
# Advanced Programming For Business Analytics

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# Introduction

- Mission: To consistently produce top quality, premium valued bakery products with the taste of hometown goodness in every bite.
- Muffin Town is a leading bakery based in Chelsea, Massachusetts, known for its exceptional baked goods.
- Established in 1978, Muffin Town has grown from a small bakery into a renowned brand recognized for its high-quality products.
- Muffin Town offers a diverse range of baked goods, including muffins, cakes, pastries, and other delicious treats, catering to various tastes and preferences.
- With a nationwide presence, Muffin Town serves both retail consumers and the foodservice industry, providing its products to a wide range of customers across the country.

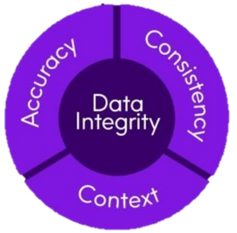
# Project Background

- Visited Muffin Town's plant in Lawrence to gain insights into their operations and meet with Brian, the key contact.
- Engaged in discussions with Brian to understand his needs and objectives for the project.
- Brian provided Excel files containing data on plant performance for each SKU (Stock Keeping Unit).
- Conducted data cleaning and analysis to prepare the data for further insights.
- Established biweekly meetings with Brian to update him on project progress and gather feedback.
- Developed an Excel template covering the previously shared files and utilized the Gradio library in Python to create a platform for Brian to obtain quick insights on the performance of different plants.

# Input

Muffin Town used  several excel sheets to manage the information

- Formats
- Units of measurement
- Protocol to entry
- Single source of information




This led to data that did not match with the needs of the business, complicating analysis

To begin the process of improvement, several conventions were implemented in their process of managing inputs

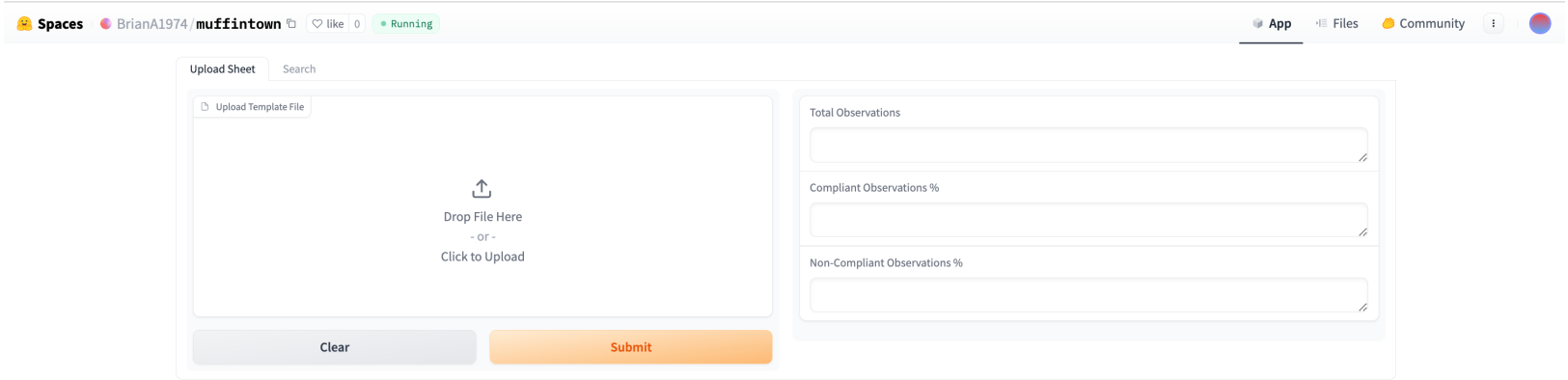
- Created a single source of information after mapping the process and creating a schema
- Created a Master Data for all SKUs, Production Lines, and capacity
- Created tables to organize information and fed through the primary key
- Validated data through conditional formatting
- Minimized error and manual input with drop down lists

