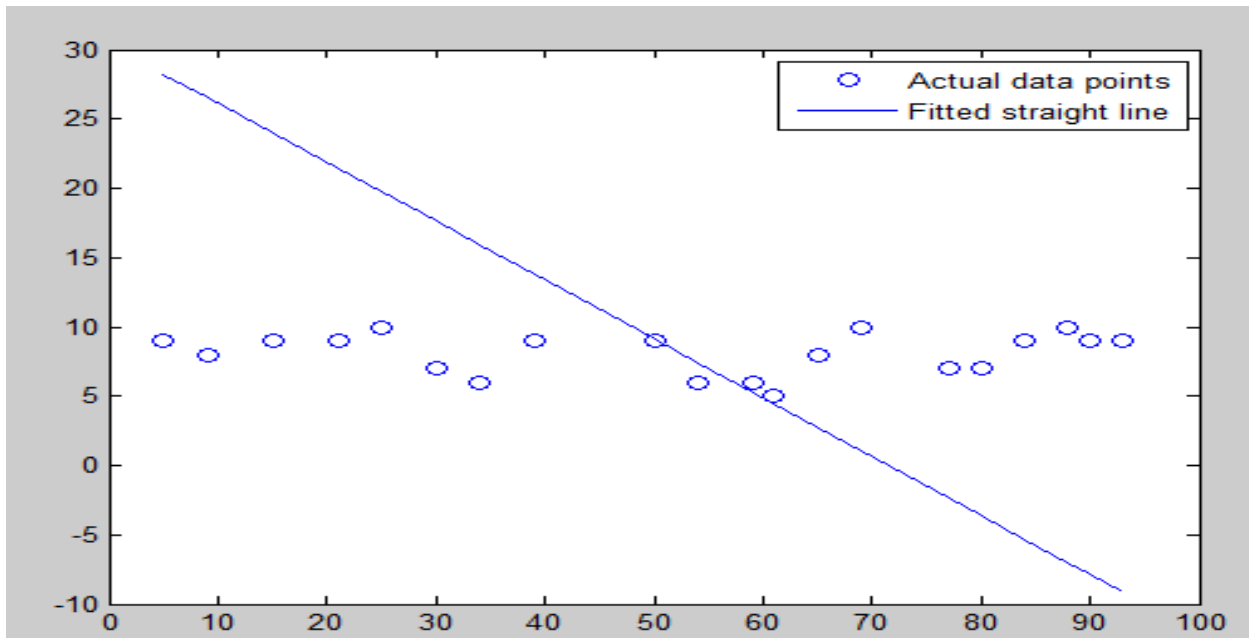


Fig 6.3.7: linear Regression graph for Dhanmondi area restaurant food service ratings sample

From the graph sample, we see that the pattern of Service ratings for Dhanmondi food does vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

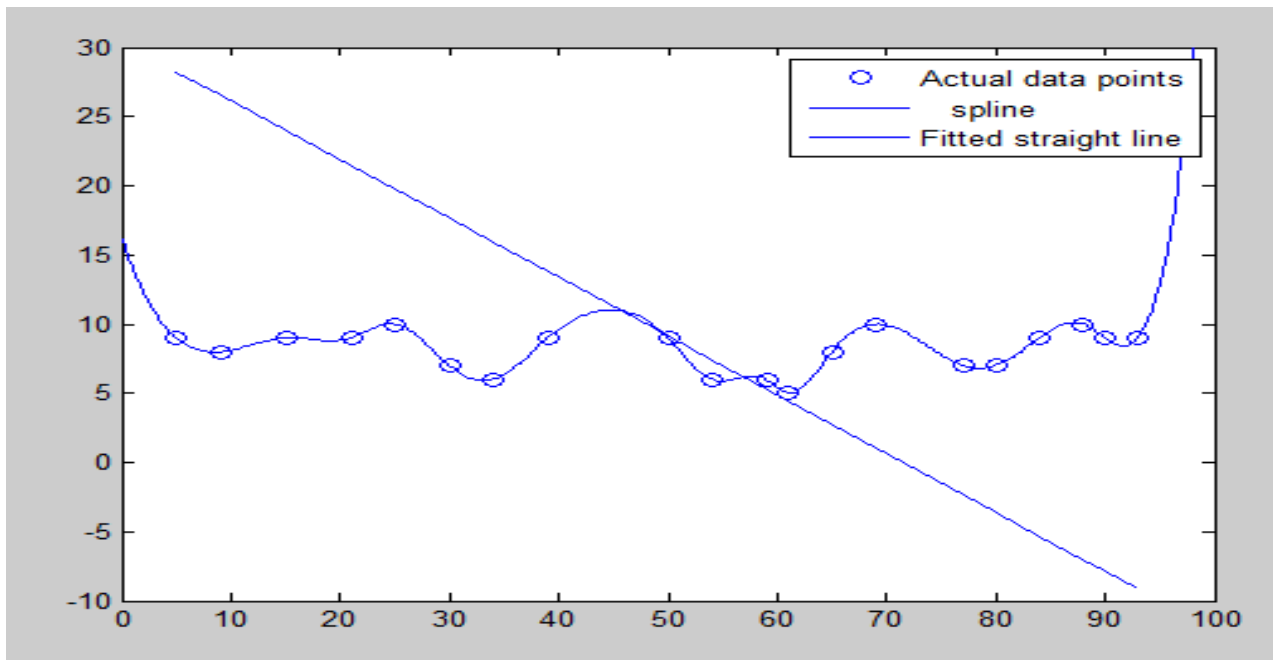


Fig 6.3.8: Spline Interpolation graph for Dhanmondi area restaurant food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern on this from another algorithm.

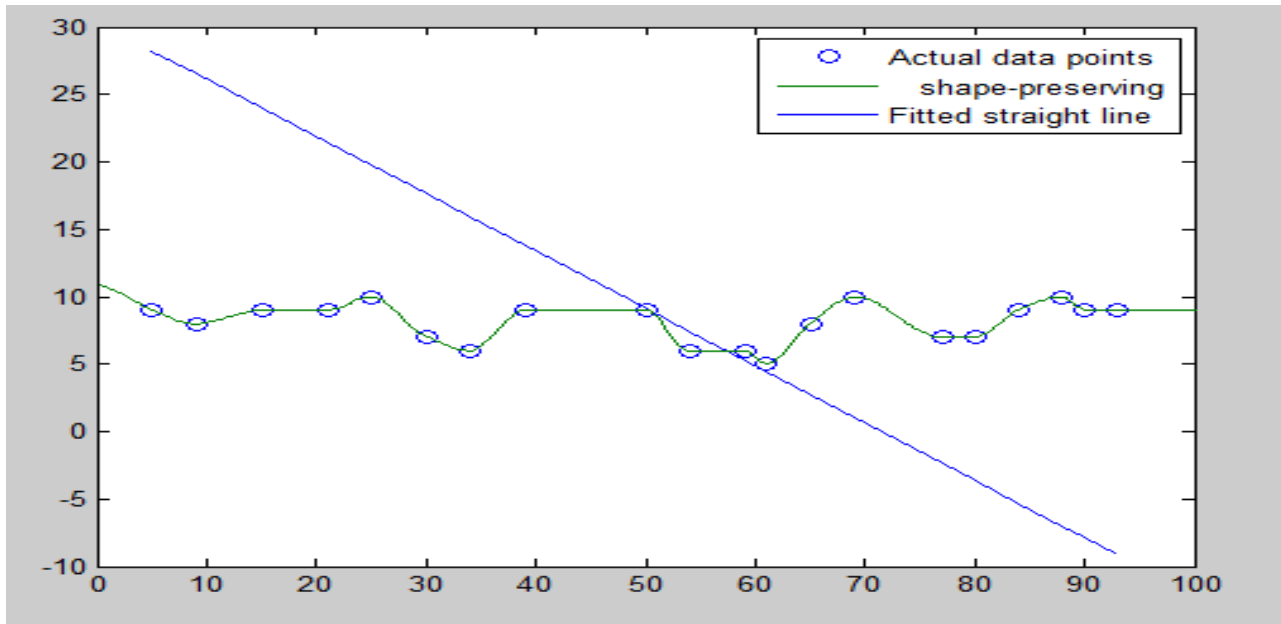


Fig 6.3.9: Shape Preserving Interpolant graph for Dhanmondi area restaurant food service ratings sample

From the analysis, we can see that the service rating pattern for most of the restaurants in Dhanmondi region is much fluctuating, this also means people are averagely satisfied with Dhanmondi region restaurants service.

We can see from the graphs of taste ratings, price ratings and service ratings of Dhanmondi region that the taste rating is more or less consistent as compared to the price and service ratings. This means that people find the taste of food served by the restaurants more or less of same quality but the price varies unlike the taste rating. This also indicates that the price of food as charged by the restaurants of Dhanmondi region directly affects the quality of service they provide.

6.4 AREA -3: BANANI And GULSHAN

We determine the food trend of Banani and Gulshan area depending on certain criteria. The criteria are as follows

1. Taste Ratings of Banani and Gulshan area restaurants
2. Price Ratings of Banani and Gulshan area restaurants
3. Service Ratings of Banani and Gulshan area restaurants

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.4.1 Taste Ratings: Banani and Gulshan Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$b_1 = \frac{n\sum N_B T_B - \sum N_B \sum T_B}{n\sum N_B^2 - (\sum N_B)^2}$$

$$b_0 = \bar{T}_B - a_i \bar{N}_B$$

Here n is number of samples taken for the sample graph

N_B is serial number of the item and restaurant

T_B is the taste rating of the items of restaurants

We see a small portion of the some sample data input for taste ratings.

Enter Data set =3

N_B value: 15

T_B value: 8

Enter Data set =4

N_B value: 18

T_B value: 9

Enter Data set =5

N_B value: 21

T_B value: 8

Enter Data set =6

N_B value: 25

T_B value: 8

The output of the co-efficient that we got from applying the algorithm is given below.

Here b_1 and b_0 are the coefficient that are derived from the algorithm.

$b_1 = -0.5004$

$b_0 = 30.2678$

The graph that we got from applying linear regression for this particular sample is given below.

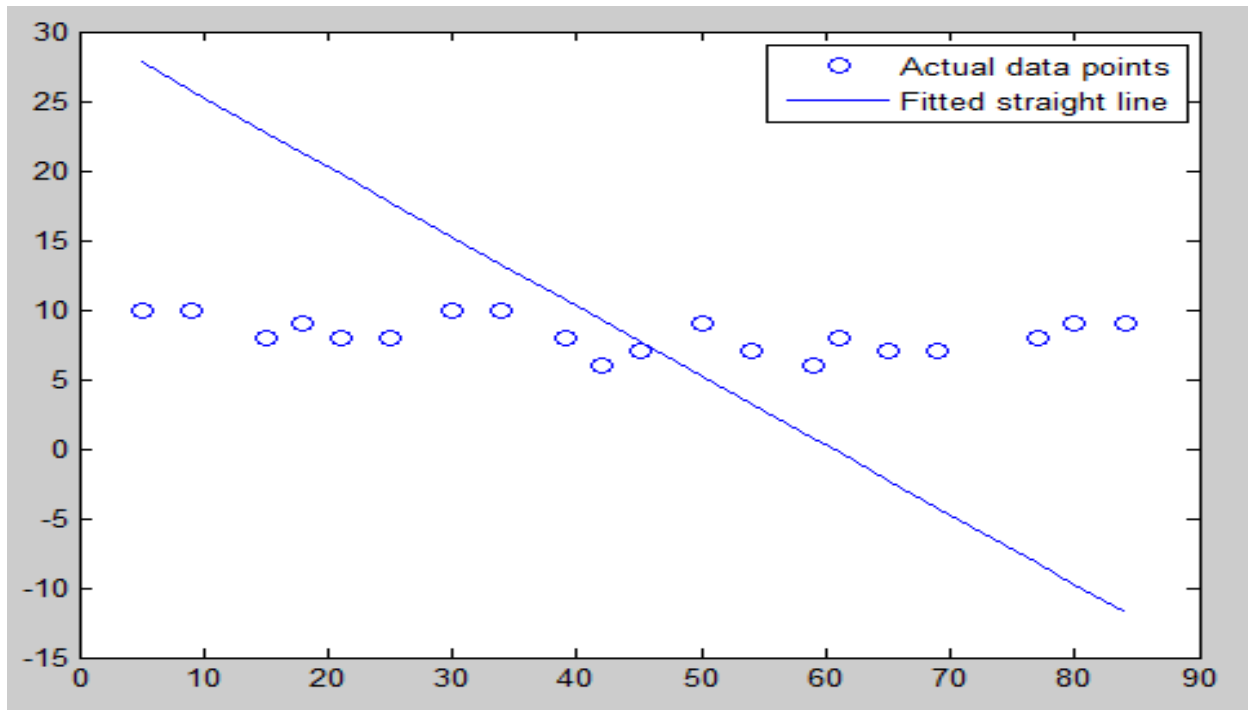


Fig 6.4.1: linear Regression graph for Banani and Gulshan area food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for Banani and Gulshan area food does vary much for different restaurants.

