

**Project
Proposal**

SHOP BY IMAGE SEARCH

Presented by: Thu Thao Phan

Position: E-commerce data scientist

Date: Aug 03 rd, 2023



STAKEHOLDERS

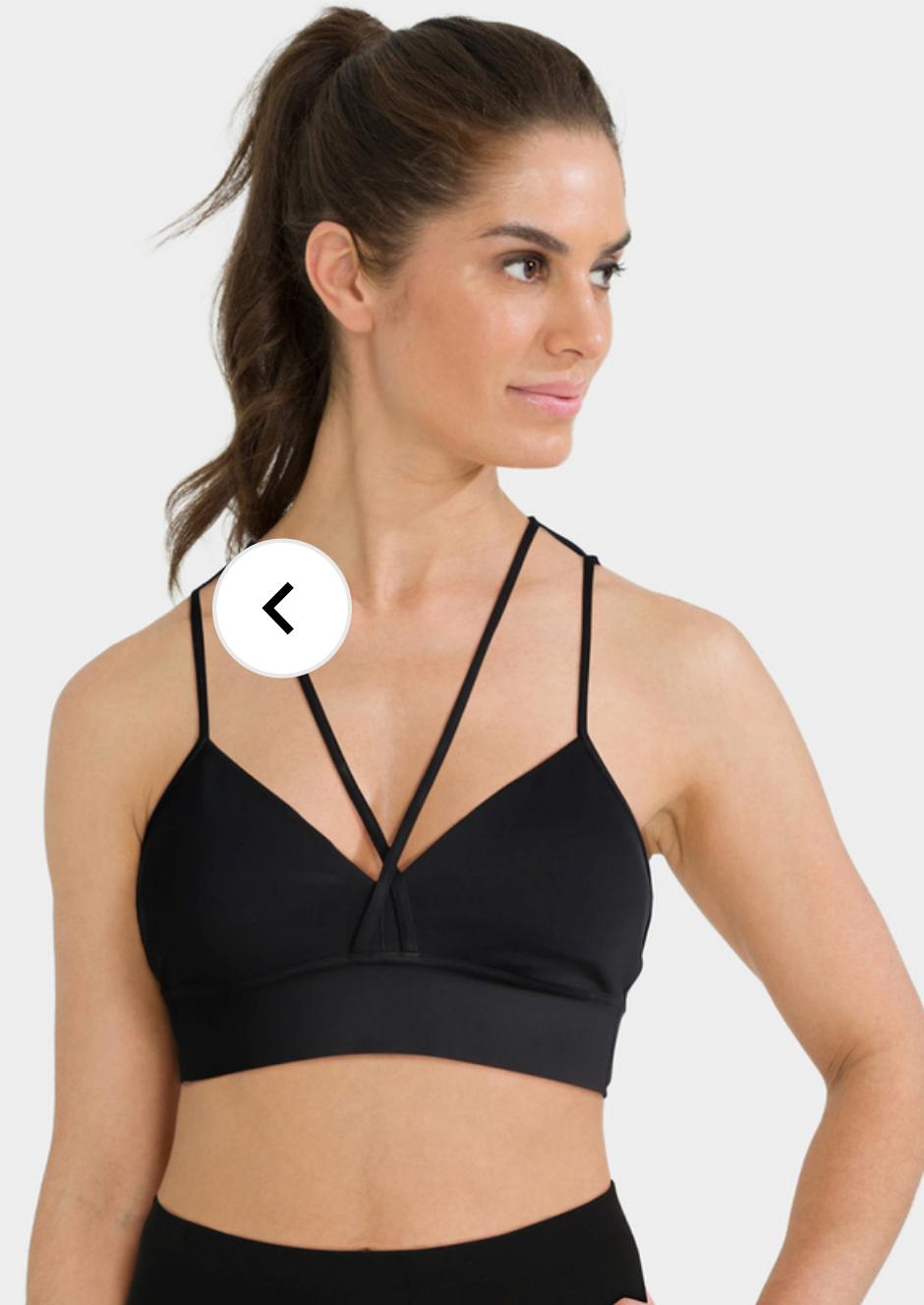
- CEO
- Department Heads



ABOUT US

An e-commerce fashion company which distributes over 400 local and international brands.

Apparel



Footwear



Accessories



Personal care



BUSINESS PROBLEM

Survey in 2022 conducted on ~2000 customers:

Customer experience from searching by keywords:

- 35% of customers could not locate their desired products among a sea of offerings.
- 42% said they spent too much time on the website and then could find the target item.
- 22% wanted to search by images



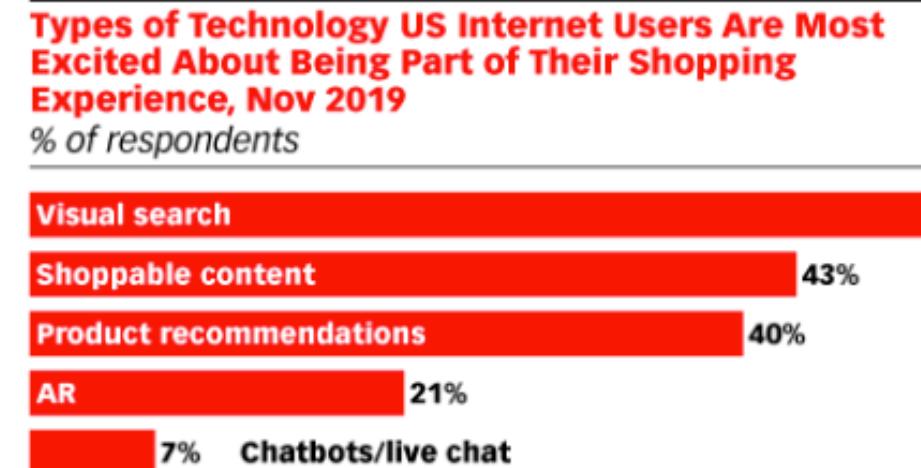
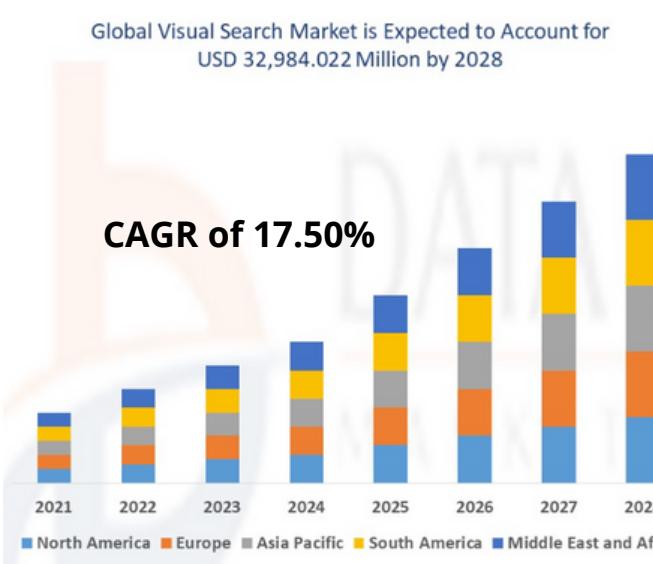
KEY BUSINESS QUESTION

**How to improve customer experience
during product searches?**



VISUAL SEARCH POTENTIAL

(Image search & video search)



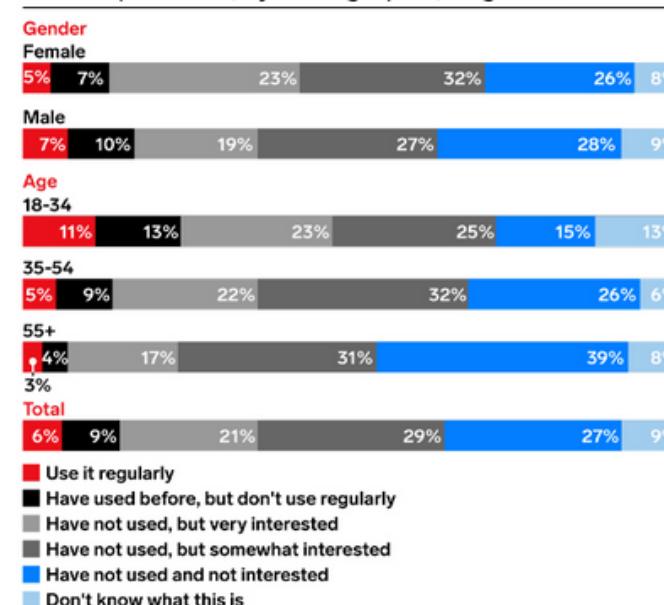
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www.eMarketer.com

Position	Search categories	Trending searches
1	Fashion	Tattoos
2	Home decor	Nails
3	Art	Sunglasses
4	Food	Jeans
5	Products	Cats
6	Animals	Wedding dress
7	Outfits	Plants
8	Beauty	Quilts
9	Vehicles	Brownies
10	Travel	Natural hair

Source: Pinterest Lens, 2017

How Interested Are US Adults in Using Visual Search* Retail Shopping Technology?
% of respondents, by demographic, Aug 2021



Note: numbers may not add up to 100% due to rounding. *taking a picture of a product then uploading the image onto an app or website to find it and shop for it
Source: "The Insider Intelligence Ecommerce Survey" conducted in August 2021 by Bizrate Insights, Aug 10, 2021

268679

eMarketer | InsiderIntelligence.com

- Rising demand for new search type

62% of Millennial and Generation Z customers desire visual search over any other new technology. (2019)

- Fast

- Accurate

- Increasing sales

Gartner study notes that early adopters who build in visual search will see a 30% increase in digital commerce revenue.)

