

Semantic Furniture Feature Extraction

by
decorAID

Semantic Furniture Feature Extraction

Find furnitures to realise your dream home

Click on furnitures in your image to view similar furnitures.



FortyTwo

Valencia 3 Seater...



FortyTwo

Cerny 4-Seater...

Breakdown of problem

How to search for similar
furnitures?



Clustering & feature
extraction

Categories

- 2 Seaters
- 3 Seaters
- 4 Seaters & Up
- L-Shape Sofas
- Sofa Beds
- Genuine Leather Sofas
- Recliners
- Armchairs
- Lounge Chairs
- Sofa Sets
- Outdoor Sofas & Sets
- All Sofas

- Upholstered Beds
- Storage Beds
- Bunk Beds
- Metal Bed Frames
- Wooden Bed Frames
- Trundle Beds
- Bed & Mattress Packages
- Bedroom Sets
- Mattresses

- Dining Chairs
- Office Chairs
- Bar Stools
- Dining Benches
- Benches
- Stools & Ottomans
- Bean Bags & Poufs
- Outdoor Dining Sets
- All Chairs

- Wardrobes
- TV Consoles
- Storage Cabinets
- Bookcases & Shelves
- Sideboards & High Boards
- Shoe Racks & Cabinets
- Kitchen Cabinets & Trolleys
- Chest of Drawers
- Office Cabinets
- Outdoor Storage Cabinets

- Dining Tables
- Coffee Tables
- Side Tables
- Bedside Tables
- Study Desks
- Console Tables
- Outdoor Tables
- Dressing Tables
- Bar Tables
- Office Tables
- Dining Table Sets

fortytwo

[Furniture](#) [Bed & Bath](#) [Décor](#) [Kitchen & Tabletop](#) [Lighting & Fans](#) [Kids](#) [Home Essentials](#) [Sale](#) [Trending](#)

[Home](#) > [Living Room Furniture](#) > [Sofas](#) > [3 Seaters](#) > [Ethna 3 Seater Fabric Sofa](#)



*Items sold separately



★★★★★ 414 customer reviews

~~\$5229.00~~

S\$149.90

or 4 X SGD 37.48 with [Grab Info](#)

Colour

Choose an Option...

Warranty: 1-Year



Choose your preferred product options to see the earliest delivery date available!

To buy, select Colour

Choose from options

Qty: (1)

♥ Add to Wishlist

 [Email to a Friend](#)

[Watch Product Video](#)

 100 Day Free Returns

 Free Assembly Included

 300k+ Satisfied Customers

 0% Instalment Plans Available

Description

Specifications

Essential Info

Reviews

[Ask Question](#)

This modern and functional 3 Seater sofa features comfortable fabric upholstery that is timeless and highlights the modern silhouette of the Ethna 3 Seater Fabric Sofa Brown. Crisp clean lines ensure it stands out in any space while the simplistic design ensures it works well with any interior style. Its plush design makes you feel comfortable with its thick, padded seats.

Material

- Black plastic legs
- Polyester fabric upholstery
- Solid plywood frame structure
- Hardwood internal support structure
- Black non-woven fabric lining underneath the sofa

Seat Firmness



Iteration 1: issues

Can use a better model

L1 distance + sigmoid

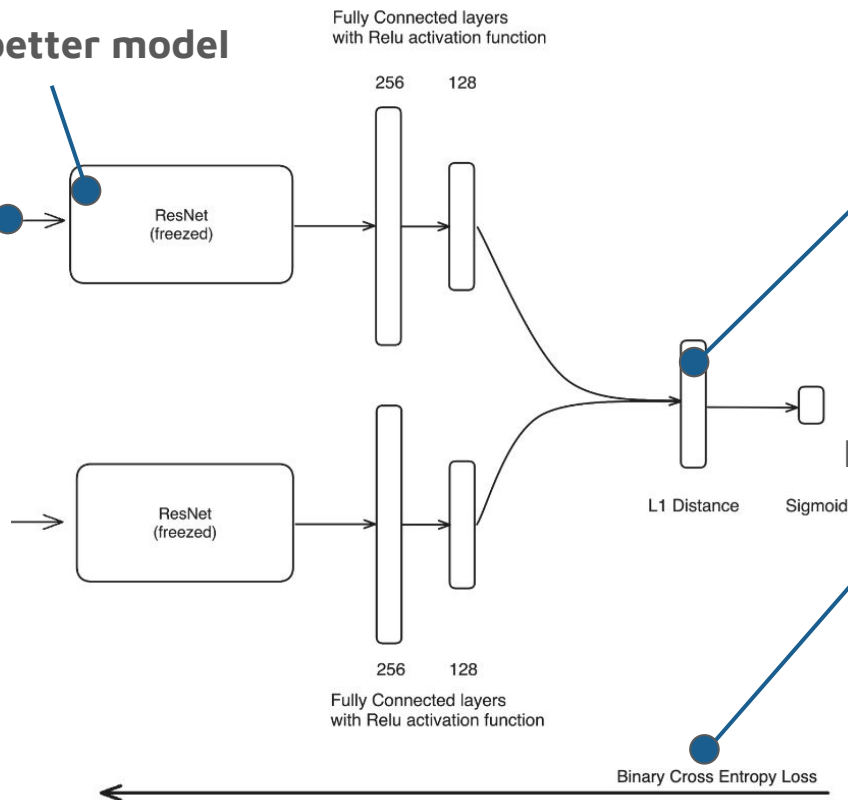
- Not differentiable
- Positive and unbounded
- Doesn't make sense to feed into Sigmoid

