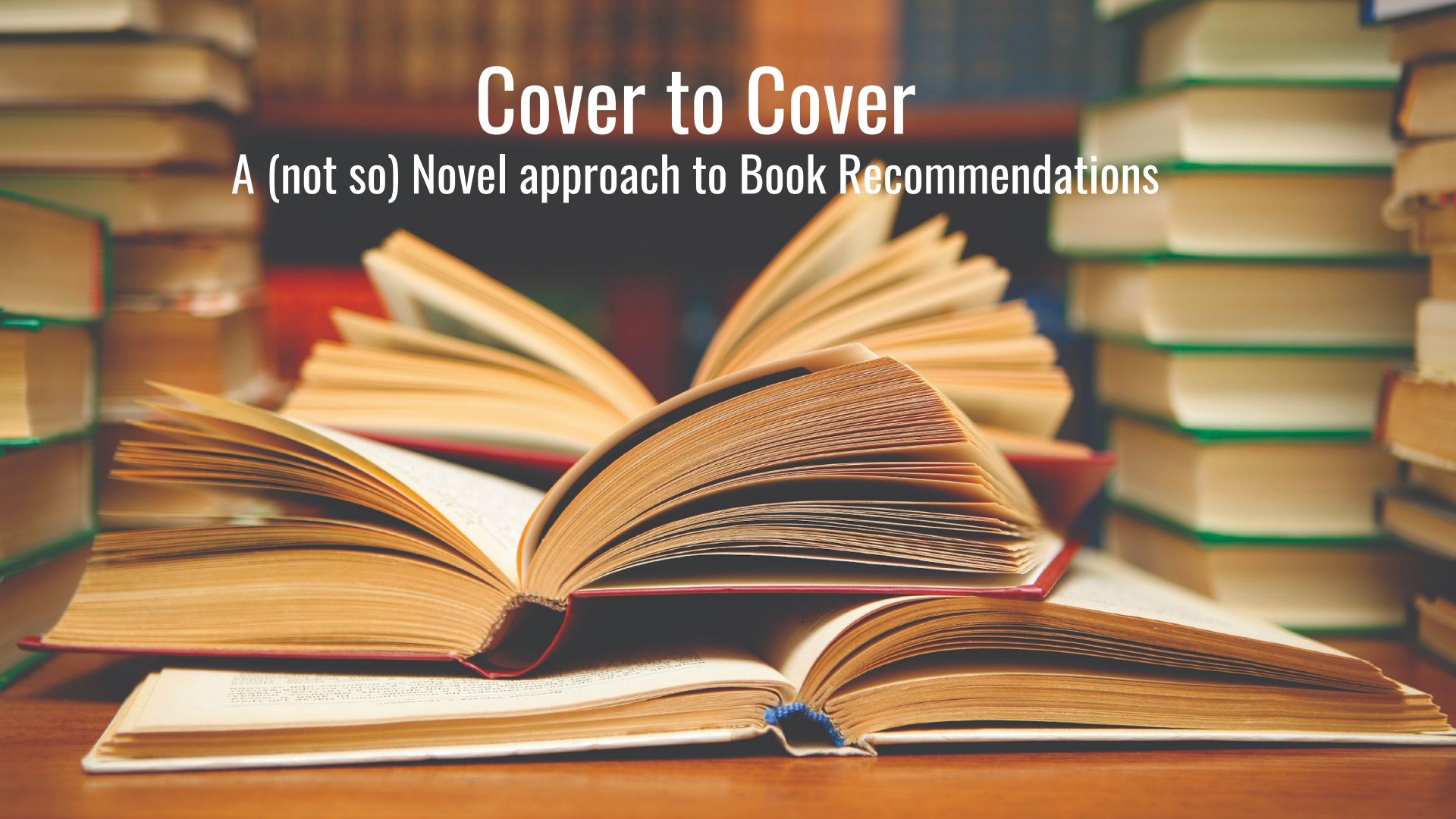


Cover to Cover

A (not so) Novel approach to Book Recommendations



The Data

Sampled from [Amazon book-covers](#) dataset (40,000 Images scraped from Amazon.com across 23 genre classes, 1700 per class)