Therefore, the taste or quality of food has varied in Banani and Gulshan area.

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

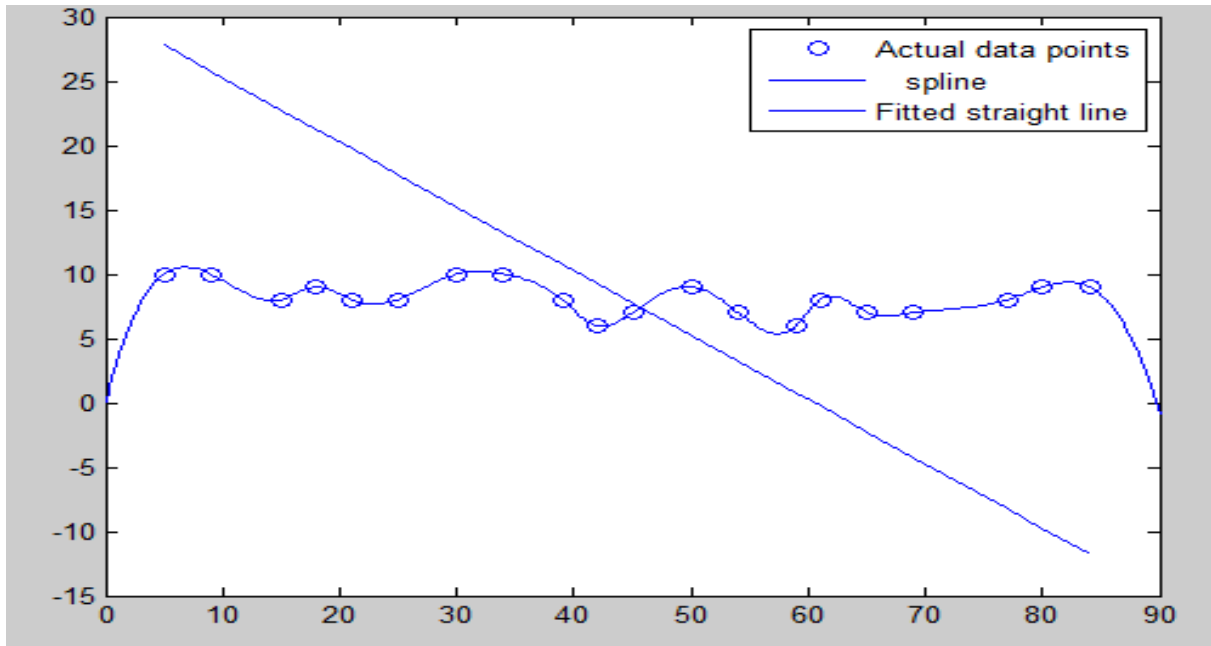


Fig 6.4.2: Spline Interpolation graph for Banani and Gulshan area food taste ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis.

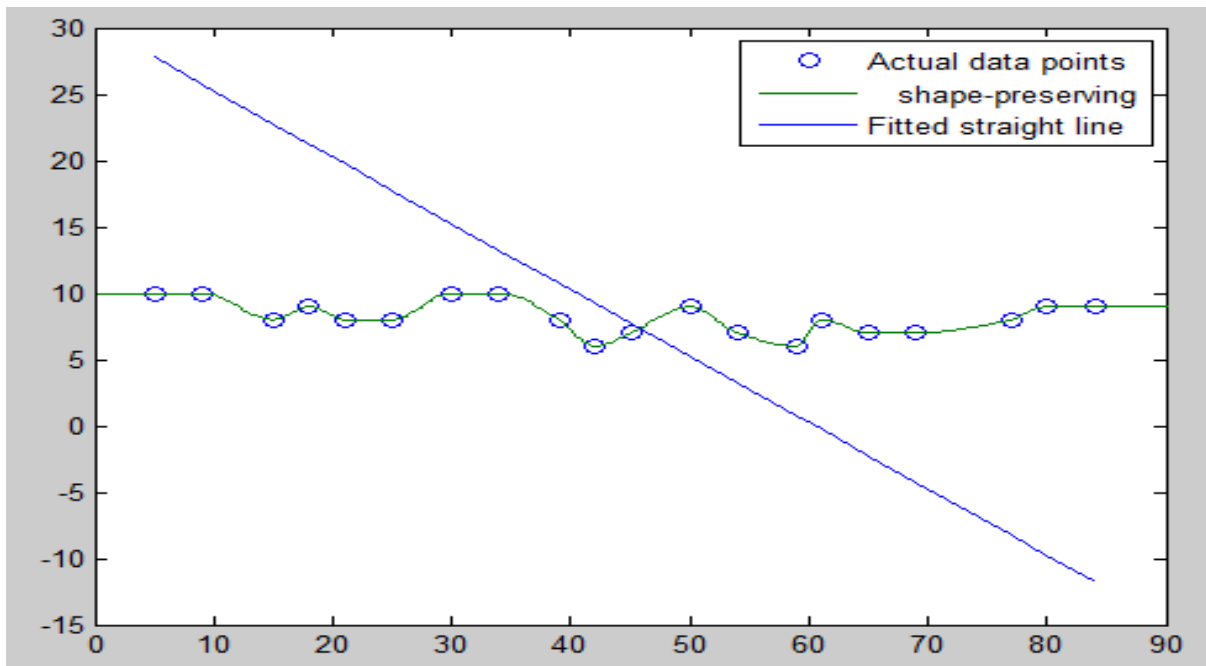


Fig 6.4.3: Shape Preserving Interpolant graph for Banani and Gulshan area food taste ratings sample

The conclusion that we achieved is the taste ratings for Banani and Gulshan area's restaurants food is high and the rating of most restaurants are more or less similar pattern. The graph shows that the food served by the restaurants of Banani and Gulshan area satisfy the customers. Therefore the business strategy depends on the price they offer to the customers.

6.4.2 Price Rating: Banani and Gulshan Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$b_1 = \frac{n\sum N_B P_B - \sum N_B \sum P_B}{n\sum S_B^2 - (\sum N_B)^2}$$

$$b_0 = \bar{P}_B - a_i \bar{N}_B$$

Here n is number of samples taken for the sample graph

N_B is serial number of the item and restaurant of Dhanmondi area

P_B is the price rating of the items of restaurant of Dhanmondi area

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input price that we applied is given below. Here only three inputs are given.

Enter Data set =8

N_B value: 30

P_B value: 8

Enter Data set =9

N_B value: 34

P_B value: 8

Enter Data set =10

N_B value: 39

P_B value: 8

Enter Data set =11

N_B value: 42

P_B value: 6

Enter Data set =14

N_B value: 54

P_B value: 7

The output of the co-efficient that we got from applying the algorithm is given below.

Here b_1 and b_0 are the coefficient that are derived from the algorithm.

$b_1 = -0.4719$

$b_0 = 27.4355$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

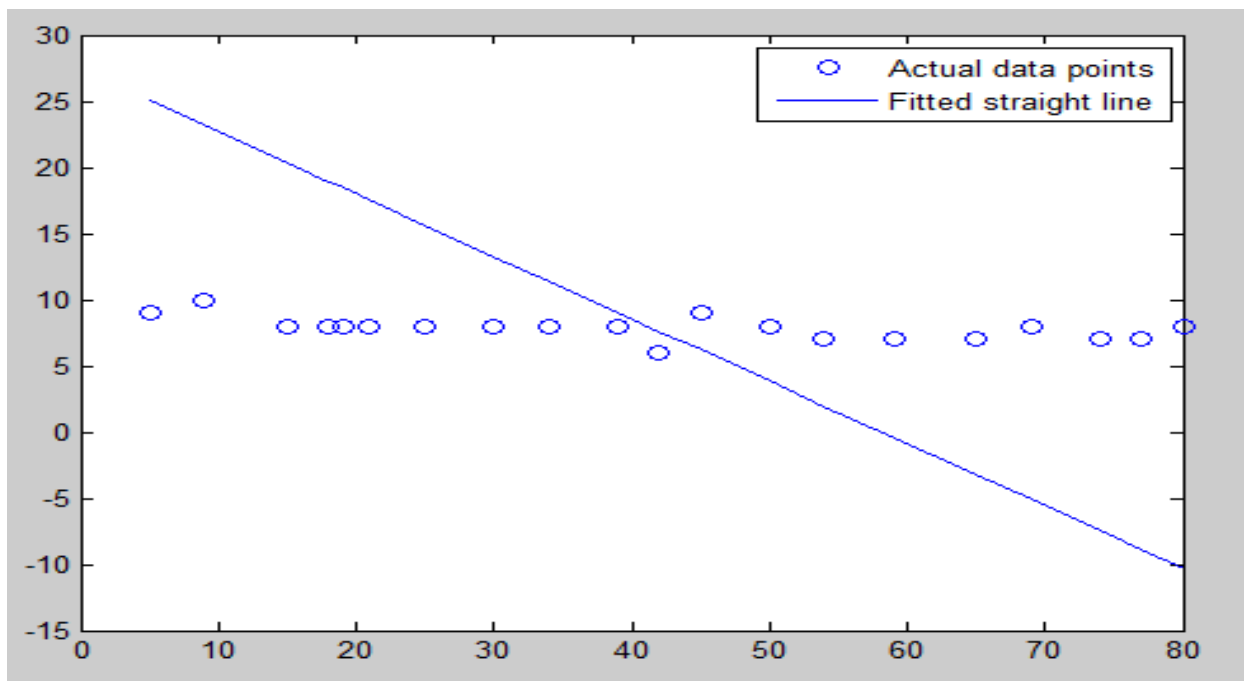


Fig 6.4.4: linear Regression graph for Dhanmondi area restaurant food price ratings sample

We see most of the ratings are more or less of the same level. Therefore, we need to apply other algorithms on this sample to clarify the patter of price ratings for this region.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

We then analyze the graph from spline interpolation algorithm which is given on the next page along with comparison with linear regression.

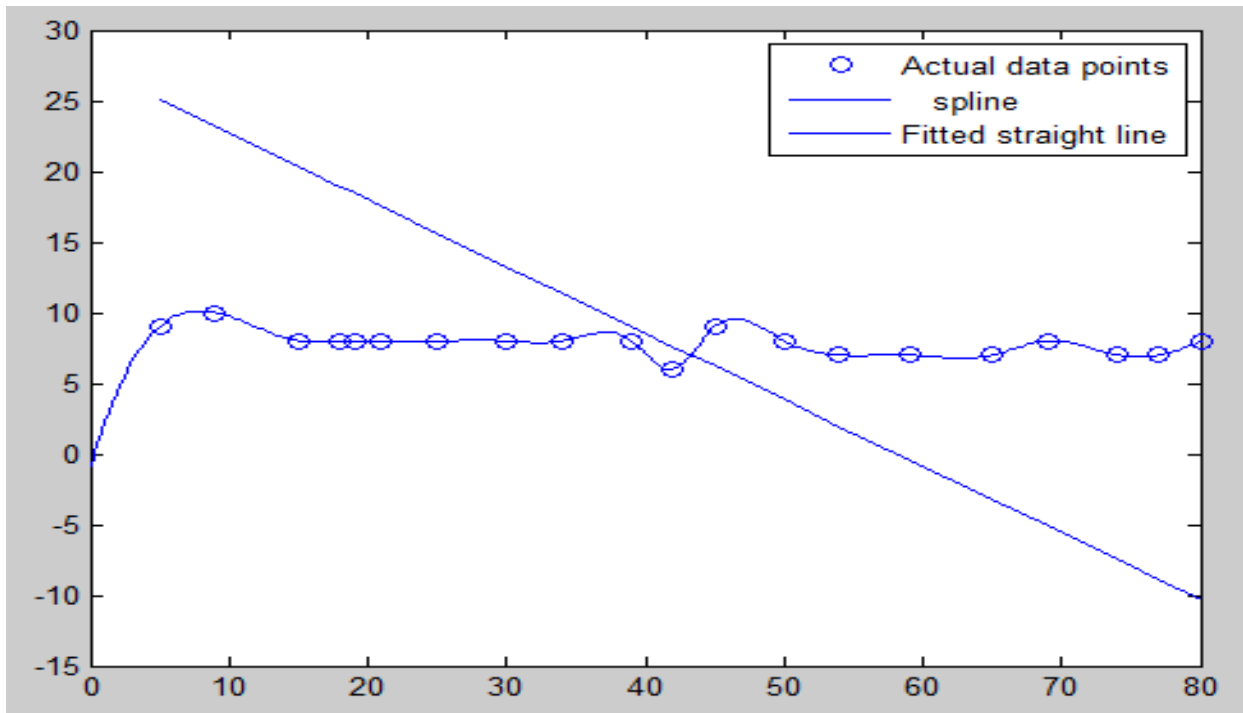


Fig 6.4.5: Spline Interpolation graph for Banani and Gulshan area restaurant food price ratings sample

From the graph comparison of price ratings, we can see that the price range of Banani and Gulshan area foods does not vary much from restaurant to restaurant. This indicates that the price of Banani and Gulshan area foods are more or less limited to a certain range.

