

Crust & Craft:

A DATA-DRIVEN APPROACH TO ENTERING THE U.S. PIZZA MARKET

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COURSE NAME: MDA 720 APPLIED BUSINESS ANALYTICS

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BACKGROUND: ENTERING THE PIZZA MARKET IN THE UNITED STATES

Overview of the U.S. Pizza Industry

The U.S. pizza industry is a major segment of the broader restaurant market, renowned for its robust growth and universal consumer appeal. Pizza is considered a staple in American dining culture, characterized by its versatility and broad demographic reach. From quick-service options to gourmet offerings, the pizza industry caters to a wide array of tastes and preferences, making it a vibrant and dynamic field for new entrants. As of the latest data, the U.S. pizza industry is estimated to generate over \$45 billion in annual sales, with projections indicating a growth rate of 3% per year over the next five years.

Consumer Preferences and Trends

Consumer preferences in the pizza market have evolved significantly over recent years. There is an increasing demand for premium ingredients, gluten-free and vegan options, and innovative flavors. Additionally, technology plays a crucial role in shaping consumer habits, with online ordering and home delivery services becoming increasingly prevalent. These trends offer opportunities for new businesses to innovate in how they produce and deliver their products. According to a 2023 consumer survey, 65% of millennials prefer restaurants that offer high-quality, sustainable ingredients.

Market Size and Growth Potential

As of the latest data, the pizza industry generates billions in annual sales in the U.S. alone, with projections indicating sustained growth. This growth is fueled by the increasing convenience of delivery services, the rising popularity of craft and artisan pizzas, and the integration of new technologies in ordering and operations.

The Concept: "Crust & Craft"

"Crust & Craft" aims to differentiate itself by offering a unique blend of traditional and innovative pizza options. The concept revolves around quality and customer experience, focusing on:

Artisanal Quality: Using high-quality, locally-sourced ingredients to craft pizzas that offer a superior taste and healthier options compared to conventional fast food pizza.

Customization: Allowing customers to personalize their pizzas from crust to toppings, catering to a wide range of dietary preferences and tastes.

Technology Integration: Implementing a robust digital ordering system that enhances customer convenience for both pick-up and delivery services.

Target Market

The target market for "Crust & Craft" includes millennials and Generation Z consumers who value quality, sustainability, and convenience. These consumers are typically urban dwellers, students,

and young professionals who are willing to pay a premium for better ingredients and a customizable dining experience.

Competitive Analysis

The competitive landscape features a mix of large pizza chains and local pizzerias. Standing out in this crowded market requires not only a superior product but also strategic marketing, a strong brand identity, and exceptional customer service. "Crust & Craft " plans to leverage local marketing, social media engagement, and community involvement to build a loyal customer base.

OBJECTIVE/GOALS OF THE PROJECT

Main Objective

The primary objective of this project is to establish "Crust & Craft" as a profitable and distinctive player in the U.S. pizza market by leveraging competitive analysis, customer insights, and strategic location and pricing models.

Specific Goals

Competitive Observation and Analysis

Goal: To systematically analyze direct and indirect competitors to understand their success factors, pricing strategies, customer loyalty drivers, and areas of dissatisfaction.

Objective: Identify at least three competitive advantages "Crust & Craft" can exploit, such as superior ingredient quality, innovative pizza offerings, or a more effective digital customer engagement strategy.

Development of Unique Pizza Offerings

Goal: To create a menu that distinguishes "Crust & Craft" from competitors by focusing on unique flavors, dietary options, and customization capabilities.

Objective: Develop a list of 10 signature pizza recipes that incorporate local tastes and preferences, health-conscious options, and trending ingredients by the end of Q2 2024.

Optimization of Pricing Strategy

Goal: To establish a pricing model that maximizes profitability while remaining competitive and accessible to the target demographic.

Objective: Conduct a price sensitivity analysis to determine optimal pricing tiers for various menu items, factoring in cost, perceived value, and competitor pricing by Q3 2024.

Selection of Strategic Locations

Goal: To identify and secure restaurant locations in areas that support high foot traffic, demographic alignment, and minimal direct competition.

Objective: Utilize geographic and demographic data to select three ideal locations for the first "Crust & Craft" outlets by the end of Q4 2024.

Understanding Market Demand and Customer Preferences

Goal: To gauge potential customer responses to various aspects of the pizza business, including product preferences, pricing, and dining experiences.

Objective: Deploy a market survey targeting the primary demographic to gather data on customer preferences and expectations, achieving a minimum of 500 responses by Q1 2025.

Menu Options and Customization

Goal: To offer a menu that adapts to varying customer needs and desires, from classic selections to innovative, personalized pizzas.

Objective: Design a flexible menu structure that includes build-your-own options and seasonal specialties, ready for customer feedback and refinement by mid-2025.

DATA EXTRACTION/COLLECTION/SCRAPING

For "Crust & Craft," data-driven decision-making is pivotal. To this end, the project utilizes a multi-pronged approach to data collection encompassing existing datasets, web scraping, and trend analysis.

Existing Data Utilization

Data.world Dataset: An existing dataset from data.world has been used, which offers comprehensive information on pizza restaurants, including location details, menu specifics, pricing, and sales data. This dataset's attributes, such as menu offerings and pricing structures, provide insight into current market standards and profitability models.

Attributes: Key attributes from the dataset include:

- Geographic information (address, city, latitude, longitude, province, postal code)
- Business information (name, categories, primary categories, year of data collection)
- Menu specifics (menus.name, menus.description, menus.amountMax, menus.amountMin)
- Financial metrics (price range, selling price, pizza making cost, profit)
- Temporal data (year, month, day)

Success indicators for business operations

This dataset forms the backbone of our market analysis, enabling a detailed understanding of competitive positioning and financial benchmarks.

