

Analysis of blood sugar level patterns and insulin dose administration in Patients based on daily blood sugar level given for span of 2-3 years

Data-set for analysis

Apache Spark has been used to analyze blood sugar report of around 50 Patients based on the data set obtained from below source.

The format of the data in the base file consists of the following:

>

PATIENT_NO	DATE	TIME	CODE	VALUE
Patient_1	4/21/1991	9:09	58	100
Patient_1	4/21/1991	9:09	33	9
Patient_1	4/21/1991	9:09	34	13
Patient_1	4/22/1991	10:09	58	105
Patient_2	4/28/1991	9:09	34	10
Patient_2	4/20/1991	9:09	58	120
...

Load Data

Before we can access the stored file in Object Storage using the [SparkContext](#), we have to set the Hadoop configuration. This can be done with the following configuration function:

In [177]:

```
def set_hadoop_config(credentials):
    prefix = "fs.swift.service." + credentials['name']
    hconf = sc._jsc.hadoopConfiguration()
    hconf.set(prefix + ".auth.url", credentials['auth_url'] + '/v3/auth/tokens')
    hconf.set(prefix + ".auth.endpoint.prefix", "endpoints")
    hconf.set(prefix + ".tenant", credentials['project_id'])
    hconf.set(prefix + ".username", credentials['user_id'])
    hconf.set(prefix + ".password", credentials['password'])
    hconf.setInt(prefix + ".http.port", 8080)
    hconf.set(prefix + ".region", credentials['region'])
    hconf.setBoolean(prefix + ".public", True)
```

In the code cell below, credentials for Source files have been pasted.

In [178]:

```
credentials_2 = {
    'auth_url': 'https://identity.open.softlayer.com',
    'project': 'object_storage_d19e928b_e4b5_41c3_a1dd_52e0ef9cd369',
    'project_id': '1ef29c85000e4bd4adf3a905dd6661a6',
    'region': 'dallas',
    'user_id': '33ddb0cd7f46410ea83ded6c172cfae2',
    'domain_id': '22da6bc73b8444b1adfaef5af9c4fec5',
    'domain_name': '965639',
    'username': 'Admin_371a7c9d53ca9e41673e1b29dae0d93301fa7ab2',
    'password': '""1~1jS}aD02uJ^J0n""',
    'filename': 'Patient_1_Record.csv',
    'container': 'notebooks',
    'tenantId': 's244-0fd88f7a010898-26760440299a'
};
credentials_1 = {
```

```

'auth_url': 'https://identity.open.softlayer.com',
'project': 'object_storage_d19e928b_e4b5_41c3_aldd_52e0ef9cd369',
'project_id': '1ef29c85000e4bd4adf3a905dd6661a6',
'region': 'dallas',
'user_id': '33ddb0cd7f46410ea83ded6c172cfae2',
'domain_id': '22da6bc73b8444bladfaef5af9c4fec5',
'domain_name': '965639',
'username': 'Admin_371a7c9d53ca9e41673e1b29dae0d93301fa7ab2',
'password': '""1~1jS}aD02uJ^J0n""',
'filename': 'Code_Description.csv',
'container': 'notebooks',
'tenantId': 's244-0fd88f7a010898-26760440299a'
};
credentials = {
'auth_url': 'https://identity.open.softlayer.com',
'project': 'object_storage_d19e928b_e4b5_41c3_aldd_52e0ef9cd369',
'project_id': '1ef29c85000e4bd4adf3a905dd6661a6',
'region': 'dallas',
'user_id': '33ddb0cd7f46410ea83ded6c172cfae2',
'domain_id': '22da6bc73b8444bladfaef5af9c4fec5',
'domain_name': '965639',
'username': 'Admin_371a7c9d53ca9e41673e1b29dae0d93301fa7ab2',
'password': '""1~1jS}aD02uJ^J0n""',
'filename': 'Diabetes_Consolidated_data.csv',
'container': 'notebooks',
'tenantId': 's244-0fd88f7a010898-26760440299a'
}

```

Hadoop configuration name has been set with "keystone".

In [179]:

```

credentials['name'] = 'keystone'
set_hadoop_config(credentials)

```

In [180]:

```

credentials_1['name'] = 'keystone_1'
set_hadoop_config(credentials_1)

```

In [181]:

```

credentials_2['name'] = 'keystone_2'
set_hadoop_config(credentials)

```

With the raw data file stored in Object Storage, we can now access it using the configured SparkContext in our notebook.