Better Grouping

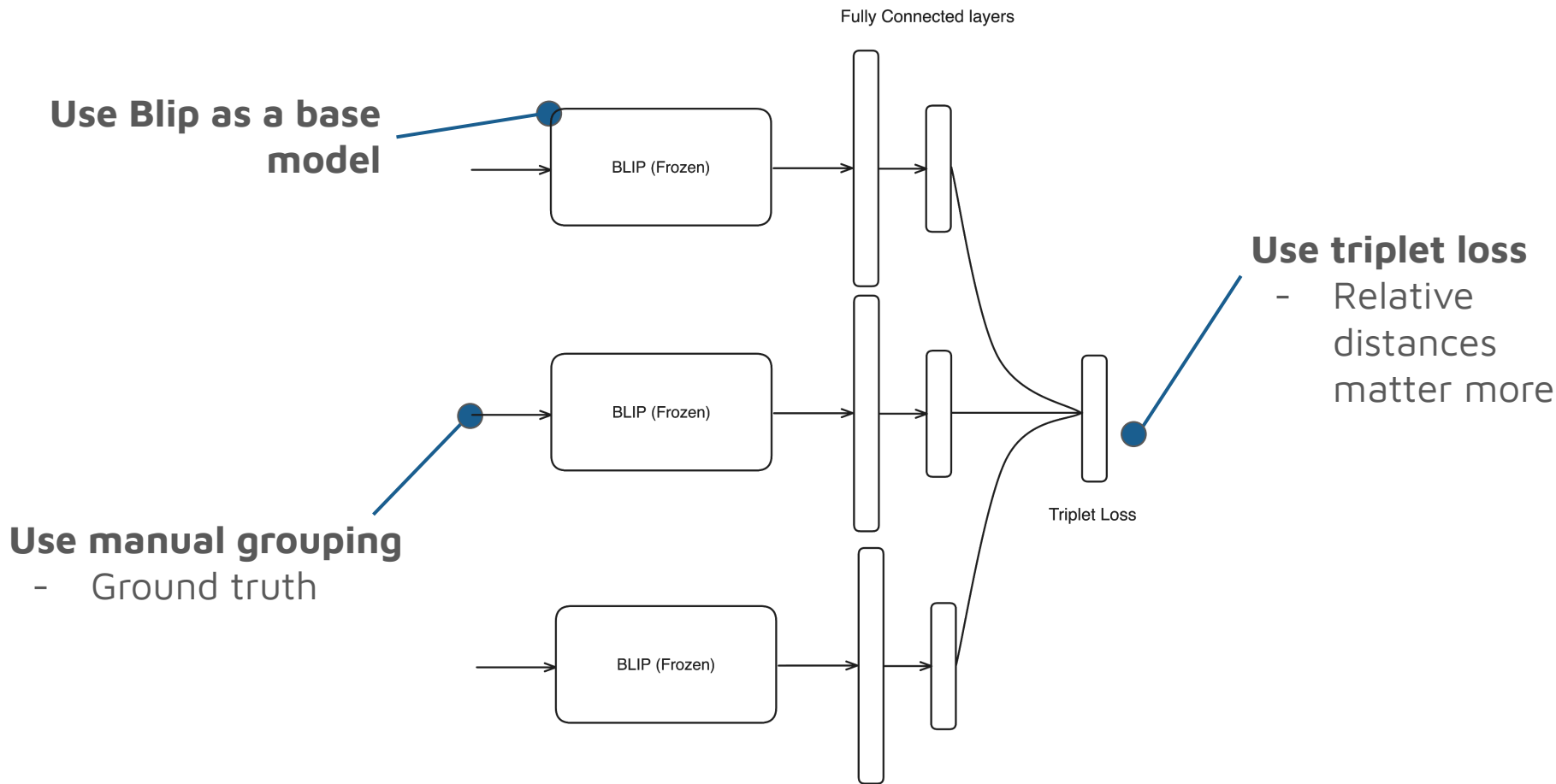
- Sub-category is not a good measure of similarity

Binary Cross Entropy Loss

- Classification loss function
- Punished high and low L1 distances, but that's not what is important



