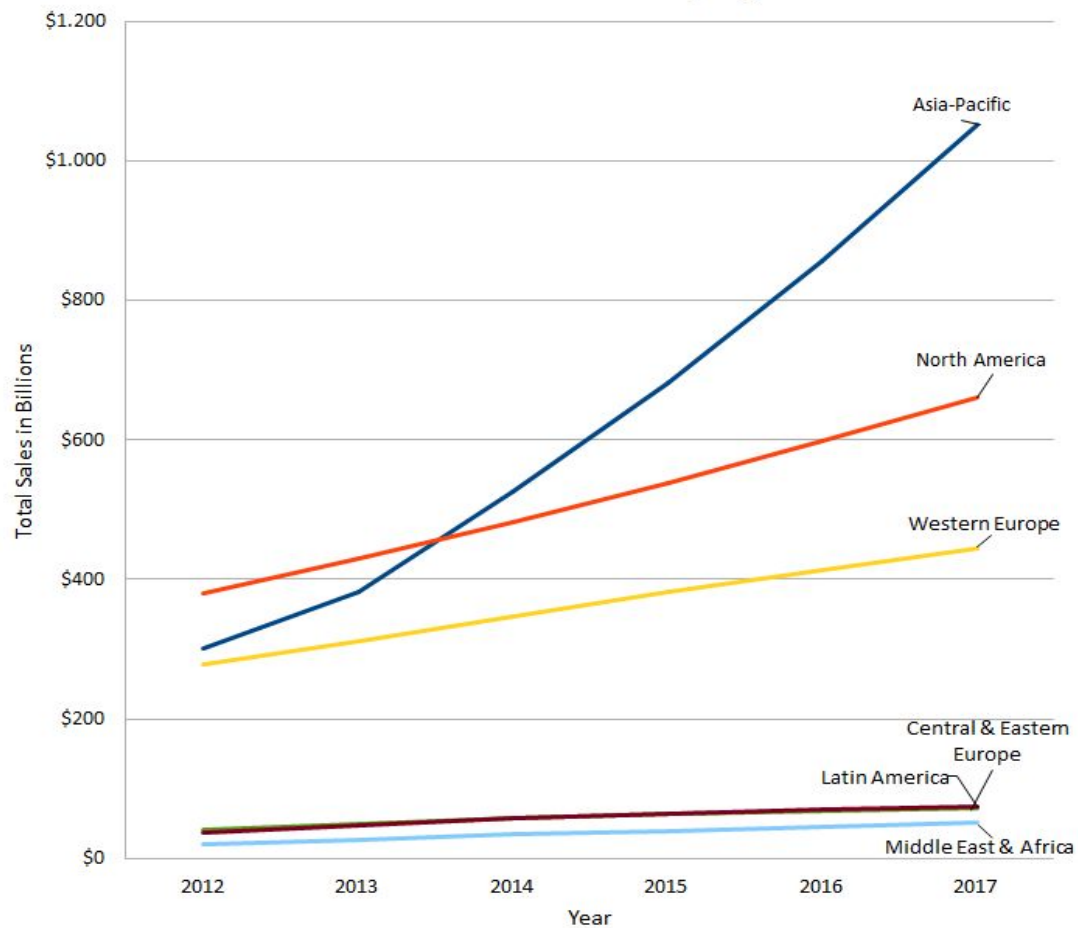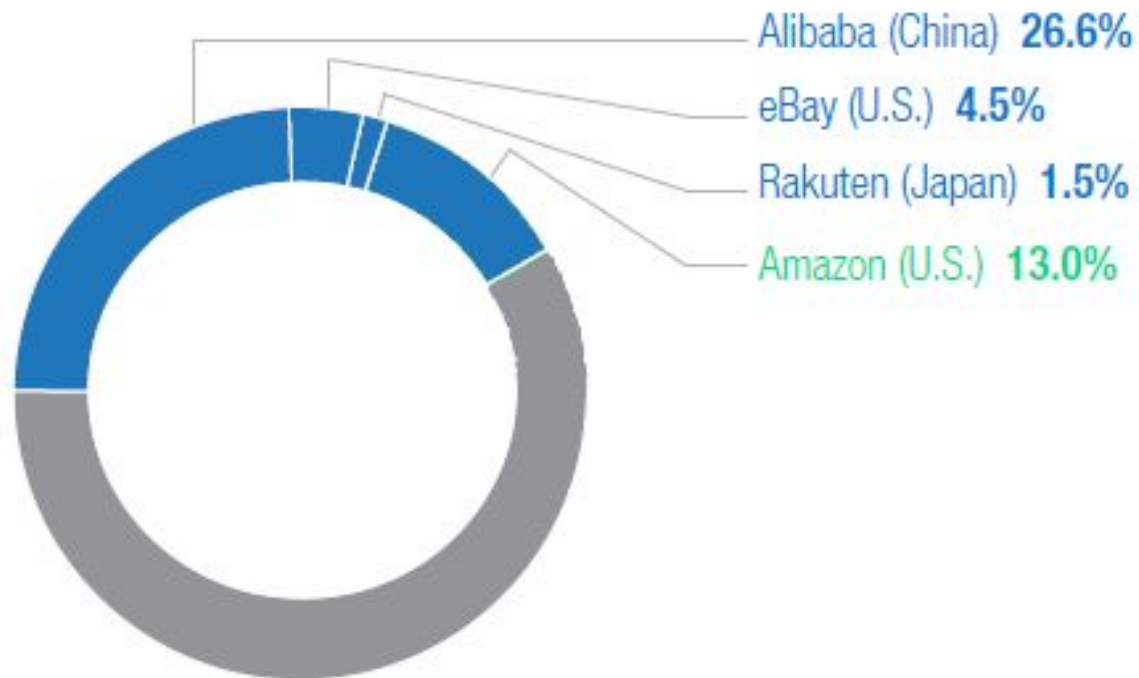# Relevance Ranking of Q&A Systems