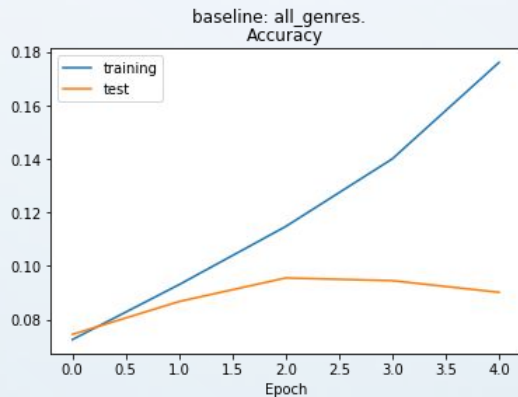
Original Dataset contains 200,000+ images from 32 classes



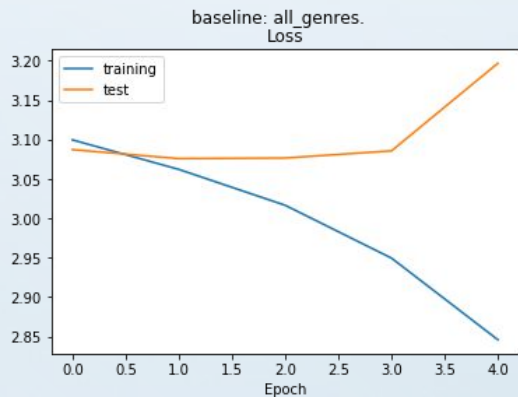


Exploring Genre classification with Neural Networks

Exploring the data

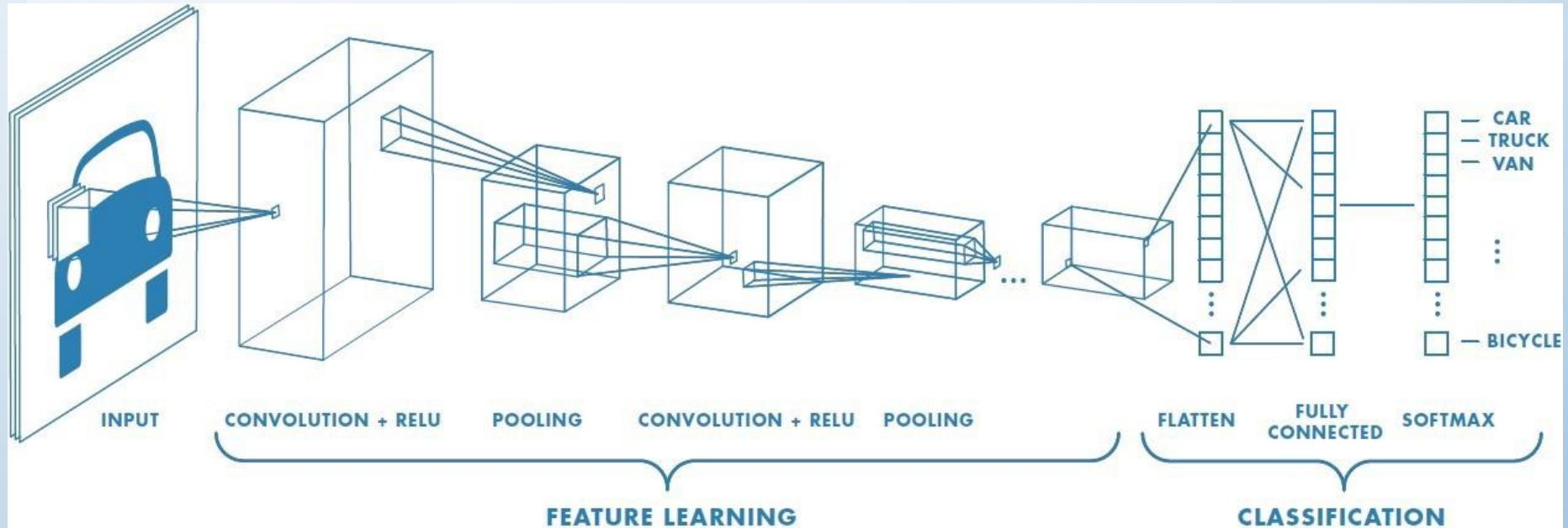


Initial attempts to Classify every genre results in very low test accuracy <10%