We will now analyze using shape preserving interpolant through which we can see how the graph behaves as progresses preserving the shape of the actual graph.

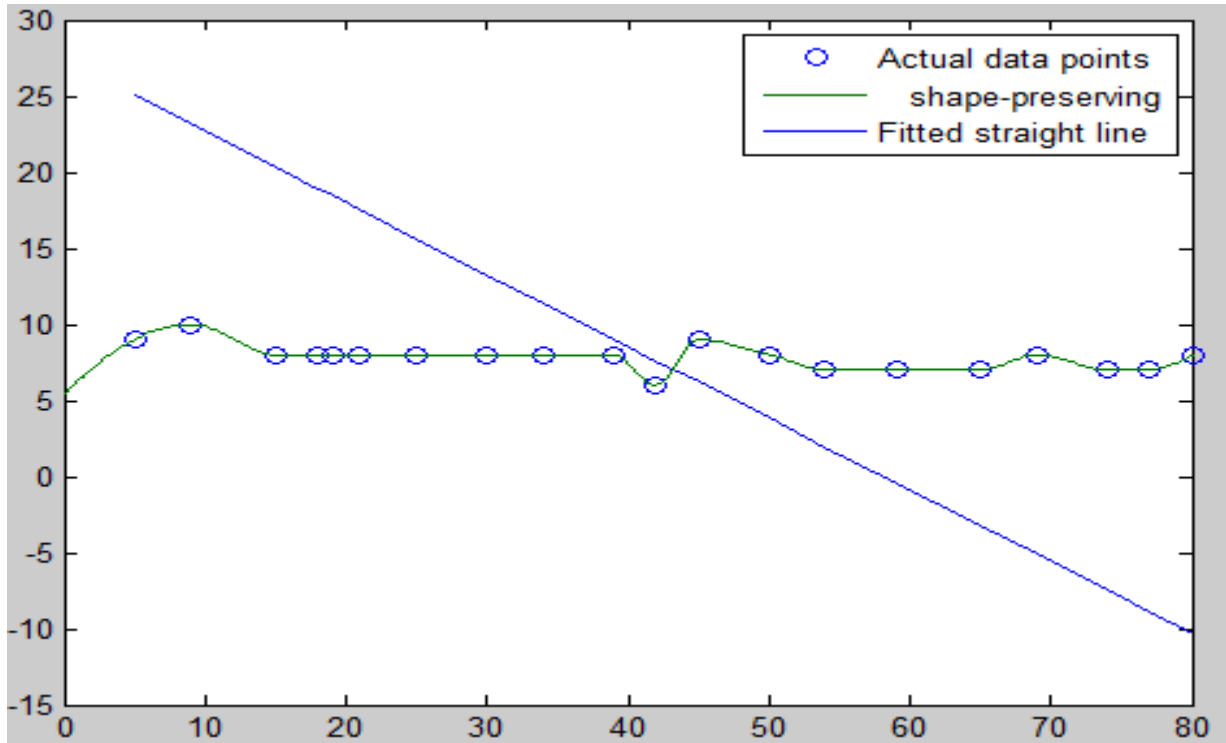


Fig 6.4.6: Shape Preserving Interpolant graph for Banani and Gulshan area restaurant food price ratings sample

From the analysis, we find that most of the ratings are more or less similar and the curve has similarities with the curve generated from spline. Applying linear regression graph does not serve much in case of detecting pattern.

We do not see much similarities between the graphs of taste rating and price ratings of foods of the Dhanmondi region. We see that the taste ratings are high whereas the price ratings varied much.

6.4.3 Service Rating: Banani and Gulshan Area Restaurants

We have already seen the taste ratings and price ratings, so the only thing that we are left with is the service rating graph of Banani and Gulshan area. We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$b_1 = \frac{n\sum N_B S_B - \sum N_B \sum S_B}{n\sum N_B^2 - (\sum N_B)^2}$$

$$b_0 = \bar{S}_B - a_i \bar{N}_B$$

Here n is number of samples taken for the sample graph

N_B is serial number of the item and restaurant

S_B is the service rating of the items of restaurant

Applying the linear regression algorithm initially we will look for a pattern. We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

Enter Data set =8

x value: 34

y value: 9

Enter Data set =9

x value: 39

y value: 8

Enter Data set =10

x value: 45,

y value: 8

x value: 50

y value: 9

Enter Data set =12

x value: 54

y value: 9

The output of the co-efficient that we got from applying the algorithm is given below. Here $d1$ and $d0$ are the coefficient that are derived from the algorithm.

$d1 = -0.4891$

$d0 = 30.7011$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the service ratings for this particular sample is given below.

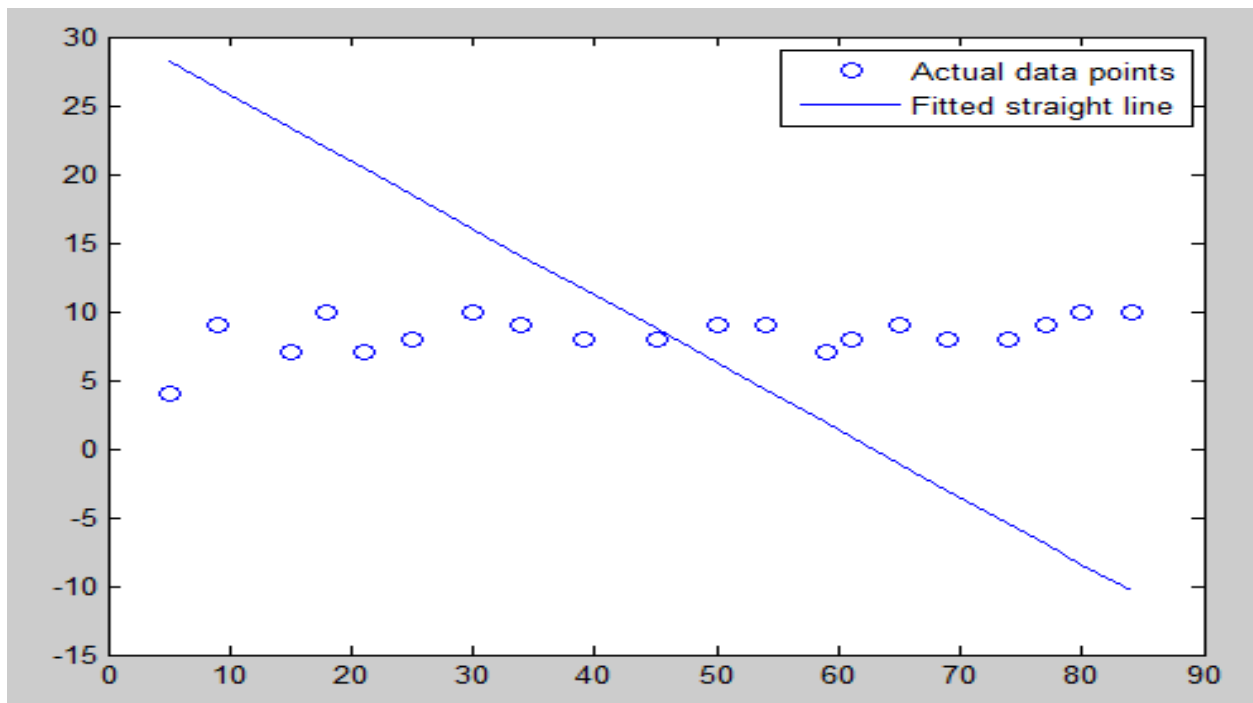


Fig 6.4.7: linear Regression graph for Banani and Gulshan area restaurant food service ratings sample

From the graph sample, we see that the pattern of Service ratings for Dhanmondi food does vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

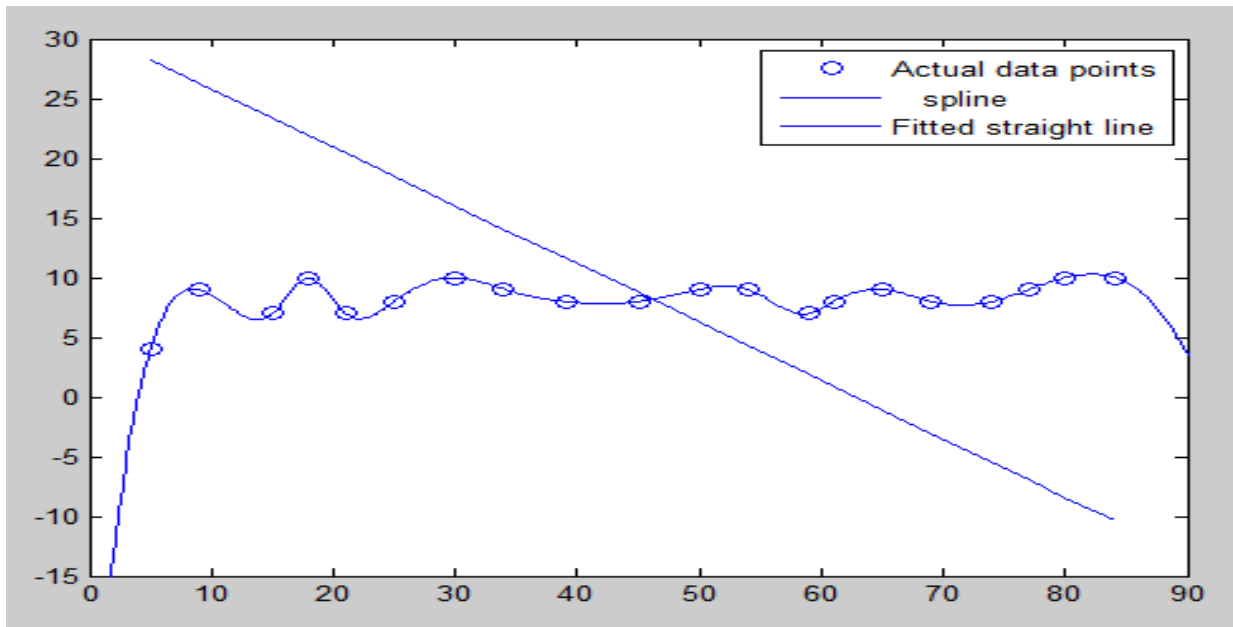


Fig 6.4.8: Spline Interpolation graph for Banani and Gulshan area restaurant food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern.

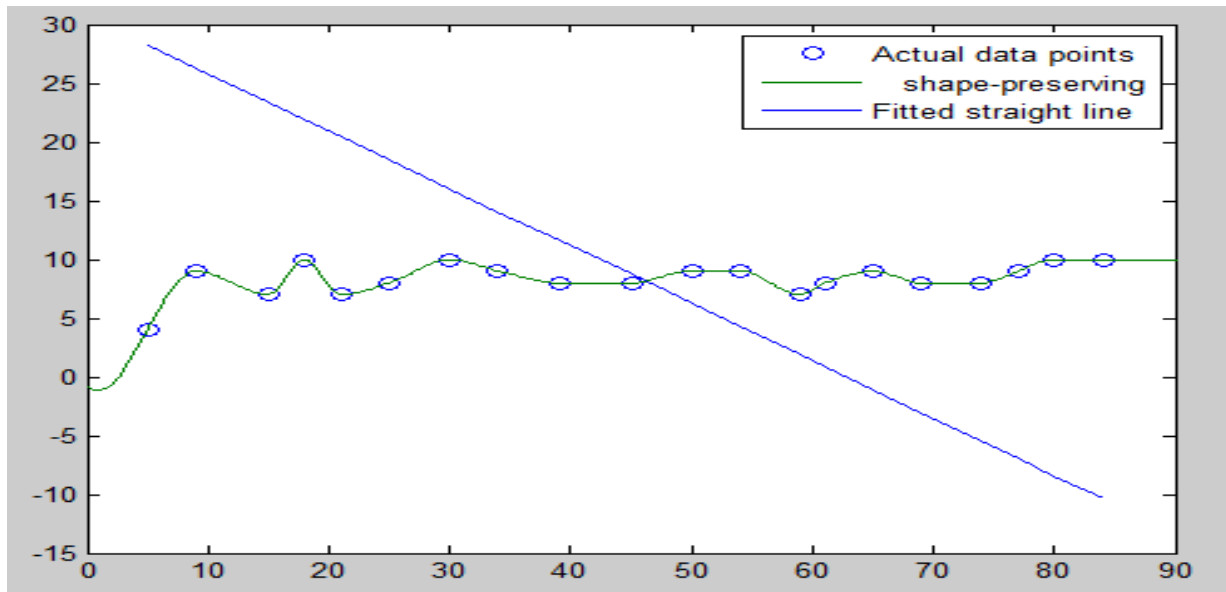


Fig 6.4.9: Shape Preserving Interpolant graph for Banani and Gulshan area restaurant food service ratings

From the analysis, we can see that the service rating pattern for most of the restaurants in Banani and Gulshan region is much fluctuating, this also means people are averagely satisfied with Banani and Gulshan region restaurants service.