Forever 21 instituted visual search and within one month, saw a 20% increase in average purchase value;

- Increasing conversions

Syte's partner, BooHoo, reported an 85% conversion rate for customers that used Camera Search versus those who did not

- Increasing engagement

Tommy Hilfiger's use of visual search nearly doubled average time spent on site, as well as engagement with additional fashion show-related content.



★The future of search will be about pictures rather than keywords. (Pinterest's CEO, Ben Silbermann, 2019)

★Visual search is the future of e-commerce and the key role in driving user experience.



SOLUTIONS



Develop image search feature

- Classify images by product types
- Suggest top 5 similar images



Revolutionize our customers' shopping experience



Enhance our platform's competitiveness in the market

FOUNDATIONAL MODELS

CONTENT

A-Image classification

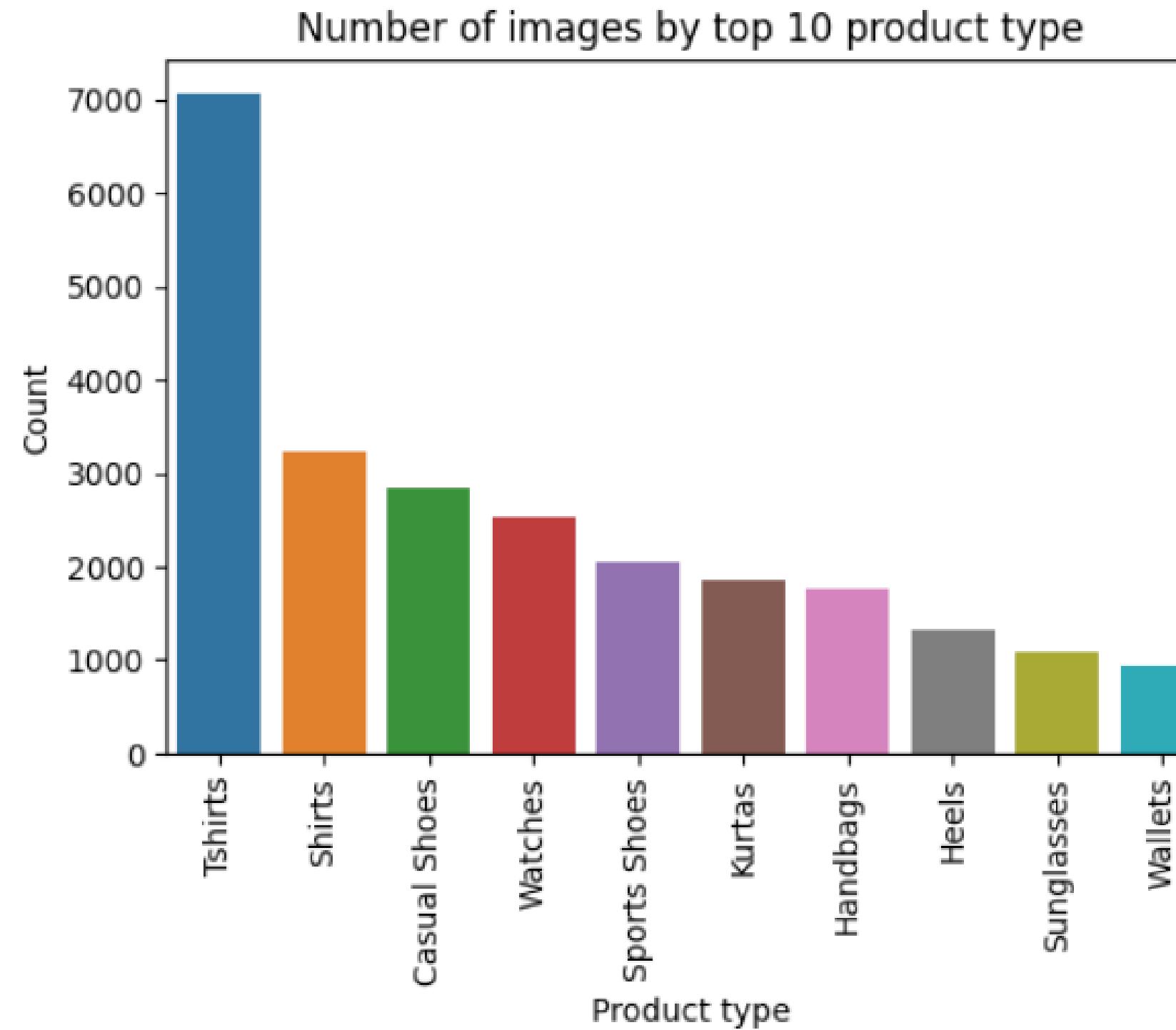
B-Image similarity

C-Deployment

D-Recommendation



DATA UNDERSTANDING



Total dataset

- ~ 44,000 images
- 143 product types

Working dataset

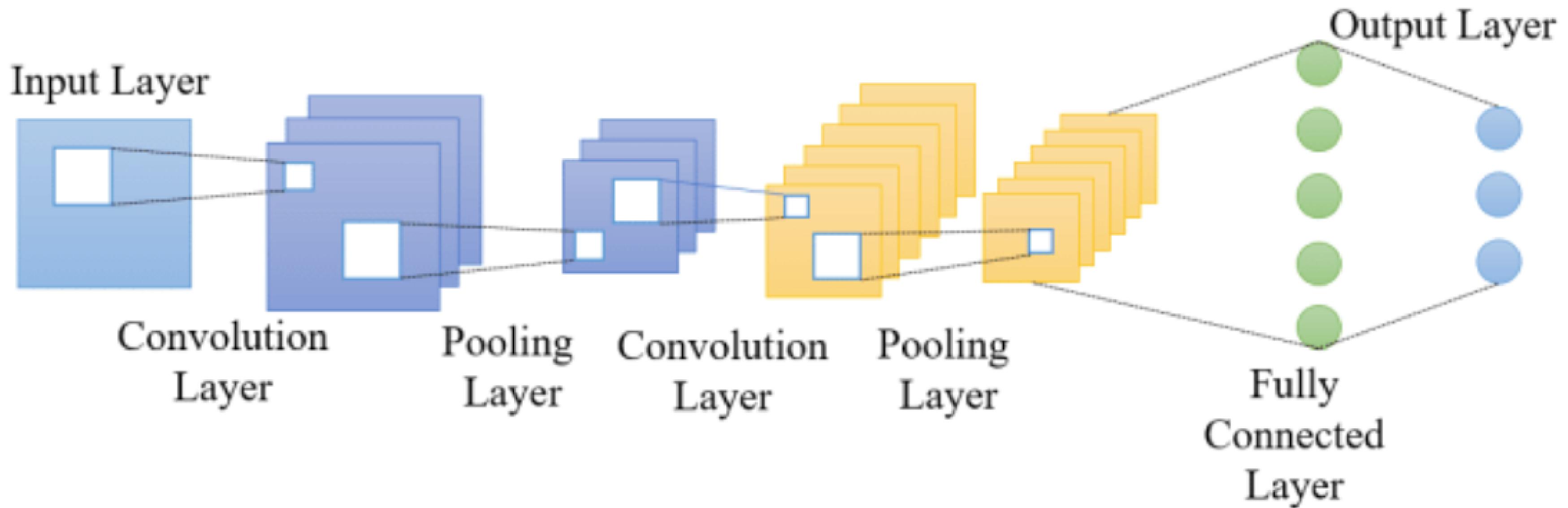
- ~24,000 images
- 10 product types

A-IMAGE CLASSIFICATION





CONVOLUTIONAL NEUTRAL NETWORK (CNN)

