CxC 2025 TouchBistro Challenge

By Shami-uz Zaman, Tony Ngo, Roah Cho, Angad Ahluwalia

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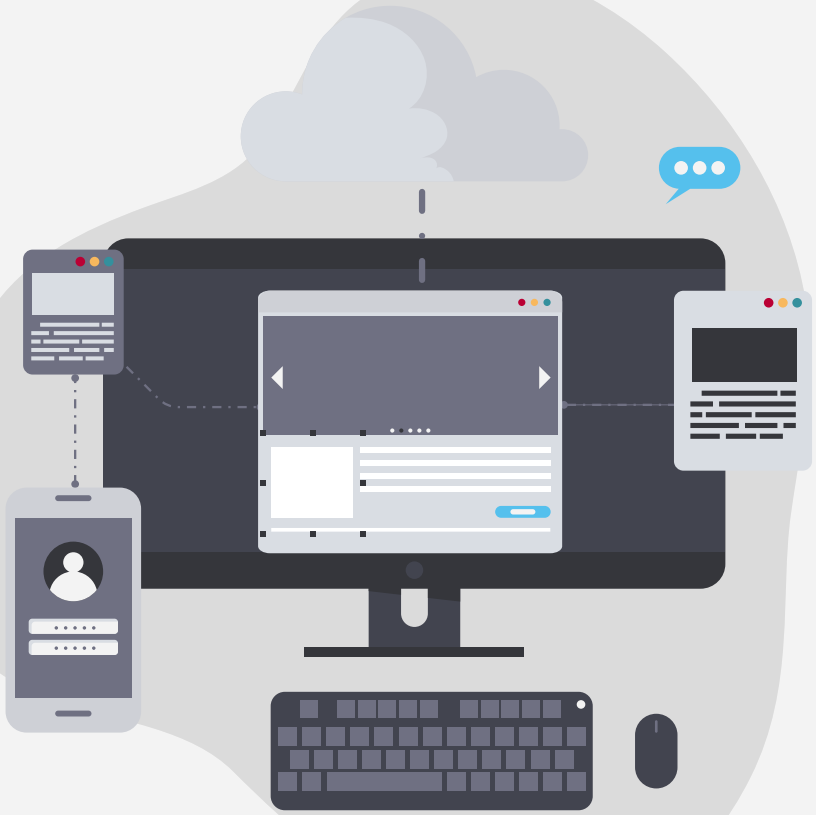

Introduction

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TouchBistro is a restaurant management platform used across North America to help restaurant owners:

1. **Process Orders & Payments**
   - Seamlessly manage dine-in, takeout, and delivery transactions.
2. **Optimize Staffing**
   - Improve workforce scheduling based on demand.
3. **Enhance Customer Experience**
   - Manage loyalty programs and customer engagement.
4. **Analyze Business Performance**
   - Gain insights from real-time data analytics.

Why does this matter?

- Restaurants **generate** huge amounts of **data** every day.
- Many businesses **fail** to **leverage** this data effectively.
- Our project aims to help restaurants **use data** for **smarter decision-making**.

Key Business Questions

1. Peak Period Analysis

- When are restaurants **busiest**?
- How can **staffing** be **optimized** to improve efficiency?

2. Customer Spending Behavior

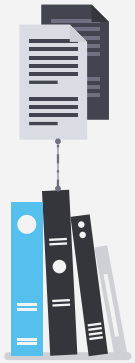
- Do people **tip more** for dine-in vs. takeout?
- What factors influence **spending** and **tipping** behavior?

3. Sale Forecasting

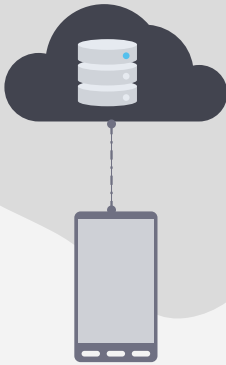
- Can we **predict** future sales **revenue**?
- How can restaurants use this information for **inventory** and **staffing** decisions?