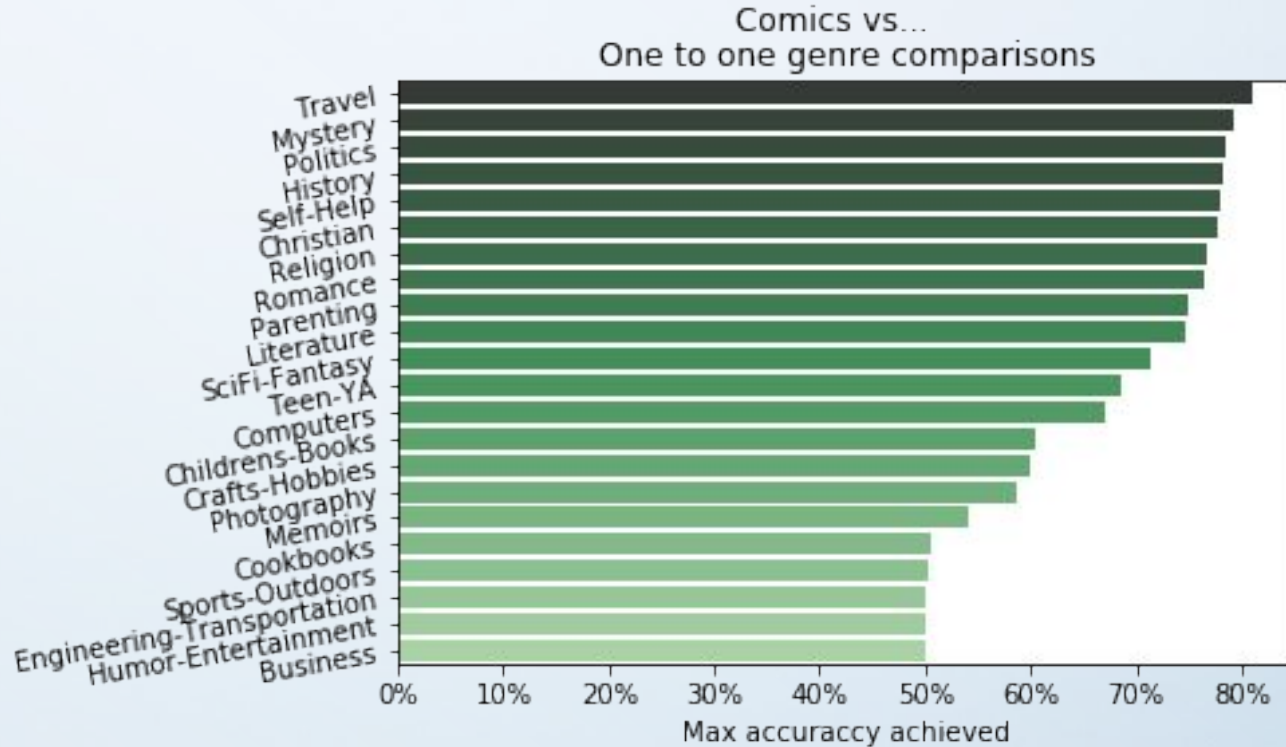


Transfer Learning Results from Original Research paper achieve max accuracy of 24%

Convolutional Neural Networks



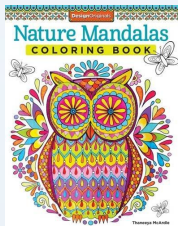
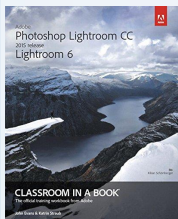
One to one genre classification with CNNs