Below is the RDD created [RDD](#) from the raw data file to refer it using a URI of the form: swift://container_name.name/object_name

In [182]:

```
record = sc.textFile("swift://notebooks.keystone/Diabetes_Consolidated_data.csv")
```

In [183]:

```
record_1 = sc.textFile("swift://notebooks.keystone/Code_Description.csv")
```

In [184]:

```
record_2 = sc.textFile("swift://notebooks.keystone/Patient_1_Record.csv")
```

Results & Findings:

1. Total number of records present in blood sugar report data files

In [185]:

```
print "Total records in the Diabetes_Consolidated_data.csv dataset:", record.count()
```

Total records in the Diabetes_Consolidated_data.csv dataset: 19872

In [186]:

```
print "Total records in the Code_Description.csv dataset:", record_1.count()
```

Total records in the Code_Description.csv dataset: 21

In [187]:

```
print "Total records in the Patient_1_Record.csv dataset:", record_2.count()
```

Total records in the Patient_1_Record.csv dataset: 943

Results & Findings:

2. Column names and Records value types in each dataset

In [188]:

```
print "The first row in the Diabetes_Consolidated_data.csv dataset:", record.first()
```

The first row in the Diabetes_Consolidated_data.csv dataset: Patient_No,Date,Time,Code,Value

In [189]:

```
print "The first row in the Code_Description.csv dataset:", record_1.first()
```

The first row in the Code_Description.csv dataset: Code,Description

In [190]:

```
print "The first row in the Patient_1_Record.csv dataset:", record_2.first()
```

The first row in the Patient_1_Record.csv dataset: 4/21/1991,9:09,58,100

Parse Data to Calculate the Average values of blood Sugar in Each Patient

In [191]:

```
recordParse = record.map(lambda line : line.split(","))
```

In [192]:

```
record_1Parse = record_1.map(lambda line : line.split(","))
```

In [193]:

```
record_2Parse = record_2.map(lambda line : line.split(","))
```

In [194]:

```
recordParse.first()
```

Out[194]:

```
[u'Patient_No', u'Date', u'Time', u'Code', u'Value']
```

In [195]:

```
recordParse.first()[0]
```

Out[195]:

```
u'Patient_No'
```

In [196]:

```
recordParse.first()[2]
```

Out[196]:

```
u'Time'
```

Reduce Dataset to get pre-breakfast and pre-supper blood sugar level in Patients

In [197]:

```
Record_Glucose = recordParse.filter(lambda x: x[3] == "58")
```

In [198]:

```
Record_Glucose_1 = recordParse.filter(lambda x: x[3] == "62")
```

In [199]:

```
Record_Glucose.first()
```

Out[199]:

```
[u'Patient_1', u'4/21/1991', u'9:09', u'58', u'100']
```

In [200]:

```
Record_Glucose_1.first()
```

Out[200]:

```
[u'Patient_1', u'4/21/1991', u'17:08', u'62', u'119']
```

In [201]:

```
# x[0] is the patient  
# x[4] is the pre-breakfast blood sugar measurement  
Record_GlucoseCountByKey = Record_Glucose.map(lambda x : (x[0], (int(x[4]), 1)))
```

In [202]:

```
# x[0] is the patient  
# x[4] is the pre-breakfast blood sugar measurement  
Record_Glucose_1_CountByKey = Record_Glucose_1.map(lambda x : (x[0], (int(x[4]), 1)))
```

In [203]:

```
Record_GlucoseCountByKey.first()
```

Out[203]:

```
(u'Patient_1', (100, 1))
```

In [204]:

```
Record_Glucose_1_CountByKey.first()
```

Out[204]:

```
(u'Patient_1', (119, 1))
```

In [205]:

```
Record_GlucoseCountByKey.top(10)
```

Out[205]:

```
[(u'Patient_9', (365, 1)),  
(u'Patient_9', (346, 1)),  
(u'Patient_9', (309, 1)),  
(u'Patient_9', (297, 1)),  
(u'Patient_9', (289, 1)),  
(u'Patient_9', (254, 1)),  
(u'Patient_9', (241, 1)),  
(u'Patient_9', (219, 1)),  
(u'Patient_9', (203, 1)),  
(u'Patient_9', (156, 1))]
```

In [206]:

```
Record_Glucose_1_CountByKey.top(10)
```

Out[206]:

```
[(u'Patient_9', (324, 1)),  
(u'Patient_9', (281, 1)),  
(u'Patient_9', (270, 1)),  
(u'Patient_9', (261, 1)),  
(u'Patient_9', (252, 1)),  
(u'Patient_9', (222, 1))]
```

```
(u'Patient_9', (213, 1)),
(u'Patient_9', (195, 1)),
(u'Patient_9', (142, 1)),
(u'Patient_9', (121, 1))]
```