Web Scraping

Yelp Review Analysis: Utilizing Python-based web scraping, customer reviews have been extracted from Yelp. This allows for a rich sentiment analysis to understand public perception and customer satisfaction levels, which are critical for identifying areas of improvement and potential market gaps.

Trend Analysis

PyTrends Analysis: PyTrends, a Python library for accessing Google Trends data, has been deployed to analyze the recent popularity trends of restaurants. This aids in identifying trending concepts and preferences in the restaurant industry, which can influence the strategic positioning of "Crust & Craft."

Data Processing

The data collected from these sources will undergo rigorous processing, including cleaning, normalization, and integration. This will ensure a coherent dataset that is primed for further analysis, such as predictive modeling and sentiment analysis.

Ethical Considerations

While collecting data, ethical considerations and compliance with data privacy regulations have been strictly adhered to. Data is used only in aggregate form, and no personally identifiable information is extracted during the web scraping process.

DATA EXPLORATION/VISUALIZATION

Prior to diving into the heart of data exploration, it was essential to ensure that "Crust & Craft's" dataset was clean and reliable. The initial phase of data preparation involved several key steps:

Data Manipulation

Null Value Treatment: Null values were systematically identified and treated with appropriate imputation methods. Numerical columns were filled with mean or median values after assessing the data distribution to maintain the integrity of the dataset.

Feature Engineering: Recognizing the value of time-based insights, new features such as year, date, and month were engineered from existing data, setting the stage for a more granular temporal analysis.

Data Standardization: Inconsistencies in the 'name' field were resolved, thereby streamlining the data and ensuring uniformity across similar entries.

Pattern Identification: Utilizing regular expressions, a methodical approach was applied to extract unique pizza names from menu descriptions. This will be instrumental in understanding menu diversity and customer preferences.

Data Exploration

With a cleansed dataset, the exploration phase commenced. The following steps outline the journey of discovery undertaken with "Crust & Craft's" dataset:

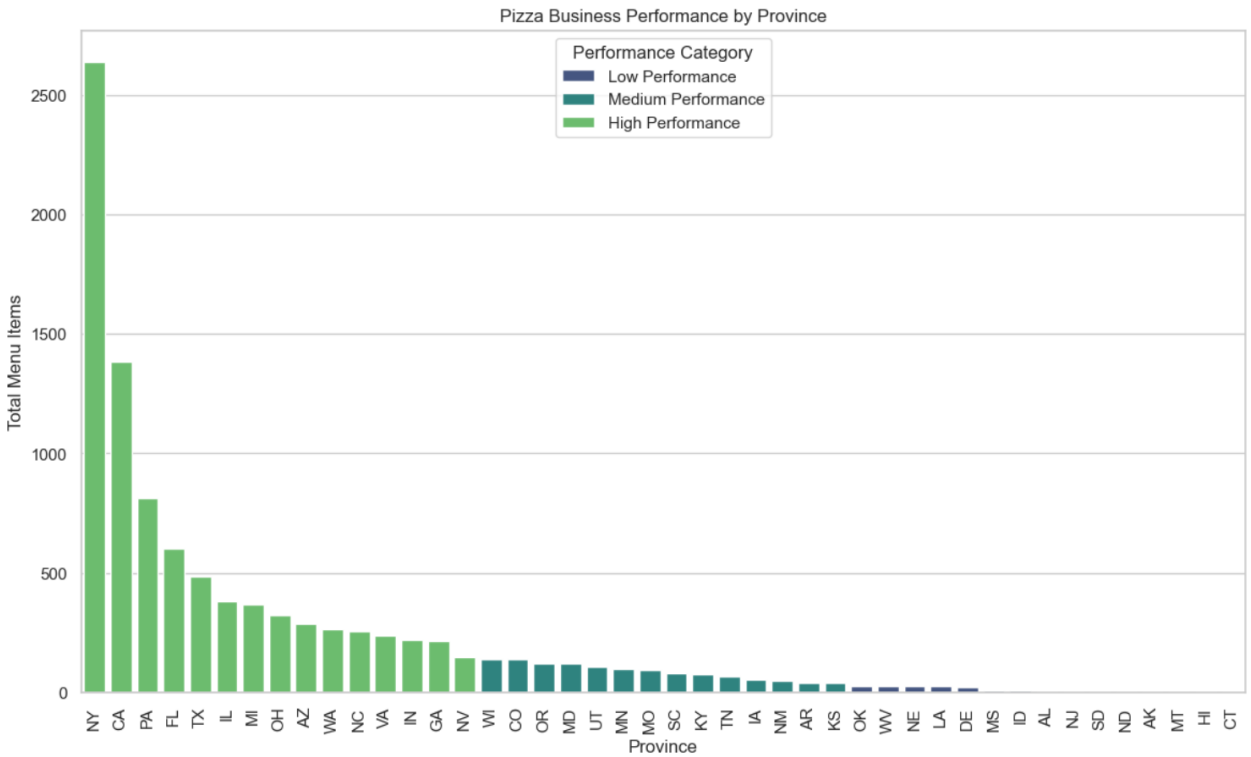
Outlier Analysis: Outliers were identified using statistical techniques. Decisions on whether to exclude or investigate these data points were made based on their potential impact on the overall analysis.

Correlation Assessment: A preliminary correlation matrix was developed to uncover any direct relationships between variables such as location, menu pricing, sales volume, and profit margins.

Menu Popularity: Bar charts were developed to display the popularity of different pizzas, offering a visual representation of consumer tastes and potential market opportunities.