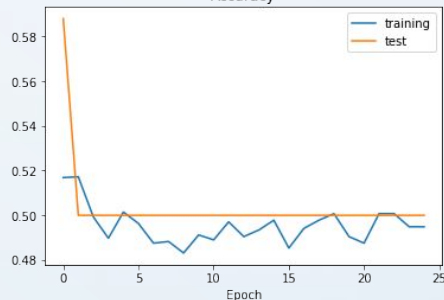
*Ordering of best performing genres varied slightly from run to run

Poor performing categories had too much variance and/or poor sampling resulting of books belonging to multiple genres

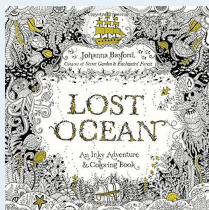
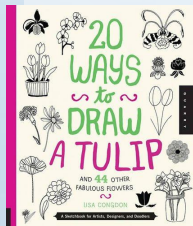
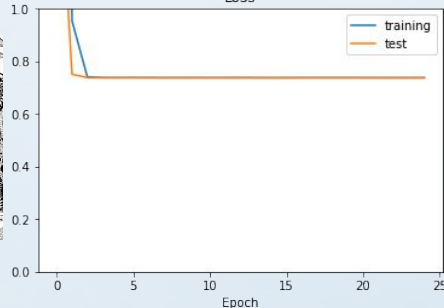
Photography



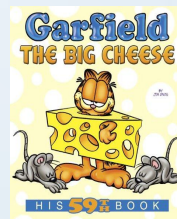
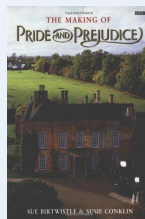
CNN: Comics or Photography Accuracy



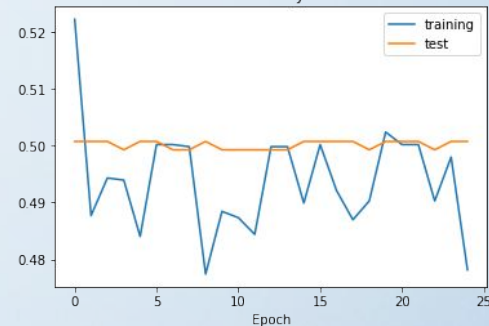
CNN: Comics or Photography Loss



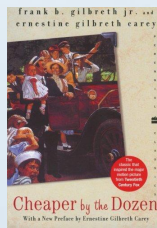
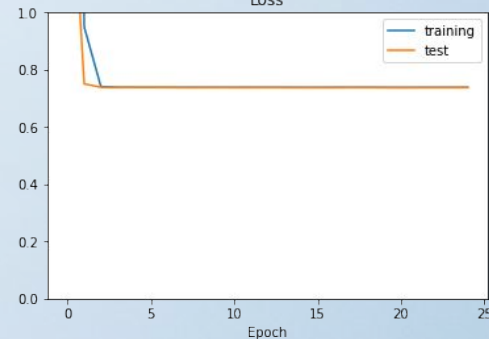
Humor & Entertainment



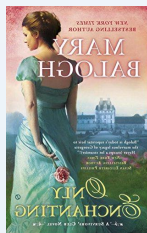
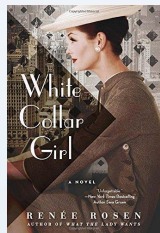
CNN: Comics or Humor-Entertainment Accuracy



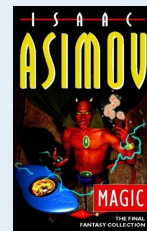
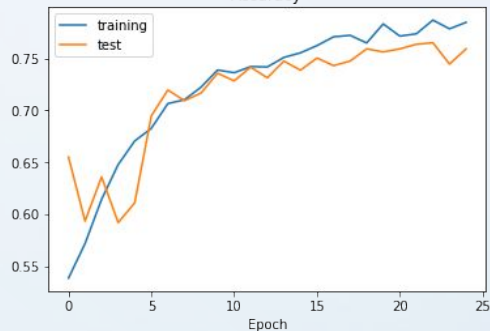
CNN: Comics or Humor-Entertainment Loss



