

Finding Similar Items in Amazon Book Reviews

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Abstract

I built a system to detect duplicate book reviews using MinHash and Locality-Sensitive Hashing (LSH). Each review was turned into 3-word shingles, hashed into 100-length signatures, and grouped by similarity. Candidate pairs were checked with exact Jaccard similarity (threshold 0.8). On 20,000 reviews, the method found 151 near-duplicate pairs and showed linear runtime growth.

1 Dataset and Preprocessing

I used the Amazon Books Reviews dataset (`Books_rating.csv`) from Kaggle. To keep the runtime manageable, I randomly selected 20,000 reviews. Each text was lowercased, cleaned of punctuation and numbers, and split into words. I also removed English stopwords. Then I created 3-word shingles (e.g., “read this book”) for each review to capture phrase-level similarity.

2 Algorithm

My approach follows four steps:

- 1. Shingling:** Represent each review as a set of 3-word shingles.
- 2. MinHashing:** Assign each shingle an ID and compute 100 MinHash values using random hash functions. Matching hash values approximate Jaccard similarity.
- 3. LSH Banding:** Split each signature into 20 bands of 5 rows. Reviews sharing the same band key become candidate pairs.
- 4. Verification:** For each candidate pair, I computed exact Jaccard similarity and kept those with $J \geq 0.8$.

This method avoids checking all ~ 200 million possible pairs and runs much faster while keeping good accuracy.

3 Experiments

Jaccard on Small Sample

First, I tested 200 reviews using exact Jaccard similarity. Almost all pairs had very low similarity. Figure 1 shows the distribution — most values are close to zero, meaning few reviews are alike because of the sample’s size.

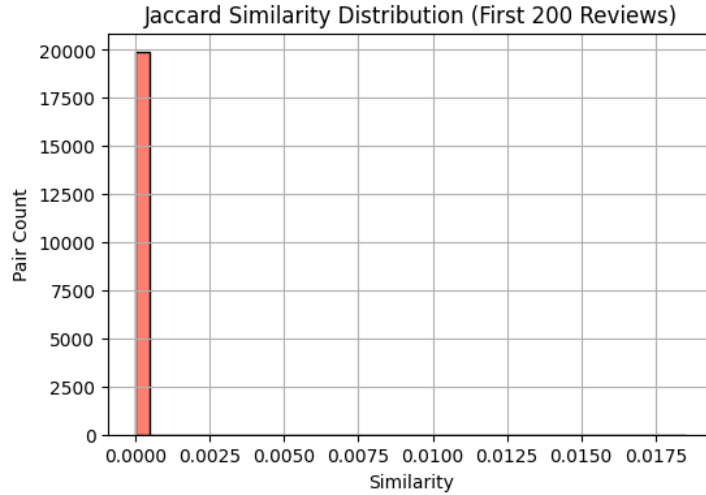


Figure 1: Jaccard similarities among 200 reviews. All pairs are not similar.

LSH on 20k Reviews

On 20,000 reviews, LSH produced 154 candidate pairs. After exact verification, 151 pairs had similarity ≥ 0.8 . Nearly all candidates were correct, showing high precision.

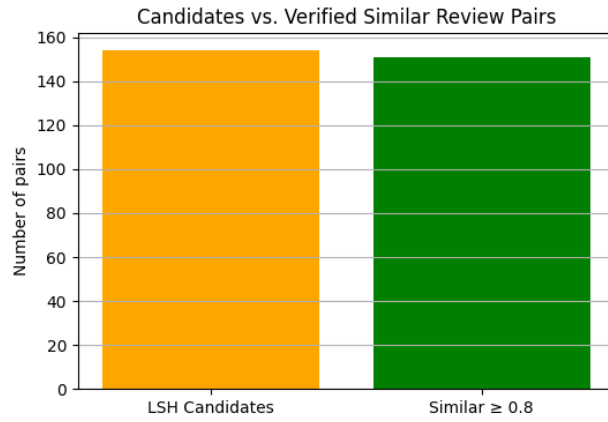


Figure 2: Candidate pairs (orange) vs. verified similar pairs (green). 151 of 154 were true matches.

Top Similar Pairs

The 30 most similar pairs had Jaccard values equal to 1.0.. Figure 3 shows the similarity scores for these top pairs.

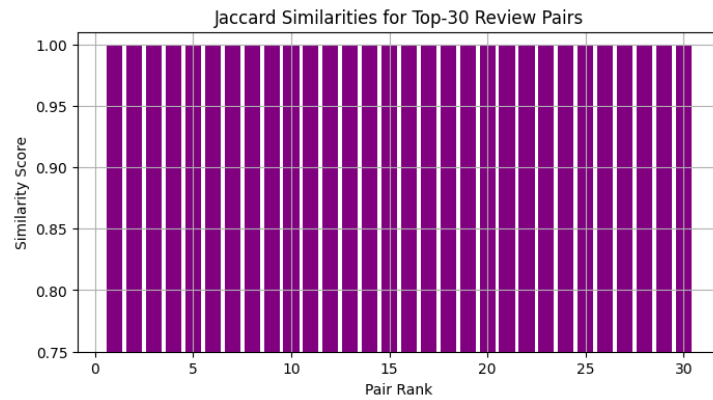


Figure 3: Jaccard similarities for the 30 most similar pairs. All of them are exact duplicates.

4 Results

The system found 151 similar review pairs with Jaccard ≥ 0.8 . Figure 2 confirms that most LSH candidates were true matches. Figure 1 shows why LSH is needed: almost all pairs are dissimilar, and brute-force search would be extremely slow. The top pairs in Figure 3 are exact or nearly identical texts.

5 Scalability

I tested the runtime for 5k, 10k, and 20k reviews. The times were about 2.4s, 5.6s, and 8.0s, showing near-linear growth. Figure 4 illustrates this. The method scales well and can handle larger datasets if parallelized.

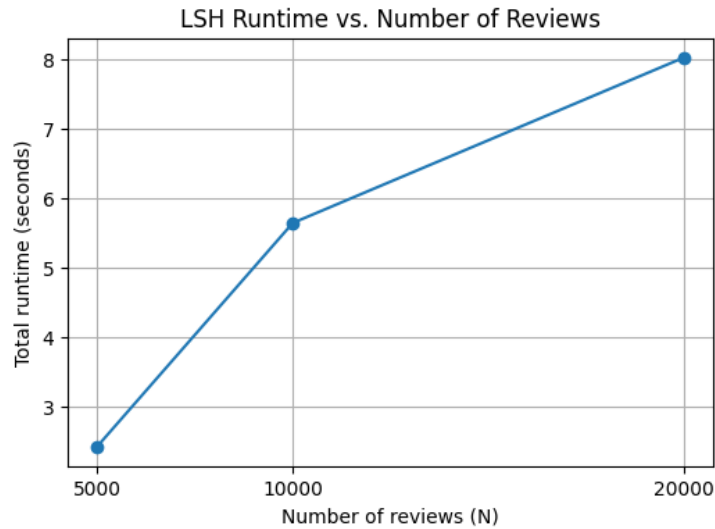


Figure 4: Runtime vs. number of reviews. Growth is close to linear.

6 Conclusion

I created a scalable system to detect similar book reviews. Using MinHash and LSH, I found 151 near-duplicate pairs out of 20,000 reviews. The method avoids redundant comparisons and runs efficiently.

Declaration

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