State Performance Analysis

To identify optimal regions for the expansion of "Crust & Craft," we investigated the performance of pizza businesses across various U.S. states. This involved analyzing the number of menu items offered as a proxy for market activity and competition levels.



Findings

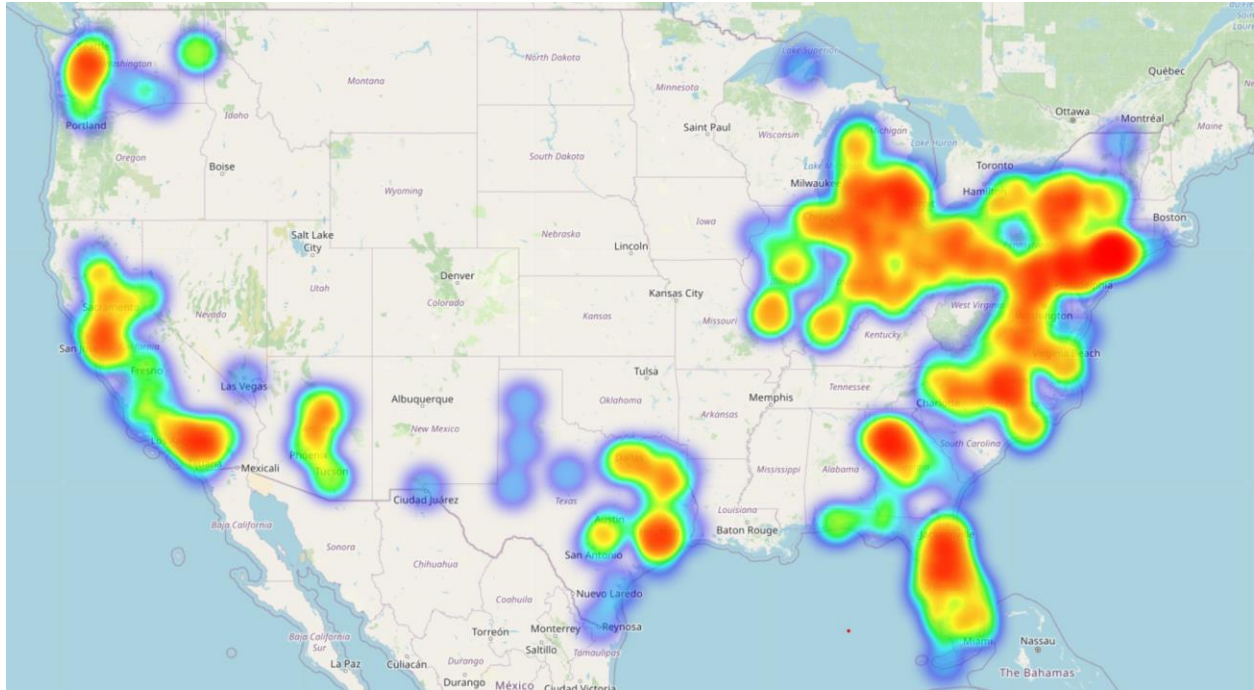
- **High Competition States:** NY, CA, and PA show high competition with diverse offerings.
- **Emerging Markets:** States with fewer menu items may represent growth opportunities.

Analysis

- **Competitive Differentiation:** In competitive states, "Crust & Craft" should focus on unique offerings.
- **Growth Potential:** States with lower competition require market viability analysis.
- **Strategic Positioning:** A balanced approach is needed for market entry decision-making.

Geographic Distribution Analysis for "Crust & Craft"

"Crust & Craft" aims to understand the geographic concentration of pizza restaurants across regions to identify market saturation and potential areas for expansion.



Findings

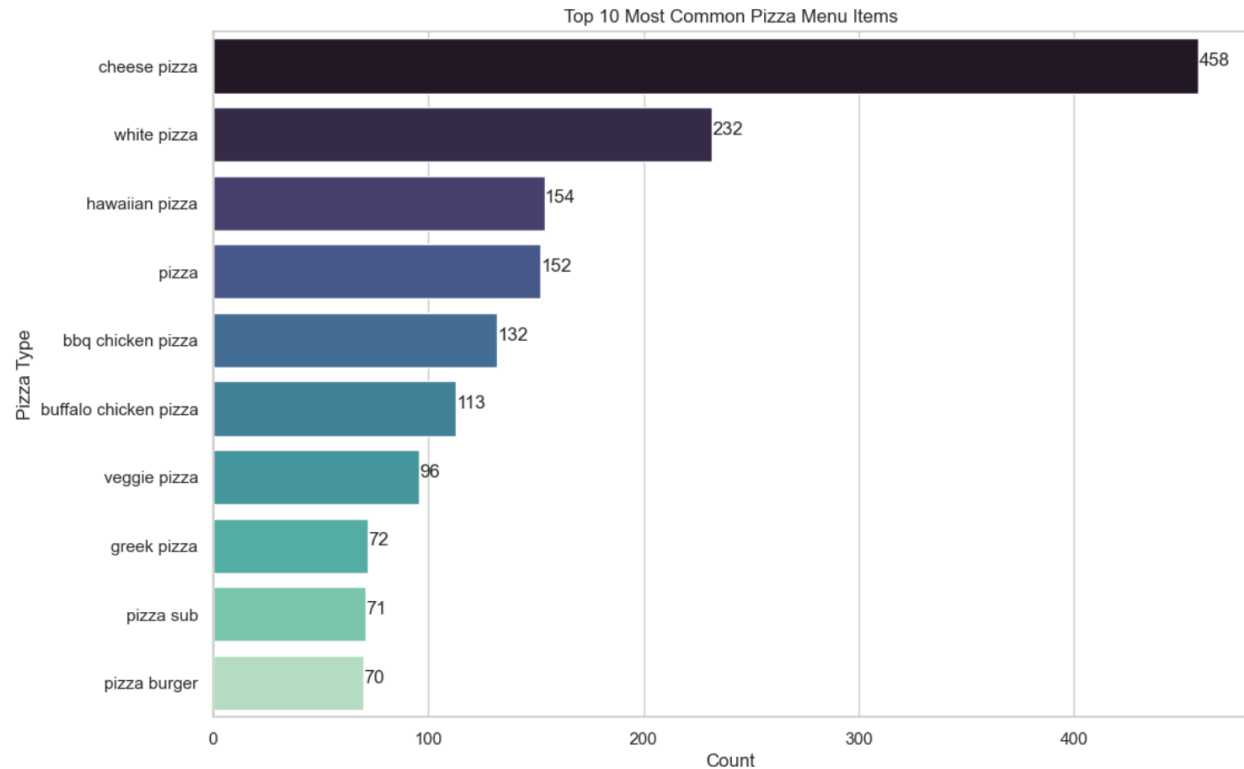
- **Hotspots:** High concentrations of pizza places are in the Northeast, West Coast, and Texas.
- **Saturation Indicators:** Bright areas may indicate markets with high competition.

