MACHINE LEARNING BASED MESS FOOD SAVER

TEAM NAME: IGNITED MINDS

Agenda

- Problem Description
- Machine Learning Context
- Solution framework
- Solution framework- DFD & ER
- Data Description
- Machine Learning Models and Validation
- Enhancements in Pipeline- Model Error Correction
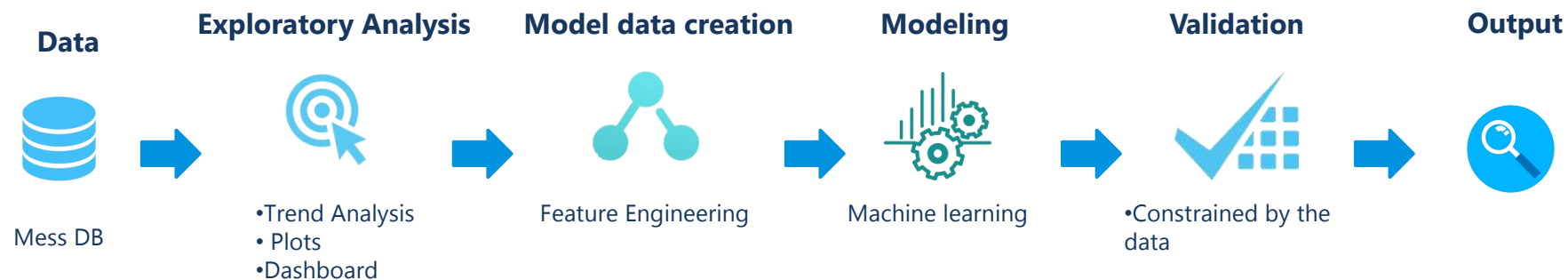- Web-Application

Problem Description

- Reduce the Wastage of Food in Mess
- Ascertain the Quantities of Items to be prepared
- Automatic Feedback Mechanism to adjust the quantities
- Student Feedback and Analysis
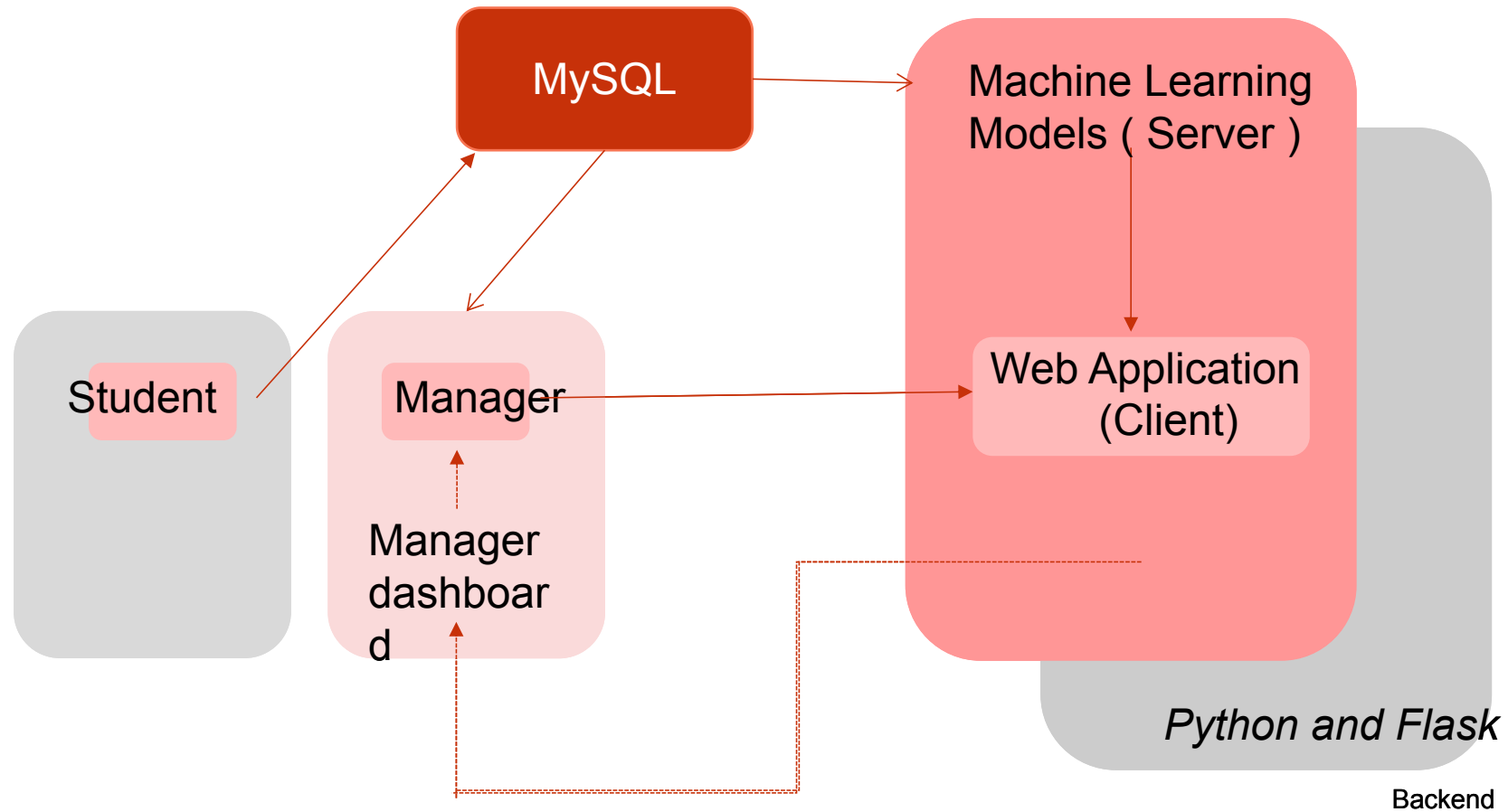
Machine Learning Context