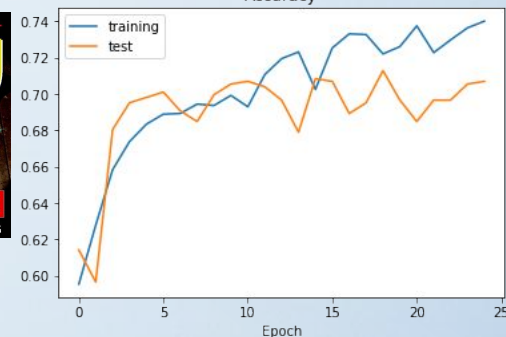
Categories with learnable features



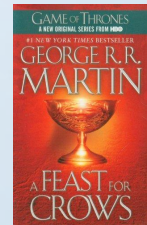
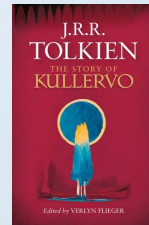
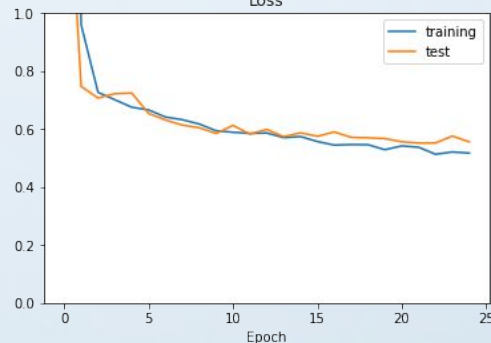
CNN: Comics or Romance
Accuracy



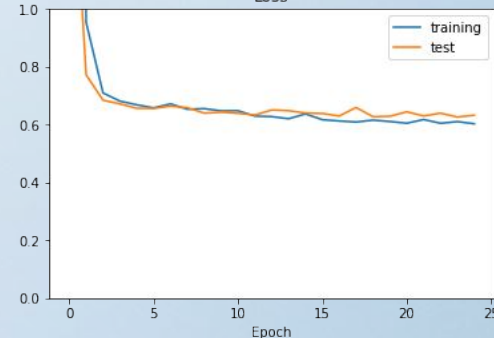
CNN: Comics or SciFi-Fantasy
Accuracy



CNN: Comics or Romance
Loss

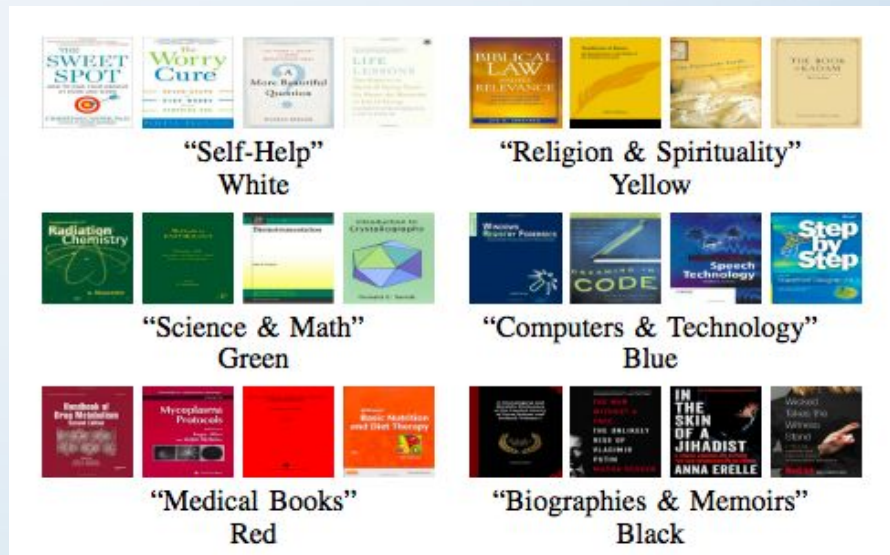


CNN: Comics or SciFi-Fantasy
Loss



Transfer Learning Results of the Original research paper

Using pre-trained Alexnet and Lee-net architectures, more complex design patterns (including **color**) of a particular genre are proven to be learnable. [1]