# Excel Template

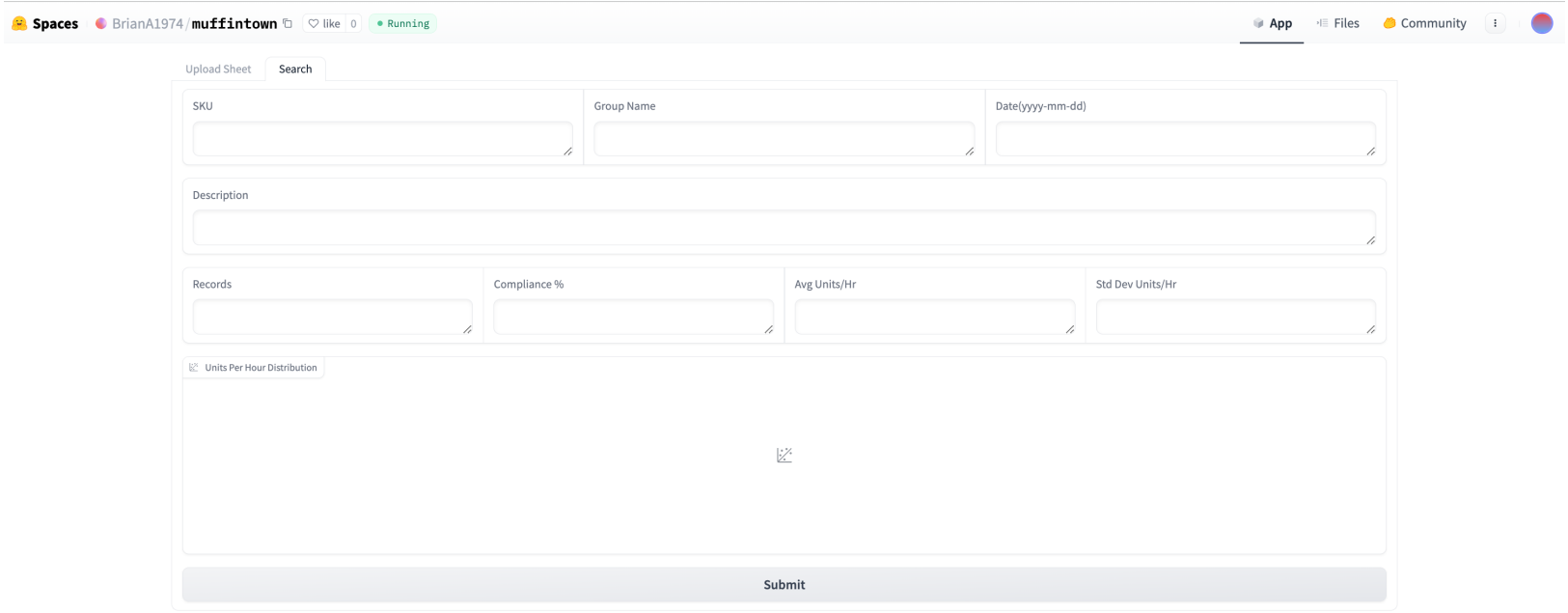
- The excel file standard sets the right path for the codes proper run
- Uses color coding to define data type and inputs
- Show flexibility for SKUs increase and other production parameters