- Footfall always have some recent , some seasonal patterns
- Competencies of Mess Managers to determine food quantity is just a wild assumption which varies a lot
- ML is the way to predicting the number of people going to dine in next shift.
- Use the predicted counts to determine the Quantity of food to be prepared
- Adjust the per student consumption as per the recent trends(model correction)

Features
- Count of students in Mess shows both seasonal and recent trends
- Features creation capturing both these trends

Data → **Exploratory Analysis** → **Model data creation** → **Modeling** → **Validation** → **Output**

Mess DB

- Trend Analysis
- Plots
- Dashboard

Feature Engineering

Machine learning

- Constrained by the data

Solution Framework

Solution Framework
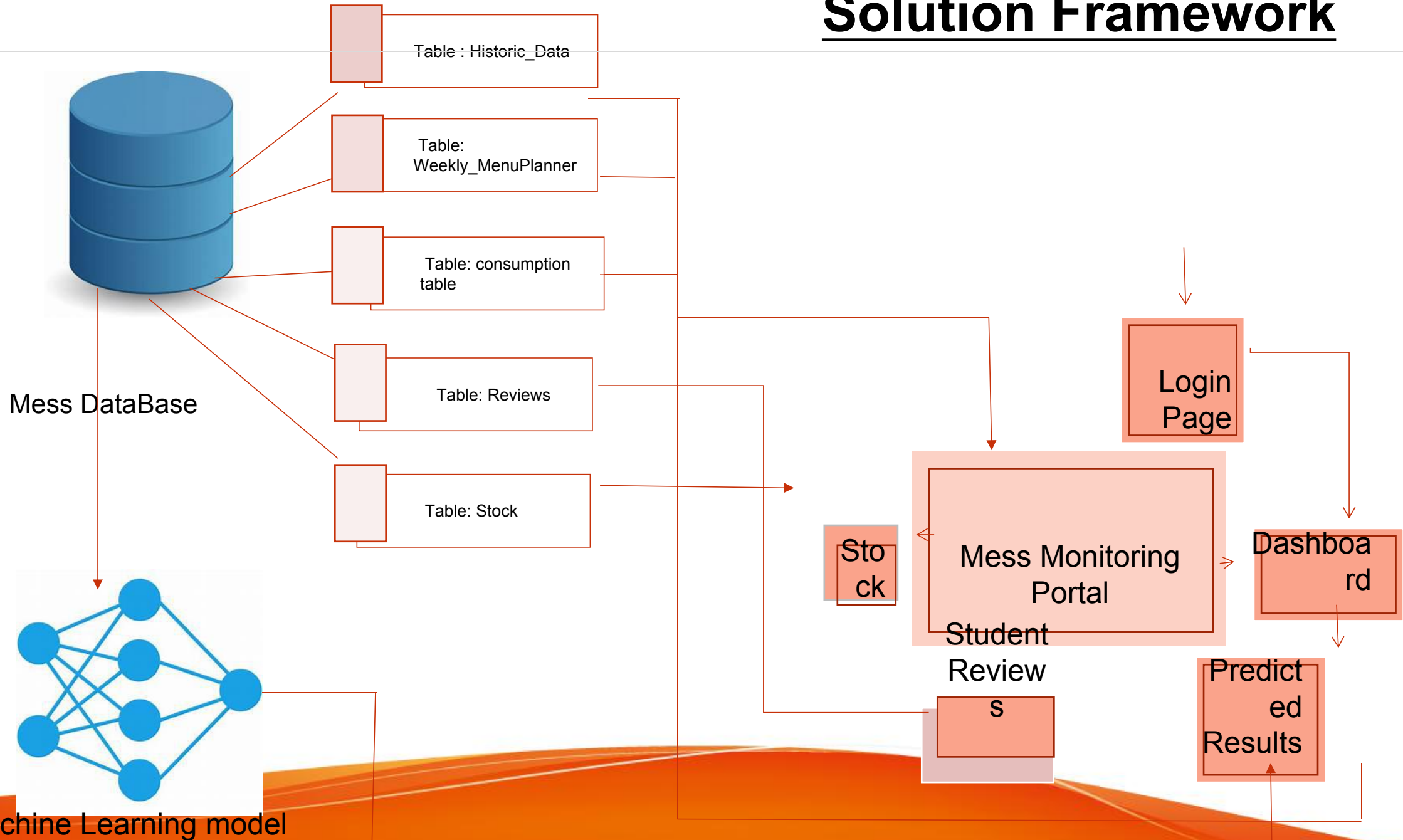
Solution Framework- DFD & ER