4. Impact of External Factors

- Does **weather** impact sales?
- How do **holidays** and **inflation** affect consumer behavior?



Dataset Overview



Transaction Data

(Bill-Level Details)

- **Order details**
  - Order timestamps
  - Order type (dine-in, takeout, delivery)
- **Revenue details**
  - Total bill amount
  - Tax amount
  - Tip amount
- **Operational details**
  - Order duration
  - Time the bill was paid

Venue Data

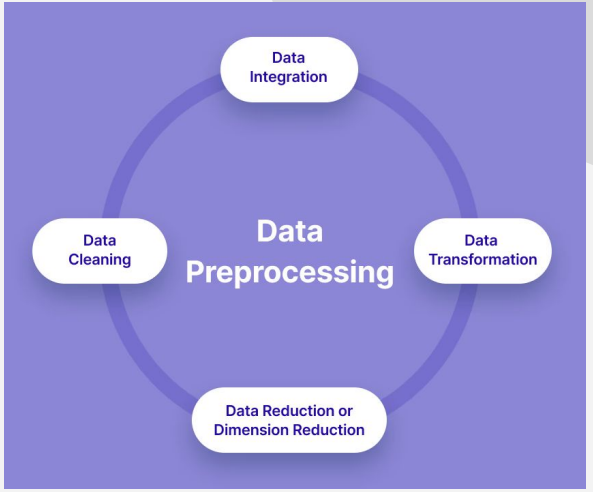
(Restaurant-Level Details)

- **Location details**
  - City
  - Country
  - Venue ID
- **Operating hours**
  - Start-of-day offsets
  - Business hours

Additional Data

- **Weather Data API**
  - To analyze impact of temperature & precipitation on sales
- **Inflation Data**
  - To examine economic influences on customer spending

Data Preprocessing



Step 1: Handling Missing Values

- Some transaction records had missing timestamps or payment details.
- We removed incomplete rows to ensure accuracy.

Step 2: Time Formatting & Parsing

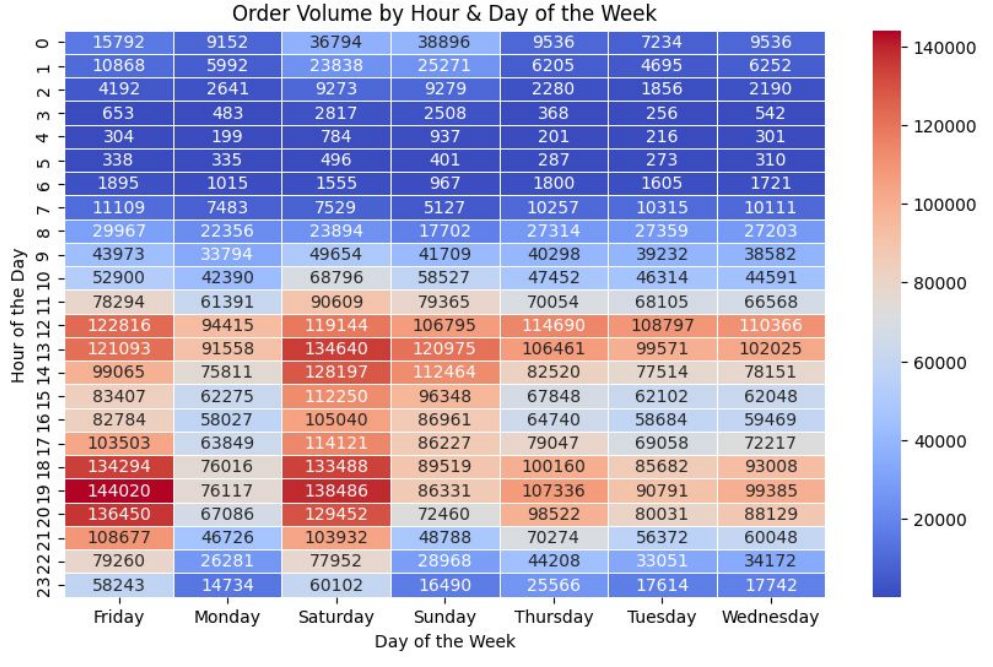
- Converted time-related fields (e.g., order_seated_at_local, bill_paid_at_local) into standard datetime format for easier analysis.