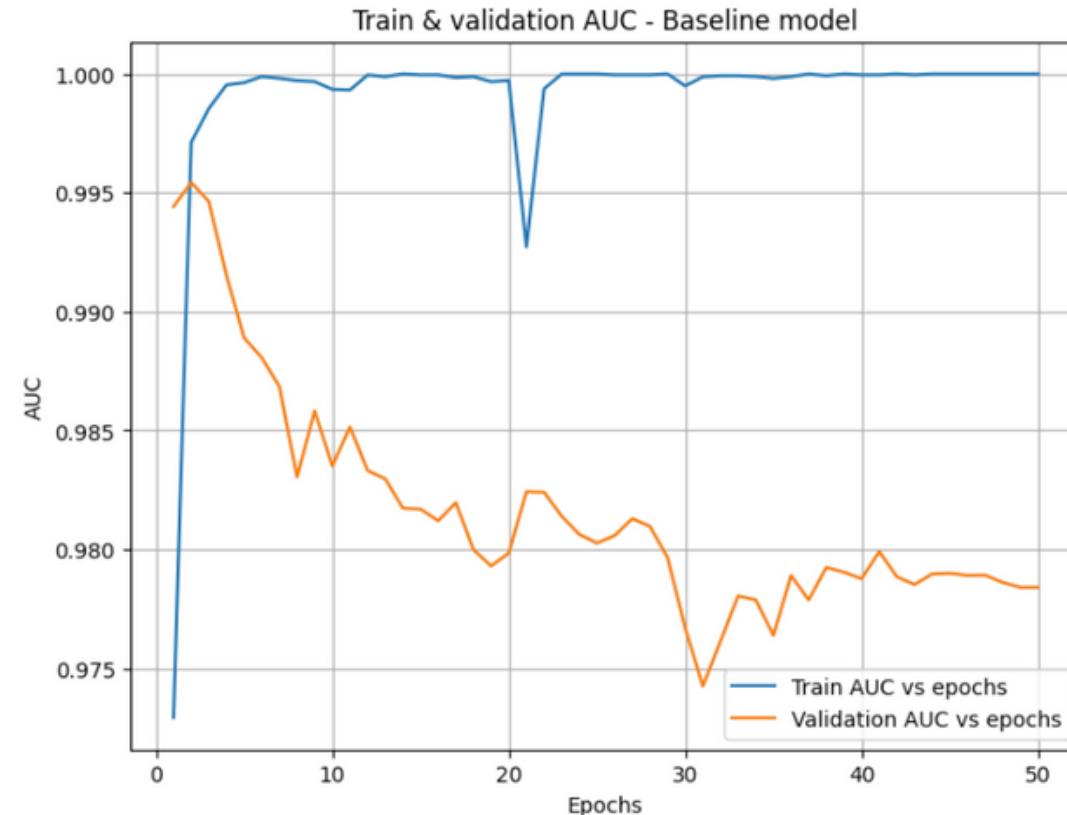
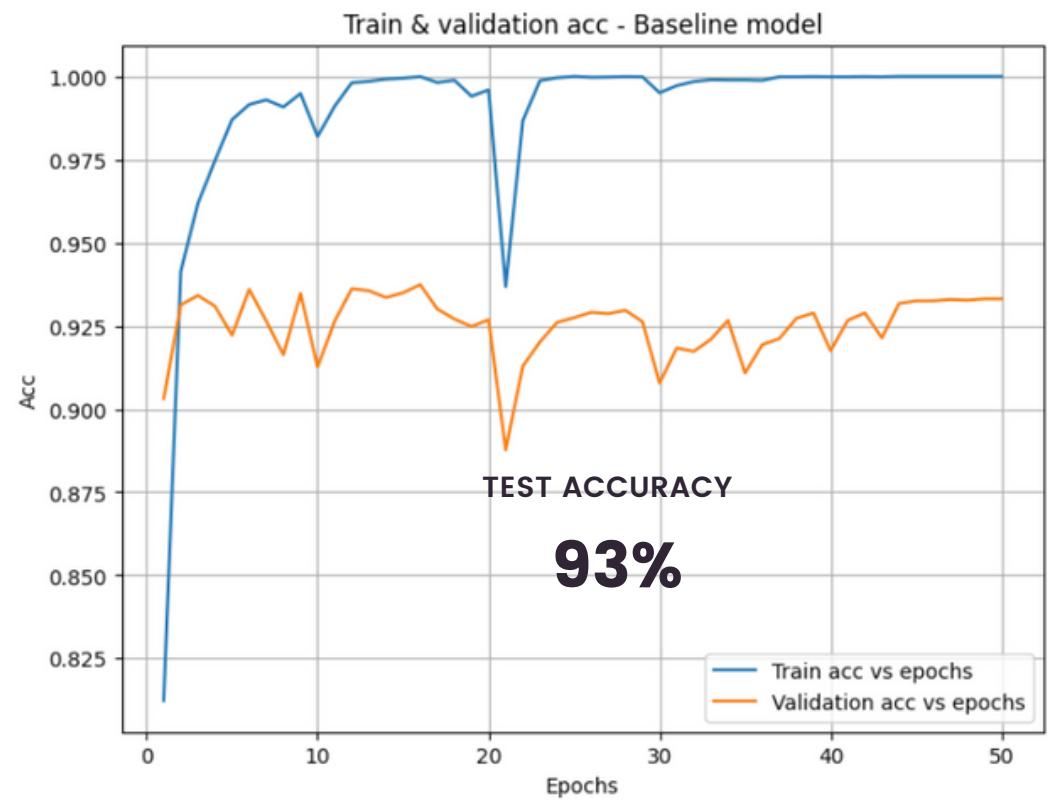




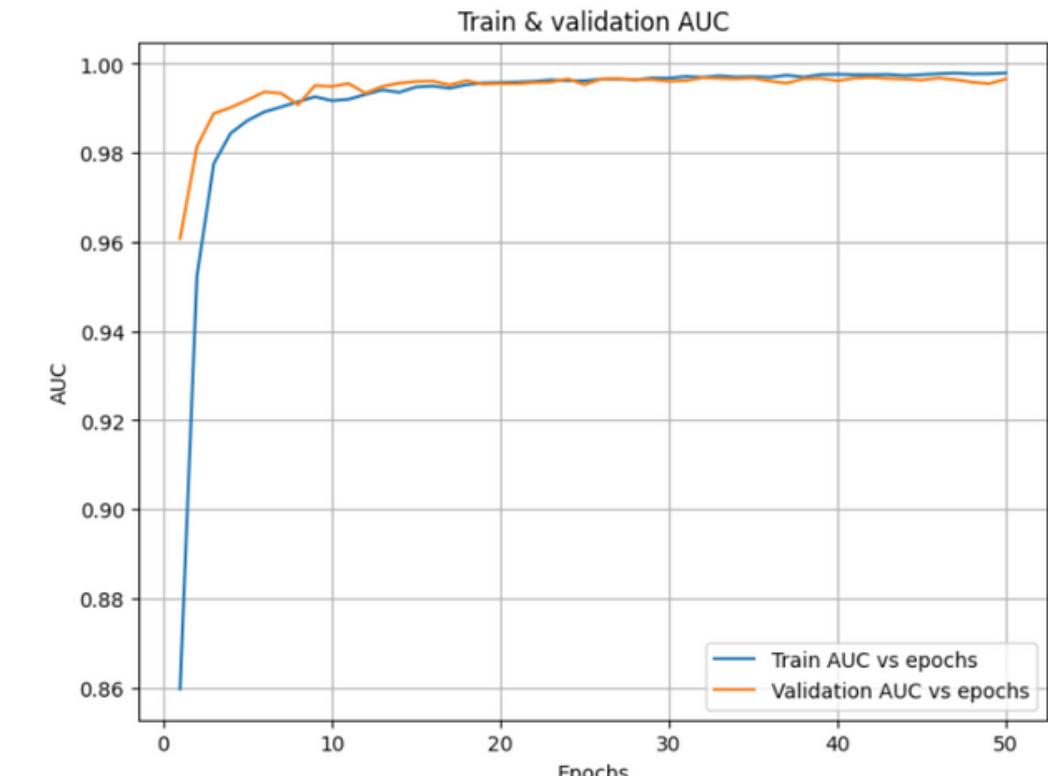
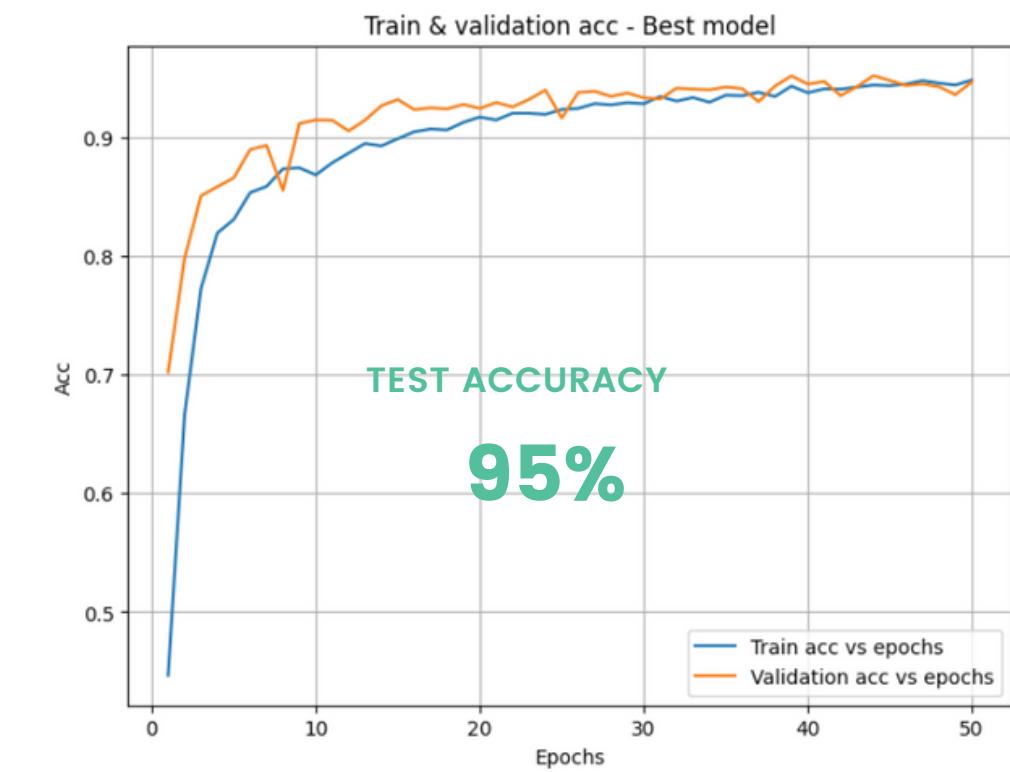
NITA
FASHION