Iteration 2

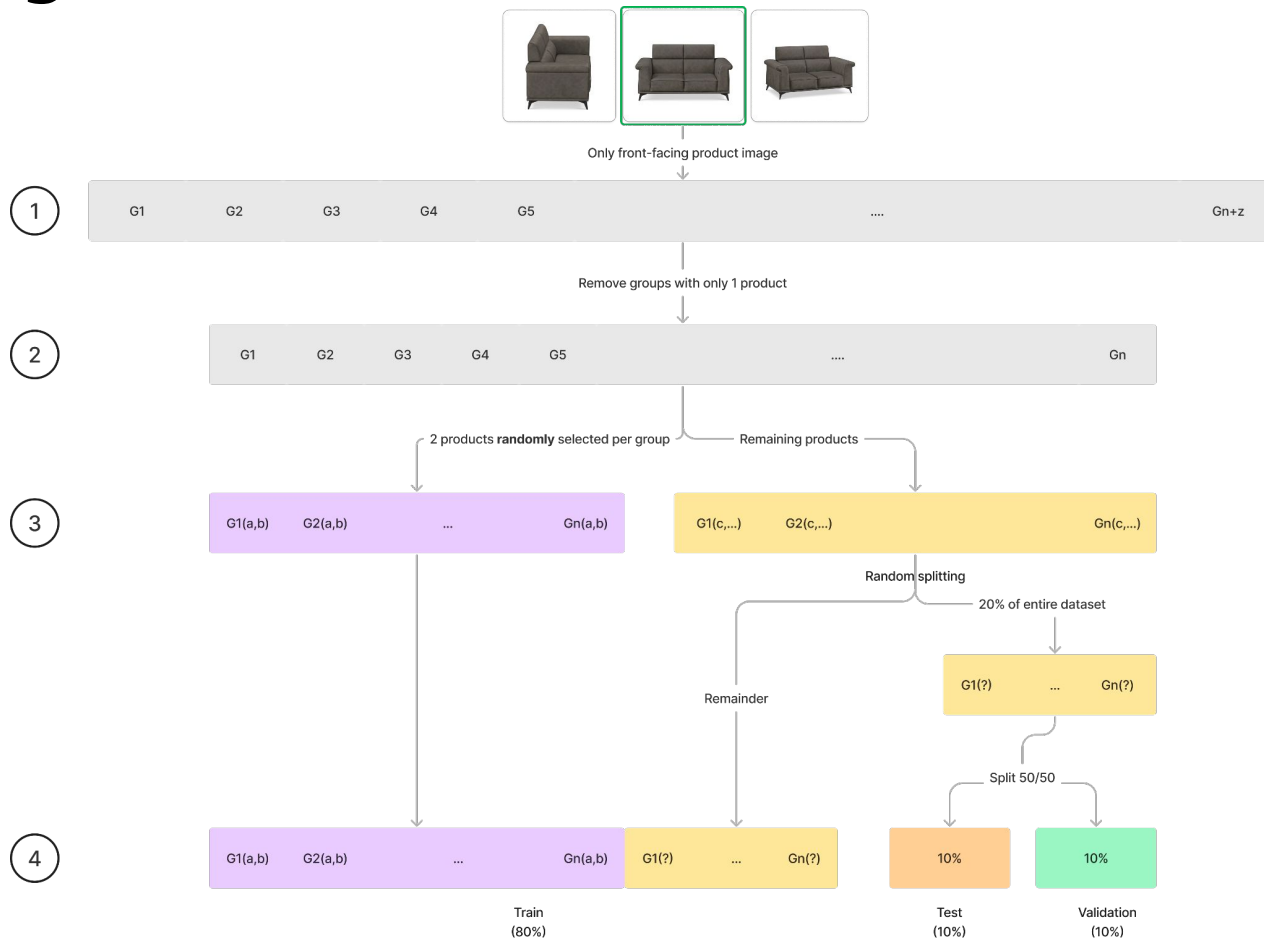


Manual grouping of clusters

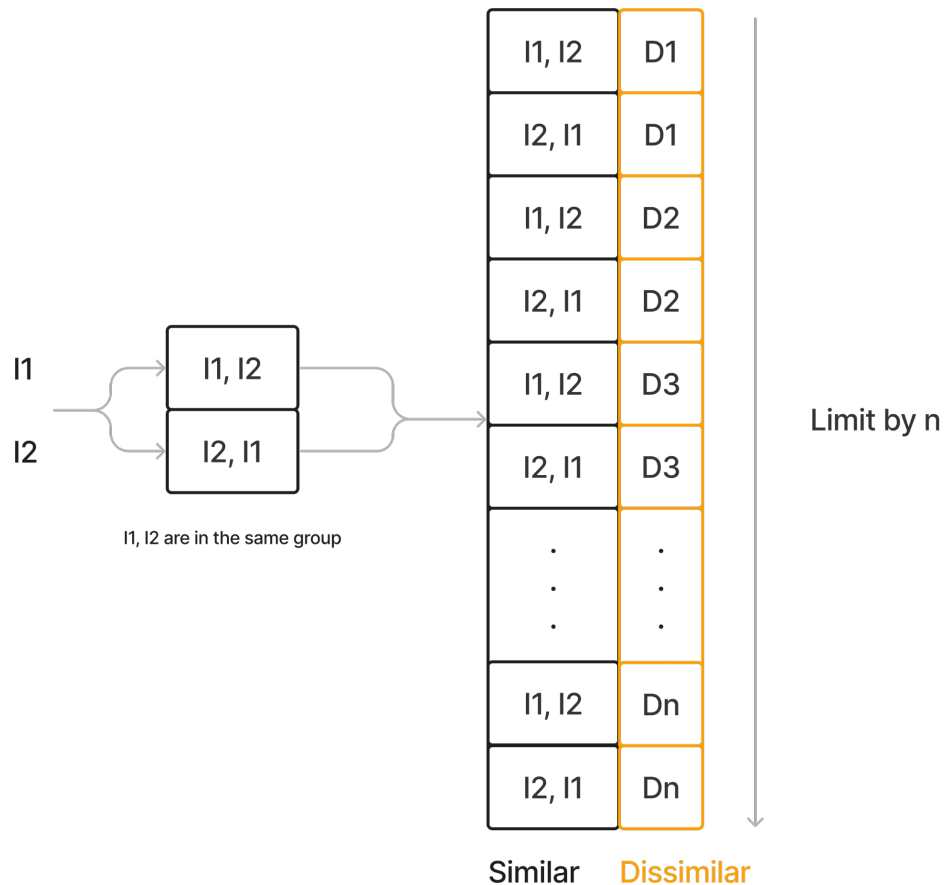


- Group based on Form, Pattern and material
- Consistent interpretation of considerations
- Forms a solid ground truth

Splitting of dataset



Generation of triplets



Evaluation Intuition

- Given an image, we want to measure if it is clustered among other products of the same group
- We know the trained model has some baseline understanding of the training data and has clustered them
- We can use the training data to form cluster centroids
- Given an evaluation image, we can then predict a product's group by its nearest cluster centroid