| Equipment ID | Group Name | Date | Current Jo | Start of Batch Date/Tim | End of Batch Date/Ti | Batch Cou | User1 | LINE -LOCATION (Eqp Co | Optimal Cases Per H | Lower Tar | Upper Tar |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | LAWRENCE AUTOBAKE | 2020-08-24 | 96,605 | 24-Aug-20 | 8/24/2020 19:42:41 | 2,445 | 96,605 | EQP-LAWPACK1 | 347 | 312 | 382 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-24 | 24,970 | 24-Aug-20 | 8/24/2020 20:00:05 | 3 | 24,970 | EQP-LAWPACK1 | 364 | 328 | 400 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-24 | 7,910 | 24-Aug-20 | 8/24/2020 20:19:10 | 49 | 7,910 | EQP-LAWPACK1 | 349 | 314 | 384 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-25 | 24,970 | 24-Aug-20 | 8/25/2020 06:54:17 | 504 | 24,970 | EQP-LAWPACK1 | 364 | 328 | 400 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-25 | 27,805 | 25-Aug-20 | 8/25/2020 15:17:31 | 2,087 | 27,805 | EQP-LAWPACK1 | 260 | 234 | 286 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-26 | 27,405 | 25-Aug-20 | 8/26/2020 06:56:42 | 2,123 | 27,405 | EQP-LAWPACK1 | 260 | 234 | 286 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-26 | 2,666 | 26-Aug-20 | 8/26/2020 12:59:08 | 1,272 | 2,666 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-26 | 2,661 | 26-Aug-20 | 8/26/2020 14:06:39 | 158 | 2,661 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-26 | 88,888 | 26-Aug-20 | 8/26/2020 19:38:30 | 0 | 88,888 | EQP-LAWPACK1 | | | |
| 20 | LAWRENCE AUTOBAKE | 2020-08-27 | 2,661 | 26-Aug-20 | 8/27/2020 06:54:47 | 296 | 2,661 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-31 | 99,999 | 28-Aug-20 | 8/31/2020 06:55:54 | 0 | 99,999 | EQP-LAWPACK1 | | | |
| 20 | LAWRENCE AUTOBAKE | 2020-08-31 | 2,991 | 31-Aug-20 | 8/31/2020 09:03:04 | 380 | 2,991 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-31 | 2,946 | 31-Aug-20 | 8/31/2020 11:05:40 | 406 | 2,946 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-31 | 23,905 | 31-Aug-20 | 8/31/2020 17:23:46 | 2,130 | 23,905 | EQP-LAWPACK1 | 364 | 328 | 400 |
| 20 | LAWRENCE AUTOBAKE | 2020-08-31 | 24,975 | 31-Aug-20 | 8/31/2020 18:45:00 | 371 | 24,975 | EQP-LAWPACK1 | 364 | 328 | 400 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-01 | 6,670 | 31-Aug-20 | 9/1/2020 06:57:36 | 1,482 | 6,670 | EQP-LAWPACK1 | 352 | 317 | 387 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-01 | 2,666 | 01-Sep-20 | 9/1/2020 14:10:18 | 770 | 2,666 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-02 | 2,661 | 01-Sep-20 | 9/2/2020 06:57:13 | 1,670 | 2,661 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-02 | 24,961 | 02-Sep-20 | 9/2/2020 07:35:52 | 11 | 24,961 | EQP-LAWPACK1 | 364 | 328 | 400 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-02 | 6,661 | 02-Sep-20 | 9/2/2020 10:59:48 | 1,130 | 6,661 | EQP-LAWPACK1 | 352 | 317 | 387 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-01 | 2,675 | 01-Sep-20 | 9/1/2020 10:34:53 | 760 | 2,675 | EQP-LAWPACK1 | 217 | 195 | 239 |
| 20 | LAWRENCE AUTOBAKE | 2020-09-02 | 24,961 | 02-Sep-20 | 9/2/2020 15:16:00 | 1,361 | 24,961 | EQP-LAWPACK1 | 364 | 328 | 400 |

# Gradio Layout



# Gradio Layout



# Gradio Layout

```
with gr.Blocks() as tab_search_by_sku:
    with gr.Row():
        sku = gr.Textbox(label="SKU")
        group_name = gr.Textbox(label="Group Name")
        date = gr.Textbox(label="Date(yyyy-mm-dd)")

    with gr.Row():
        description = gr.Textbox(label="Description")

    with gr.Row():
        records = gr.Textbox(label="Records")
        compliance = gr.Textbox(label="Compliance %")
        avgunits = gr.Textbox(label="Avg Units/Hr")
        stddev = gr.Textbox(label="Std Dev Units/Hr")

    with gr.Row():
            graph = gr.Plot(label="Units Per Hour Distribution")

    with gr.Row():
        submit_btn = gr.Button('Submit')
        submit_btn.click(
            fn=search_data,
            inputs=[sku, group_name, date],
            outputs=[description, records, compliance, avgunits, stddev, graph]
        )
```

```
tab_files = gr.Interface(
    fn = upload_file,
    inputs = [
        gr.File(label="Upload Template File", file_types=[".xlsx"], file_count="single")
    ],
    outputs = [
        gr.Textbox(label="Total Observations", interactive=False),
        gr.Textbox(label="Compliant Observations %", interactive=False),
        gr.Textbox(label="Non-Compliant Observations %", interactive=False)
    ],
    allow_flagging = "never"

)

demo = gr.TabbedInterface([tab_files, tab_search_by_sku], ["Upload Sheet", "Search"])

demo.launch(auth=("BrianA", "Brian@Muffintown1"))
```

# Function prepare_df

```
def prepare_df(file_path):

    df = pd.read_excel(file_path)

    df['Current Job'] = df['Current Job'].astype(str)

    df['Start of Batch Date/Time'] = pd.to_datetime(df['Start of Batch Date/Time'])
    df['End of Batch Date/Time'] = pd.to_datetime(df['End of Batch Date/Time'])

    df['Batch Length (Hours)'] = (df['End of Batch Date/Time'] - df['Start of Batch Date/Time']).dt.total_seconds() / 3600

    df['Units Per Hour'] = df['Batch Count'] / df['Batch Length (Hours)']

    df.dropna(subset=['Optimal Cases Per Hour'], inplace=True)

    return df
```