We can see from the graphs of taste ratings, price ratings and service ratings of Banani and Gulshan region that the taste rating is inconsistent as compared to the price and service ratings. This means that people find the taste of food served by the restaurants of different quality but the price does not differ unlike the taste rating. However the service rating is high as compared to Khilgaon and Dhanmondi area.

6.5 AREA -1: KHILGAON

We determine the food trend of Khilgaon area depending on the following criteria:

1. Taste Ratings of Khilgaon area restaurants
2. Price Ratings of Khilgaon area restaurants
3. Service Ratings of Khilgaon area restaurants

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.5.1 Taste Ratings: Khilgaon Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$k_1 = \frac{n\sum N_K T_K - \sum N_K \sum T_K}{n\sum N_K^2 - (\sum N_K)^2}$$

$$k_0 = \bar{T}_K - a_i \bar{N}_K$$

Here n is number of samples taken for the sample graph

N_K is the serial number of the items and restaurants

T_K is the taste rating of the items of restaurants

A sample of the input price that we applied is given below. Here only three inputs are given.

Enter Data set =17

N_K value: 84

T_K value: 10

Enter Data set =18

N_K value: 88

T_K value: 9

Enter Data set =19

N_K value: 90

T_K value: 8

Enter Data set =20

N_K value: 93

T_K value: 8

The output of the co-efficient that we got from applying the algorithm is given below.

Here k_1 and k_0 are the coefficient that are derived from the algorithm.

$k_1 = -0.4545$

$k_0 = 32.2668$

The graph that we got from applying linear regression for this particular sample of taste ratings of foods of Khilgaon area restaurants is given below.

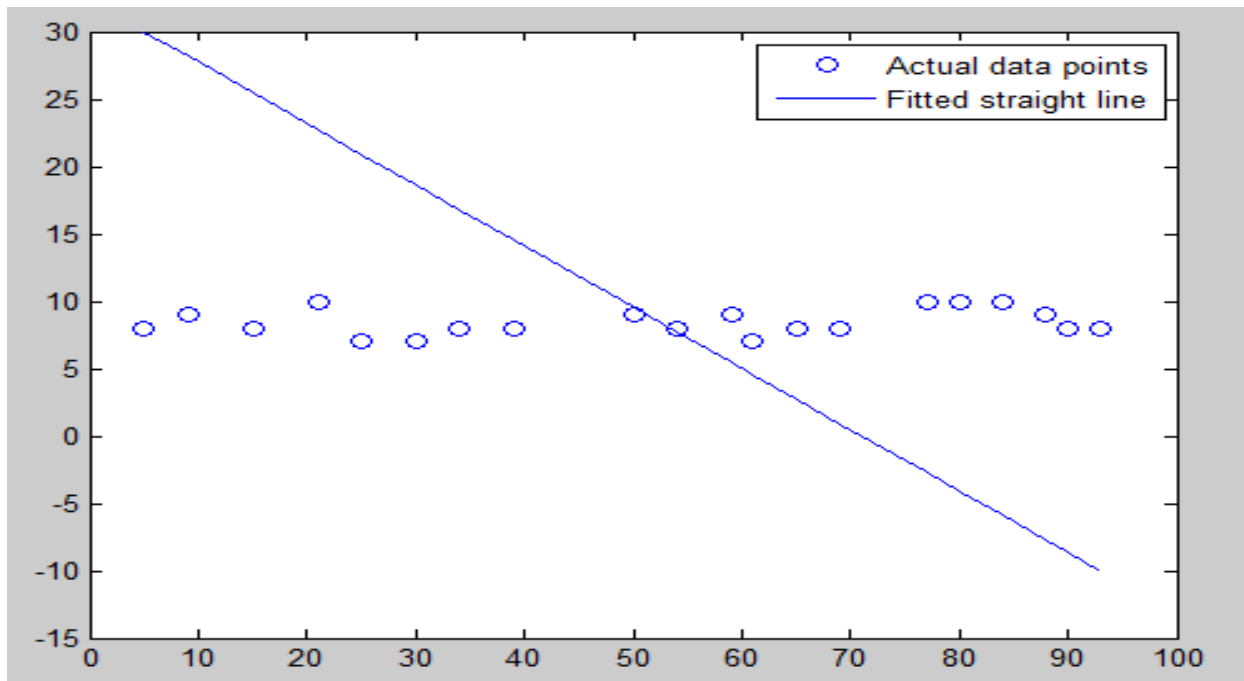


Fig 6.5.1: linear Regression graph for Khilgaon area food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for Dhanmondi area food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms. The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

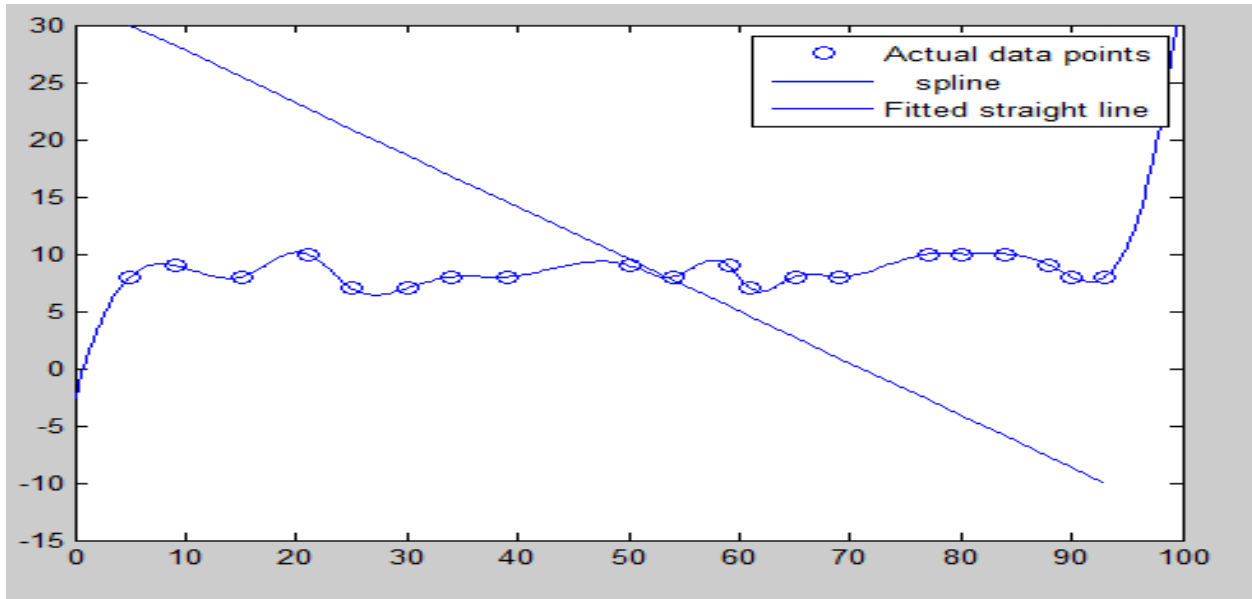


Fig 6.5.2: Spline Interpolation graph for Khilgaon area food taste ratings sample

From spline interpolation, we see the graph is not consistent at many portions. We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis.

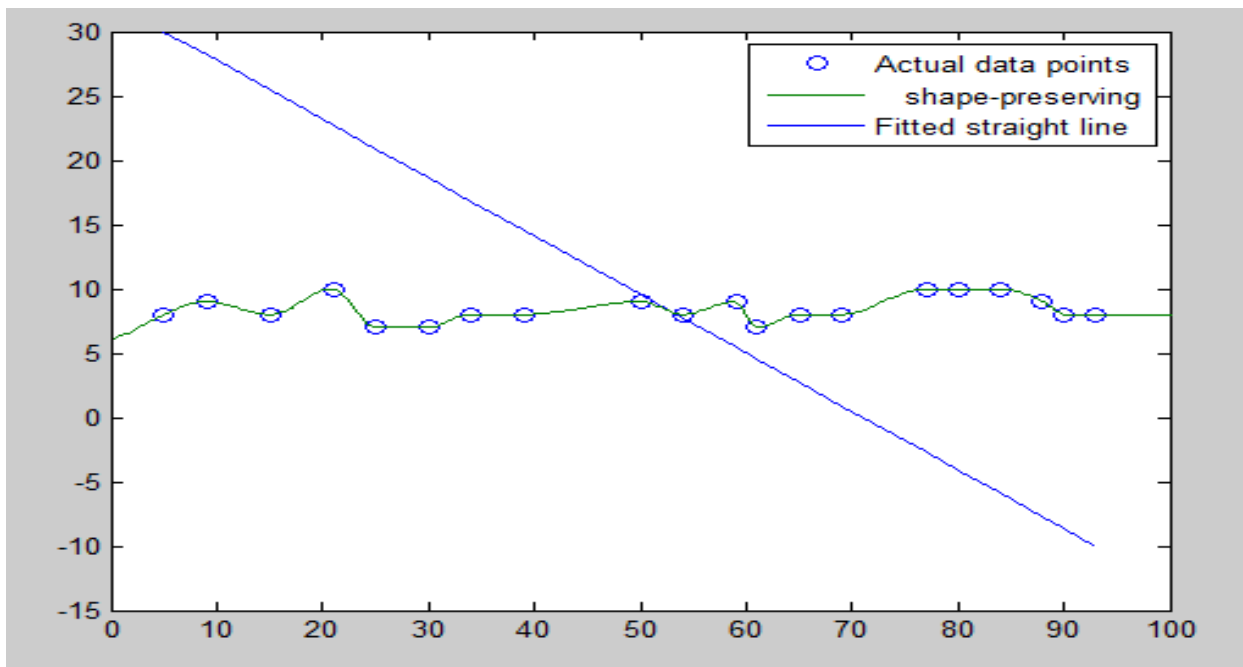


Fig 6.5.3: Shape Preserving Interpolant graph for Khilgaon area food taste ratings sample

The conclusion that we achieved is the taste ratings for Khilgaon area's restaurants food is very fluctuating and the ratings vary for many samples of the same restaurants. The graph shows that the foods served by the restaurants of Khilgaon area have mixed reviews. This is very unlike as compared to the taste ratings of Dhanmondi area where the taste ratings were of similar pattern.

6.5.2 Price Rating: Khilgaon Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$k_1 = \frac{n\sum N_K P_K - \sum N_K \sum P_K}{n\sum S_K^2 - (\sum N_K)^2}$$

$$k_0 = \bar{P}_K - a_i \bar{N}_K$$

Here n is number of samples taken for the sample graph

N_K is serial number of the item and restaurant of Khilgaon area

P_K is the price rating of the items of restaurant of Khilgaon area

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input price that we applied is given below. Here only three inputs are given.

Enter Data set =11

x value: 59

y value: 9

Enter Data set =12

x value: 61

y value: 9

Enter Data set =13

x value: 65

y value: 9

Enter Data set =14

x value: 69

y value: 7

The output of the co-efficient that we got from applying the algorithm is given below.

Here k_1 and k_0 are the coefficient that are derived from the algorithm.