CONVOLUTIONAL NEUTRAL NETWORK (CNN)

2 Con2D layers



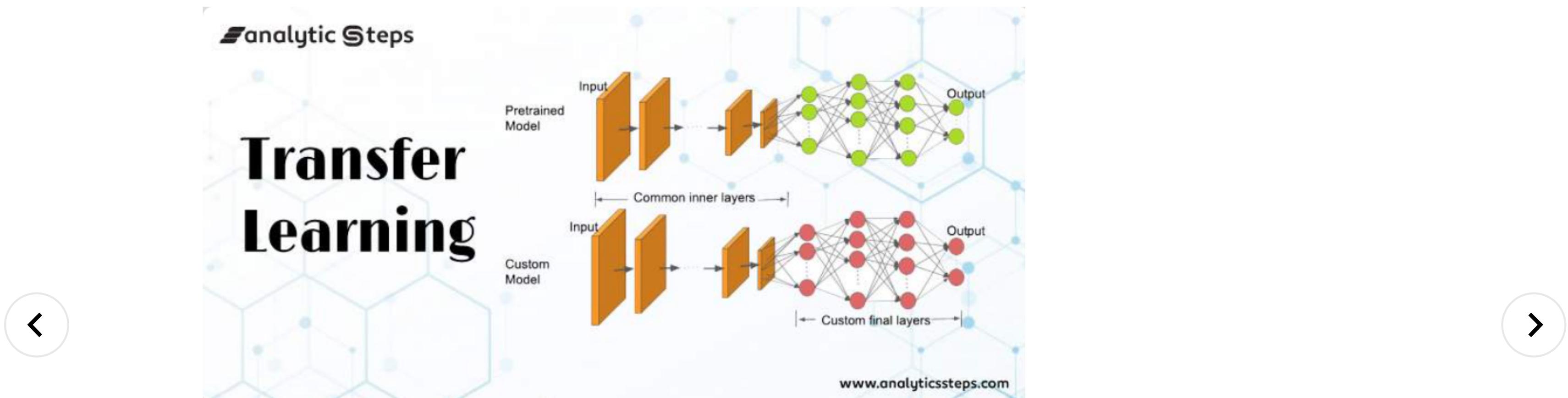
4 Con2D layers



+ {
2 Con2D layers
Tune data augmentation

TRANSFER LEARNING

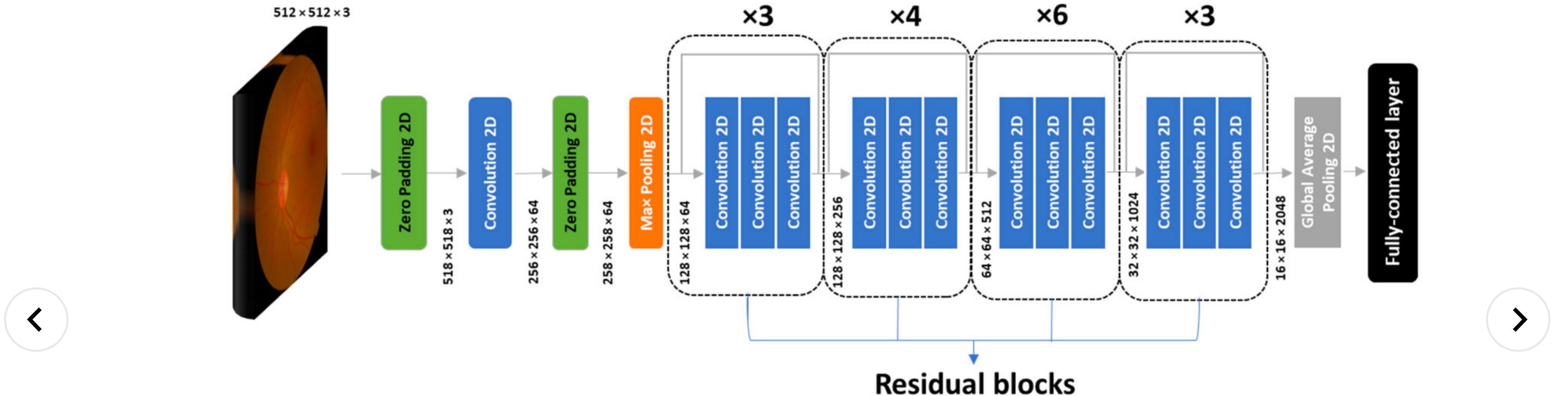
- Transfer learning is a powerful technique used in Deep Learning
- It is reuse of a pre-trained model on a new problem.



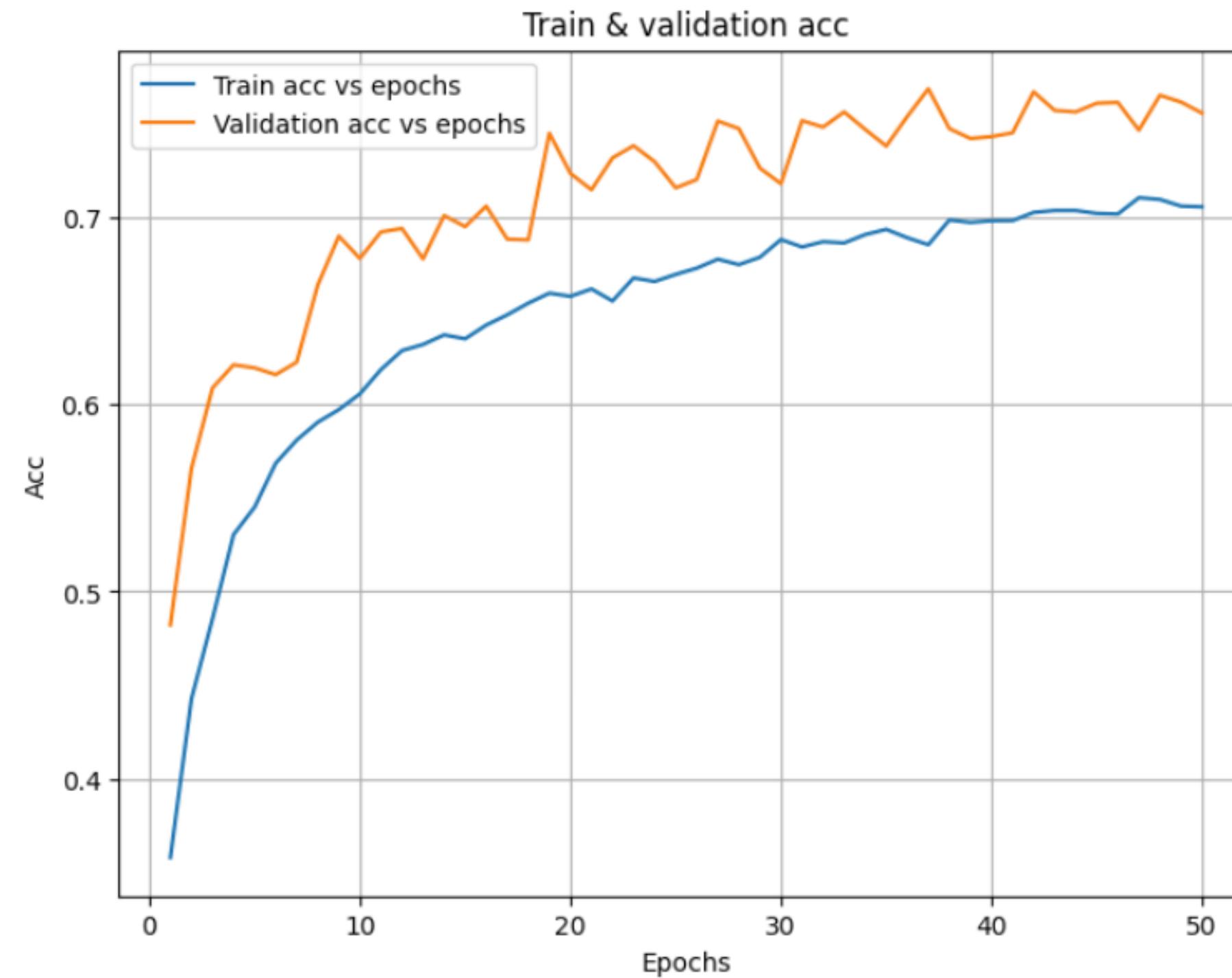
- Applied network:
 - ResNet50
 - MobileNetV2
 - VGG16



