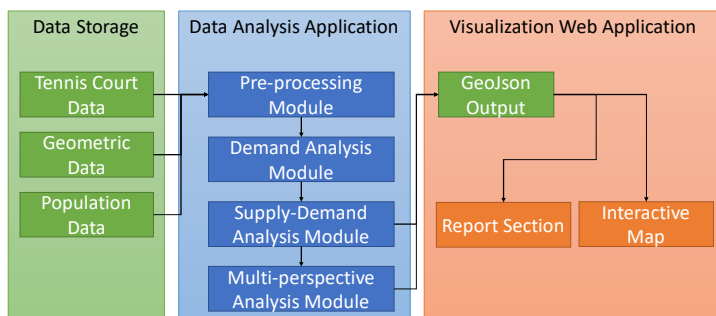


Summary

This research aims to **assess the supply and demand state of public tennis courts** to provide valuable insights for park administrators, local tennis players, and academic researchers. By identifying areas with high demand but low supply of tennis courts, policymakers and stakeholders can prioritize improvements to public parks and sports facilities and allocate resources to promote physical activity and health benefits for individuals and communities. To address this issue, we developed a statistical model to analyze the supply and demand of the public tennis courts. Additionally, we created a comprehensive data visualization tool that helps users determine the supply and demand of public tennis courts in the Chicago metropolitan area.

Approaches

To assess the public tennis courts, we divide our research in three sections, **data collection, analysis, and visualization**. For the analysis section, we statistically analyze the supply and demand ratio of the public tennis courts and relationship between the ratio with population characteristics.



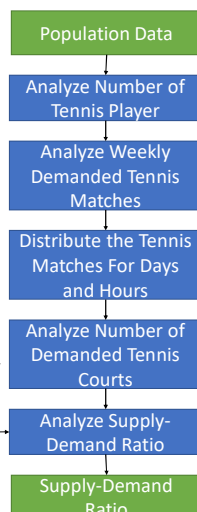
Data Collections



We collected supply of tennis courts, population characteristics, and geometric information. The tennis courts data is scraped by cross checking the city park district web site and Google Maps. The population data used the CENSUS dataset that offers detailed data about the population, ethnicity, wealth, age, and sex of cities within the Chicago Metropolitan area. The tennis courts data was collected manually from the Google Maps and parks websites of each city. We used open-source data to collect the city boundaries in GeoJson format.

Supply-Demand Analysis

The supply-demand analysis is conducted as the flow chart on the right. The number of tennis player are analyzed by the population data according to USTA report. The demanded tennis matches are analyzed by the frequency survey that was conducted for the 10,380 players. The tennis matches are distributed for days and hours by optimal and weighted cases. The optimal cases assume all the matches distributed equally for 7 days and 12 hours per day while the weighted case uses the weekdays and hourly popularity time information. The supply-demand ratio is analyzed by the single and double play cases with the tennis court supply data. Therefore, the final output is the min/max supply-demand ratio for single/double play cases.



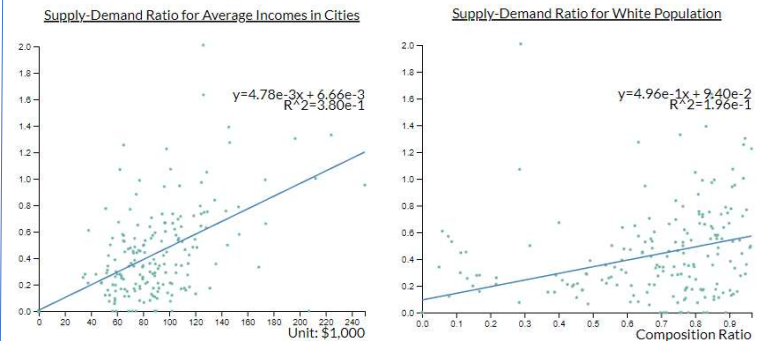
Multi Perspective Analysis

We analyzed the relationship between the supply-demand ratio and multi factors of population characteristics such as education, wealth, age, and ethnicity.

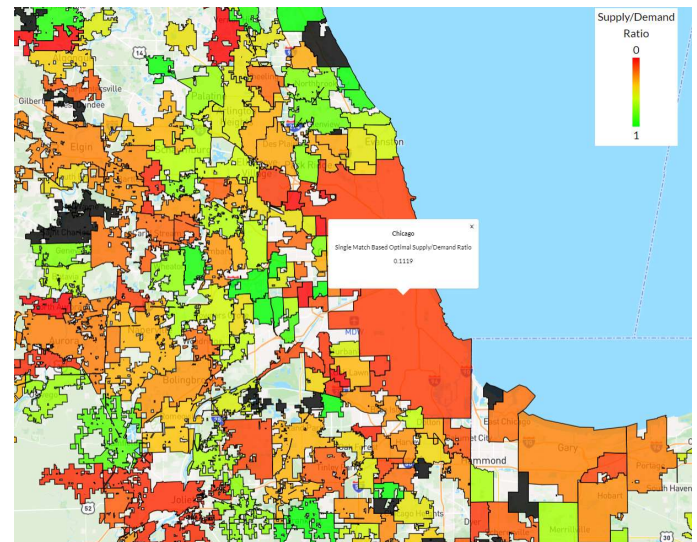
Education, and age factors are not relative to the ratio

For the wealth analysis, the **higher income city has higher supply-demand ratio**, but the property values are not relative to the ratio

For the ethnicity analysis, the **higher white population city has higher supply-demand ratio**, but the other ethnicity are not relative to the ratio



Visualization



The visualization shows the interactive map and report section.

The map shows the supply-demand ratio as a heatmap to provide the comprehensive understanding in geometric perspective

The report section shows the summary of the analysis and the details of the multi perspective analysis.

The visualization with detail results is accessible though the link: <http://ec2-3-89-251-158.compute-1.amazonaws.com/>

Evaluation

By our statistical analysis model, we found out that **only 10.27% of cities satisfied the demand** of public tennis courts in the Chicago metropolitan area had enough to meet. Also, the **average supply-demand ratio is 0.449** and 9 cities do not have any tennis courts, suggesting a potential demand for more public tennis courts to meet the needs of the community. In addition, we identify characteristics of the tennis player in Chicago metropolitan area while analyze the demand of the tennis courts: A. 60.1% of the Chicago metropolitan area tennis players were between the ages of 18 to 65. B. 68.5% of tennis players in the Chicago metropolitan area identify as white, which is the largest ethnicity group. C. Chicago metropolitan area tennis player was more likely to have an income of \$92,338. D. 39.9% tennis players have college degree or higher. Although the analysis model had limitations to capture the data for all cities in Chicago metropolitan area, this statistical approach was significantly efficient to analyze the large region comparing to the survey or interview-based market research.