Mikhail Boulgakov, Silvia Jinrong Gong, Shan Hannadige, Lavanya Satyan

Ecommerce Sales Worldwide by Region

The World's Top 10 Largest Retailers Hold Nearly Half the Global Market

Global E-Retail Market Share, Company Type

Alibaba (China) **26.6%**

eBay (U.S.) **4.5%**

Rakuten (Japan) **1.5%**

Amazon (U.S.) **13.0%**

Related Work

1. Document Summarization

2. Semantic Similarity

3. Ranking Systems

4. Moqa

Document Summarization

Advantages:

- Extracts a succinct summary with main points from all reviews

Disadvantages:

- Answer to a specific question may not be in summary

Semantic Similarity

Advantages:

- Similar questions will likely have related answers

Disadvantages:

- There may not be a similar previously-answered question

Ranking Systems

Advantages:

- Promotes the most helpful reviews

Disadvantages:

- Answer to a user's question may be hidden in non-featured reviews

Moqa

What about metrics like...

Reviewer's Reputation

Customer Reviews: 409
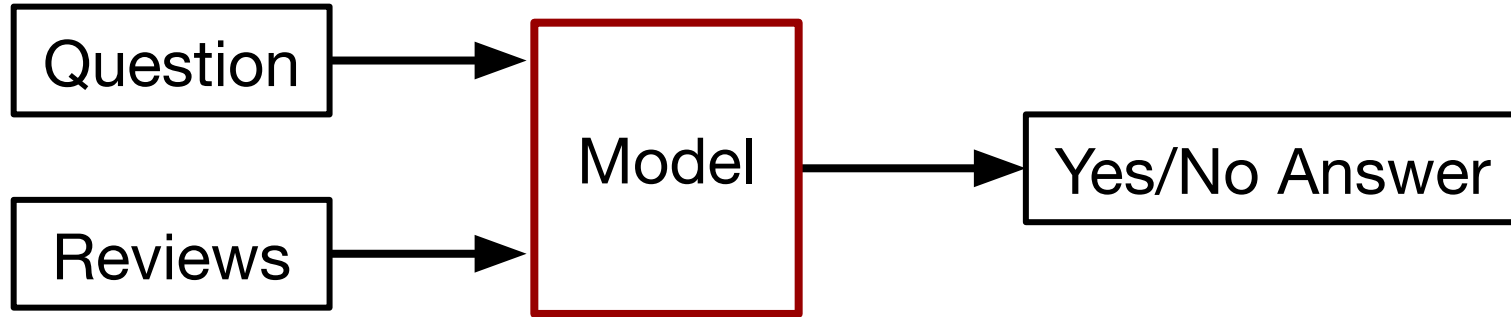Top Reviewer Ranking: 4805
Helpful Votes: 1879