Step 3: Feature Engineering

- Created new variables:
  - Peak vs. Off-Peak hours
  - Tip percentage (tip ÷ total bill)
  - Weekday vs. Weekend sales trends

Peak Period Analysis

When Are Restaurants the Busiest?



Hour of the Day	Friday	Monday	Saturday	Sunday	Thursday	Tuesday	Wednesday
0	15792	9152	36794	38896	9536	7234	9536
1	10868	5992	23838	25271	6205	4695	6252
2	4192	2641	9273	9279	2280	1856	2190
3	653	483	2817	2508	368	256	542
4	304	199	784	937	201	216	301
5	338	335	496	401	287	273	310
6	1895	1015	1555	967	1800	1605	1721
7	11109	7483	7529	5127	10257	10315	10111
8	29967	22356	23894	17702	27314	27359	27203
9	43973	33794	49654	41709	40298	39232	38582
10	52900	42390	68796	58527	47452	46314	44591
11	78294	61391	90609	79365	70054	68105	66568
12	122816	94415	119144	106795	114690	108797	110366
13	121093	91558	134640	120975	106461	99571	102025
14	99065	75811	128197	112464	82520	77514	78151
15	83407	62275	112250	96348	67848	62102	62048
16	82784	58027	105040	86961	64740	58684	59469
17	103503	63849	114121	86227	79047	69058	72217
18	134294	76016	133488	89519	100160	85682	93008
19	144020	76117	138486	86331	107336	90791	99385
20	136450	67086	129452	72460	98522	80031	88129
21	108677	46726	103932	48788	70274	56372	60048
22	79260	26281	77952	28968	44208	33051	34172
23	58243	14734	60102	16490	25566	17614	17742

Objective: Analyze hourly sales patterns to determine when restaurants experience the highest order volumes.

Methodology:

1. Extracted order timestamps and grouped them by hour.
2. Counted total orders and total revenue per hour.
3. Created a heatmap visualization to highlight peak traffic periods.

Peak Period Insights

When Should Restaurants Adjust Staffing?

Key Insights & Business Implications

- The busiest time across most restaurants was 6pm to 9pm.
- Some restaurants had unexpected late-night spikes (10pm to 12am).
- Mid-week traffic was lower than weekends, but some venues had high weekday lunch rushes.

Recommendations:

- Increase staffing during peak hours to reduce wait times.
- Adjust shifts dynamically based on real-time sales trends.
- Offer discounts/promotions during off-peak hours to increase traffic.

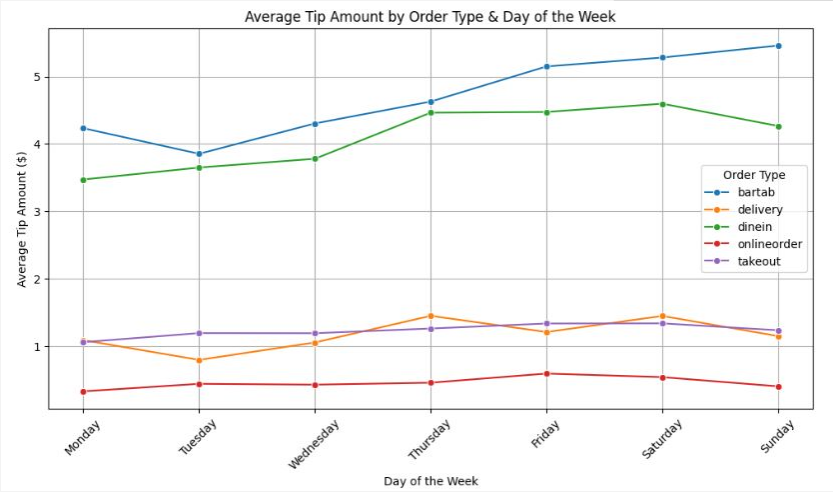
Customer Spending Insights

Do People Tip More for Dine-In?