Implications for "Crust & Craft"

- **Location Strategy:** Use map insights to identify less saturated markets for potential expansion.
- **Market Research:** Conduct in-depth analysis in dense regions to assess entry feasibility.

Menu Item Popularity Analysis for "Crust & Craft"

The objective was to identify the most popular pizza varieties based on menu frequency to inform "Crust & Craft's" menu development and potential specialty offerings.



Findings

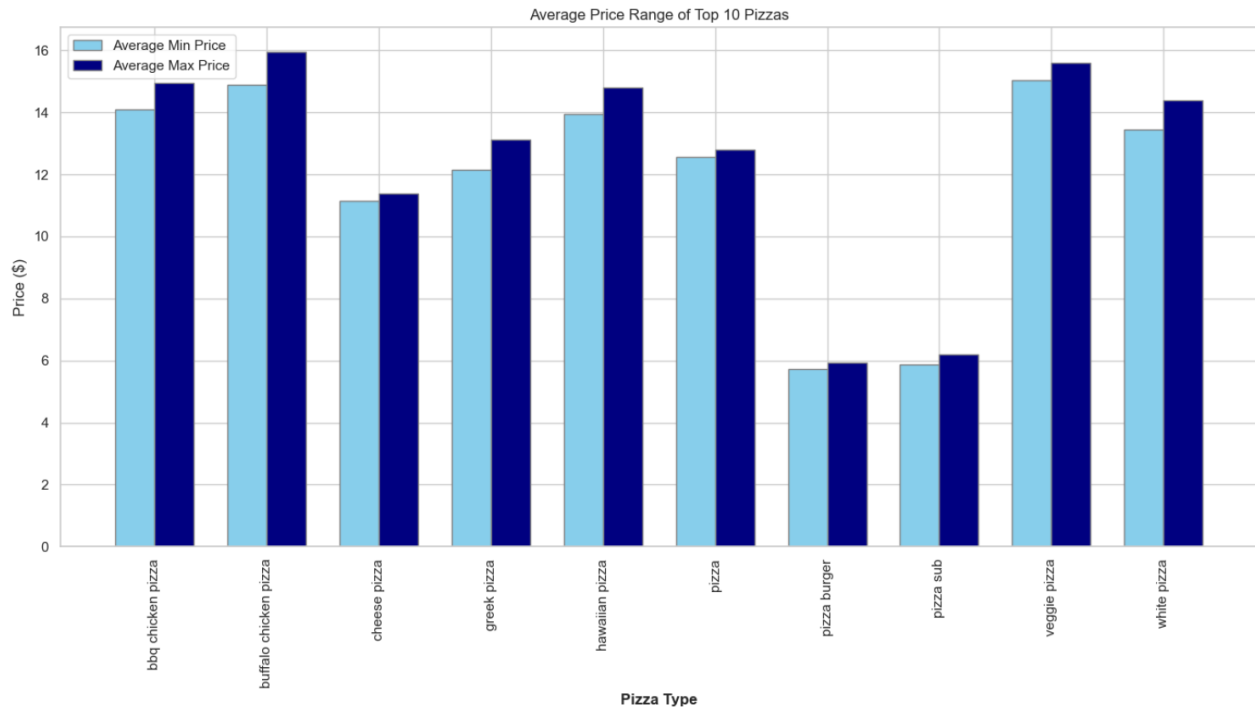
- **Top Picks:** Cheese, white, and Hawaiian pizzas are the favorites, showing demand for both classic and diverse options.
- **Unique Selections:** Greek pizza and pizza burgers are less common, offering niche appeal.

Strategic Implications for "Crust & Craft"

- **Essentials:** Include well-loved varieties like cheese pizza to satisfy popular demand.
- **Distinctive Menu:** Explore unique pizzas to differentiate and attract those seeking novelty.

Pricing Strategy Analysis for "Crust & Craft"

To establish a competitive and profitable pricing strategy, "Crust & Craft" analyzed the average price ranges of the most popular pizza types.