Rating of the Review

Most Helpful Customer Reviews
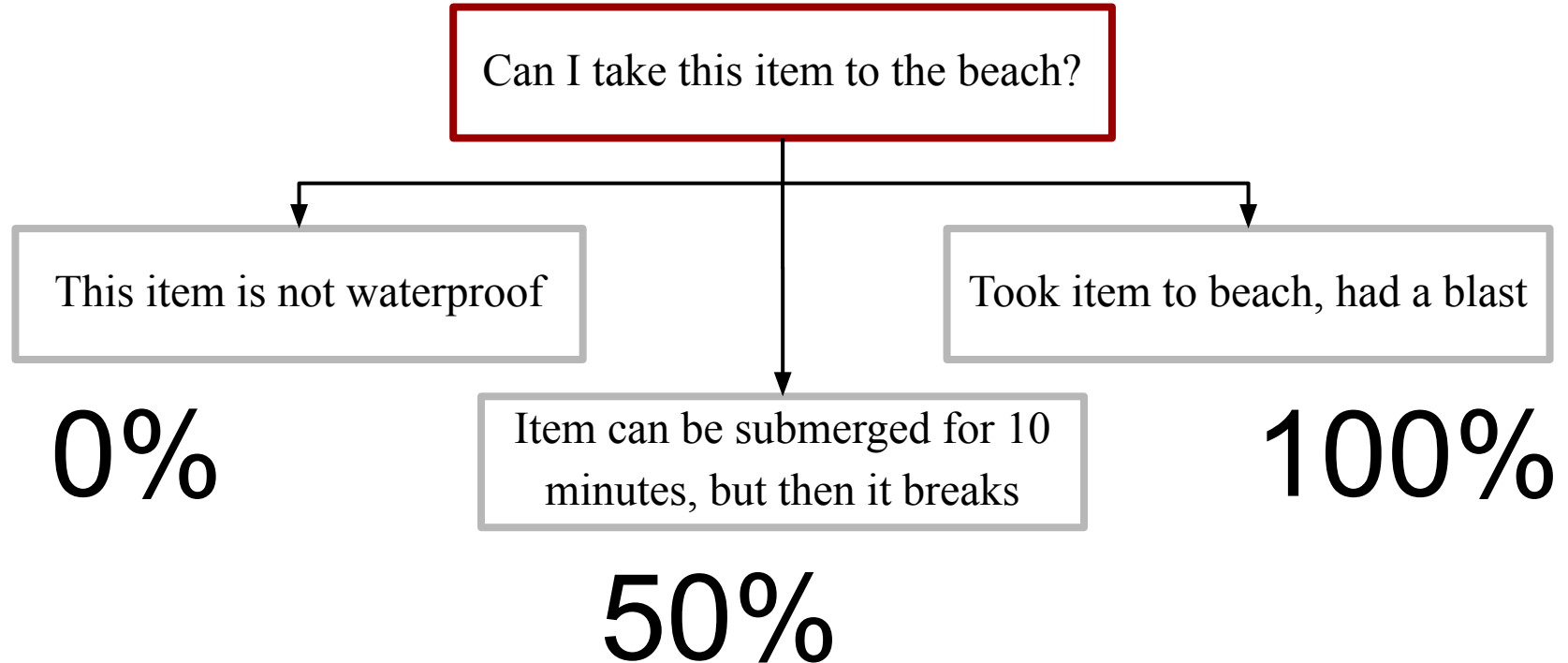38 of 40 people found this review helpful

Problem Statement

Our Model

How relevant review r is to question Q

$$\underbrace{p(y|Q)}_{\text{Predicted answer to question}} = \sum_r \overbrace{p(r|Q)}^{} \underbrace{p(y|r,Q)}_{\text{Answer review predicts}}$$

Our Model - Voting Function

Probability an answer is yes

Can I take this item to the beach?