RESNET50



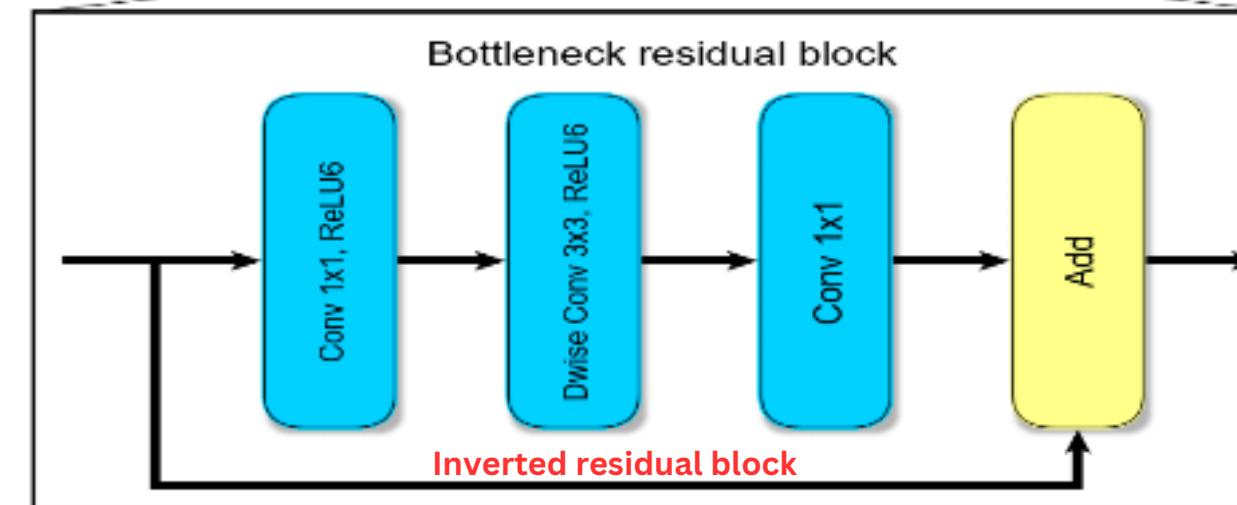
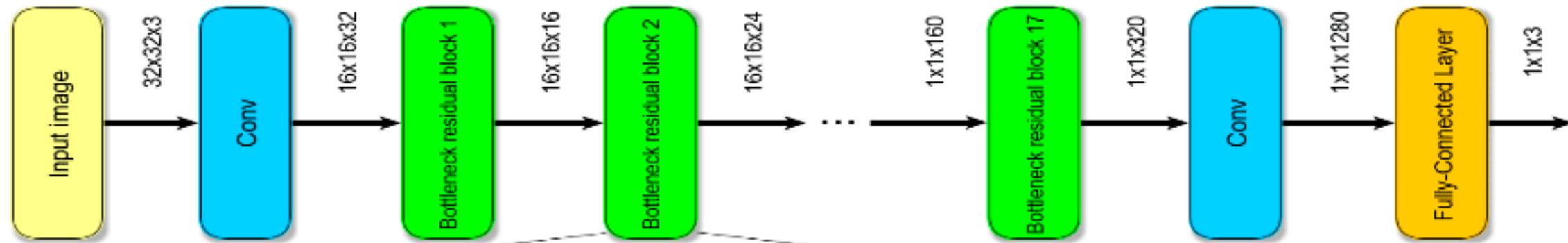
RESNET50



TEST ACCURACY
75%

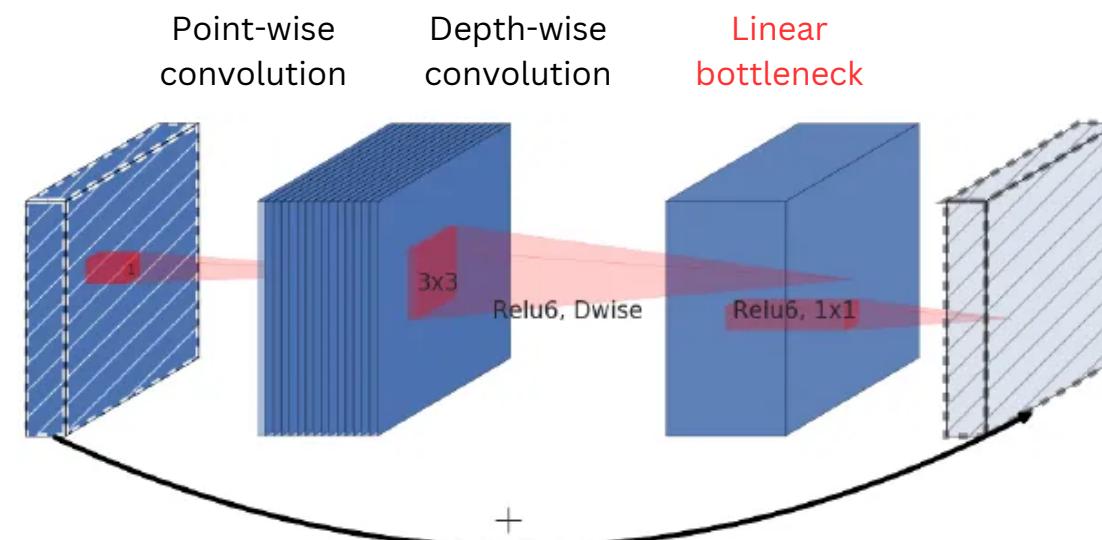


MOBILENETV2



Fast, lightweight convolutional network

- Depth-wise separable: parameters reduction
- Skip connections within the narrow part of the network