Findings

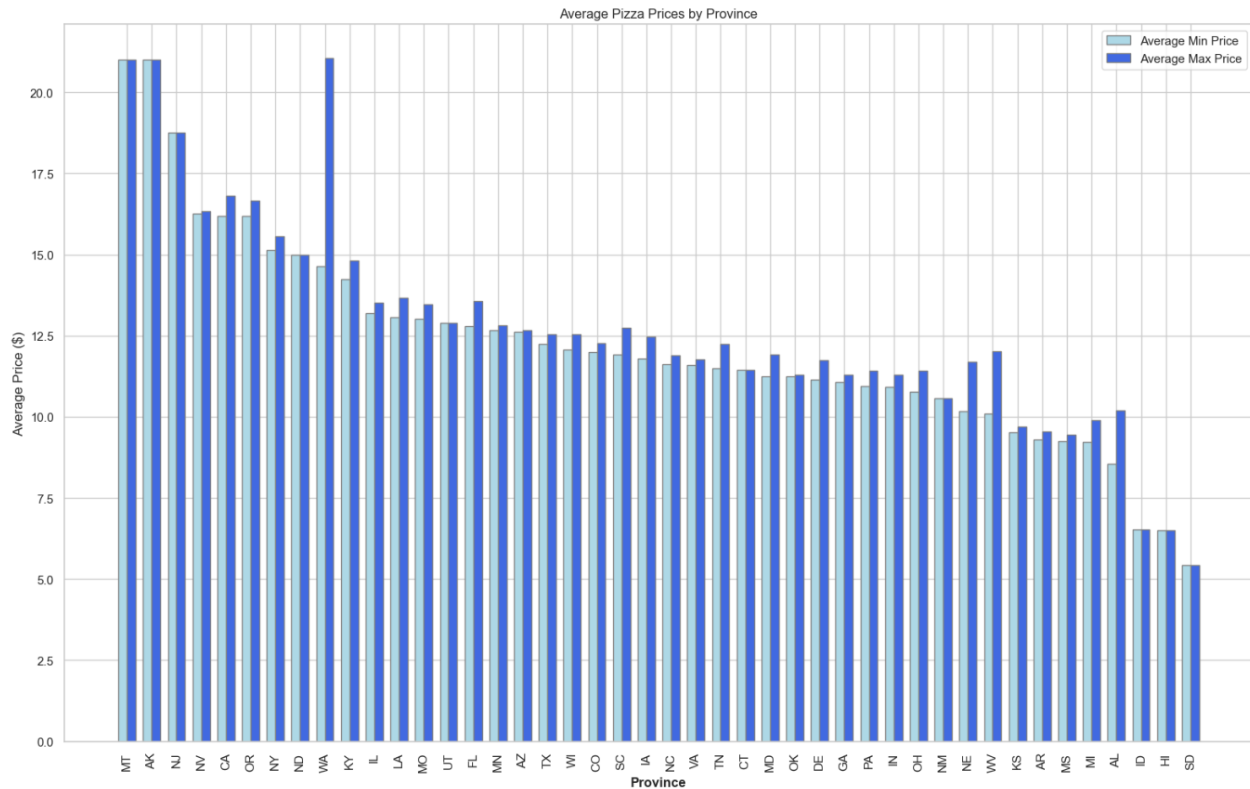
- **Price Variation:** Significant price differences exist among pizza types, hinting at varied ingredient costs and market demand.
- **High-End Options:** White pizzas are priced higher, suggesting a premium segment.
- **Economical Choices:** Pizza burgers and subs fall into the lower price range, indicating value options.

Strategy for "Crust & Craft"

- **Pricing Tactics:** Align prices with market rates to balance profit and customer appeal.
- **Menu Strategy:** Combine premium and value pizzas to attract diverse customers.

Regional Pricing Analysis for "Crust & Craft"

To discern regional pricing trends, "Crust & Craft" analyzed average pizza prices across different provinces/states. This helps in understanding geographic price variances and setting a pricing strategy that caters to regional economic conditions.



Findings

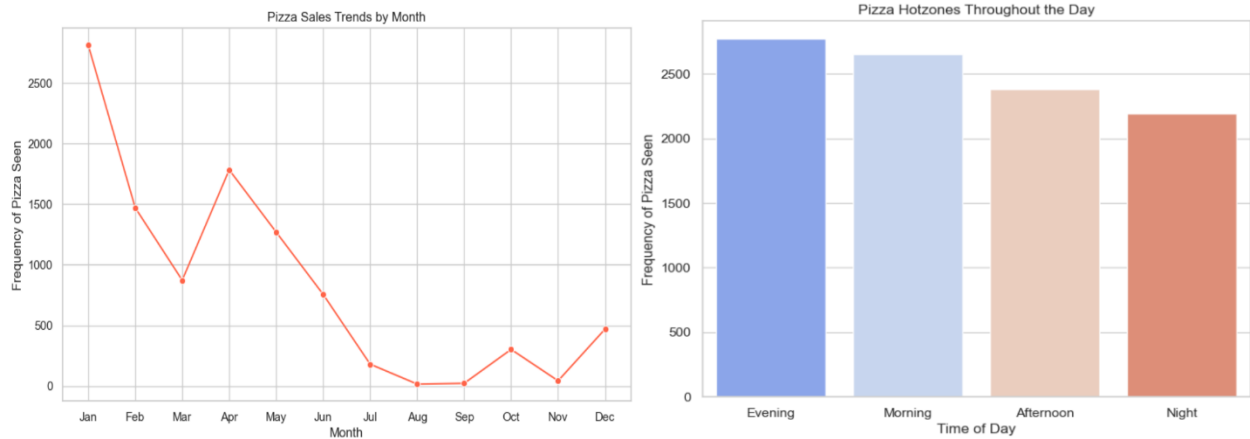
- **Price Fluctuations:** Significant price differences across regions suggest varying economic conditions.
- **Premium Markets:** States like AK and NY have higher average prices, indicating potential for premium offerings.
- **Economical Regions:** Some states exhibit lower prices, hinting at a more cost-conscious customer base.