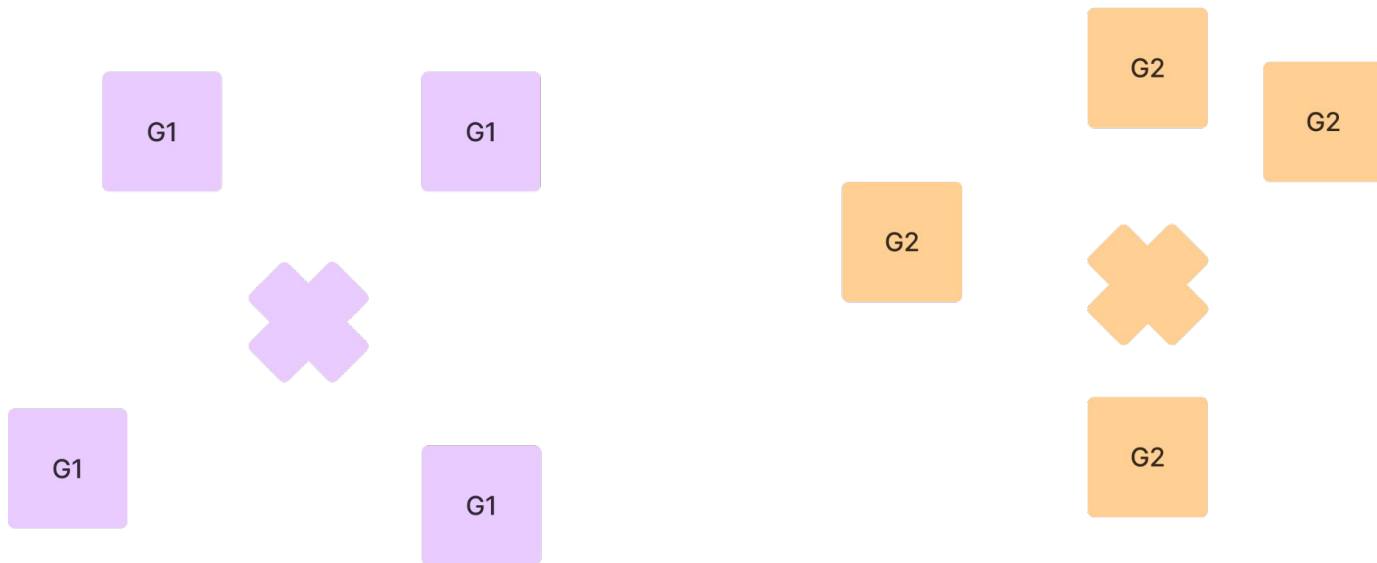
Getting centroids



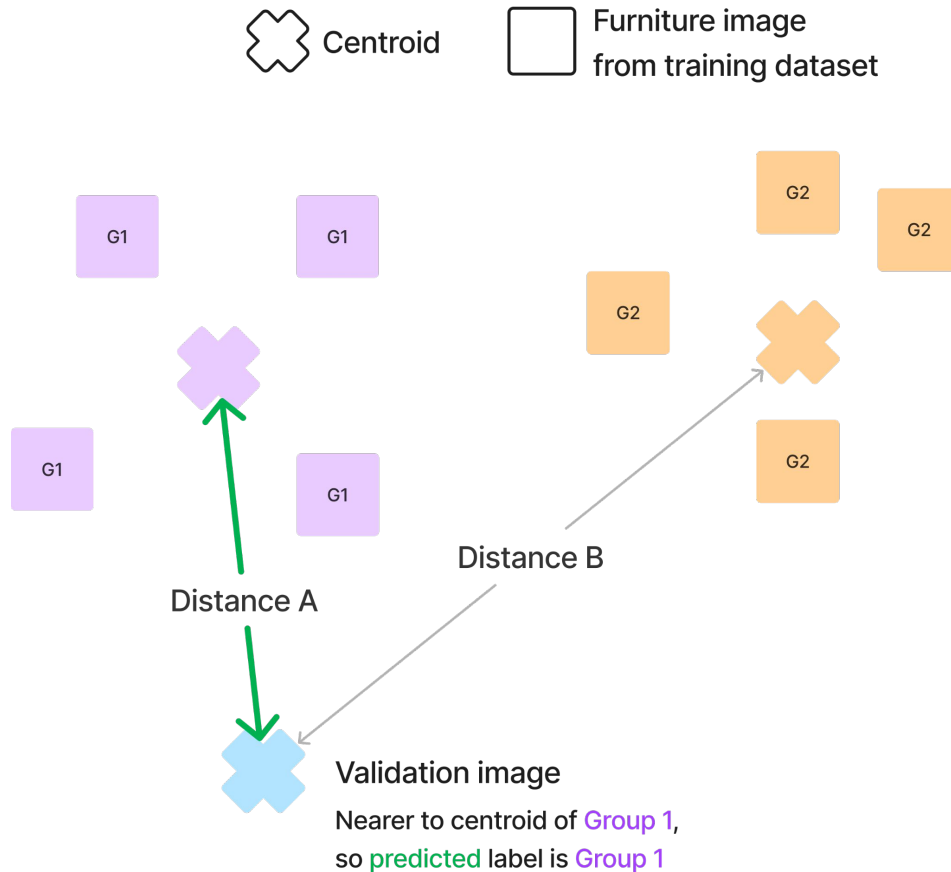
Centroid



Furniture image
from training dataset



Getting predicted group



Precision score

- With the predicted and true group labels, we calculated the F1, precision and recall score
- Needed to choose a metric as a measure of success

To improve user experience:

