Query:

Image Retrieval:
https://images-na.ssl-images-amazon.com/images/I/81q5+IxFVUL._SY88.jpg

Review Text:
Loving these vintage springs on my vintage strat. They have a good tension and great stability. If you are floating your bridge and want the most out of your springs than these are the way to go.

Results from Text Retrieval:

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Top 5 documents retrieved based on text similarity:
Rank: 1
Product ID: 3452
Text Cosine Similarity: 1.0
Review Text: Loving these vintage springs on my vintage strat. They have a good tension and great stability. If you are floating your bridge and want the most out of your springs than these are the way to go.

Image Link: https://images-na.ssl-images-amazon.com/images/I/81q5+IxFVUL._SY88.jpg
Image Cosine Similarity: 0.9999999999999999


Rank: 2
Product ID: 2220
Text Cosine Similarity: 0.32491853868058057
Review Text: Nice solid springs and defeinitely more silent. Easy installation and the black looks cool.

Pictured with some old uninstalled springs next to them.

Image Link: https://images-na.ssl-images-amazon.com/images/I/81Z1d7HaBfL._SY88.jpg
Image Cosine Similarity: 0.17905590381951145


Rank: 3
Product ID: 1666
Text Cosine Similarity: 0.23520798523269196
Review Text: Fits great but the only complaint I have is that the tremolo springs are cheap quality and so is the block that attaches to the bridge. I took it off and put my own on. When you do that though, the wammy bar won't fit.

Image Link: https://images-na.ssl-images-amazon.com/images/I/61rFj+KtBRL._SY88.jpg
Image Cosine Similarity: 0.40240954293464415


Rank: 4
Product ID: 2939
Text Cosine Similarity: 0.2021305036111353
Review Text: Great Quality, adjustable tension. Well made.

Image Link: https://images-na.ssl-images-amazon.com/images/I/81U3GJsTjNL._SY88.jpg
Image Cosine Similarity: 0.3815973333525535


Rank: 5
Product ID: 1898
Text Cosine Similarity: 0.15667855610280404
Review Text: Simple to install and it works. I have an old Ibanez RG that I just didn't want to fuss with as far as tuning adjustments. Installed this with an extra spring and really tightened up the claw into the body, works as advert
d. The coolest part is how you can set your bridge height before the final claw adjustment. Can still dive if I want but I'm just having fun playing the RG again in alternative tuning. I can go from 1/2 step down Van Halen right back up
 standard leads w/o having to access the cavity. I may get a Tremol-no for my American Strat as I feel this is too limiting for a more expensive guitar.
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Results from Image Retrieval:

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Top 5 documents retrieved based on image similarity:
Rank:  1
Product ID:  3452
Image Link:  https://images-na.ssl-images-amazon.com/images/I/81q5+IxFVUL._SY88.jpg
Image Cosine Similarity:  0.9999999999999999


Review Text:  Loving these vintage springs on my vintage strat. They have a good tension and great stability. If you are floating your bridge and want the most out of your springs than these are the way to go.
Text Cosine Similarity:  1.0


Rank:  2
Product ID:  3612
Image Link:  https://images-na.ssl-images-amazon.com/images/I/710VwzzYcSL._SY88.jpg
Image Cosine Similarity:  0.692200431982636


Review Text:  This was a gift from my sister and brother in law for babysitting there kids until school start. I have to say this is an Amazing Guitar. For 200$ it's worth the buy and if your new to 7 string guitars you'll love it. Well
ipped and a well made guitar. I couldn't be any more happier with the White looks so sick.
Text Cosine Similarity:  0.016727176360489617


Rank:  3
Product ID:  3058
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71YbxPL2TOL._SY88.jpg
Image Cosine Similarity:  0.670341004059674


Review Text:  tried something different rather than my daddario xl 10's ( nickels)...- they didn't seem as  as smooth  and  initially i thought they had too much bite  - overly bright not as balanced as the d'ad's 10 pure Nickel... BUT
ter 2 days they have settled in and like all strings have  gotten some wear and sound much better!  very clear  and punchy - a tad bright for my style but  still good  im sure its perfect for many!- if they hold up for a decent spell i
djust my review to 4 stars...they have -I did
Text Cosine Similarity:  0.008442439026359176


Rank:  4
Product ID:  2416
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71vT2-nW7-L._SY88.jpg
Image Cosine Similarity:  0.6672328398597757


Review Text:  I purchased an old Yamaha E112C electric guitar that needed to be completely redone and I decided that I would replace the original chrome parts with Gold and the strap pegs look great. You can't see the strap pegs in the
ture you do see the color and how the gold parts look.
Text Cosine Similarity:  0.007809296343994599