$k_1 = -0.4560$

$k_0 = 32.5464$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

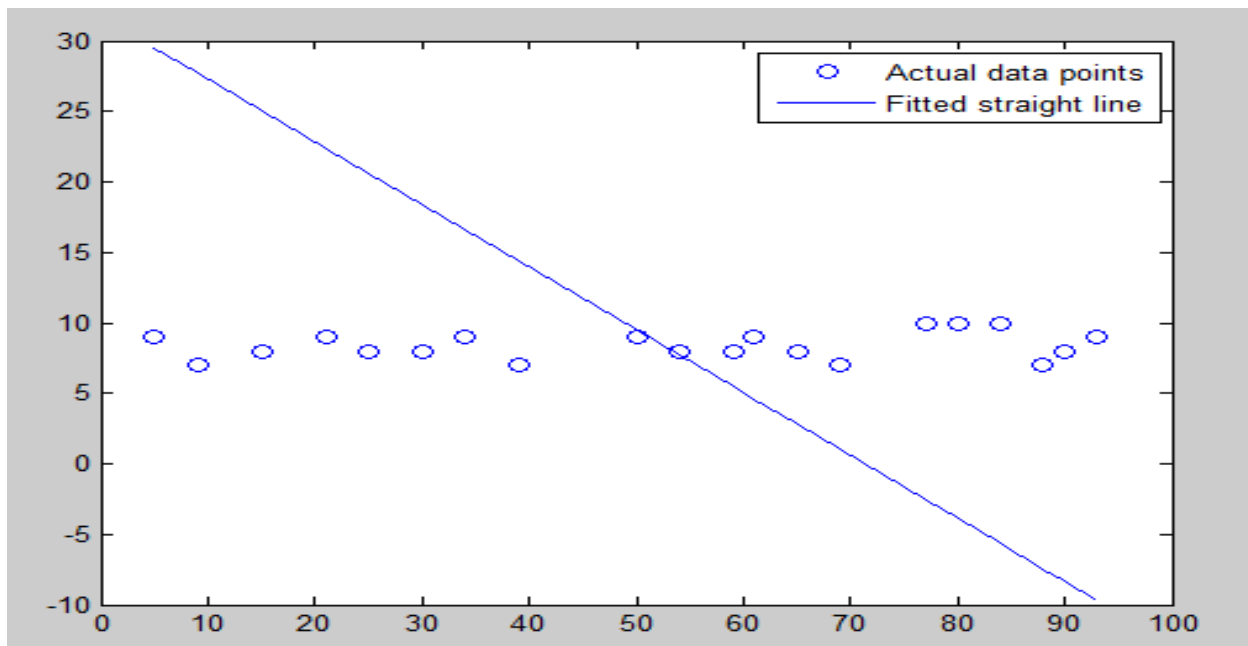


Fig 6.5.4: linear Regression graph for Khilgaon area restaurant food price ratings sample

From the graph sample, we see that the pattern of Price ratings for Khilgaon area restaurant food does not vary much for different restaurants. We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

We then analyze the graph from spline interpolation algorithm which is given on the next page along with comparison with linear regression. We then analyze the graph from spline interpolation algorithm which is given below along with comparison with linear regression.

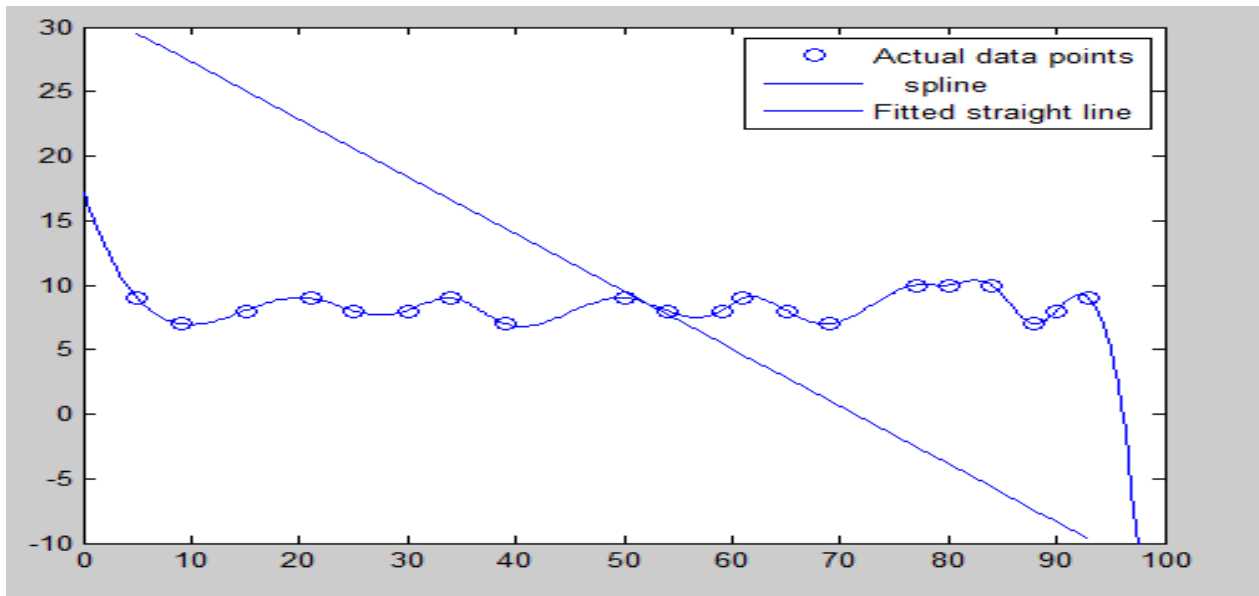


Fig 6.5.5: Spline Interpolation graph for Khilgaon area restaurant food price ratings sample

From the graph comparison of price ratings, we can see that the price range of local foods does vary but there are similarities in pattern in some cases.

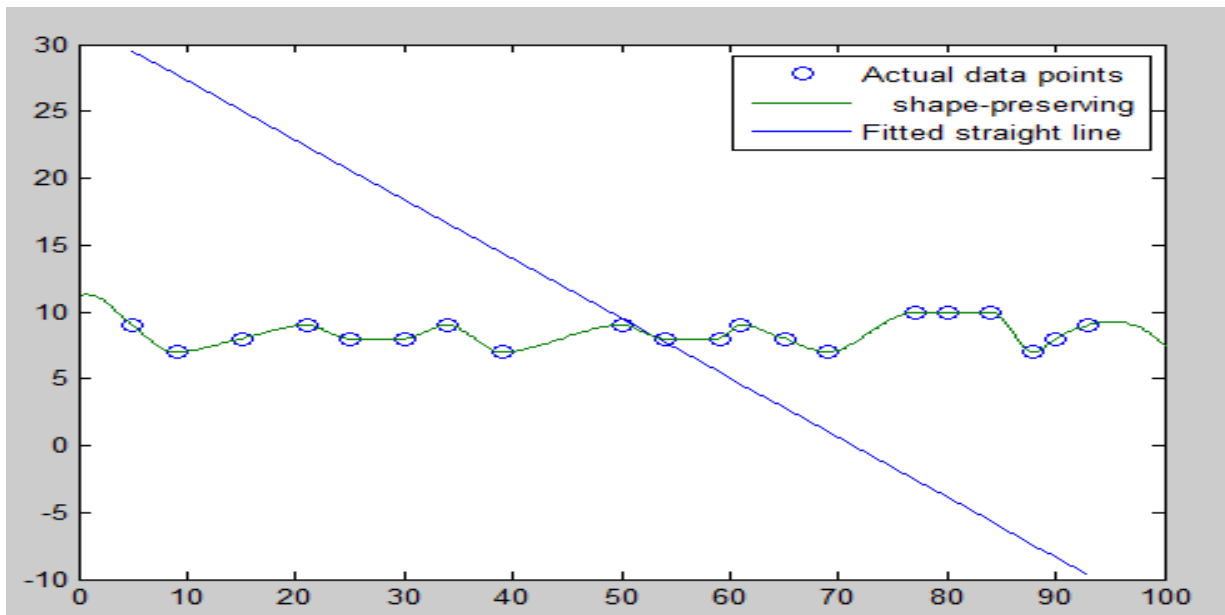


Fig 6.5.6: Shape Preserving Interpolant graph for Khilgaon area restaurant food price ratings sample

From the analysis, we find that there are much variations in the price of food served by restaurants of Khilgaon area.

We can see some similarities between the graphs of taste rating and price ratings of foods of the Khilgaon region. We see that both the taste ratings and price ratings varied much but has high ratings as well.

6.5.3 Service Rating: Khilgaon Area Restaurants

We have already seen the taste ratings and price ratings, so the only thing that we are left with is the service rating graph of Dhanondi area. We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$k_1 = \frac{n\sum N_K S_K - \sum N_K \sum S_K}{n\sum N_K^2 - (\sum N_K)^2}$$

$$k_0 = \bar{S}_K - a_i \bar{N}_K$$

Here n is number of samples taken for the sample graph

N_K is serial number of the item and restaurant

S_K is the service rating of the items of restaurants

Applying the linear regression algorithm initially we will look for a pattern. We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

Enter Data set =11

x value: 59

y value: 6

Enter Data set =12

x value: 61

y value: 5

Enter Data set =13

x value: 65

y value: 8

Enter Data set =14

x value: 69

y value: 10

The output of the co-efficient that we got from applying the algorithm is given below. Here d1 and d0 are the coefficient that are derived from the algorithm.

d1 = -0.4249

d0 = 30.3665

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the service ratings for this particular sample is given below.

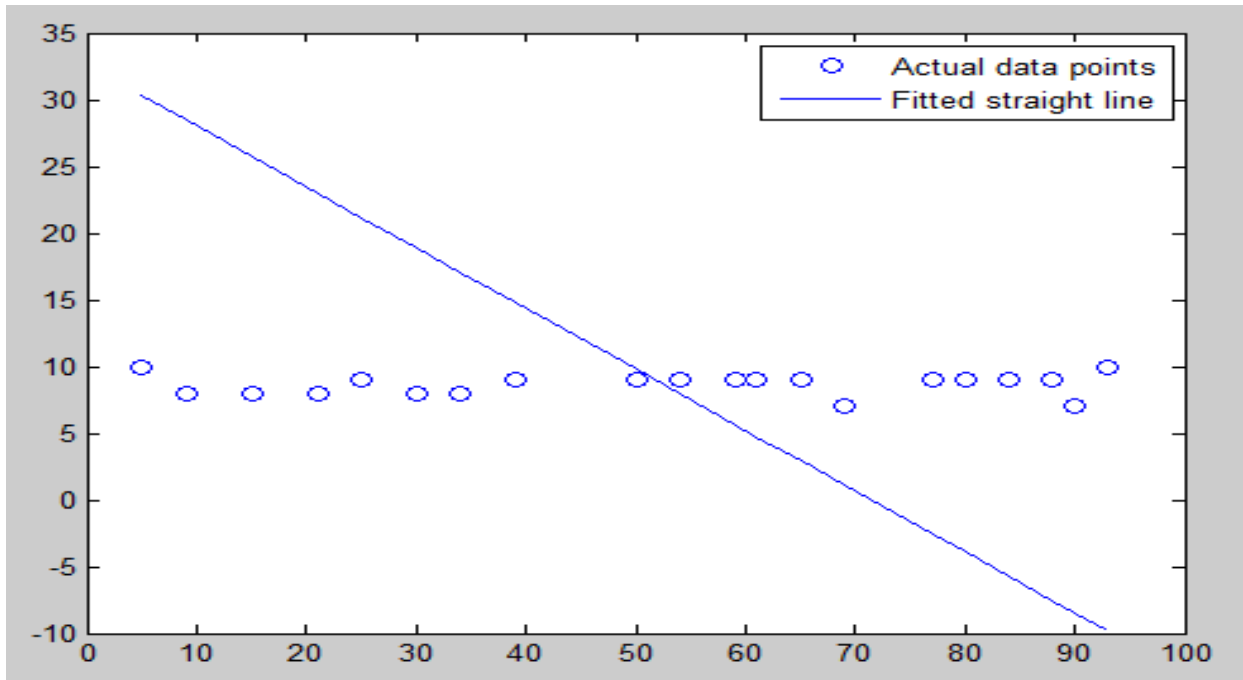


Fig 6.5.7: linear Regression graph for Khilgaon area restaurant food service ratings sample

From the graph sample, we see that the pattern of Service ratings for Khilgaon food does not vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