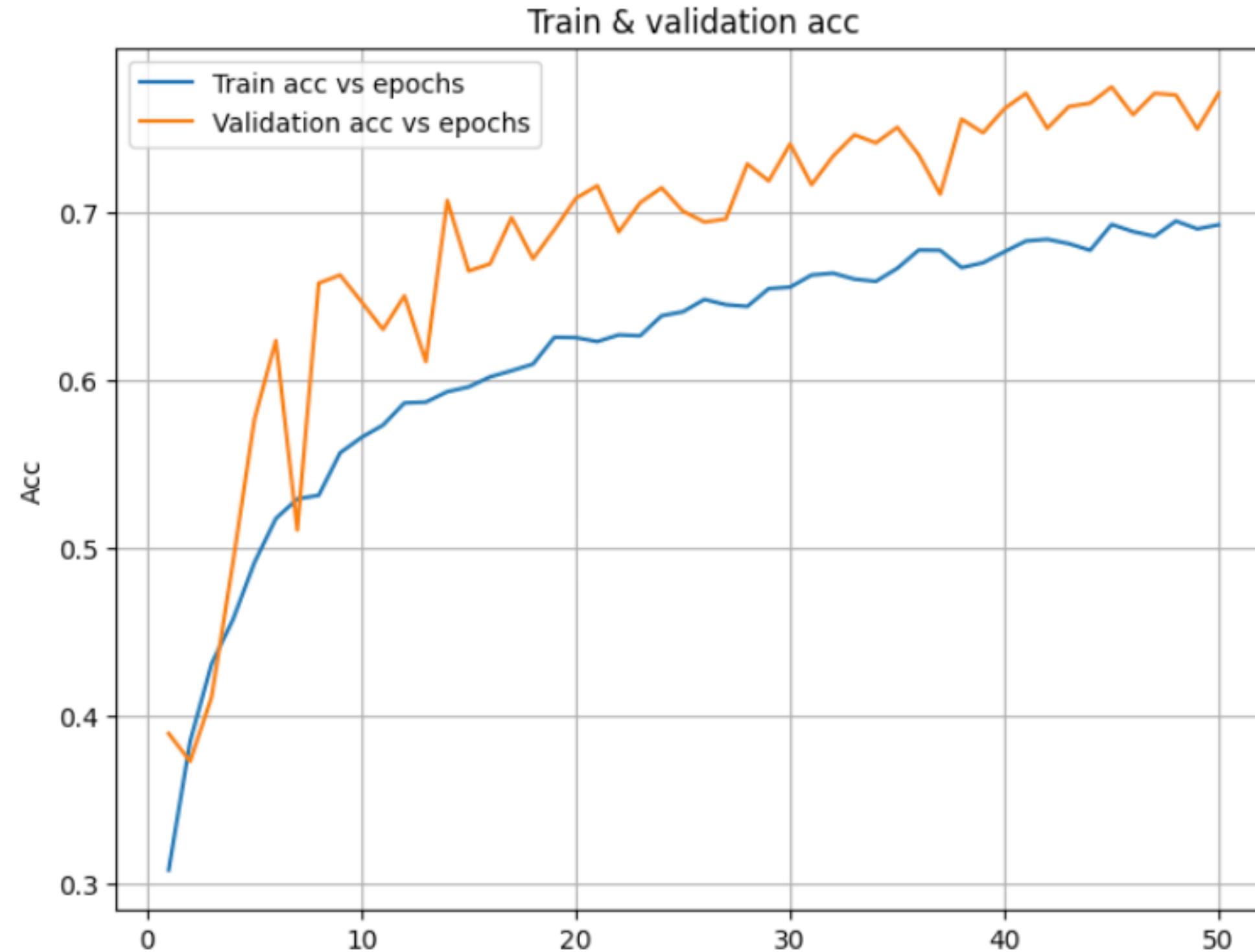


An inverted residual block connects narrow layers with a skip connection while layers in between are wide

```
def inverted_residual_block(x, expand=64, squeeze=16)
    m = Conv2D(expand, (1,1), activation='relu')(x)
    m = DepthwiseConv2D((3,3), activation='relu')(m)
    m = Conv2D(squeeze, (1,1), activation='relu')(m)
    return Add()([m, x])
```