In [207]:

```
Record_GlucoseAddByKey = Record_GlucoseCountByKey.reduceByKey(lambda v1,v2 : (v1[0]+v2[0], v1[1]+v2[1])
)
```

In [208]:

```
Record_Glucose_1_AddByKey = Record_Glucose_1_CountByKey.reduceByKey(lambda v1,v2 : (v1[0]+v2[0], v1[1]+
v2[1]))
```

In [209]:

```
Record_GlucoseAddByKey.first()
```

Out[209]:

```
(u'Patient_13', (6411, 32))
```

In [210]:

```
Record_Glucose_1_AddByKey.first()
```

Out[210]:

```
(u'Patient_13', (2659, 24))
```

Computing the Average Values for Each Patient (average of daily blood sugar level given for span of 2-3 years for 50 Patients) and sorting entire list to find Patients with Minimum and Maximum levels

In [211]:

```
Record_GlucoseAverages = Record_GlucoseAddByKey.map(lambda k: (k[0], k[1][0] / float(k[1][1] ) ) )
```

In [212]:

```
Record_1_GlucoseAverages = Record_Glucose_1_AddByKey.map(lambda k: (k[0], k[1][0] / float(k[1][1] ) ) )
```

In [213]:

```
Record_GlucoseAverages.first()
```

Out[213]:

```
(u'Patient_13', 200.34375)
```

In [214]:

```
Record_1_GlucoseAverages.first()
```

Out[214]:

```
(u'Patient_13', 110.79166666666667)
```

Results & Findings:

3 : Average Pre-breakfast blood Sugar of 50 Patients (calculated based on daily blood sugar level given for span of 2-3 years)

In [215]:

```
for pair in Record_GlucoseAverages.top(50):
```

```
print "patient %s had average Pre-breakfast blood Sugar of %f" % (pair[0],pair[1])
```

```
patient Patient_9 had average Pre-breakfast blood Sugar of 173.000000
patient Patient_8 had average Pre-breakfast blood Sugar of 186.658537
patient Patient_7 had average Pre-breakfast blood Sugar of 182.529412
patient Patient_6 had average Pre-breakfast blood Sugar of 213.523810
patient Patient_50 had average Pre-breakfast blood Sugar of 94.266667
patient Patient_5 had average Pre-breakfast blood Sugar of 147.432432
patient Patient_49 had average Pre-breakfast blood Sugar of 100.219512
patient Patient_48 had average Pre-breakfast blood Sugar of 172.483871
patient Patient_47 had average Pre-breakfast blood Sugar of 173.064516
patient Patient_46 had average Pre-breakfast blood Sugar of 192.718750
patient Patient_45 had average Pre-breakfast blood Sugar of 178.222222
patient Patient_44 had average Pre-breakfast blood Sugar of 180.142857
patient Patient_43 had average Pre-breakfast blood Sugar of 138.892857
patient Patient_42 had average Pre-breakfast blood Sugar of 104.353846
patient Patient_41 had average Pre-breakfast blood Sugar of 137.015873
patient Patient_4 had average Pre-breakfast blood Sugar of 141.571429
patient Patient_39 had average Pre-breakfast blood Sugar of 161.533333
patient Patient_38 had average Pre-breakfast blood Sugar of 169.321429
patient Patient_37 had average Pre-breakfast blood Sugar of 214.400000
patient Patient_36 had average Pre-breakfast blood Sugar of 206.966667
patient Patient_35 had average Pre-breakfast blood Sugar of 159.517241
patient Patient_34 had average Pre-breakfast blood Sugar of 151.655172
patient Patient_33 had average Pre-breakfast blood Sugar of 153.357143
patient Patient_32 had average Pre-breakfast blood Sugar of 180.363636
patient Patient_31 had average Pre-breakfast blood Sugar of 157.188235
patient Patient_30 had average Pre-breakfast blood Sugar of 173.432432
patient Patient_3 had average Pre-breakfast blood Sugar of 117.675000
patient Patient_29 had average Pre-breakfast blood Sugar of 182.302013
patient Patient_28 had average Pre-breakfast blood Sugar of 173.024590
patient Patient_27 had average Pre-breakfast blood Sugar of 146.136752
patient Patient_26 had average Pre-breakfast blood Sugar of 126.898734
patient Patient_24 had average Pre-breakfast blood Sugar of 179.045455
patient Patient_23 had average Pre-breakfast blood Sugar of 58.500000
patient Patient_21 had average Pre-breakfast blood Sugar of 145.396226
patient Patient_20 had average Pre-breakfast blood Sugar of 184.296296
patient Patient_2 had average Pre-breakfast blood Sugar of 207.843750
patient Patient_19 had average Pre-breakfast blood Sugar of 182.935484
patient Patient_18 had average Pre-breakfast blood Sugar of 126.875000
patient Patient_17 had average Pre-breakfast blood Sugar of 144.041667
patient Patient_16 had average Pre-breakfast blood Sugar of 179.471698
patient Patient_15 had average Pre-breakfast blood Sugar of 168.075472
patient Patient_14 had average Pre-breakfast blood Sugar of 181.176471
patient Patient_13 had average Pre-breakfast blood Sugar of 200.343750
patient Patient_12 had average Pre-breakfast blood Sugar of 193.375000
patient Patient_11 had average Pre-breakfast blood Sugar of 161.714286
patient Patient_10 had average Pre-breakfast blood Sugar of 202.705882
patient Patient_1 had average Pre-breakfast blood Sugar of 169.718519
```