Examples correctly classified by Alex-net [2]

“I just want a good book...let's check amazon”



[3]

Kindle eBooks

Kindle Deals

Kindle Unlimited

Prime Reading

Show results for

New Releases

Last 30 days

Last 90 days

Coming Soon

Books

Arts & Photography

Biographies & Memoirs

Business & Money

Calendars

Children's Books

Christian Books & Bibles

Comics & Graphic Novels

Computers & Technology

Cookbooks, Food & Wine

Crafts, Hobbies & Home

Education & Teaching

Engineering & Transportation

Health, Fitness & Dieting

History

Humor & Entertainment

Law

Lesbian, Gay, Bisexual & Transgender Books

Literature & Fiction

Medical Books

Mystery, Thriller & Suspense

Parenting & Relationships

Politics & Social Sciences

Reference

Religion & Spirituality

Romance

Science & Math

Science Fiction & Fantasy

Self-Help

Sports & Outdoors

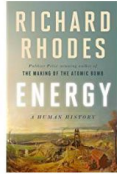
Teen & Young Adult

Test Preparation


Travel

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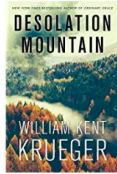
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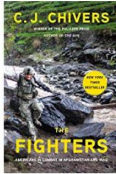
Looker: A Novel
Laura Sims
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Desolation Mountain: A Novel
William Kent Krueger
★★★★☆ 177
Kindle Edition: \$13.99
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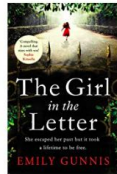
The Mars Room: A Novel
Rachel Kushner
★★★★☆ 241
Kindle Edition: \$12.99
Hardcover: \$14.84




The Fighters
C. J. Chivers
★★★★☆ 97
Kindle Edition: \$14.99
Hardcover: \$16.24

More items to consider

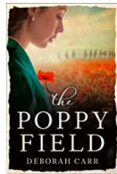
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The Girl in the Letter: The most gripping...
Emily Gunnis
★★★★☆ 360
Kindle Edition: \$1.99
Paperback: \$16.99



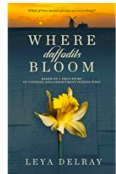
The Night Child: A Novel
Anna Quinn
★★★★☆ 240
Kindle Edition: \$0.99
Hardcover: \$16.99



The Poppy Field: A gripping and emotional World...
Deborah Carr
★★★★☆ 117
Kindle Edition: \$1.99
Paperback: \$10.14



The Orphan Sisters: An utterly heartbreaking...
Shirley Dickson
★★★★☆ 78
Kindle Edition: \$2.99
Paperback: \$9.89



Where Daffodils Bloom: Based on a True Story of...
Leya Delray
★★★★☆ 32
Kindle Edition: \$2.99
Hardcover: \$24.99

"You cannot invent an algorithm that is as good at recommending books as a good bookseller, that's the secret weapon of the bookstore — is that no algorithm will ever understand readers the way that other readers can understand readers."