Data Flow Diagram(DFD)

Given Data Description

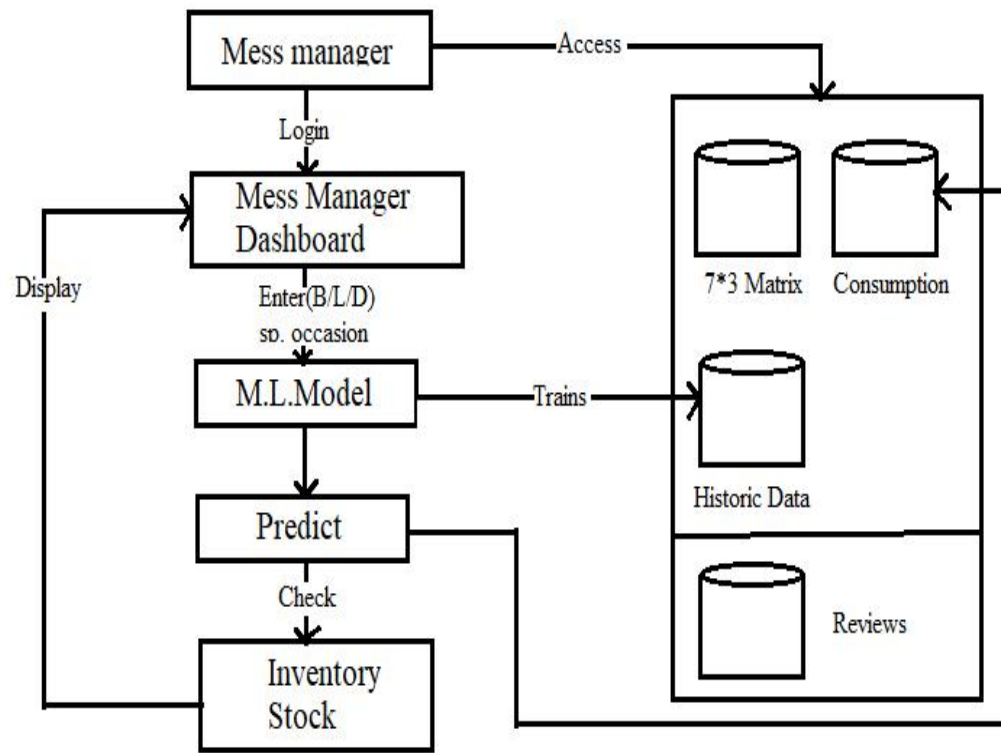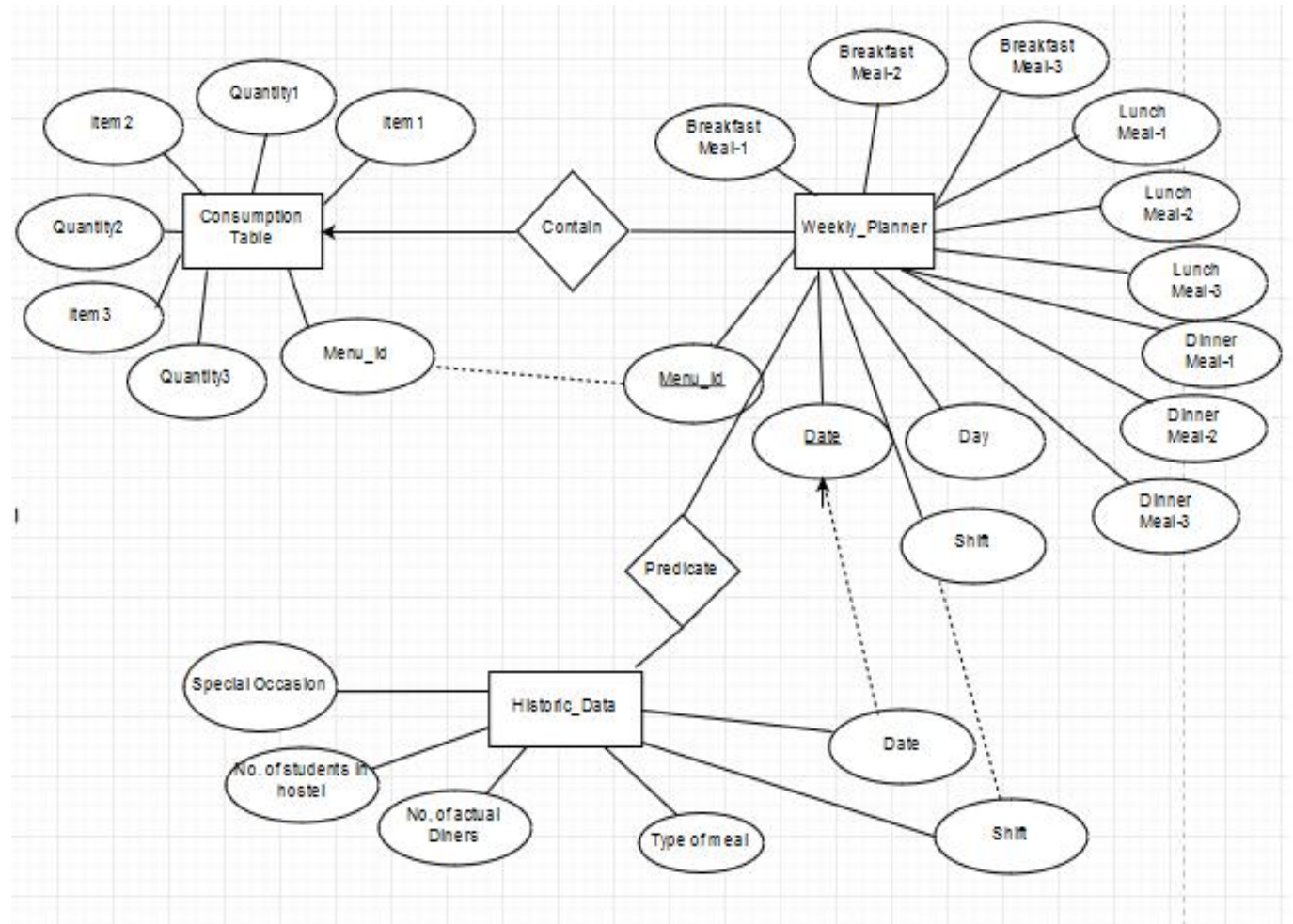| Historic_Data					
Special_Occasion	Date	No_of_Students_in_Hostel	No_of_Actual_Diners	Type_Of_Meal	Mess_No
Regular	04-12-2017	581	590	B	0
Regular	04-12-2017	660	402	B	1
Regular	04-12-2017	588	413	B	2

Weekly Menu Planner									
Day	B_Menu_Item1	B_Menu_Item2	B_Menu_Item3	L_Menu_Item1	L_Menu_Item2	L_Menu_Item3	D_Menu_Item1	D_Menu_Item2	D_Menu_Item3
Mon	XX	YY	ZZ	XX1	YY1	ZZ1	XX2	YY2	ZZ2
Tue	XX	YY	ZZ	XX1	YY1	ZZ1	XX2	YY2	ZZ2
Wed	XX	YY	ZZ	XX1	YY1	ZZ1	XX2	YY2	ZZ2