Results & Findings:

4 : Average Pre-supper blood Sugar of 50 Patients (calculated based on daily blood sugar level given for span of 2-3 years)

In [216]:

```
for pair in Record_1_GlucoseAverages.top(50):
    print "patient %s had average Pre-supper blood Sugar of %f" % (pair[0],pair[1])
```

```
patient Patient_9 had average Pre-supper blood Sugar of 160.052632
patient Patient_8 had average Pre-supper blood Sugar of 176.031250
patient Patient_7 had average Pre-supper blood Sugar of 182.655172
patient Patient_6 had average Pre-supper blood Sugar of 199.235294
patient Patient_50 had average Pre-supper blood Sugar of 89.607143
patient Patient_5 had average Pre-supper blood Sugar of 226.878788
patient Patient_49 had average Pre-supper blood Sugar of 90.875000
patient Patient_48 had average Pre-supper blood Sugar of 148.370370
patient Patient_47 had average Pre-supper blood Sugar of 102.791667
patient Patient_46 had average Pre-supper blood Sugar of 185.689655
patient Patient_45 had average Pre-supper blood Sugar of 167.625000
patient Patient_44 had average Pre-supper blood Sugar of 166.115385
patient Patient_43 had average Pre-supper blood Sugar of 176.040000
```

```

patient Patient_42 had average Pre-supper blood Sugar of 152.015625
patient Patient_41 had average Pre-supper blood Sugar of 189.100000
patient Patient_4 had average Pre-supper blood Sugar of 217.843750
patient Patient_39 had average Pre-supper blood Sugar of 145.333333
patient Patient_38 had average Pre-supper blood Sugar of 134.379310
patient Patient_37 had average Pre-supper blood Sugar of 150.939394
patient Patient_36 had average Pre-supper blood Sugar of 135.250000
patient Patient_35 had average Pre-supper blood Sugar of 125.366667
patient Patient_34 had average Pre-supper blood Sugar of 121.387097
patient Patient_33 had average Pre-supper blood Sugar of 169.607143
patient Patient_32 had average Pre-supper blood Sugar of 188.000000
patient Patient_31 had average Pre-supper blood Sugar of 139.987952
patient Patient_30 had average Pre-supper blood Sugar of 141.087838
patient Patient_3 had average Pre-supper blood Sugar of 165.066667
patient Patient_29 had average Pre-supper blood Sugar of 150.880503
patient Patient_28 had average Pre-supper blood Sugar of 127.358974
patient Patient_27 had average Pre-supper blood Sugar of 126.132743
patient Patient_26 had average Pre-supper blood Sugar of 149.500000
patient Patient_24 had average Pre-supper blood Sugar of 147.880000
patient Patient_23 had average Pre-supper blood Sugar of 89.000000
patient Patient_21 had average Pre-supper blood Sugar of 133.900000
patient Patient_20 had average Pre-supper blood Sugar of 184.659259
patient Patient_2 had average Pre-supper blood Sugar of 190.784946
patient Patient_19 had average Pre-supper blood Sugar of 163.814815
patient Patient_18 had average Pre-supper blood Sugar of 176.321429
patient Patient_17 had average Pre-supper blood Sugar of 177.400000
patient Patient_16 had average Pre-supper blood Sugar of 203.083333
patient Patient_15 had average Pre-supper blood Sugar of 151.000000
patient Patient_14 had average Pre-supper blood Sugar of 110.363636
patient Patient_13 had average Pre-supper blood Sugar of 110.791667
patient Patient_12 had average Pre-supper blood Sugar of 116.166667
patient Patient_11 had average Pre-supper blood Sugar of 92.769231
patient Patient_10 had average Pre-supper blood Sugar of 214.058824
patient Patient_1 had average Pre-supper blood Sugar of 161.235294

```

Results & Findings:

5 : Average Pre-breakfast blood Sugar of 50 Patients sorted in

descending order (calculated based on daily blood sugar

level given for span of 2-3 years)

In [217]:

```

sugarTop10=[]
patientsTop10=[]
for pair in Record_GlucoseAverages.map(lambda (x,y) : (y,x)).top(50):
    sugarTop10.append(pair[0])
    patientsTop10.append(pair[1])
print "Patient %s had average Pre-breakfast blood Sugar of %f" % (pair[1],pair[0])

```

```

Patient Patient_37 had average Pre-breakfast blood Sugar of 214.400000
Patient Patient_6 had average Pre-breakfast blood Sugar of 213.523810
Patient Patient_2 had average Pre-breakfast blood Sugar of 207.843750
Patient Patient_36 had average Pre-breakfast blood Sugar of 206.966667
Patient Patient_10 had average Pre-breakfast blood Sugar of 202.705882
Patient Patient_13 had average Pre-breakfast blood Sugar of 200.343750
Patient Patient_12 had average Pre-breakfast blood Sugar of 193.375000
Patient Patient_46 had average Pre-breakfast blood Sugar of 192.718750
Patient Patient_8 had average Pre-breakfast blood Sugar of 186.658537
Patient Patient_20 had average Pre-breakfast blood Sugar of 184.296296
Patient Patient_19 had average Pre-breakfast blood Sugar of 182.935484
Patient Patient_7 had average Pre-breakfast blood Sugar of 182.529412
Patient Patient_29 had average Pre-breakfast blood Sugar of 182.302013
Patient Patient_14 had average Pre-breakfast blood Sugar of 181.176471
Patient Patient_32 had average Pre-breakfast blood Sugar of 180.363636
Patient Patient_44 had average Pre-breakfast blood Sugar of 180.142857
Patient Patient_16 had average Pre-breakfast blood Sugar of 179.471698
Patient Patient_24 had average Pre-breakfast blood Sugar of 179.045455
Patient Patient_45 had average Pre-breakfast blood Sugar of 178.222222
Patient Patient_30 had average Pre-breakfast blood Sugar of 173.432432
Patient Patient_47 had average Pre-breakfast blood Sugar of 173.064516

```

Patient Patient_28 had average Pre-breakfast blood Sugar of 173.024590
 Patient Patient_9 had average Pre-breakfast blood Sugar of 173.000000
 Patient Patient_48 had average Pre-breakfast blood Sugar of 172.483871
 Patient Patient_1 had average Pre-breakfast blood Sugar of 169.718519
 Patient Patient_38 had average Pre-breakfast blood Sugar of 169.321429
 Patient Patient_15 had average Pre-breakfast blood Sugar of 168.075472
 Patient Patient_11 had average Pre-breakfast blood Sugar of 161.714286
 Patient Patient_39 had average Pre-breakfast blood Sugar of 161.533333
 Patient Patient_35 had average Pre-breakfast blood Sugar of 159.517241
 Patient Patient_31 had average Pre-breakfast blood Sugar of 157.188235
 Patient Patient_33 had average Pre-breakfast blood Sugar of 153.357143
 Patient Patient_34 had average Pre-breakfast blood Sugar of 151.655172
 Patient Patient_5 had average Pre-breakfast blood Sugar of 147.432432
 Patient Patient_27 had average Pre-breakfast blood Sugar of 146.136752
 Patient Patient_21 had average Pre-breakfast blood Sugar of 145.396226
 Patient Patient_17 had average Pre-breakfast blood Sugar of 144.041667
 Patient Patient_4 had average Pre-breakfast blood Sugar of 141.571429
 Patient Patient_43 had average Pre-breakfast blood Sugar of 138.892857
 Patient Patient_41 had average Pre-breakfast blood Sugar of 137.015873
 Patient Patient_26 had average Pre-breakfast blood Sugar of 126.898734
 Patient Patient_18 had average Pre-breakfast blood Sugar of 126.875000
 Patient Patient_3 had average Pre-breakfast blood Sugar of 117.675000
 Patient Patient_42 had average Pre-breakfast blood Sugar of 104.353846
 Patient Patient_49 had average Pre-breakfast blood Sugar of 100.219512
 Patient Patient_50 had average Pre-breakfast blood Sugar of 94.266667
 Patient Patient_23 had average Pre-breakfast blood Sugar of 58.500000

Results & Findings:

6 : Average Pre-supper blood Sugar of 50 Patients sorted in

descending order (calculated based on daily blood sugar

level given for span of 2-3 years)