MOBILENETV2



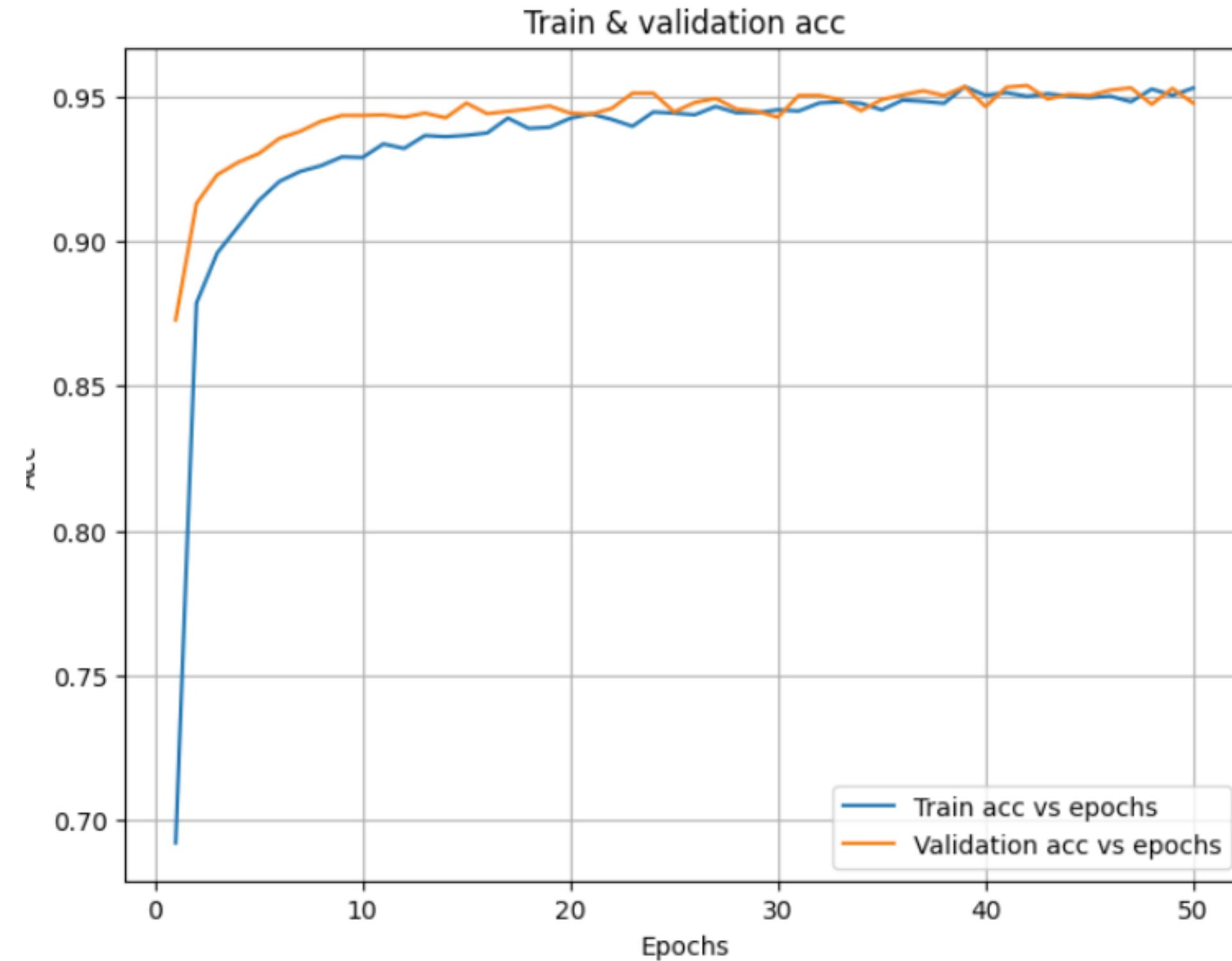
TEST ACCURACY
79%



VGG16



VGG16

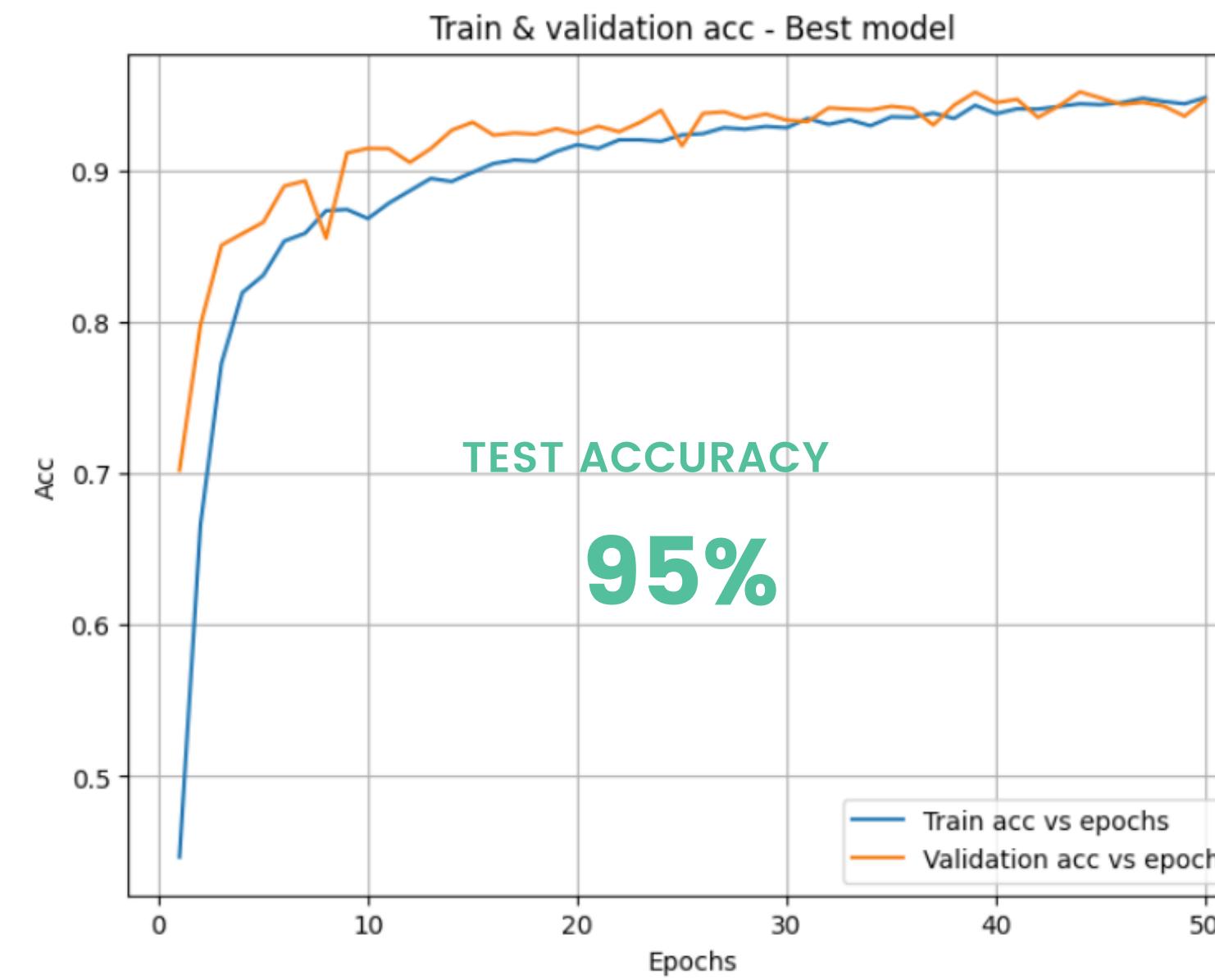


TEST ACCURACY
95%

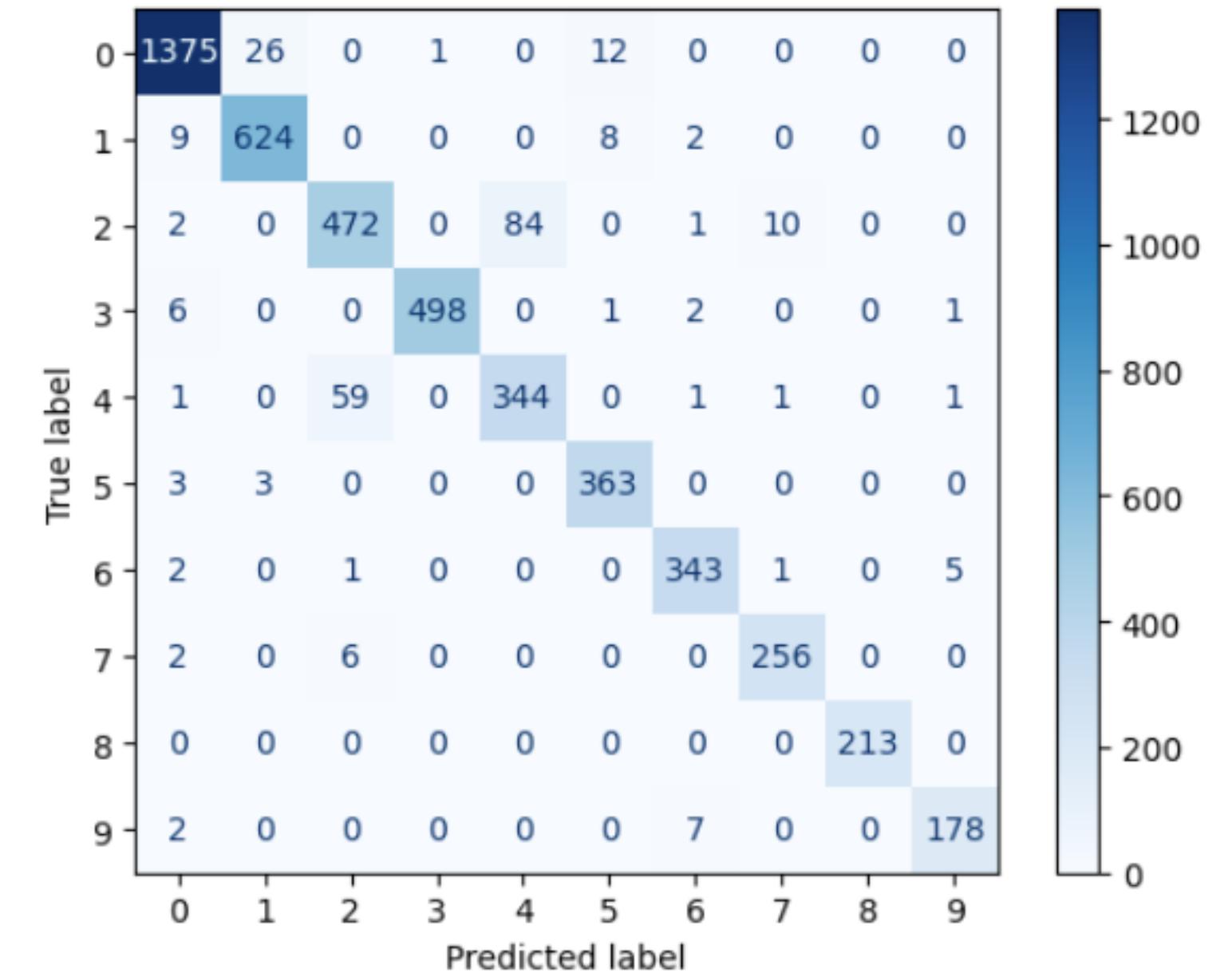


MODEL EVALUATION

BEST MODEL



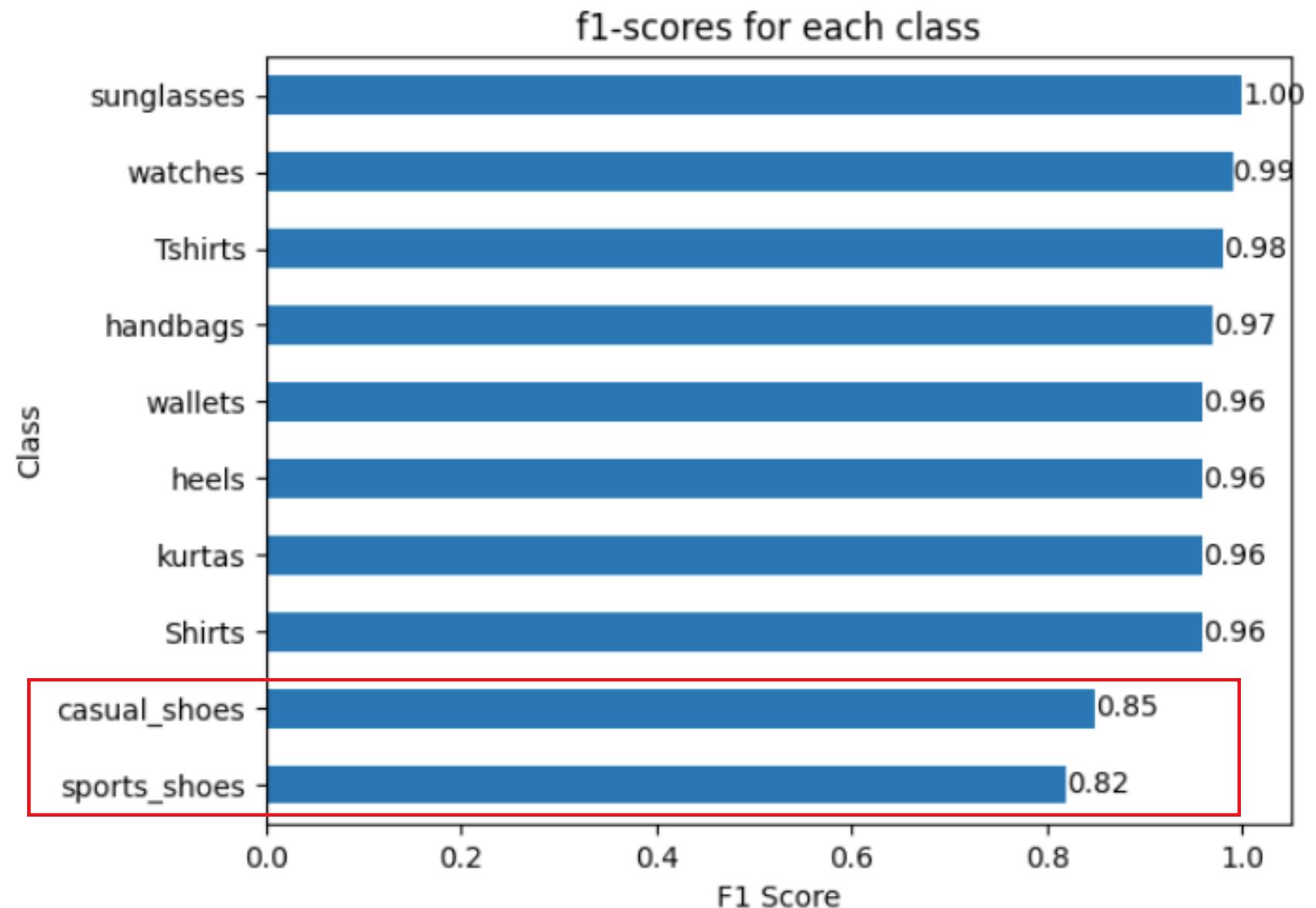
Confusion matrix



MODEL EVALUATION

Classification report

	precision	recall	f1-score	support
Tshirts	0.98	0.97	0.98	1414
Shirts	0.96	0.97	0.96	643
casual_shoes	0.88	0.83	0.85	569
watches	1.00	0.98	0.99	508
sports_shoes	0.80	0.85	0.82	407
kurtas	0.95	0.98	0.96	369
handbags	0.96	0.97	0.97	352
heels	0.96	0.97	0.96	264
sunglasses	1.00	1.00	1.00	213
wallets	0.96	0.95	0.96	187
accuracy			0.95	4926
macro avg	0.94	0.95	0.95	4926
weighted avg	0.95	0.95	0.95	4926



