Successful and popular are important traits to businesses but are not immediately obvious. Utilizing the Yelp data, we will determine the metrics and algorithms that can identify businesses that fit in these classifications.

Definitions of popular and successful businesses: Popular businesses attract more customers compared to others in its category. Successful businesses are long standing and have many loyal customers.

The metrics used to determine a successful business are:

**Average Rating**, taken from an average of the “stars” field of all reviews given for a business.

**Business age**, estimated by the difference in the “date” field between the oldest and newest reviews on a business. This metric is meant to measure how long a business has lasted.

**Average Rating Percentile**, this is an average rating percentile a business has achieved among other businesses containing any of its categories. This measures how much better a business is rated than its competitors. This percentile is calculated by the formula: (number of businesses sharing a category with a worse average rating) / (total number of businesses sharing a category).

A business that has maintained a high average rating percentile over a long time period has demonstrated to be more capable than a business who still maintained a high average rating percentile but over a short time period. This means that business age weighted by its average rating percentile is a good quantitative measure of its success. This results in the formula:

**Success Score = Average Rating Percentile \* Business age**

The metrics used to determine a popular business are:

**Review Count**, the count of all reviews made on a particular business.

**Review Frequency**, the frequency at which reviews are made on a business. Determined by the number of reviews per day which is calculated from the review count and the estimated business age taken from the metric proposed for success. The formula for review frequency is: Review Count / Business Age.

**Check-ins per Person**, the number of check-ins to a business per person in the population of the business’s zip code. This metric estimates local popularity by how much of the community around the business visits it. The formula for check-ins per person is: (Total Check-ins) / (business zip code population). Total check-ins is the total of all check-ins to a business on all days.

Together a business’s review frequency and local popularity estimate business popularity with the formula:

**Popularity Score = Review Frequency \* Check-ins per Person**

Together the formulas for popularity and success determine whether a business is popular or successful by its ranking among the popularity and success scores calculated for all other businesses. A business’s highest ranking score determines the category it belongs to.