In [218]:

```
sugar_1_Top10=[]
patients_1_Top10=[]
for pair in Record_1_GlucoseAverages.map(lambda (x,y) : (y,x)).top(50):
    sugar_1_Top10.append(pair[0])
    patients_1_Top10.append(pair[1])
print "Patient %s had average Pre-supper blood Sugar of %f" % (pair[1],pair[0])
```

Patient Patient_5 had average Pre-supper blood Sugar of 226.878788
 Patient Patient_4 had average Pre-supper blood Sugar of 217.843750
 Patient Patient_10 had average Pre-supper blood Sugar of 214.058824
 Patient Patient_16 had average Pre-supper blood Sugar of 203.083333
 Patient Patient_6 had average Pre-supper blood Sugar of 199.235294
 Patient Patient_2 had average Pre-supper blood Sugar of 190.784946
 Patient Patient_41 had average Pre-supper blood Sugar of 189.100000
 Patient Patient_32 had average Pre-supper blood Sugar of 188.000000
 Patient Patient_46 had average Pre-supper blood Sugar of 185.689655
 Patient Patient_20 had average Pre-supper blood Sugar of 184.659259
 Patient Patient_7 had average Pre-supper blood Sugar of 182.655172
 Patient Patient_17 had average Pre-supper blood Sugar of 177.400000
 Patient Patient_18 had average Pre-supper blood Sugar of 176.321429
 Patient Patient_43 had average Pre-supper blood Sugar of 176.040000
 Patient Patient_8 had average Pre-supper blood Sugar of 176.031250
 Patient Patient_33 had average Pre-supper blood Sugar of 169.607143
 Patient Patient_45 had average Pre-supper blood Sugar of 167.625000
 Patient Patient_44 had average Pre-supper blood Sugar of 166.115385
 Patient Patient_3 had average Pre-supper blood Sugar of 165.066667
 Patient Patient_19 had average Pre-supper blood Sugar of 163.814815
 Patient Patient_1 had average Pre-supper blood Sugar of 161.235294
 Patient Patient_9 had average Pre-supper blood Sugar of 160.052632
 Patient Patient_42 had average Pre-supper blood Sugar of 152.015625
 Patient Patient_15 had average Pre-supper blood Sugar of 151.000000
 Patient Patient_37 had average Pre-supper blood Sugar of 150.939394
 Patient Patient_29 had average Pre-supper blood Sugar of 150.880503
 Patient Patient_26 had average Pre-supper blood Sugar of 149.500000
 Patient Patient_48 had average Pre-supper blood Sugar of 148.370370
 Patient Patient_24 had average Pre-supper blood Sugar of 147.880000


```

Patient Patient_39 had average Pre-supper blood Sugar of 145.333333
Patient Patient_30 had average Pre-supper blood Sugar of 141.087838
Patient Patient_31 had average Pre-supper blood Sugar of 139.987952
Patient Patient_36 had average Pre-supper blood Sugar of 135.250000
Patient Patient_38 had average Pre-supper blood Sugar of 134.379310
Patient Patient_21 had average Pre-supper blood Sugar of 133.900000
Patient Patient_28 had average Pre-supper blood Sugar of 127.358974
Patient Patient_27 had average Pre-supper blood Sugar of 126.132743
Patient Patient_35 had average Pre-supper blood Sugar of 125.366667
Patient Patient_34 had average Pre-supper blood Sugar of 121.387097
Patient Patient_12 had average Pre-supper blood Sugar of 116.166667
Patient Patient_13 had average Pre-supper blood Sugar of 110.791667
Patient Patient_14 had average Pre-supper blood Sugar of 110.363636
Patient Patient_47 had average Pre-supper blood Sugar of 102.791667
Patient Patient_11 had average Pre-supper blood Sugar of 92.769231
Patient Patient_49 had average Pre-supper blood Sugar of 90.875000
Patient Patient_50 had average Pre-supper blood Sugar of 89.607143
Patient Patient_23 had average Pre-supper blood Sugar of 89.000000

```

#

#

Creating Plots to show analysis results

#

#

Results & Findings:

7 : Plot for Average Pre-breakfast blood Sugar of 50 Patients

sorted in descending order (calculated based on daily blood

sugar level given for span of 2-3 years)