Consumption						
Menu_Item	Ingredient_1	per_student_consumption_Ing_1	Ingredient_2	per_student_consumption_Ing_2	Ingredient_3	per_student_consumption_Ing_3
XX	I1	1	I2	XX1	I5	1
YY	I1	3	I4	XX1	I4	2
ZZ	I2	2	I3	XX1	I2	3

Reviews				
Student ID	Date	Type_of_meal	Rating	Comments
1111	04-12-2017	B	4	Dal was not good

- **Columns in Black represent Given data**
- **Columns in Red represent additional suggested columns that can be used**

Feature Engineering

1. Necessary to club features for analysis
2. Response Variable for Machine Learning model is to predict the count of people to Dine
3. Special Occasion –Capture Last day of Exam, Exam, Capture variability in the attendance pattern during fests, Holidays
4. Season
5. Weekend , Weekdays represented by Day of Week
6. Recent Features –Last 4 shift count in hostel and mess, average count of students in Mess and hostel in (Special Ocassion-1) day
7. Menu Items, Ingredients and Makers as Additional Features. (Ingredients and Makers may be important)

Model Ready Data

Date	Month	Day of Week	Type of Meal	No of Students in Hostel(Real Time)	Special Occasion_1	Special Occasion_2	Special Occasion_3	No of Student in Hostel in Shift-1	Number of Students dined in PresentShiftminus1	No of Student in Hostel in PresentShiftminus2	Number of Students dined in PresentShiftminus2	No of Student in Hostel in PresentShiftminus3	Number of Students dined in PresentShiftminus 3	No of Student in Hostel in PresentShiftminus4	Number of Students dined in PresentShiftminus4	Menu_item_1	Menu_Item_2	Menu_item_3	Actual People Dined

| Menu_Item1_In	Menu_Item1_Ingr 2	Menu_Item1_Ingr 3	Menu_Item2_Ingr 1	Menu_Item2_Ingr 2	Menu_Item2_Ingr 3	Menu_Item3_Ingr 1	Menu_Item3_Ingr 2	Menu_Item3_Ingr 3	Menu1_Prepare	Menu2_Prepare	Menu3_Prepared By 1	Exam_day_&_Exam da	Average_No_of_People_present_before_Event or Average Last

Models

- Implemented Linear Regression on Manually Generated Dataset
- Coefficients from Linear Regression can tell the reasons behind the mismatch
- Correction of the Model based on the feedback is in progress. (Change in per student Quantity)