This item is not waterproof

0%

Item can be submerged for 10 minutes, but then it breaks

50%

Took item to beach, had a blast

100%

Our Model

How relevant review r is to question Q

$$p(y|Q) = \sum_r \overbrace{p(r|Q)}p(y|r,Q)$$

Predicted answer to question

Answer review predicts

Our Model - Relevance Function

Probability review answers question

Can I take this item to the beach?

100%

This item is not waterproof

0%

This speaker is *very* red

Item can be submerged for 10 minutes, but then it breaks

Took item to beach, had a blast

100%

100%

Our Model

$$p(y|Q) = \sum_r p(r|Q)p(y|r, Q)$$

Relevance function =

Relevant reviews + Trustworthy answer

Relevant reviews

▲
8
votes
▼

Question: If I have to carry this for a block in a sudden heavy rain would water enter the zippers?
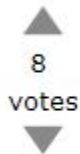
Answer:

Relevant reviews

Question: If I have to carry this for a block in a sudden heavy rain would water enter the zippers?

Answer:

8 votes

Relevant reviews

Question: If I have to carry this for a block in a sudden heavy rain would water enter the zippers?

Answer: ⭐⭐⭐⭐⭐ **Looks are deceiving**
By NY newbie on March 8, 2017
Color: red | **Verified Purchase**

I have used this backpack on several day hikes and it has exceeded my expectations. When I first received it I thought it would be too small to be of much use but I was wrong. I have carried water (there are two pockets for bottles), lunch, a sweatshirt, rain jacket, binoculars and more. The small pocket is great for keys. Very versatile.

⭐⭐⭐☆☆ **A good functional backpack.**
By EC from California on June 8, 2016
Color: red | **Verified Purchase**

The backpack has a very strong plastic odor when I opened package and the odor lingered several days before I finally put it to use (with the odor all over me). The cheap plastic odor is the reason I took one star off. The backpack also gives me a very fragile feeling that it may break apart in no time due to its paper thin materials. And I don't think its zipper would last long if one pulls zipper too harsh (such as in a hurry). Another star off for this reason. However, for the price paid, I think this backpack can serve its purpose as long as one use it "gently". This is not designed for heavy duty use.

⭐⭐⭐⭐☆ **I received the pink one and I love the color**
By Jena Sindt on September 16, 2015
Color: Hot Pink

I received this product at a discount in exchange for an honest and unbiased review.
I have seen other people's comments talking about their problems with this backpack. I haven't seen anything wrong with it at all. I have used it to take clothes back and forth from work to the gym and there are no tears in the steams.

8 votes

Relevant reviews

- User upvotes
- Star rating
- Reviewer's reputation
- Time of the review
- Tone

User Upvotes

Most Helpful Customer Reviews

56 of 63 people found the following review helpful ⬅

★★★★☆

By B.L. on January 9, 2011

This bag is waterproof.

Star-rating

Most Helpful Customer Reviews

56 of 63 people found the following review helpful

⭐⭐⭐⭐☆ ⬅

By B.L. on January 9, 2011

This bag is waterproof.

Reviewer's reputation

Most Helpful Customer Reviews

56 of 63 people found the following review helpful

★★★★☆

By B.L. on January 9, 2011

This bag is waterproof.

Time of Review

Most Helpful Customer Reviews

56 of 63 people found the following review helpful

★★★★☆

By B.L. on January 9, 2011

This bag is waterproof.