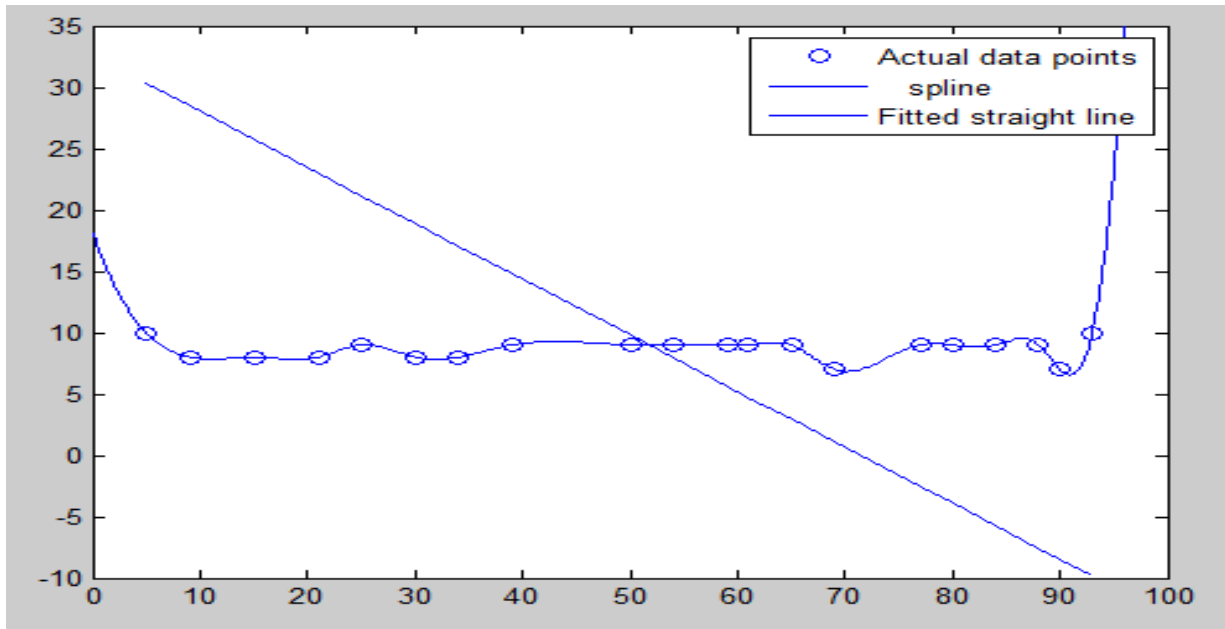


Fig 6.5.8: Spline Interpolation graph for Khilgaon area restaurant food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern on this from another algorithm

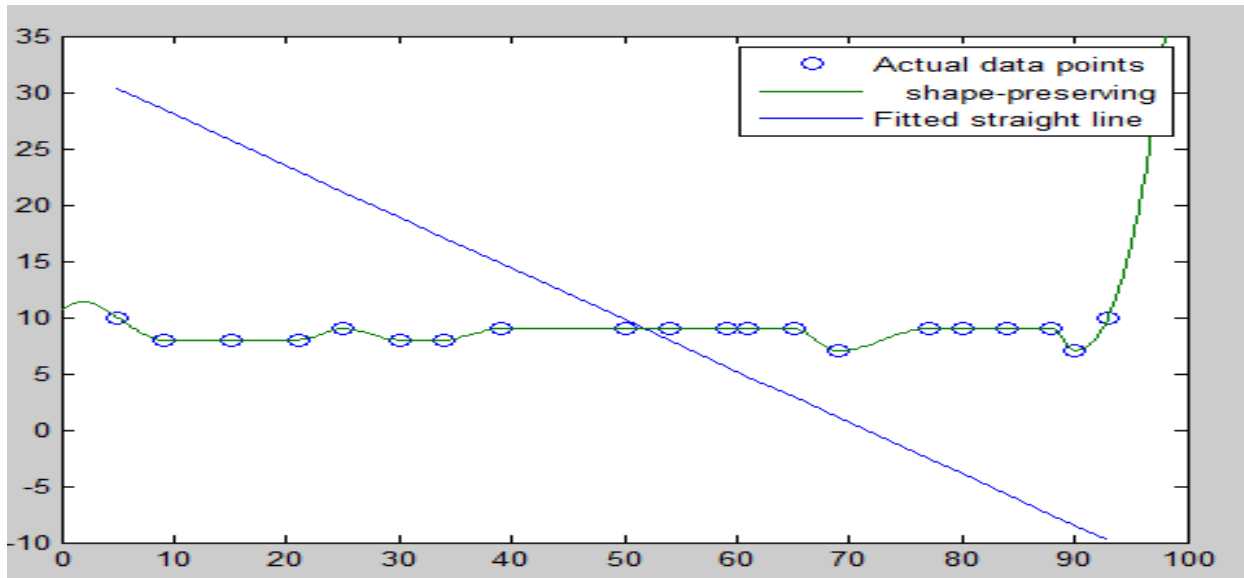


Fig 6.5.9: Shape Preserving Interpolant graph for Khilgaon area restaurant food service ratings sample

From the analysis, we can see that the service rating pattern for most of the restaurants in Khilgaon region is more or less similar, this also means people are highly satisfied with Khilgaon region restaurants service.

We can see from the graphs of taste ratings, price ratings and service ratings of Khilgaon region that the taste rating and the price ratings are inconsistent as compared to service ratings. This means that people find variety in quality of food and the price varies like as the taste rating. This also indicates that the price of food as charged by the restaurants of Khilgaon region does not directly affects the quality of service they provide and service they provide satisfy the customers as compared to the taste and price of food.

6.6 AREA -4: SHYAMOLI

We determine the food trend of Shyamoli area depending on certain criteria. The criteria are as follows

1. Taste Ratings of Shyamoli area restaurant
2. Price Ratings of Shyamoli area restaurants
3. Service Ratings of Shyamoli area restaurants

We will discuss all of this with graphical analysis as drawn through implementation of algorithms.

6.6.1 Taste Ratings: Shyamoli Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$S_1 = \frac{n\sum N_s T_s - \sum N_s \sum T_s}{n\sum N_s^2 - (\sum N_s)^2}$$

$$S_0 = \bar{T}_s - a_i \bar{N}_s$$

Here n is number of samples taken for the sample graph

N_s is serial number of the item and restaurants

T_s is the taste rating of the items of restaurants

The graph that we got from applying linear regression for this particular sample is given below.

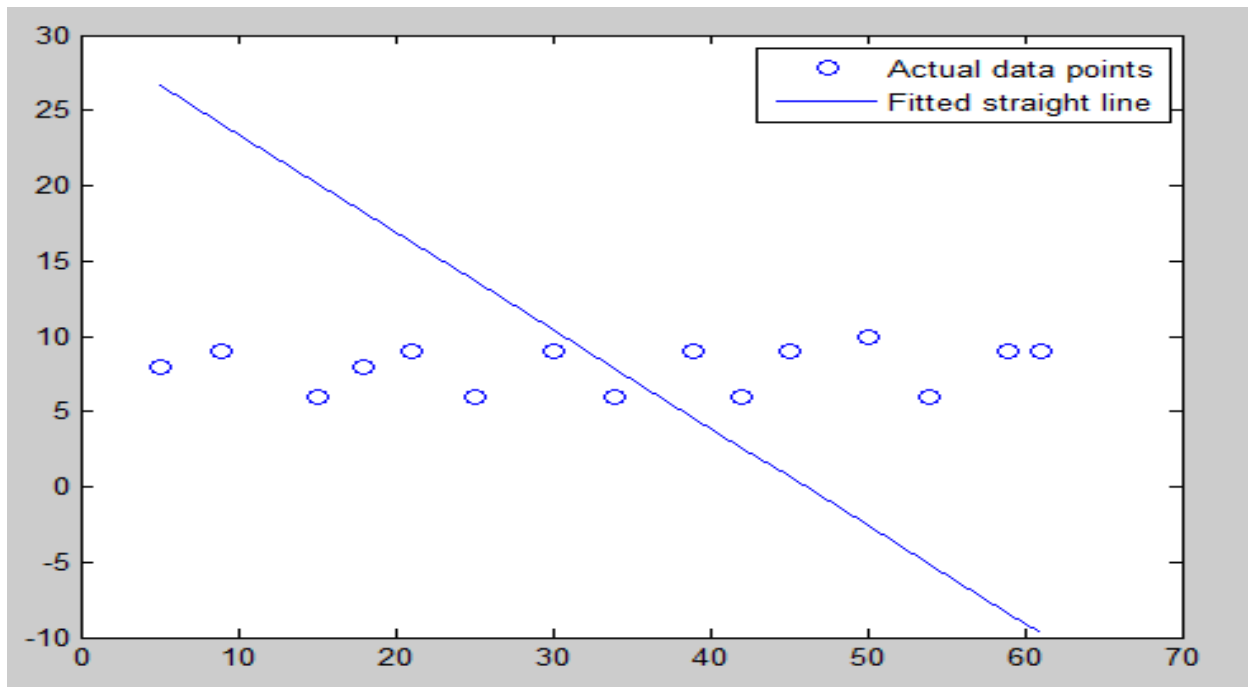


Fig 6.6.1: linear Regression graph for Shyamoli area food taste ratings sample

From the graph sample, we see that the pattern of taste ratings for Shyamoli area food does vary much for different restaurants. We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

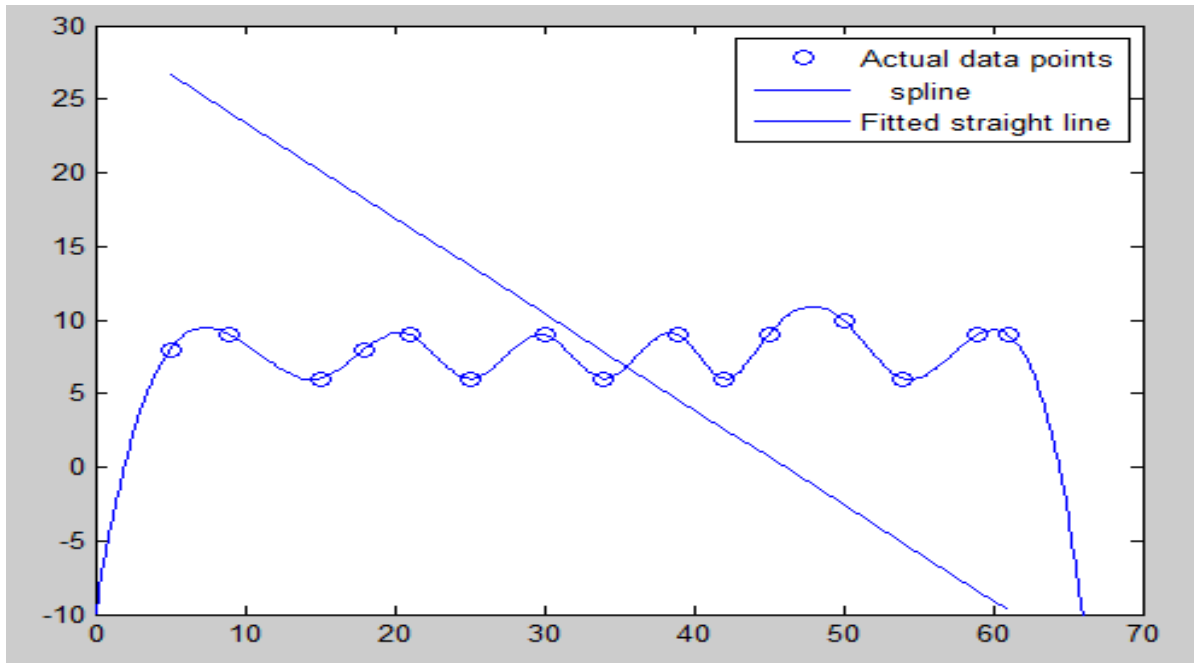


Fig 6.6.2: Spline Interpolation graph for Shyamoli area food taste ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis.

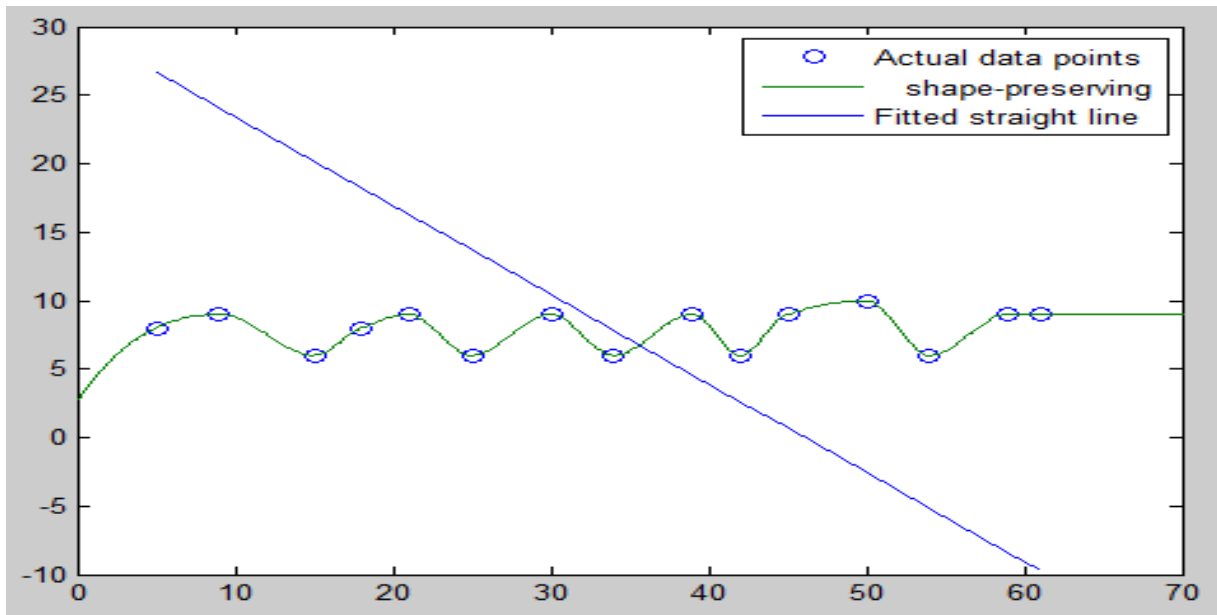


Fig 6.6.3: Shape Preserving Interpolant graph for Shyamoli area food taste ratings sample

The conclusion that we achieved is the taste ratings for Shyamoli area's restaurants food is very inconsistent and the taste rating is also high in many cases. Therefore from the graph we see many customers were satisfied where as some some certain customers were highly dissatisfied about the quality.