Strategy for "Crust & Craft"

- **Adaptive Pricing:** Region-specific pricing could make "Crust & Craft" competitive across different markets.
- **Strategic Market Entry:** Consider premium pricing in high-cost areas and volume strategies in more economical regions.

Temporal Sales Analysis for "Crust & Craft"

The goal was to determine the peak times for pizza sales both throughout the day and across the year to optimize "Crust & Craft's" operational hours and marketing efforts.



Key Points from Daily and Monthly Sales Data

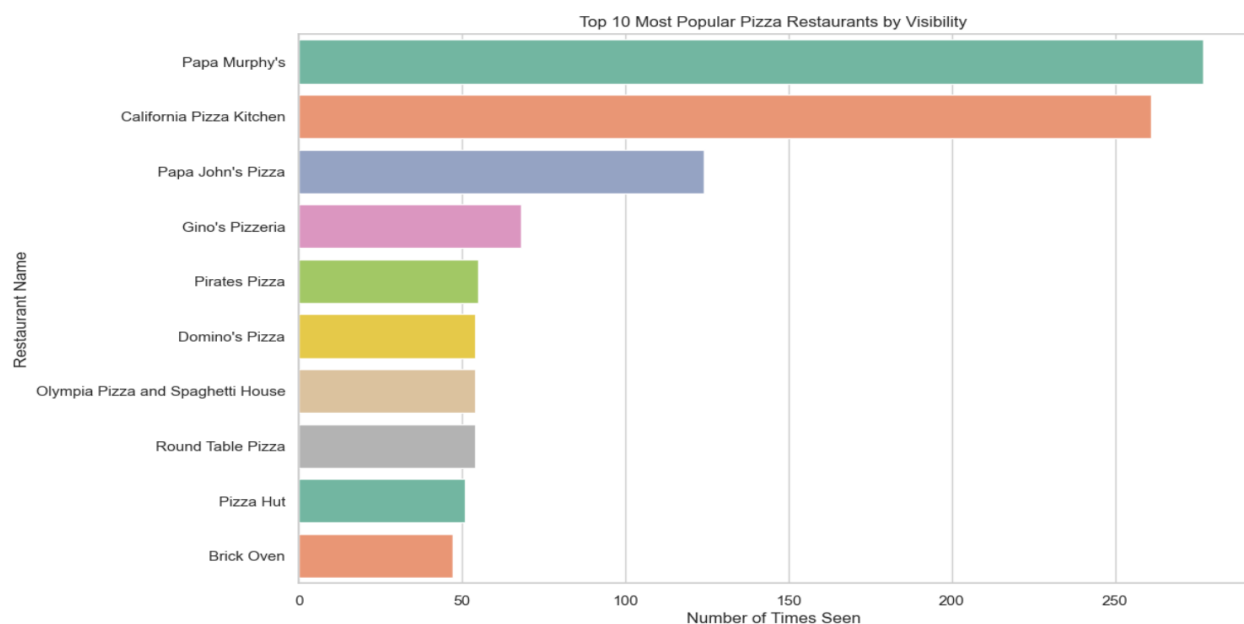
- **Daily Peaks:** Highest sales occur in the evening and late-night.
- **Morning/Afternoon Opportunity:** Potential to increase sales with special offers.
- **Monthly Variability:** Sales spike in May, dip in July, and rise towards year-end.

Strategic Takeaways

- **Staffing and Inventory:** Adjust for peak times to improve efficiency.
- **Promotional Tactics:** Target slower periods with marketing to increase sales.

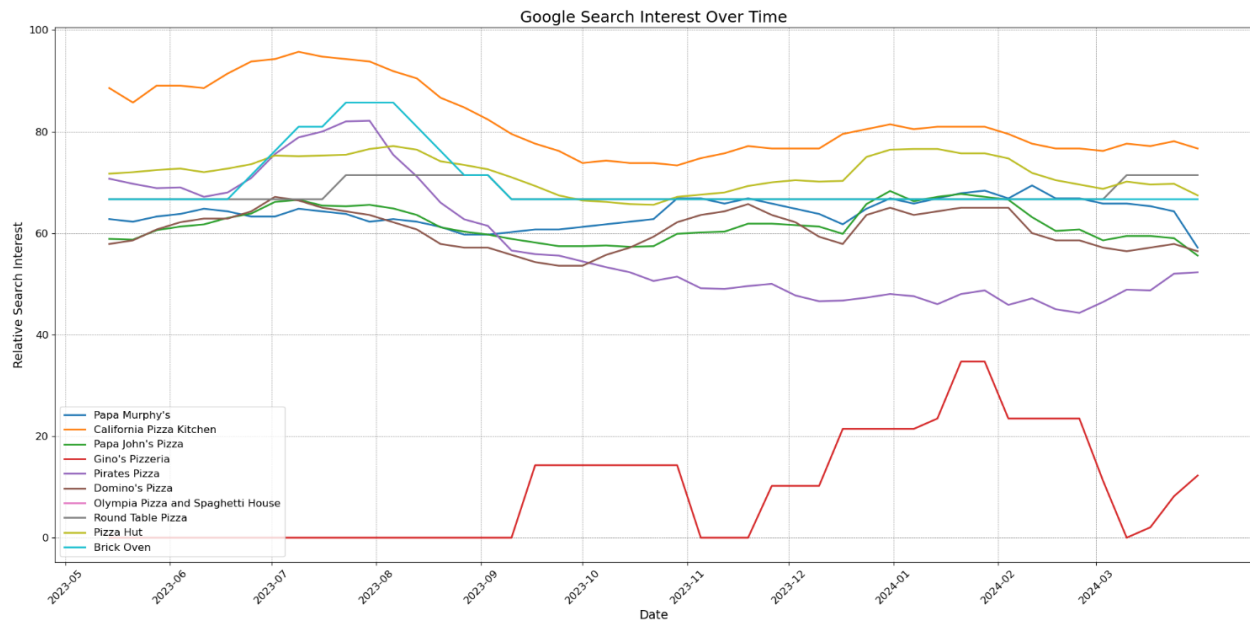
Competitor Visibility Analysis for "Crust & Craft"

To understand the competitive landscape, "Crust & Craft" sought to identify which pizza restaurants are currently the most visible in the market.