Tone

Most Helpful Customer Reviews
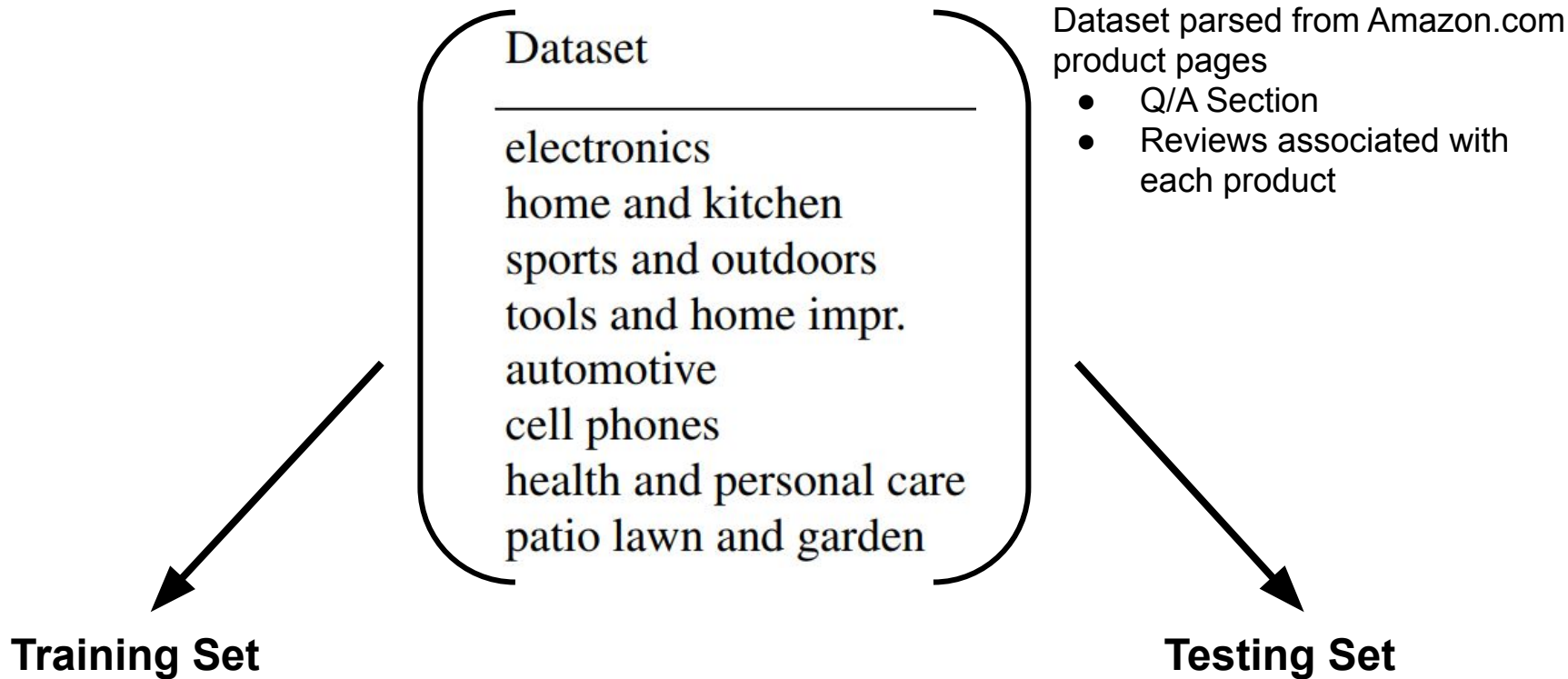
56 of 63 people found the following review helpful

★★★★☆

By B.L. on January 9, 2011

This bag is waterproof. ⟵

Evaluation Plan

Dataset

electronics
home and kitchen
sports and outdoors
tools and home impr.
automotive
cell phones
health and personal care
patio lawn and garden

Dataset parsed from Amazon.com product pages
- Q/A Section
- Reviews associated with each product

Training Set

Testing Set

Evaluation Plan - Refine the Model

Training the model will help determine difference between model's generated yes/no answer and actual yes/no answer.

We will perform gradient descent on an error function to minimize that difference.