Model Results & Validation

MSE: 1135.0813
RMSE: 33.68
R-Square->0.91


Coefficients_Linear Regression
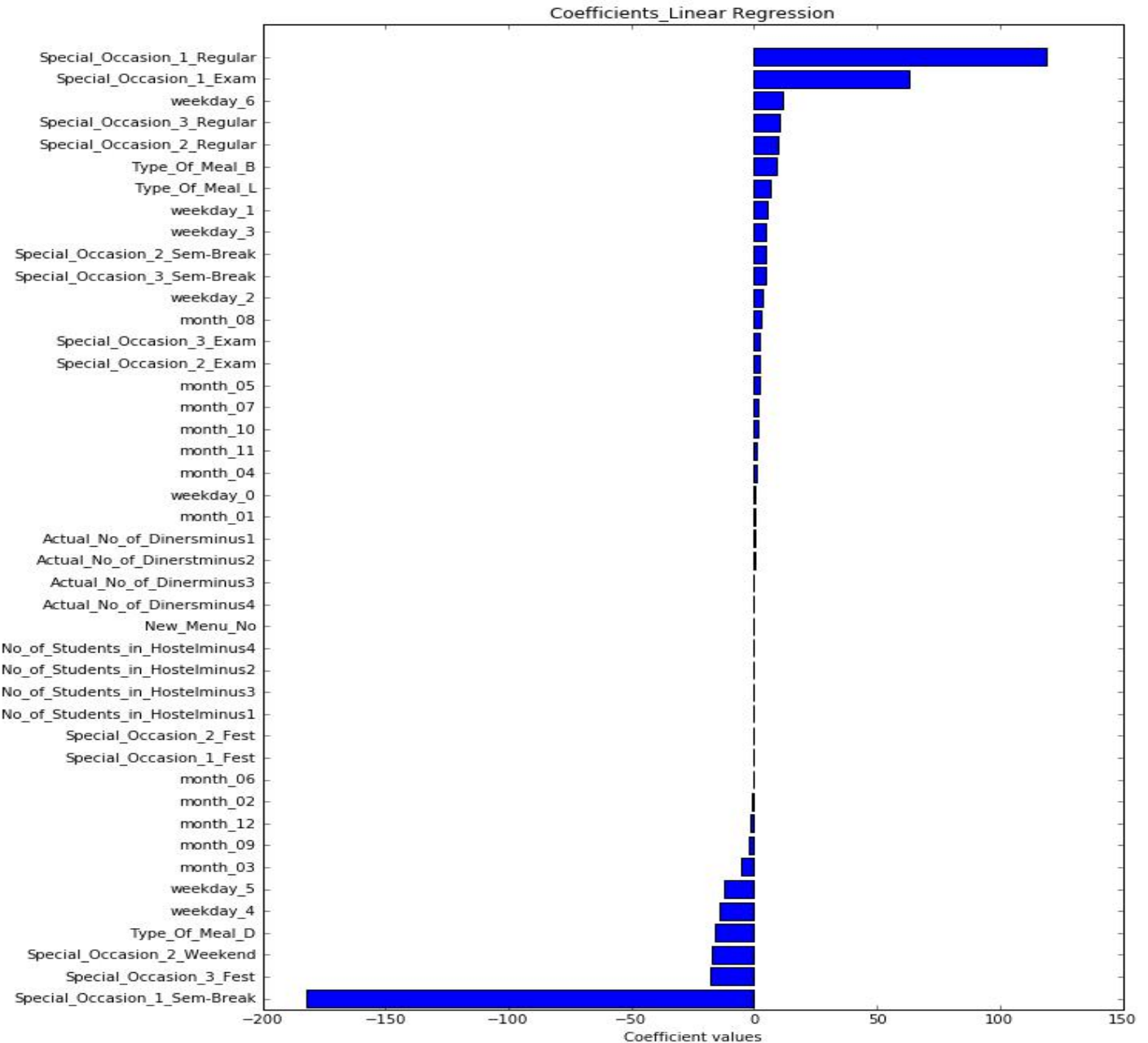
p-values—Linear Regression

p-value	Variable
0.00000	Special_Occasion_1_Exam
0.00000	Special_Occasion_1_Fest
0.00000	Special_Occasion_1_Regular
0.00000	Special_Occasion_1_Sem-Break
1.00000	Type_Of_Meal_B
0.68403	Type_Of_Meal_D
1.00000	Type_Of_Meal_L
0.97007	weekday_0
0.98419	weekday_1
0.72524	weekday_2
0.99890	weekday_3
0.08993	weekday_4
0.00000	weekday_5
1.00000	weekday_6
0.92205	month_01
0.09202	month_02
0.91492	month_03
0.91433	month_04
0.49614	month_05
0.68313	month_06
1.00000	month_07

p-value	Variable
0.00304	month_08
0.50416	month_09
0.87301	month_10
0.88780	month_11
0.98800	month_12
0.00000	Special_Occasion_2_Exam
0.00000	Special_Occasion_2_Fest
0.00000	Special_Occasion_2_Regular
0.00000	Special_Occasion_2_Sem-Break
0.00000	Special_Occasion_2_Weekend
0.00000	Special_Occasion_3_Exam
0.00000	Special_Occasion_3_Fest
0.00636	Special_Occasion_3_Regular
0.00000	Special_Occasion_3_Sem-Break
1.00000	New_Menu_No
0.00000	No_of_Students_in_Hostelminus4
0.00000	No_of_Students_in_Hostelminus3
0.00000	No_of_Students_in_Hostelminus2
0.00000	No_of_Students_in_Hostelminus1
0.00000	Actual_No_of_Dinersminus4
0.00000	Actual_No_of_Dinerminus3

	p-value	Variable
42	0.00000	Actual_No_of_Dinerstminus2
43	0.00000	Actual_No_of_Dinersminus1