Objective: Compare average bill size and tip percentage across dine-in, takeout, and delivery orders.

Methodology:

1. Grouped data by order_take_out_type_label (Dine-in, Takeout, Delivery).
2. Calculated average bill total and average tip percentage.
3. Visualized differences with bar charts and box plots.



Customer Spending Insights

What Drives Higher Tips?

Key Insights & Business Recommendations

- Dine-in orders had the highest average bill and higher tip percentages (~18-22%).
- Takeout orders had lower average spend and tipping (~10-12%).
- Delivery orders had inconsistent tipping, likely influenced by external apps (UberEats, DoorDash).

Recommendations:

- Restaurants should incentivize dine-in experiences to maximize customer spend.
- Suggest tip amounts at checkout to encourage higher tips.
- Bundle promotions for takeout to increase revenue per order.

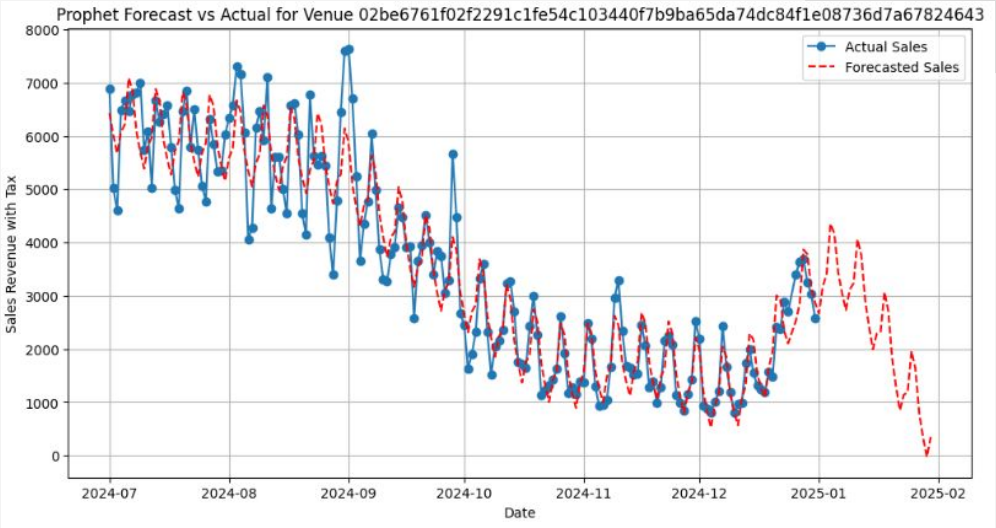
Sales Forecasting

Predicting Future Revenue

Objective: Develop a forecasting model to predict restaurant sales for the next 30 days.

Methods Used:

- Prophet Model
  - Handles seasonal trends and holidays.
- Exponential Smoothing
  - Identifies long-term revenue patterns.



External Factors

How Do Weather & Holidays Impact Sales?

Key Insights:

- Rainy days led to fewer dine-in orders but increased delivery sales.
- Weekends consistently had higher average sales than weekdays.
- Holidays like Christmas & New Year's Eve showed a 20% spike in revenue.

Recommendations:

- Increase online promotions during bad weather.
- Offer holiday special menus to maximize seasonal revenue.

Key Takeaways

1. Peak Periods

Restaurants should adjust staffing dynamically based on historical sales trends.

2. Customer Spend Insights

Dine-in orders lead to higher revenue and tips, requiring tailored marketing.

3. Sales Forecasting

Implementing predictive analytics can improve business planning.

Future Work Recommendations

1. Integrate real-time data sources (weather, holidays, inflation).

2. Develop an interactive dashboard for restaurant owners.

Thank you!