Model must recommend only
relevant furniture items

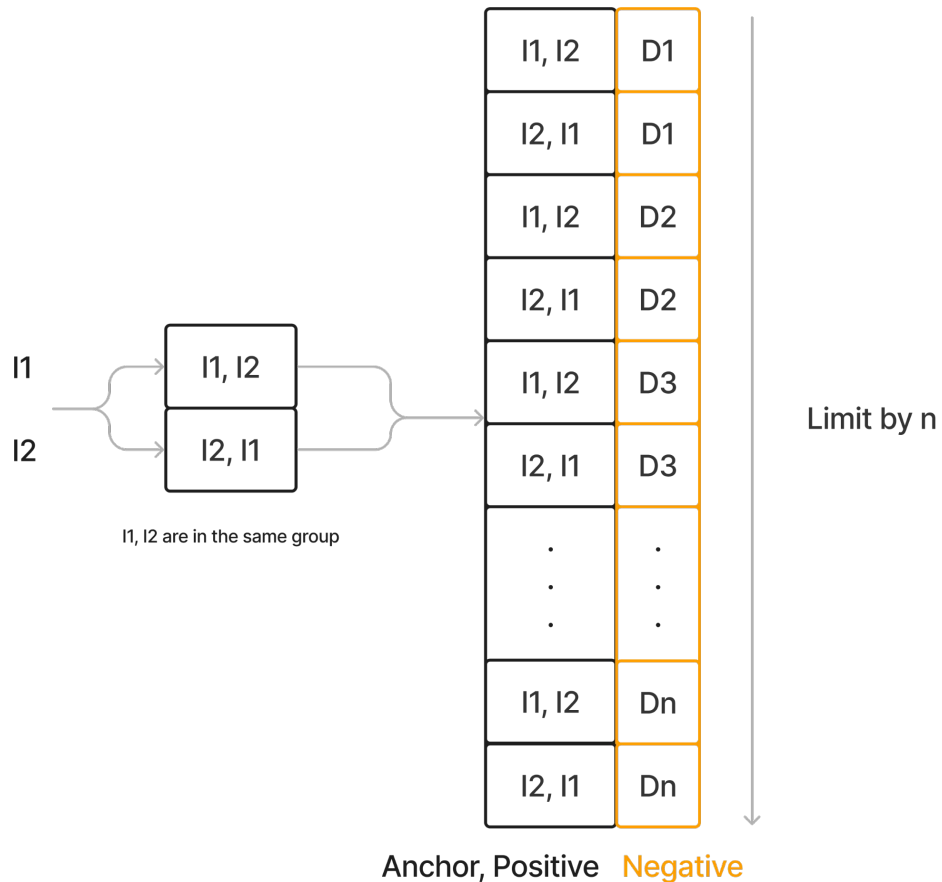
Reduce number of false positives



Precision

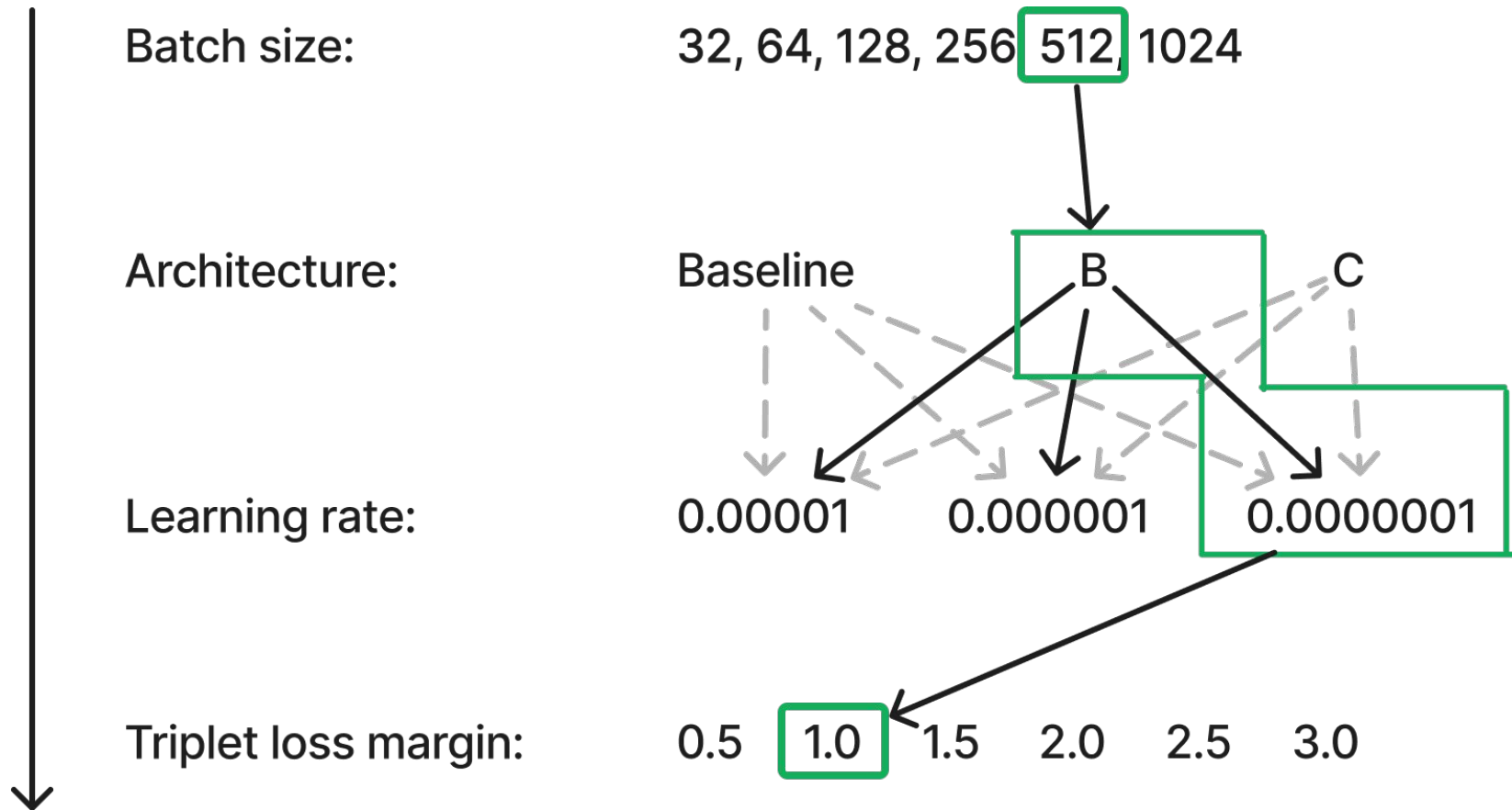
Architectural & Hyperparameter Tuning

Reducing training set for hyperparameter tuning



- Keep hyperparameter tuning relevant through a reduced training set
- Keep a high development velocity
- Same triplets generation script with a smaller n