Gradient descent helps us find the smallest produced error percentage as we change the weights of our model.
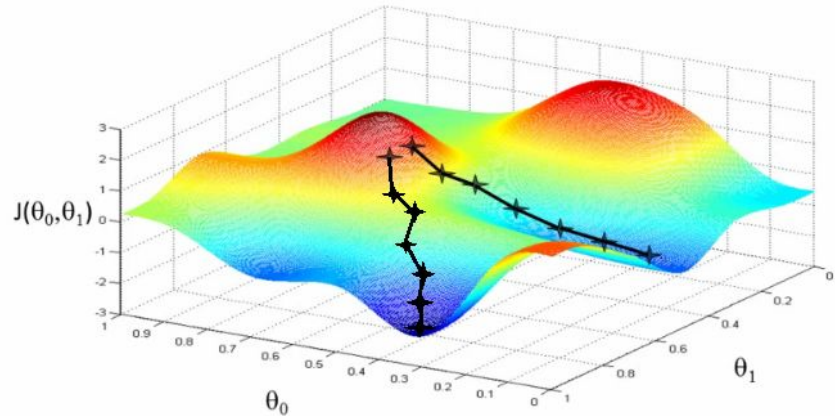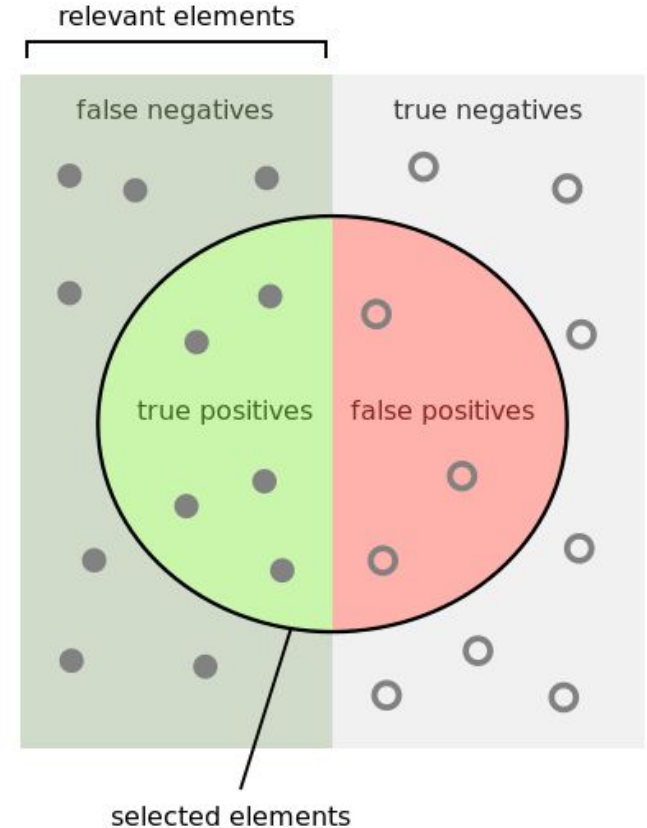
Evaluation Plan - Refine the Model

Recall:

$$\frac{reviews\ correctly\ labeled\ as\ ``yes''\ by\ model}{total\ reviews\ that\ are\ ``yes''\ answers}$$

Precision:

$$\frac{reviews\ correctly\ labeled\ as\ ``yes''\ by\ model}{total\ reviews\ labeled\ as\ ``yes''\ by\ model}$$

We will perform feature ablation experiments to see what combination of features works best with our model.

relevant elements

false negatives   true negatives

true positives   false positives

selected elements

Evaluation Plan - Benchmarks

Testing our model will measure our model's final fit against all of the given Amazon data.

Compare model with other approaches
- Semantic similarity measures: *Cosine Similarity*
- Ranking functions: *Okapi BM25*
- Question-answering systems: *Moqa*

Winter Quarter

Weeks 5-8
Add our proposed changes to
relevance function

Weeks 1-4
Implement Mixture
of elements model

Week 8-10
Refining model
- Training
- Feature ablation

Spring Quarter

Final Presentation

Weeks 1-5
Evaluate model
performance
- Testing
- Benchmarks

Weeks 6-10
Prepare findings for
final presentation