Model Results & Validation
Gradient Boosting Regression

Variable Importance
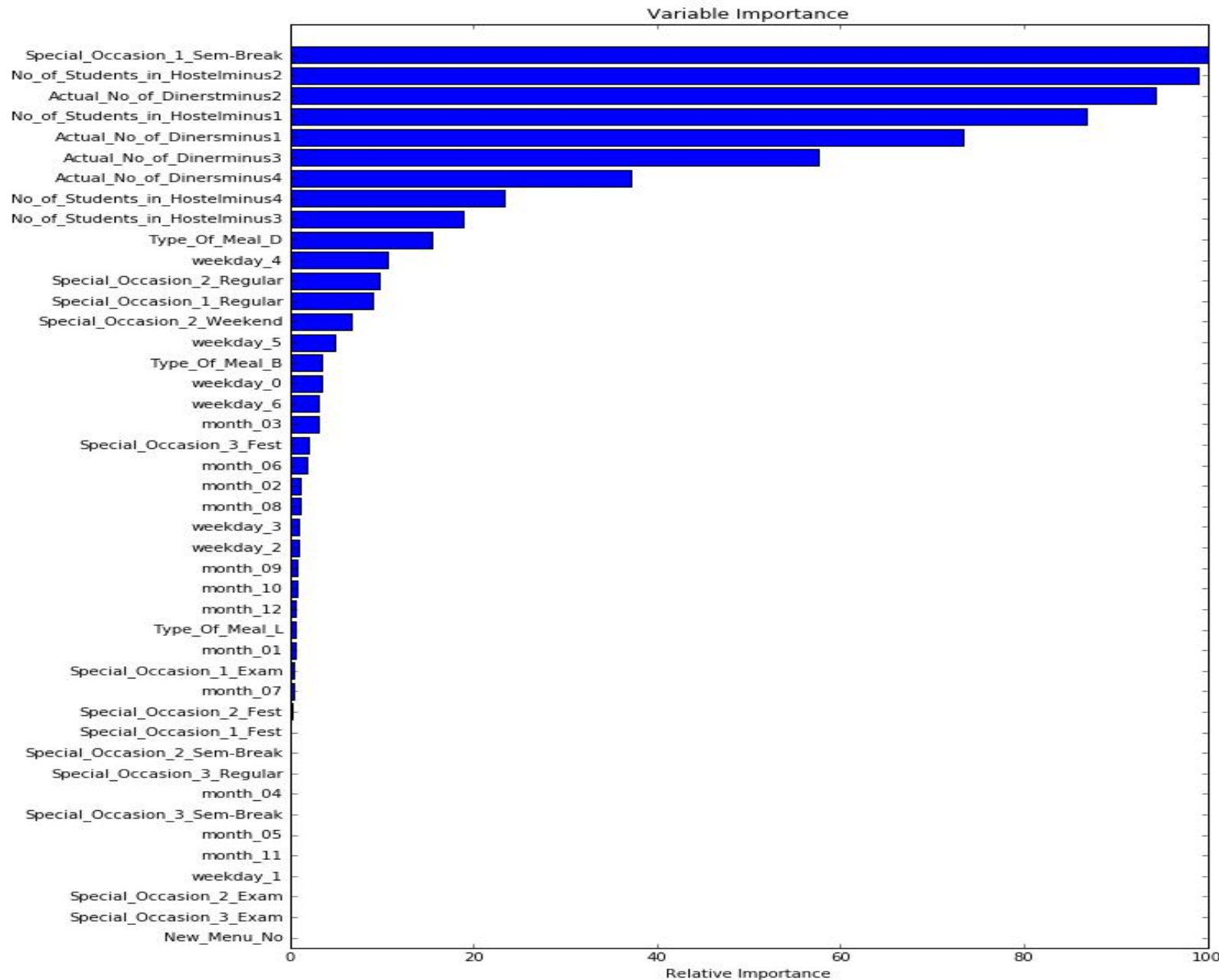
MSE: 1132.0813
RMSE: 33.64

params = {'n_estimators': 500,
'max_depth': 4,
'min_samples_split': 2,
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Enhancements in Pipeline- Model Error Correction

•Chained optimization at two levels:
    a. **Number of Students Dining**
    b. **per_student_consumption of a Menu item**

•Aggregate Wastage might not be the clear Indicator. Separate menu item wise wastage should be checked.

•If a Menu Item is having continuous large wastage, reduce the consumption_per_student of the Menu Item.

•This is absolutely at the discretion of the Mess Manager- Can be decided using some optimisation using:
e.g.
Consumption_per_student_item-
avg_wastage_of_item_in_last_week_per_student

THANK YOU