Findings

- **Market Leaders:** Brands like Papa Murphy's and California Pizza Kitchen dominate visibility.
- **Opportunity Gaps:** Significant gaps in visibility may present market entry opportunities.

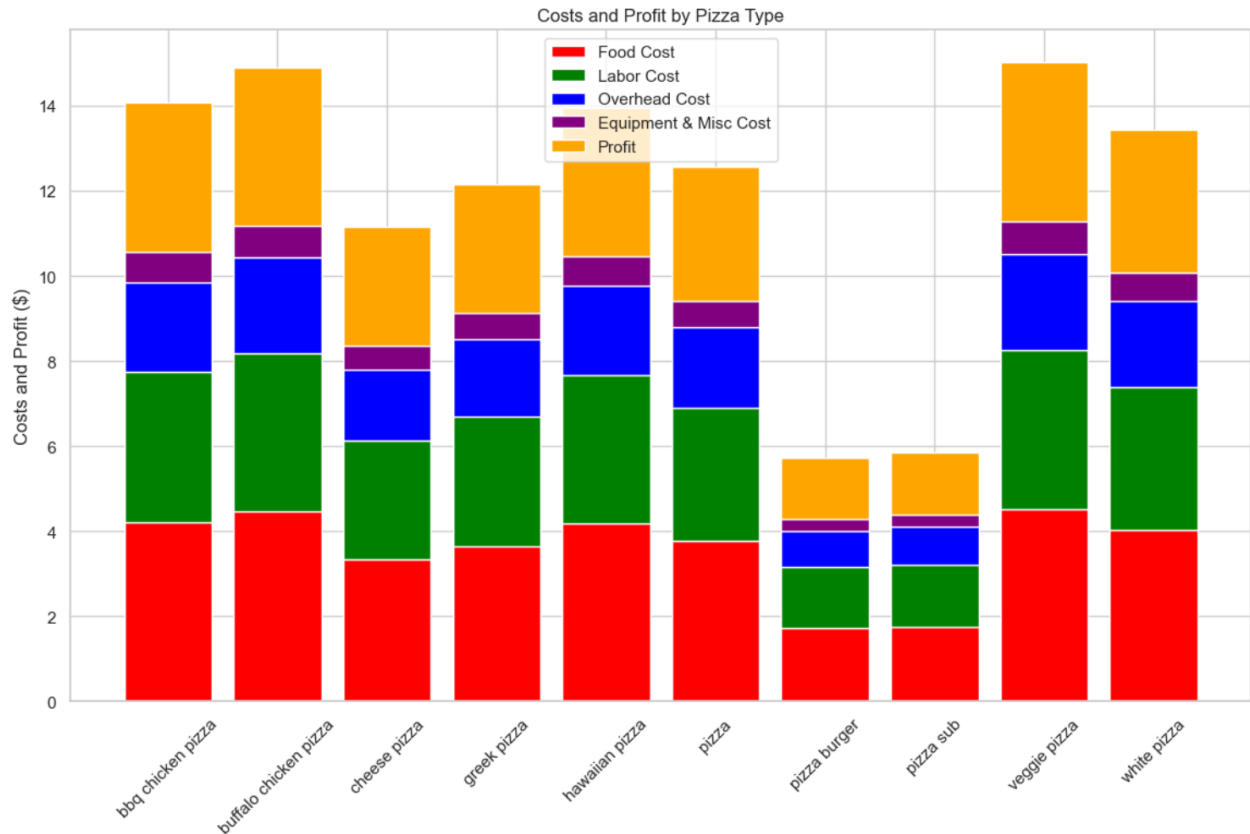


Implications for "Crust & Craft"

- **Branding Focus:** A strong branding strategy is essential to compete with market leaders.
- **Strategic Positioning:** Understanding competitor visibility can guide unique market positioning.

Cost and Profit Analysis by Pizza Type for "Crust & Craft"

The objective was to analyze the cost structure and profitability of various pizza types to inform "Crust & Craft's" menu pricing and cost management strategies.



Findings

- **Varied Costs:** Distinct cost profiles exist across pizza types.
- **Profitability:** Certain pizzas offer higher profit margins.

Implications for "Crust & Craft"

- **Menu Focus:** Prioritize high-margin pizzas.
- **Cost Efficiency:** Seek ways to lower costs while maintaining quality.

Customer Feedback Analysis for "Crust & Craft"

To identify common customer complaints and areas for improvement, "Crust & Craft" analyzed online reviews from top competitors using a word cloud.

Methodology

Keywords were extracted from Yelp reviews through web scraping, with the prominence of words in the cloud indicating the frequency of their mention in customer feedback.



Findings

- **Recurring Complaint Themes:** Words like "wrong," "never," "worst," and "disappointed" suggest common areas of customer dissatisfaction, which may include order accuracy, service expectations, and overall experience.
- **Positive Mentions:** Amidst the complaints, terms like "good" and "pepperoni" might reflect aspects of the product that are well received, even in negative reviews.

Implications for "Crust & Craft"

- **Quality Control:** Ensuring order accuracy and quality can address a significant volume of complaints.

- **Service Excellence:** Emphasizing customer service training could improve overall satisfaction.