Overview of hyperparameter tuning



Choosing the optimal batch size

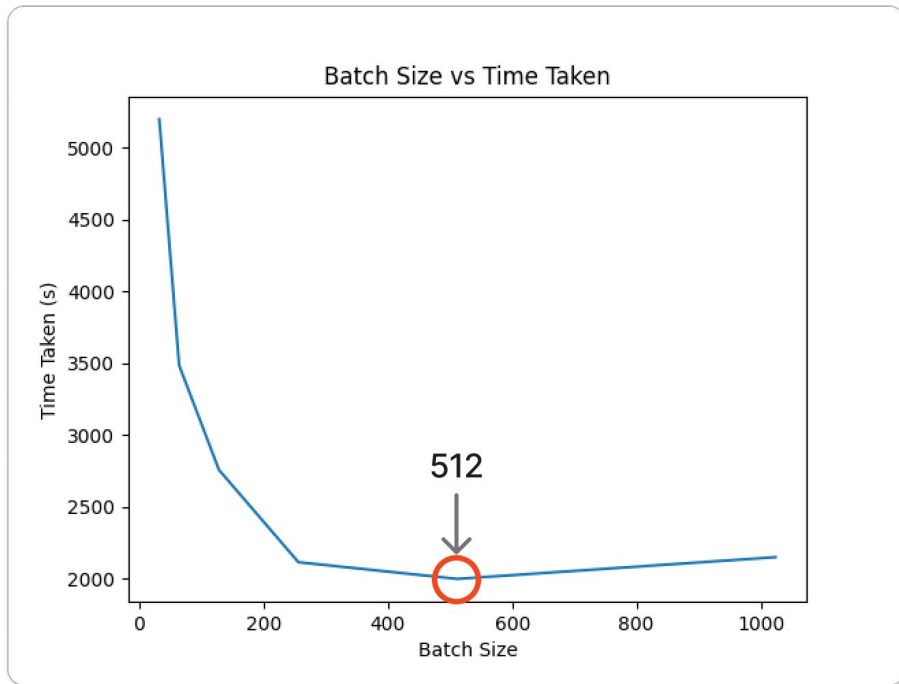
- Batch size determines our **training time** and computing resource consumption
- Shortest training time would give us **quicker** iteration cycles

Batch sizes tested:

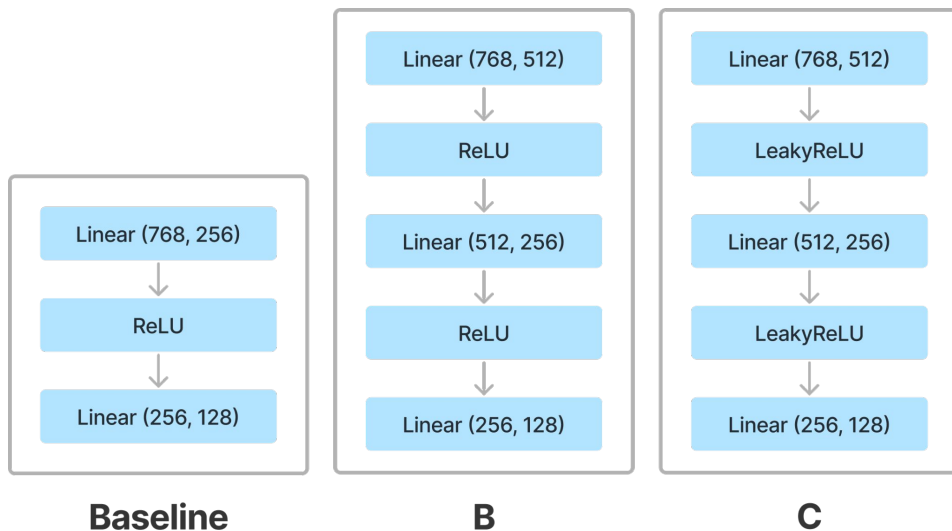
32, 64, 128, 256, 512, 1024

Optimal batch size:

512



Tuning architecture and learning rate



- With over 700 groups, more layers might be needed
- Reduced representation dimensionality in smaller steps
- LeakyReLU may help in gaining more diverse feature representations

5 epochs

Triplet loss margin of 1.0

Batch size of 512

Constant learning rate

Learning rates:

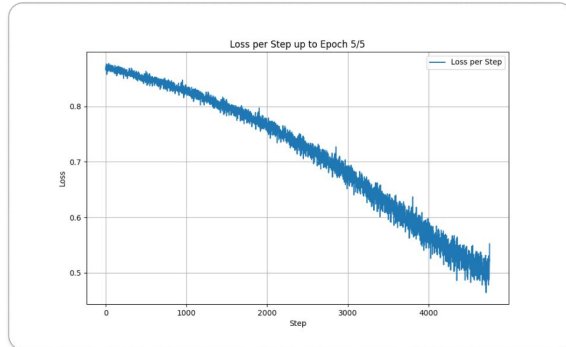
0.000001, 0.0000001, 0.00000001

Architecture	Learning rate	Average Loss	Precision
Baseline	0.0000001	0.089	0.52
B	0.00000001	0.714	0.55
C	0.000001	0.030	0.55