6.6.2 Price Rating: Shyamoli Area Restaurants

We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below

$$s_1 = \frac{n\sum N_S P_S - \sum N_S \sum P_S}{n\sum S_S^2 - (\sum N_S)^2}$$

$$s_0 = \bar{P}_S - a_i \bar{N}_S$$

Here n is number of samples taken for the sample graph

N_S is serial number of the item and restaurant of Shyamoli area

P_S is the price rating of the items of restaurant of Shyamoli area

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input price that we applied is given below. Here only three inputs are given.

Enter Data set =7

N_S value: 30

P_S value: 7

Enter Data set =8

N_S value: 34

P_S value: 9

Enter Data set =9

N_S value: 39

P_S value: 7

Enter Data set =10

N_S value: 42

P_S value: 9

The output of the co-efficient that we got from applying the algorithm is given below.

Here s_1 and s_0 are the coefficient that are derived from the algorithm.

$s_1 = -0.7455$

$s_0 = 33.9968$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the price ratings for this particular sample is given below.

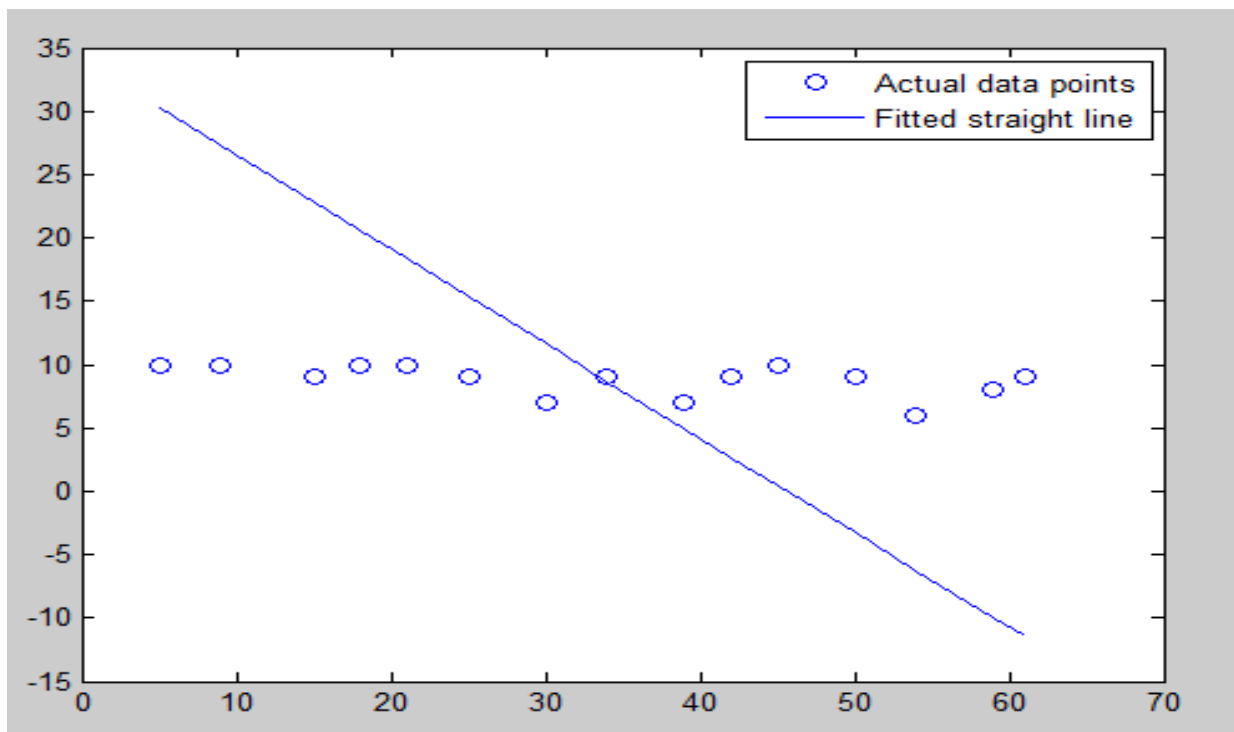


Fig 6.6.4: linear Regression graph for Shyamoli area restaurant food price ratings sample

From the graph sample, we see that the pattern of Price ratings for Shyamoli area restaurant food does not vary much for different restaurants.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms.

We then analyze the graph from spline interpolation algorithm which is given on the next page along with comparison with linear regression.

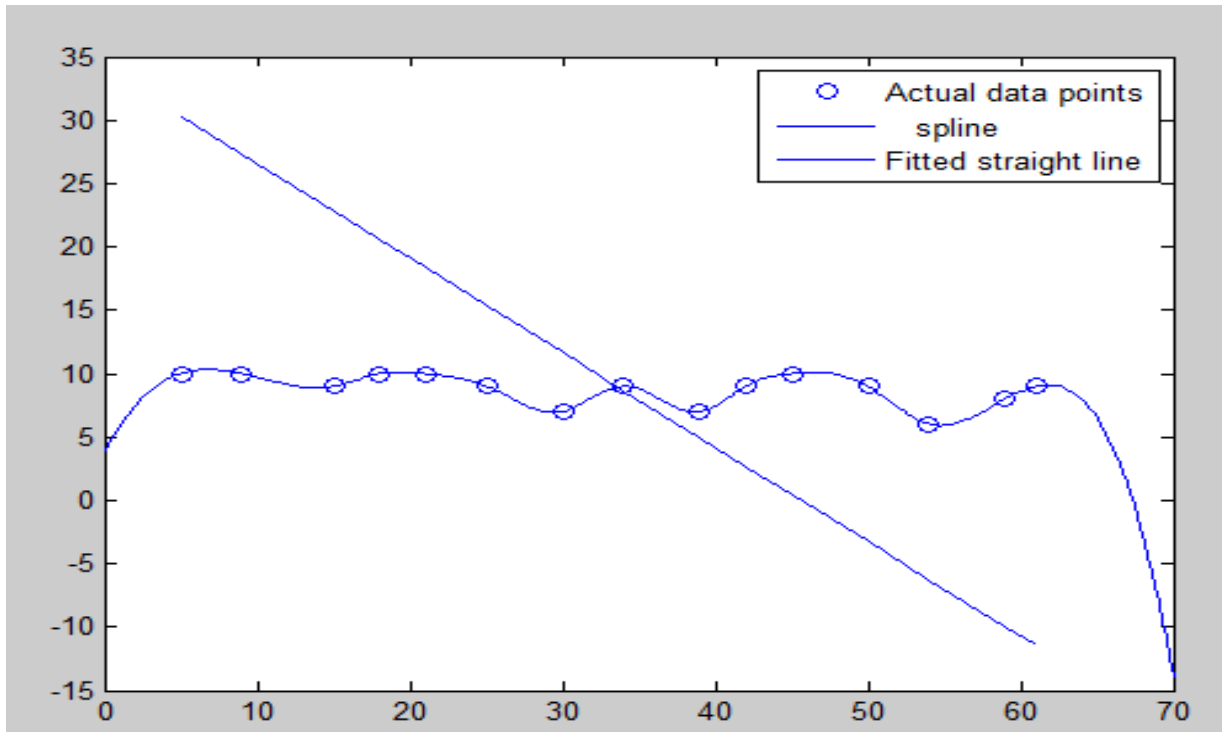


Fig 6.6.5: Spline Interpolation graph for Shyamoli area restaurant food price ratings sample

From the graph comparison of price ratings, we can see that the price range of local foods does not vary much from restaurant to restaurant. This indicates that the price of Dhanmondi area foods are more or less limited to a certain range.

We will now analyze using shape preserving interpolant through which we can see how the graph behaves as progresses preserving the shape of the actual graph.

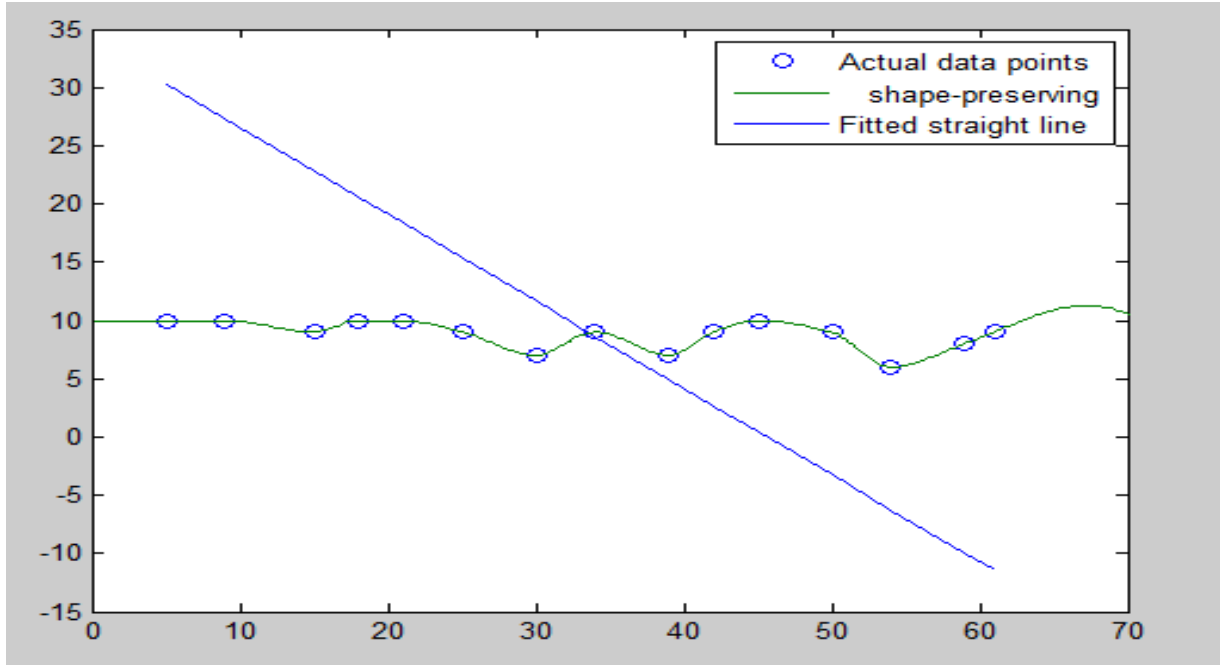


Fig 6.6.6: Shape Preserving Interpolant graph for Shyamoli area restaurant food price ratings sample

From the analysis, we find that most of the ratings are more or less similar and the curve has similarities with the curve generated from spline. Applying linear regression graph does not serve much in case of detecting pattern.

6.5.3 Service Rating: Shyamoli Area Restaurants

We have already seen the taste ratings and price ratings, so the only thing that we are left with is the service rating graph of Dhanondi area. We applied the data that we collected on linear regression algorithm, spline interpolation algorithm and shape preserving interpolant algorithm. We will analyze it from the graphs. The formula that we use for this is given below:

$$s_1 = \frac{n\sum N_S S_S - \sum N_S \sum S_S}{n\sum N_S^2 - (\sum N_S)^2}$$

$$s_0 = \bar{S}_S - a_i \bar{N}_S$$

Here n is number of samples taken for the sample graph

N_S is serial number of the item and restaurant

S_S is the service rating of the items of restaurant

Applying the linear regression algorithm initially we will look for a pattern. We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

A sample of the input service ratings that we applied is given below. Here only three inputs are given.