Google Trends Analysis for "Crust & Craft"

"Crust & Craft" utilized PyTrend to assess search interest over time for top pizza chains, aiming to understand trends and changes in consumer interest in competitors.

Findings

- **Consistent Trends:** Certain competitors maintain or increase in search popularity.
- **Interest Fluctuations:** Search interest varies, indicating potential impact from marketing or seasons.

Strategies for "Crust & Craft"

- **Marketing Timing:** Leverage trend data to plan "Crust & Craft's" marketing for maximum impact.
- **Strategic Positioning:** Use competitors' fluctuating search interest to inform market entry and positioning.

DATA ANALYSIS/DATA MINING/TEXT MINING/MACHINE LEARNING:

Advanced Data Analytics in "Crust & Craft"

"Crust & Craft" has employed Python for comprehensive data analysis, leveraging machine learning models to extract actionable insights. The models applied serve distinct yet interconnected objectives critical for business success.

Random Forest Classifier:

- **Objective:** To identify factors contributing to the success of a pizza business.
- **Performance Metrics:** High precision and recall values indicate the model's robustness in classifying successful and unsuccessful business attributes.
- **Key Outcomes:** The model provided excellent accuracy, demonstrating reliable predictions for business success factors.

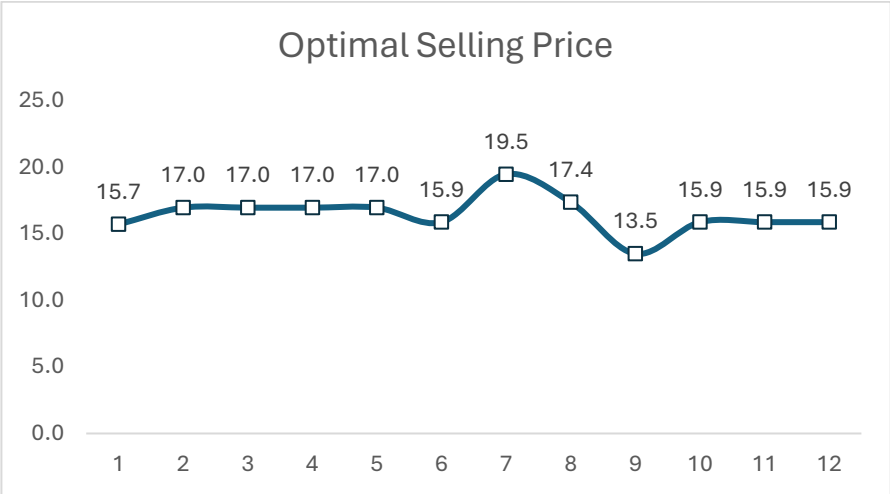
Decision	precision	recall	f1-score	support
0	0.99	0.99	0.99	2,669.00
1	0.95	0.88	0.92	331.00
accuracy	0.98	0.98	0.98	0.98
macro avg	0.97	0.94	0.95	3,000.00
weighted avg	0.98	0.98	0.98	3,000.00

Lasso Regression:

- **Objective:** To determine the most important features for optimal pricing.
- **Key Findings:** The lasso model highlighted priceRangeMin and PizzaMakingCost as significant predictors, emphasizing their influence on pricing decisions.

LightGBM:

- **Objective:** To forecast the optimal selling price for different times of the year.
- **Monthly Pricing Insights:** The model suggests varying optimal selling prices across months, accounting for seasonality and potential market trends.



Error Metrics	Score
MSE	0.02
RMSE	0.14
MAE	0.01
R2	0.99

CONCLUSIONS AND RECOMMENDATIONS FOR "CRUST & CRAFT"

Crust & Craft" has conducted an extensive data-driven analysis to underpin its strategic decisions in entering and succeeding in the competitive pizza business landscape. Key takeaways from the analysis include:

- **Market Analysis:** Location and pricing play pivotal roles in the success of pizza establishments. Markets exhibit considerable variability in consumer preferences and pricing sensitivity.
- **Temporal Sales Trends:** Sales frequency fluctuates throughout the day and across the year, emphasizing the need for adaptive business operations.
- **Customer Sentiment:** Common themes in customer feedback highlight the importance of order accuracy, quality, and customer service.
- **Competitor Visibility:** Current market leaders have a strong online presence, whereas opportunities exist to exploit visibility gaps.
- **Cost and Profitability:** Different pizza types offer varied profit margins, and understanding the cost structure is crucial for menu optimization.

- **Machine Learning Insights:** Advanced analytics reveal critical success factors for location optimization, significant cost drivers for pricing, and the dynamics of optimal selling prices throughout the year.

Recommendations

Based on these findings, the following strategic recommendations are made for "Crust & Craft":

- **Strategic Location Selection:** Leverage insights from the Random Forest model to select optimal locations with less competition and a high probability of success.
- **Dynamic Pricing Strategy:** Utilize Lasso Regression outputs to focus on key cost contributors when setting menu prices, ensuring competitiveness and profitability.
- **Adaptive Operational Hours:** Align staffing and inventory with peak sales periods identified through temporal sales analysis, ensuring operational efficiency.
- **Robust Marketing Campaigns:** Design marketing initiatives to target periods of lower search interest and to capitalize on the established consumer interest shown in Google Trends.
- **Enhanced Customer Experience:** Prioritize high-quality ingredients, menu innovation, and superior customer service to address common complaints and build brand loyalty.
- **Menu Optimization:** Use cost-profit analysis to prioritize high-margin pizzas on the menu and consider eliminating or revising low-margin options.
- **Seasonal Adjustments:** Implement flexible pricing strategies that adapt to the changing demand throughout the year, as suggested by the LightGBM model.

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