Rank:  5
Product ID:  3828
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71vT2-nW7-L._SY88.jpg
Image Cosine Similarity:  0.6672328398597757


Review Text:  The picture doesn't do this bridge justice, I was skeptical of the quality when I ordered this Tremolo bridge but was pleasantly surprised when it arrived. I wasn't so concerned with the quality because I planed on using
n an old broken down imported Kramer ST300 that I refinished. I gave it a 3 because of the screws it takes a lot of hand strength to get the screws seated. You have to be very careful that you don't strip the philip screw heads the scre
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Results from Composite Retrieval:

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Top documents retrieved based on composite similarity:
Rank:  1
Product ID:  3452
Review Text:  Loving these vintage springs on my vintage strat. They have a good tension and great stability. If you are floating your bridge and want the most out of your springs than these are the way to go.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/81q5+IxFVUL._SY88.jpg
Composite Similarity:  1.0


Rank:  2
Product ID:  3452
Review Text:  Loving these vintage springs on my vintage strat. They have a good tension and great stability. If you are floating your bridge and want the most out of your springs than these are the way to go.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/81q5+IxFVUL._SY88.jpg
Composite Similarity:  1.0


Rank:  3
Product ID:  3828
Review Text:  The picture doesn't do this bridge justice, I was skeptical of the quality when I ordered this Tremolo bridge but was pleasantly surprised when it arrived. I wasn't so concerned with the quality because I planed on using
n an old broken down imported Kramer ST300 that I refinished. I gave it a 3 because of the screws it takes a lot of hand strength to get the screws seated. You have to be very careful that you don't strip the philip screw heads the scre
river doesn't quit fit the number 2. I'll take the guitar to my shared work shop to see if a larger screw driver fits better.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71vT2-nW7-L._SY88.jpg
Composite Similarity:  0.3553097846561925G


Rank:  4
Product ID:  3612
Review Text:  This was a gift from my sister and brother in law for babysitting there kids until school start. I have to say this is an Amazing Guitar. For 200$ it's worth the buy and if your new to 7 string guitars you'll love it. Well
ipped and a well made guitar. I couldn't be any more happier with the White looks so sick.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/710VwzzYcSL._SY88.jpg
Composite Similarity:  0.3544638041715628


Rank:  5
Product ID:  3058
Review Text:  tried something different rather than my daddario xl 10's ( nickels)...- they didn't seem as  as smooth  and  initially i thought they had too much bite  - overly bright not as balanced as the d'ad's 10 pure Nickel... BUT
ter 2 days they have settled in and like all strings have  gotten some wear and sound much better!  very clear  and punchy - a tad bright for my style but  still good  im sure its perfect for many!- if they hold up for a decent spell i
djust my review to 4 stars...they have -I did
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71YbxPL2TOL._SY88.jpg
Composite Similarity:  0.3393917215430166


Rank:  6
Product ID:  2416
Review Text:  I purchased an old Yamaha E112C electric guitar that needed to be completely redone and I decided that I would replace the original chrome parts with Gold and the strap pegs look great. You can't see the strap pegs in the
ture you do see the color and how the gold parts look.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/71vT2-nW7-L._SY88.jpg
Composite Similarity:  0.33752106810188515


Rank:  7
Product ID:  1666
Review Text:  Fits great but the only complaint I have is that the tremolo springs are cheap quality and so is the block that attaches to the bridge. I took it off and put my own on. When you do that though, the wammy bar won't fit.
Image Link:  https://images-na.ssl-images-amazon.com/images/I/61rFj+KtBRL._SY88.jpg
Composite Similarity:  0.31880876408366804
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b) Observe which out of the two retrieval techniques gives a better similarity score and argue the reason.

I observe that image cosine similarity performs better in this case as it considers the overall visual content of the image. The features extracted from the CNNs capture high-level visual concepts that enable the recognition of objects, shapes and patterns. Moreover, Since the data is augmented with variations of the images being accounted for, the image cosine similarity technique is robust to variations.

On the other hand, the TF-IDF cosine similarity for text produces a very small cosine similarity score in most cases as the vocabulary is extremely large, resulting in very sparse representations.

c) Discuss the challenges faced and potential improvements in the retrieval process.

Scalability: The CNNs took a lot of time to extract features from the given augmented image dataset. For an even larger dataset, it may take a huge amount of time, demanding a lot of computational resources and time, hence making it difficult to scale.

Data Quality and Noise: Lack of good quality data and having to deal with noisy data can significantly affect the results. Better data cleaning and pre-processing techniques, along with using hybrid scores from multi-modal retrieval techniques, can help improve the results.