In [219]:

```

%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt

# Get current size
fig_size = plt.rcParams["figure.figsize"]

# Prints: [8.0, 6.0]
print "Current size:", fig_size

# Set figure width to 12 and height to 9
fig_size[0] = 18
fig_size[1] = 12
plt.rcParams["figure.figsize"] = fig_size

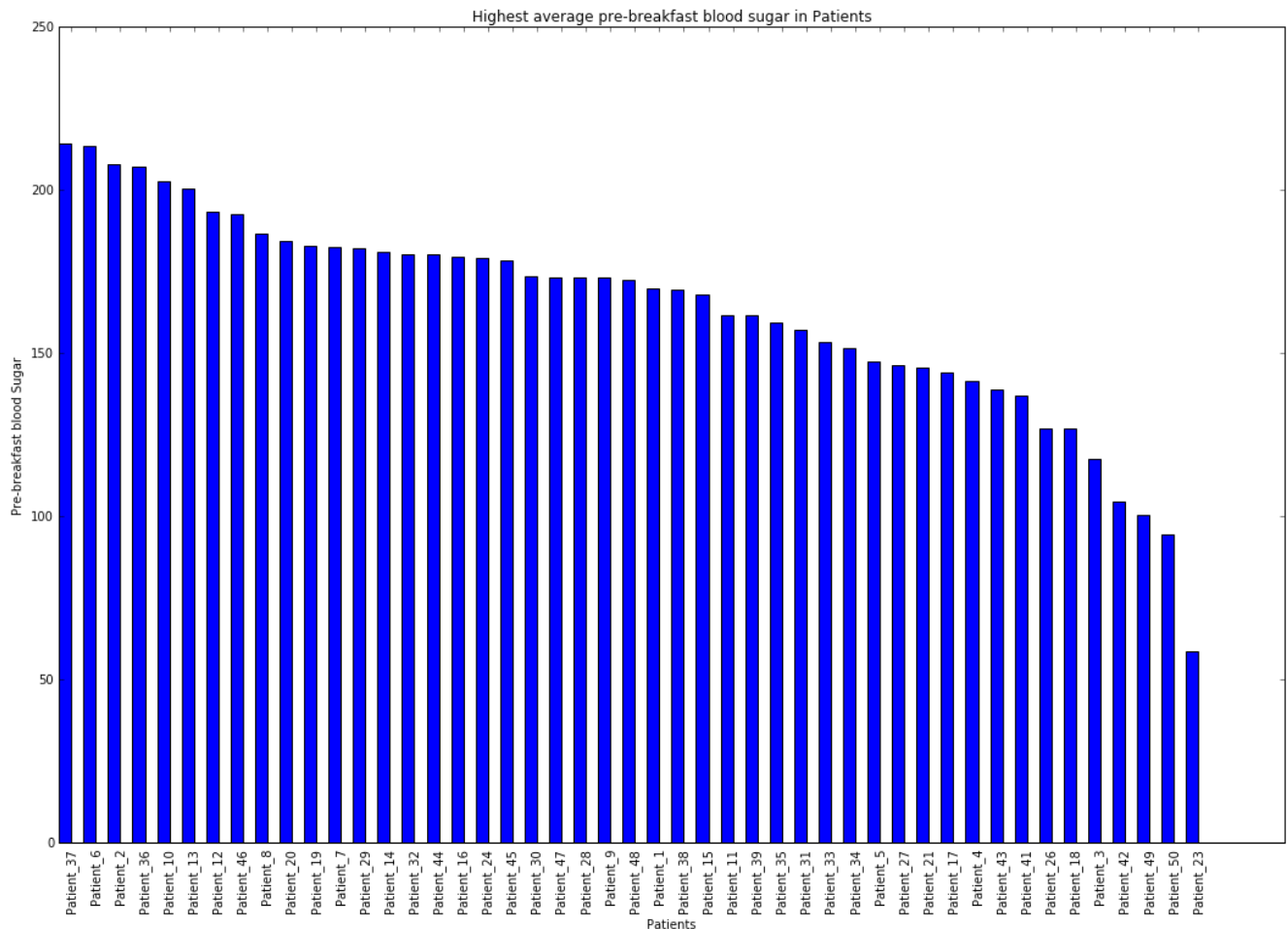
N = 47
index = np.arange(N)
bar_width = 0.5

plt.bar(index, sugarTop10, bar_width,
        color='b')

plt.xlabel('Patients')
plt.ylabel('Pre-breakfast blood Sugar')
plt.title('Highest average pre-breakfast blood sugar in Patients')
plt.xticks(index + bar_width, patientsTop10, rotation=90)
plt.show()

```

Current size: [6.0, 4.0]



Results & Findings:

8 : Plot for Average Pre-supper blood Sugar of 50 Patients sorted

in descending order (calculated based on daily blood sugar

level given for span of 2-3 years)