# Function initial_analysis

```
def initial_analysis(df):

    compliant_df = df[(df['Units Per Hour'] >= df['Lower Target']) & (df['Units Per Hour'] <= df['Upper Target'])]
    non_compliant_df = df[(df['Units Per Hour'] < df['Lower Target']) | (df['Units Per Hour'] > df['Upper Target'])]

    total_observations = len(df)
    pct_compliant = 100 * round(len(compliant_df)/total_observations,2)
    pct_non_compliant = 100 * round(len(non_compliant_df)/total_observations,2)

    return total_observations, pct_compliant, pct_non_compliant
```

# Function search_data

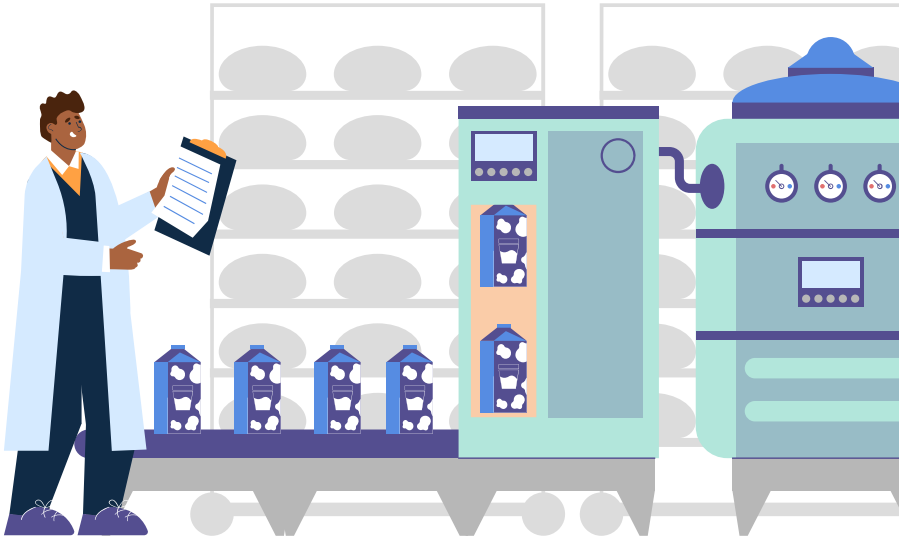
```
def search_data(sku, group_name, date):


    if(sku == '' and group_name == '' and date != ''):
        filtered_df = initial_df[initial_df['Date'] == date]

    elif(sku == '' and group_name != '' and date == ''):
        filtered_df = initial_df[initial_df['Group Name'] == group_name]

    elif(sku != '' and group_name == '' and date == ''):
        filtered_df = initial_df[initial_df['Current Job'] == sku]

    elif(sku == '' and group_name != '' and date != ''):
        filtered_df = initial_df[(initial_df['Group Name'] == group_name) & (initial_df['Date'] == date)]

    elif(sku != '' and group_name == '' and date != ''):
        filtered_df = initial_df[(initial_df['Current Job'] == sku) & (initial_df['Date'] == date)]

    elif(sku != '' and group_name != '' and date == ''):
        filtered_df = initial_df[(initial_df['Current Job'] == sku) & (initial_df['Group Name'] == group_name)]

    else:
        filtered_df = initial_df[(initial_df['Current Job'] == sku) & (initial_df['Group Name'] == group_name) & (initial_df['Date'] == date)]


    records = len(filtered_df)

    compliant_records = len(filtered_df[(filtered_df['Units Per Hour'] >= filtered_df['Lower Target']) & (filtered_df['Units Per Hour'] <= filtered_df['Upper Target'])])

    compliance_percentage = round((compliant_records / records),2) * 100 if records != 0 else 0

    avg_units_per_hour = round(filtered_df['Units Per Hour'].mean(),2)

    stdev_units_per_hour = round(filtered_df['Units Per Hour'].std(),2)

    most_common_value = filtered_df['Description'].value_counts().idxmax()

    fig1 = plt.figure()
    plt.hist(filtered_df['Units Per Hour'], bins=20, color='skyblue', edgecolor='black')
    plt.xlabel('Units Per Hour')
    plt.ylabel('Frequency')
    plt.grid(True)

    return most_common_value, records, compliance_percentage, avg_units_per_hour, stdev_units_per_hour, fig1
```

# Application Demo


https://huggingface.co/spaces/BrianA1974/muffintown

# Thanks!

**Do you have any questions?**



**CREDITS:** This presentation template was created by **Slidesgo**, and includes icons by **Flaticon**, and infographics & images by **Freepik**