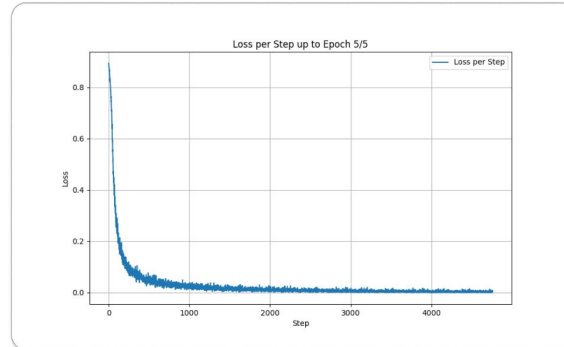
Tuning architecture and learning rate

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B



C



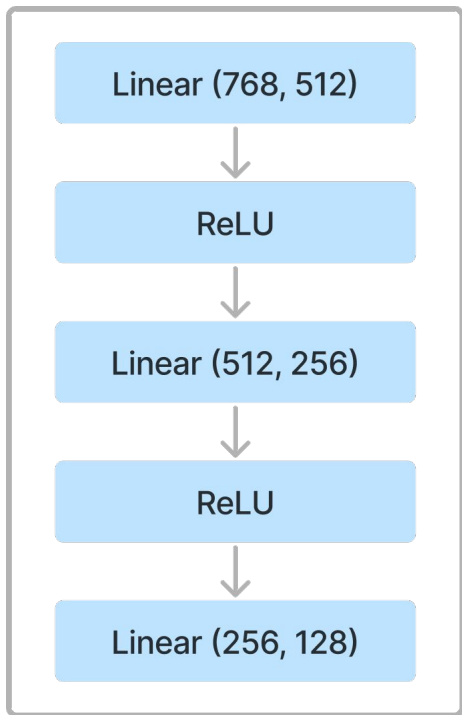
B has more room for improvement!

Triplet loss margin

An arbitrary range of triplet loss margin:
0.5, 1.0, 1.5, 2.0, 2.5, 3.0

	Average Loss	Precision
0.5	0.273	0.40
1.0	0.714	0.55
1.5	1.232	0.43
2.0	1.731	0.34
2.5	2.270	0.42
3.0	2.701	0.43

Final architecture & Hyperparameters



Batch size: 512

Triplet loss margin: 1.0

Constant Learning rate: 0.0000001

Training Results

Batch size: 512

Triplet loss margin: 1.0

Learning rate: 0.0000001

Constant learning rate

Epochs:
5, 10, 15, 20

	Precision
BLIP Only	0.46

Epochs	Average Loss	Precision
5	0.194	0.39
10	0.118	0.43
15	0.087	0.41
20	0.069	0.42

Improving the final model

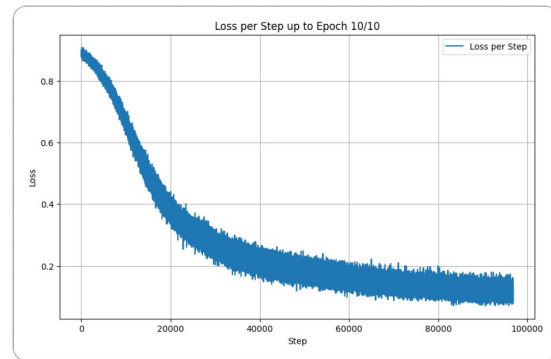
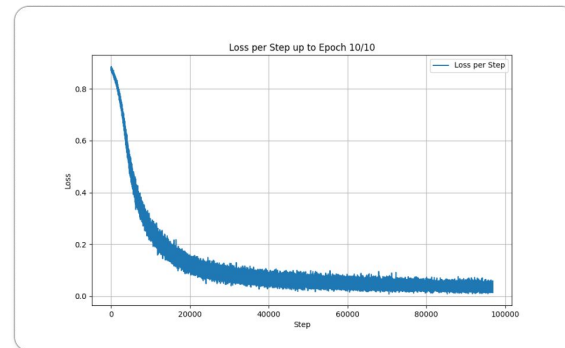
With dropout

Epochs	Average Loss	Precision
5	0.2762	0.43
10	0.1865	0.36
15	0.08678	0.41
20	0.0688	0.40

With dropout
(with lower LR)

Epochs	Average Loss	Precision
5	0.409	0.45
10	0.280	0.37

10 epochs

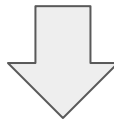


Model still converges and overfits early!

Potential improvements

Data preparation & preprocessing

Current



Future
Improvements



Multiple angles
(include existing images)

Blur



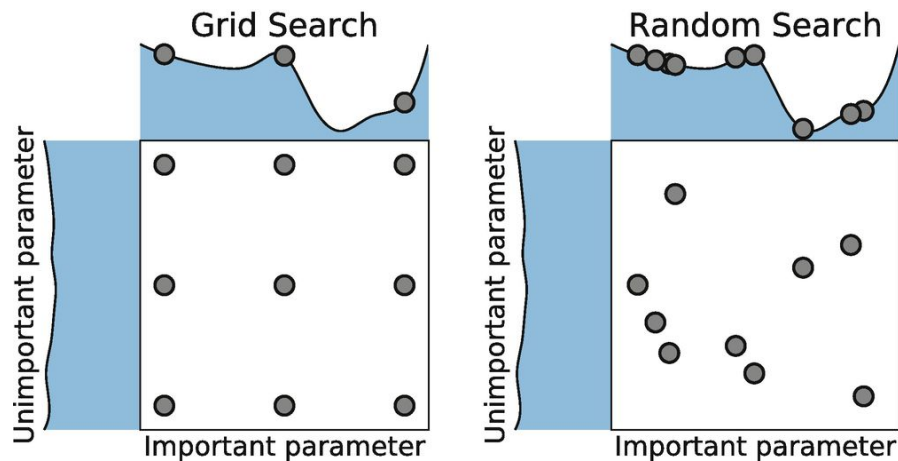
Dropout



Image
augmentation

Potential improvements

Tuning architecture & hyperparameters



Grid Search or Random Search

UI Demo