In [220]:

```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt

# Get current size
fig_size = plt.rcParams["figure.figsize"]

# Prints: [8.0, 6.0]
print "Current size:", fig_size

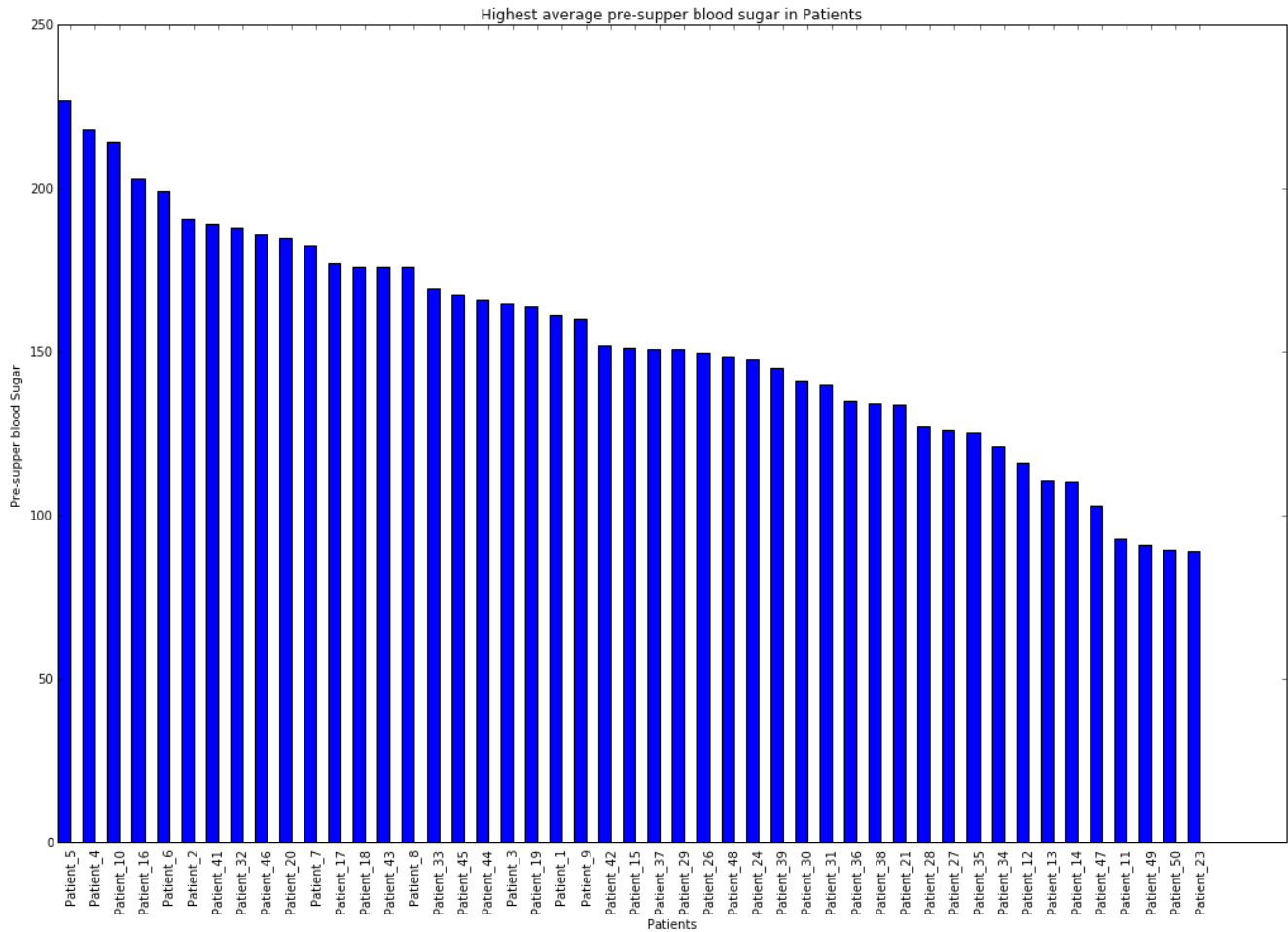
# Set figure width to 12 and height to 9
fig_size[0] = 18
fig_size[1] = 12
plt.rcParams["figure.figsize"] = fig_size

N = 47
index = np.arange(N)
bar_width = 0.5

plt.bar(index, sugar_1_Top10, bar_width,
        color='b')
plt.xlabel('Patients')
plt.ylabel('Pre-supper blood Sugar')
plt.title('Highest average pre-supper blood sugar in Patients')
```

```
plt.title('Highest average pre-supper blood sugar in Patients')
plt.xticks(index + bar_width, patients_1_Top10, rotation=90)
plt.show()
```

Current size: [6.0, 4.0]



Conclusion:

Patient 23 has the lowest average blood sugar level in both pre-breakfast and pre-supper durations. This indicates that proper quantity of insulin dose administration was carried out in this patient. Similar ratio of insulin dose if given to other patients should result in targeted limit on blood sugar level in other patients.