John Green, author of *The Fault in Our Stars* [4]



A (not so) novel approach: Feature Extraction with Similarity Models

Filter level 1: Comparing color histograms with Chi-squared

Filter Level 2: Measuring image similarity with Structural Similarity Index (SSIM)

Comparing Histograms

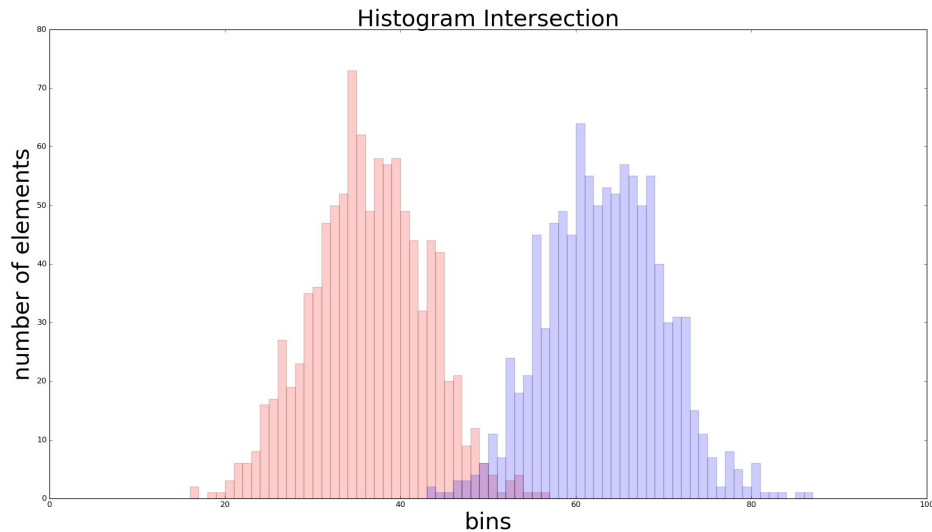
OpenCv contains several built-in methods for comparing histograms.

Correlation

Intersection

Chi-Square

Bhattacharyya Coef



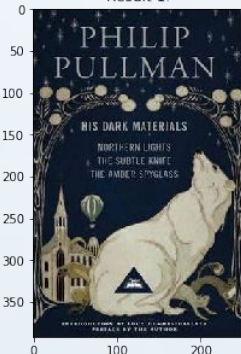
Structural Similarity Index

The Structural Similarity (SSIM) Index is based on the computation of three terms, namely the luminance term, l the contrast term, c and the structural term, s . The overall index is a multiplicative combination of the three terms. SSIM is between 1 and -1. A SSIM of 1 is a perfect match, 0 indicated no similarity and -1 indicate an inverted image. ^[5]

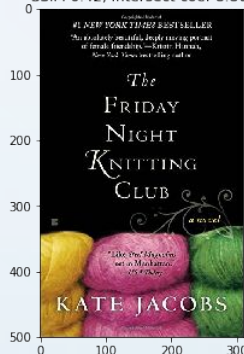
$$SSIM(x,y)=[l(x,y)]^\alpha \cdot [c(x,y)]^\beta \cdot [s(x,y)]^\gamma$$

Let's get some Recommendations!

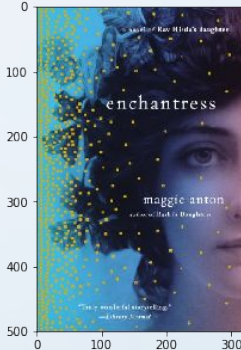
Result 1:



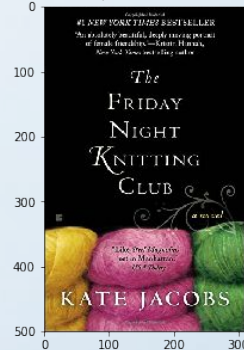
SSIM 0.42, intersect coef 8.86



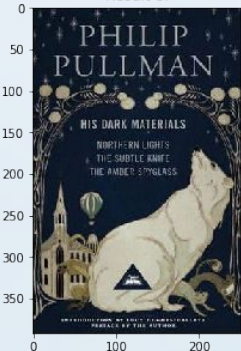
Result 4:



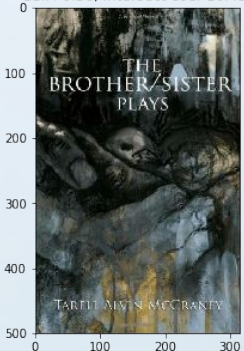
SSIM 0.42, intersect coef 18.44



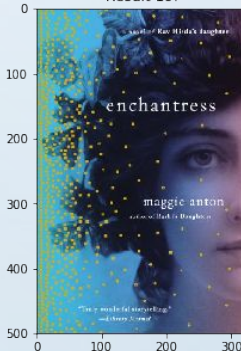
Result 8:



SSIM 0.30, intersect coef 16.45



Result 19:

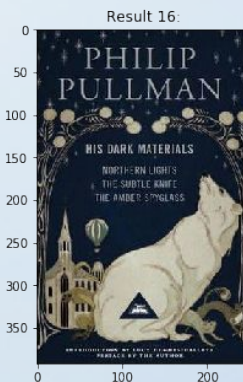
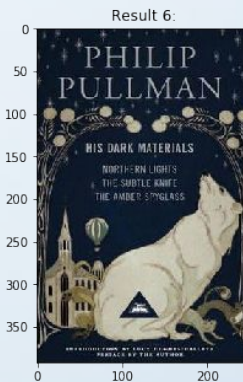
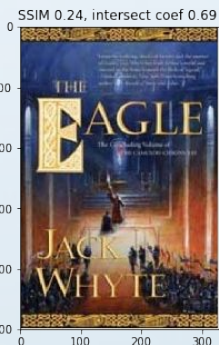
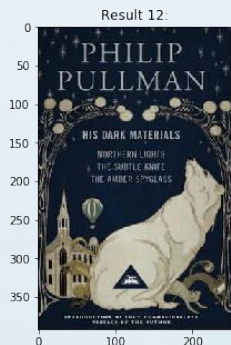
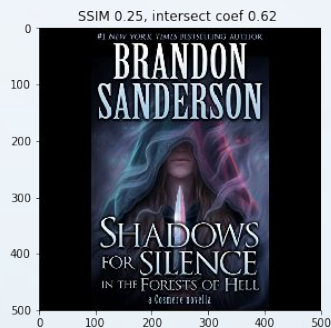
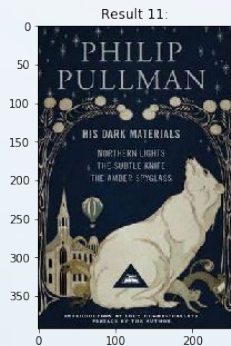


SSIM 0.30, intersect coef 34.19

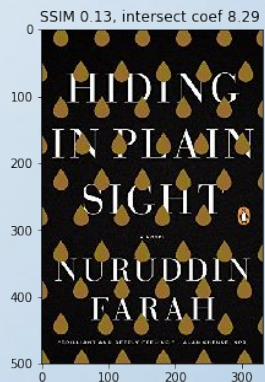
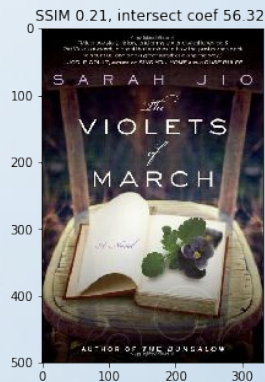


“Modeling Discovery”

*Results using alternate histogram comparison method



*Results querying alternate genre



Next Steps

Add Feedback weighting functionality to model

Scrape more data from Amazon to improve results

Create Front-end for website/IOS app

References

- [1] "Judging a Book by its Cover" Iwana et al (2017) <https://arxiv.org/pdf/1610.09204.pdf>
- [2] "Judging a Book by its Cover", Fig. 4, Iwana et al (2017)
- [3] Xkcd "Decision Paralysis" <https://xkcd.com/1801/>
- [4] "The Rise Of Independent Booksellers In The Time Of Amazon"
<https://www.buzzfeed.com/michelefilgate/the-rise-of-the-independent-bookseller-in-the-time-of-amazon>
- [5] "Structural Similarity" Wikipedia https://en.wikipedia.org/wiki/Structural_similarity



The End

Questions?