Enter Data set =2

x value: 9

y value: 8

Enter Data set =3

x value: 15

y value: 7

Enter Data set =4

x value: 18

y value: 8

Enter Data set =5

x value: 19

y value: 6

Enter Data set =6

x value: 25

y value: 9

The output of the co-efficient that we got from applying the algorithm is given below. Here s_1 and s_0 are the coefficient that are derived from the algorithm.

$s_1 = -0.6445$

$s_0 = 29.5643$

We will analyze the output as achieved from the sample through the graphs that we got from the linear regression algorithm. Then we will gradually compare that graph with other graphs that we got from spline interpolation and shape preserving interpolant.

The graph that we got from applying linear regression on the service ratings for this particular sample is given below.

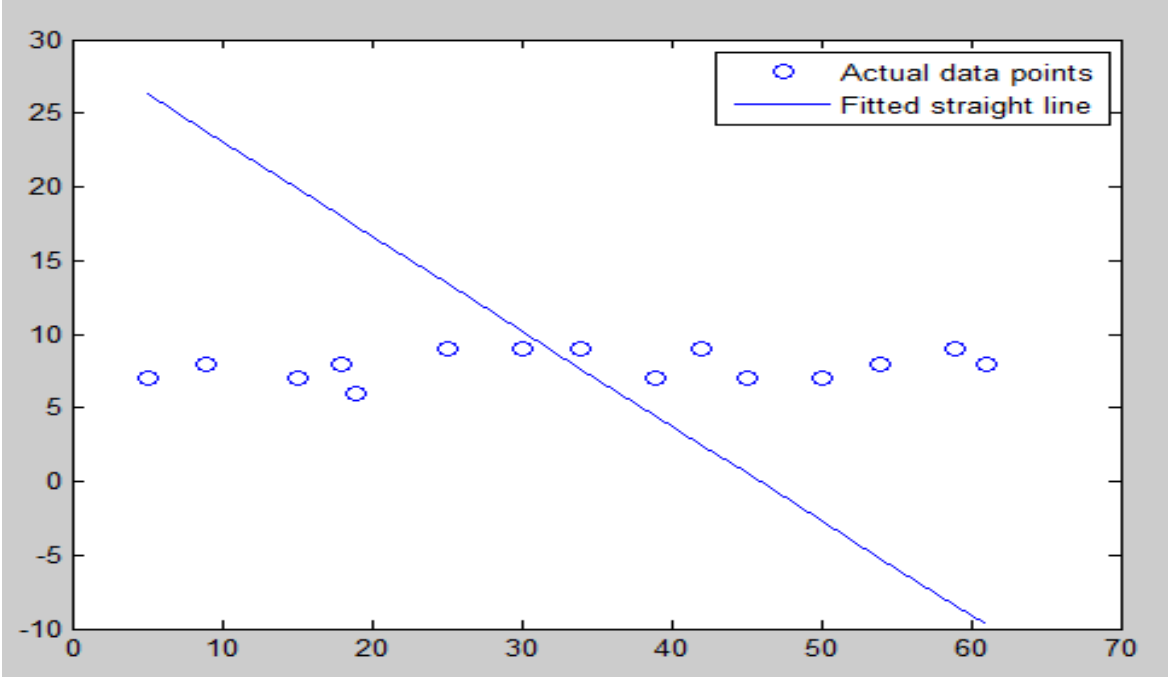


Fig 6.6.7: linear Regression graph for Dhanmondi area restaurant food service ratings sample

From the graph sample, we see that the pattern of Service ratings for Shyamoli region food does vary much for different restaurants and the pattern is quite different.

We will now analyze the sample with spline interpolation algorithm and shape preserving interpolant algorithm using the graphs obtained from applying those algorithms

The graph from spline interpolation algorithm is also given on the next page along with comparison with linear regression.

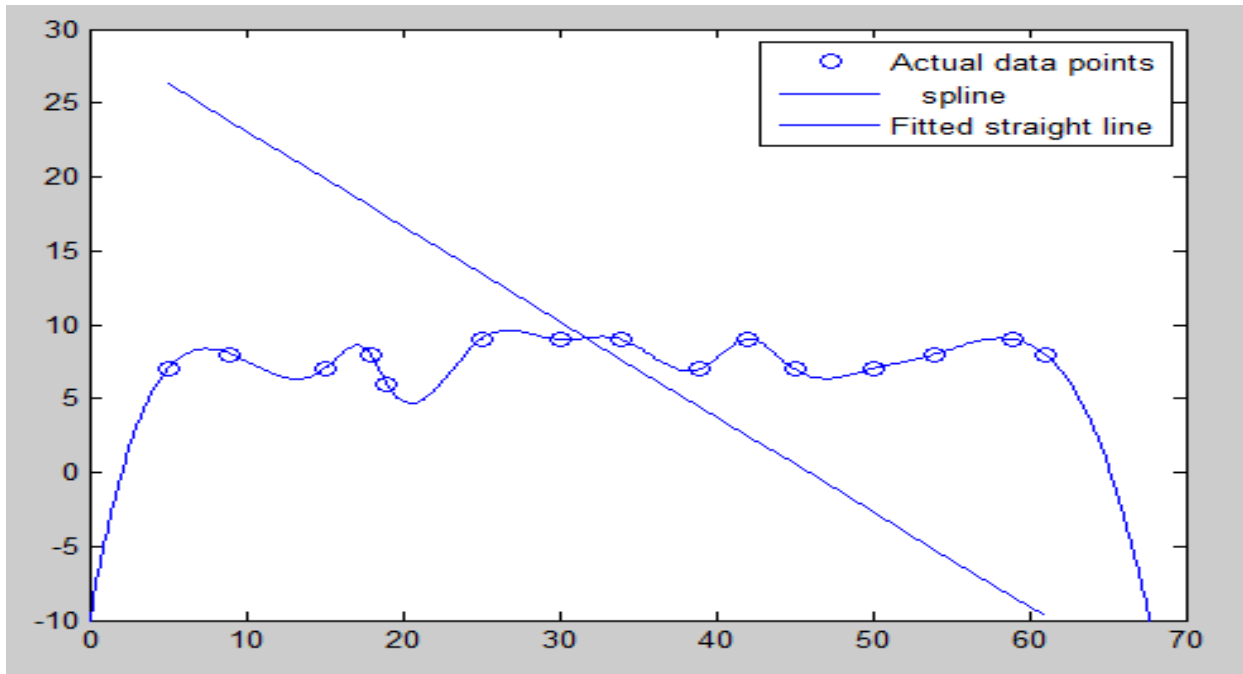


Fig 6.6.8: Spline Interpolation graph for Shyamoli area restaurant food restaurant service ratings sample

We will now analyze the sample using shape preserving interpolant algorithm in comparison to linear regression analysis so that we can predict the pattern on this from another algorithm.

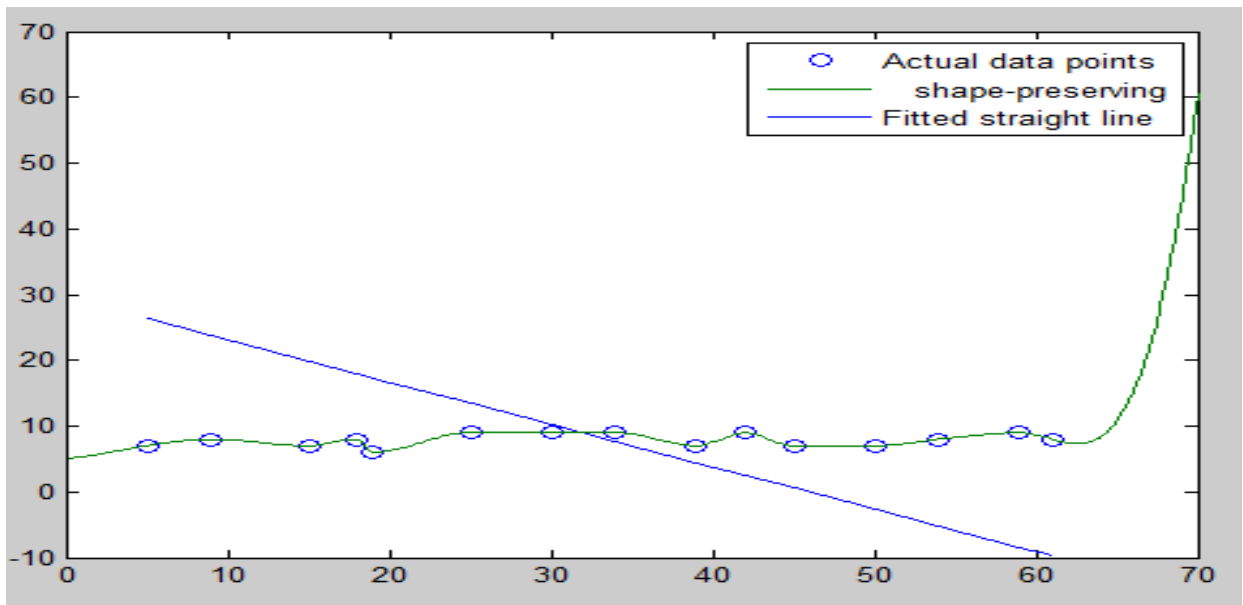


Fig 6.6.9: Shape Preserving Interpolant graph for Shyamoli area restaurant food service ratings sample

From the analysis, we can see that the service rating pattern for most of the restaurants in Shyamoli region is not much fluctuating, this also means people are satisfied with Shyamoli region restaurants service.

We can see from the graphs of taste ratings, price ratings and service ratings of Shyamoli region that the taste rating is more or less consistent as compared to the price and service ratings. This means that people find the taste of food served by the restaurants is of different quality but the price has a very good rating.

CHAPTER 7

5.1 TOOLS AND SOFTWARE USED

I had to use a number of software and frameworks in order to sort the data. Since my codes were done in both Java and Matlab I had to use different IDEs. For the java coding I used Eclipse and Netbeans software.

Deriving the graphs was the most important thing in my thesis which helped me to find the pattern and complete the analysis part. I used Matlab for the graphs and also used GNU octave. This is because to find similar type of graphs and to cross check the graphs obtained from using different software.

CHAPTER 8

8.1 FINDINGS AND RESULTS

There are couple of conclusions that I have reached from my analysis. I have stated the findings in the below paragraphs.

The taste rating pattern of foreign food is comparatively higher than the rating of local food. Therefore, people prefer more of foreign food restaurants comparatively to local food restaurants.

Another important finding about foreign and local food comparison from public reviews is, Local food has higher price rating pattern than that of foreign food.

Taste ratings for foods of restaurants in Dhanmondi and Banani area are of higher pattern than that of Khilgaon and Shyamoli area restaurants.

The price rating pattern of Dhanmondi and Shyamoli area is comparatively higher than that of Banani and Khilgaon region. This means customers find the price of foods of Dhanmondi and Shyamoli region restaurants satisfactory in terms of the quality or taste of the foods they serve.

The service ratings pattern of Banani area is comparatively higher than Dhanmondi, Khilgaon and Shyamoli area restaurants. This means customers find the service of Dhanmondi and Shyamoli region restaurants satisfactory in terms of the price of the foods they charge.

The taste to price ratings pattern is comparatively higher for Shyamoli area restaurants as compared to Banani and Khilgaon area restaurants. This signifies even though Shyamoli region is not that famous for restaurants it has good price ratings than other commercial regions of Dhaka city.

The price to service ratings pattern for Banani area has shown to be the highest and Khilgaon area has shown to be the lowest as compared to other areas.

8.2 FUTURE RESEARCH SCOPE

As I have established through my work that both machine learning and sentiment analysis can stably analyze and predict the pattern of restaurant business of different region of Dhaka city, I think there is more scope to work on. Rating for the individual restaurants based on the region network of Dhaka city is perhaps the next best extension of this research. There are other places like Shyamoli where there are few good restaurants and might soon become new zone for restaurant business on which analytical works can be done.

GLOSSARY

Correlation: Linear relation between two individual variables to find the impact of movement of one variable to another. Result of correlation is the division of covariance of two variables and their standard deviation.

Covariance: Measurement of the statistical change in values of two random variables together after each individual event.

Regression: Most widely used process for forecasting where the statistical relation of two or more variables are estimated according to the best fit line of plotted points.

Spline: a spline is a numeric function that is piecewise-defined by polynomial functions, and which possesses a high degree of smoothness at the places where the polynomial pieces connect.

Truncation error: Round off error made by truncating the outcome of a calculation to estimate a value in the finite range of set.

Desi or local food: foods that are mainly originated in Bangladesh.

Foreign food: foods that are mainly originated in countries other than Bangladesh.

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