VISUAL AMBIGUITY

- Incorrect master data
- Similar look but different functions due to their design nature



VISUAL AMBIGUITY

- Incorrect master data
- Similar look but different functions due to their design nature

Casual shoes



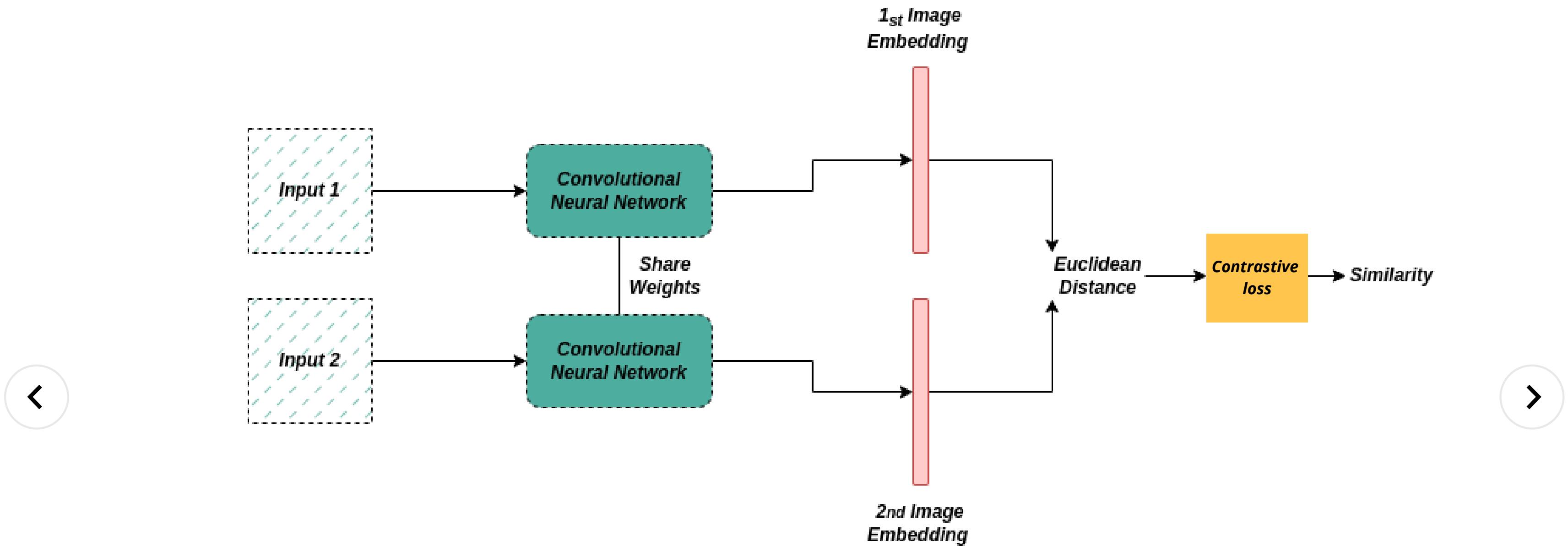
Sports shoes



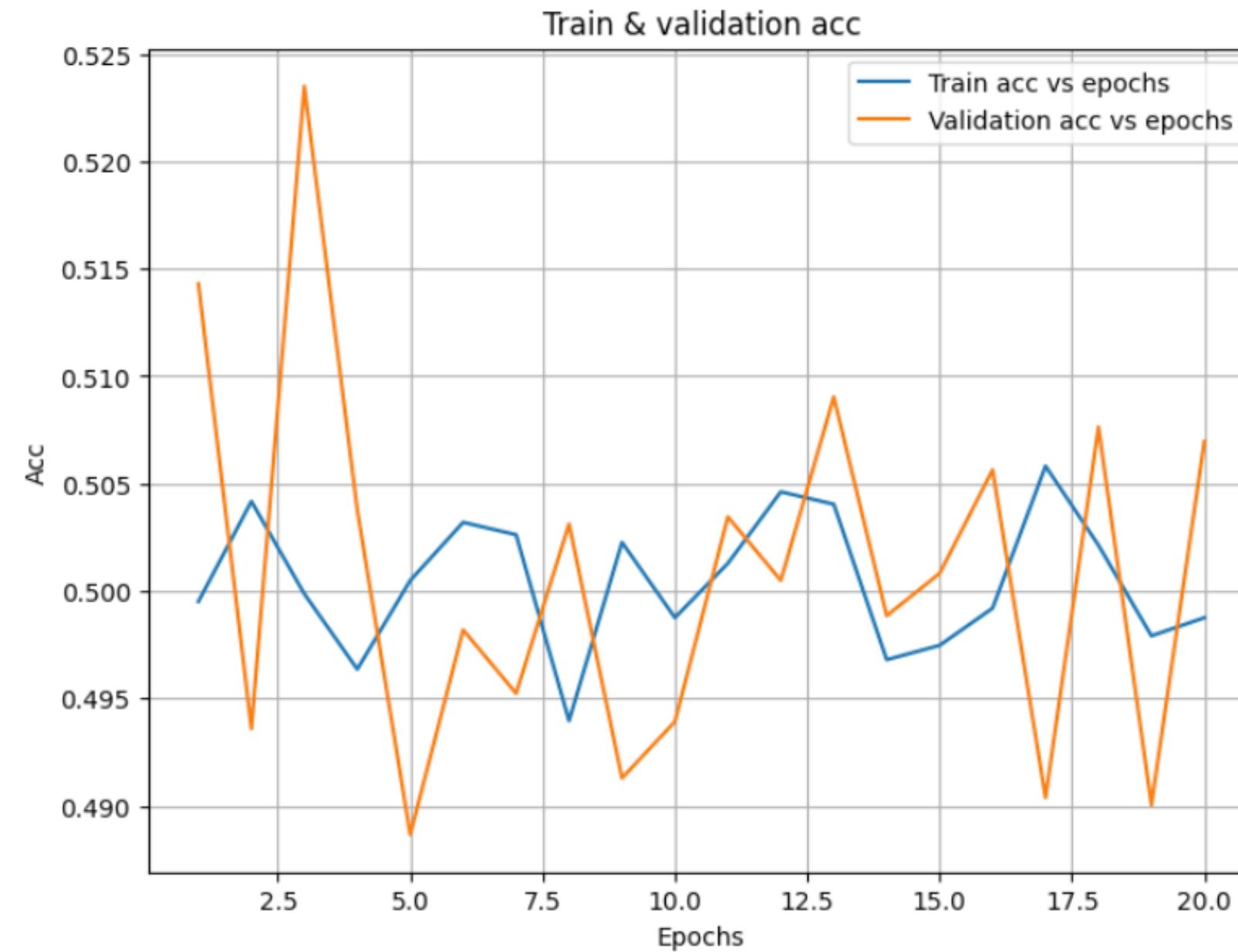
B-IMAGE SIMILIARITY



SIAMESE NEUTRAL NETWORK (SNN)



SIAMESE NEUTRAL NETWORK (SNN)



TEST ACCURACY
50%



C-DEPLOYMENT

<http://localhost:8502>



D-RECOMMENDATION

1. Check and clean master data

- Improve images classification and similarity models accuracy.
- More accurate search results gained by customers.

2. Marketing the new image search feature as a competitive advantage against competitors

- Drive more traffic to the website
- Collect a large volume of customer data in the image form for further analysis

3. Analyze image data for buying references

- Buying team can utilize image search analysis for buying references to leverage sales, especially from trendy opportunities.



LIMITATIONS

- Data have class imbalance
- Siamese model's accuracy achieved only 50%
- Due to computational limitations on laptops, training time was significantly extended, with the longest training model taking more than 3 days.



NEXT STEPS

- Improve Siamese model's accuracy
- Apply image classification and image similarity for all product types





KEY TAKE AWAY

• IMAGE SEARCH IS SUPER COOL!

TRY IT!

QUESTION?



THANK YOU!

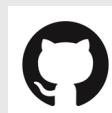
Contact:



ptthao.ftu@gmail.com



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