# How Image Similarity Search Works

My Understanding

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# 1 What I Learned About Finding Similar Images

When I first looked into image similarity search, I was confused about how computers can tell if two pictures look alike. After reading about it, I think I understand the basic idea now.

# 2 The Main Concept

Instead of comparing every single pixel (which would be really slow), we use something called a neural network to create a "summary" of each image. It's like describing a photo in 512 numbers that capture what's important about it.

The neural network we use is called ResNet18. It was trained on millions of images to recognize objects, but we're using it differently - just to extract features that describe what an image looks like.

# 3 How It Actually Works

From what I understand, there are three main steps:

## 3.1 Step 1: Extract Features

We feed each image through ResNet18, which gives us a list of 512 numbers. These numbers somehow capture things like colors, shapes, and objects in the image. I don't fully understand how the math works, but the network learned these patterns from training data.

## 3.2 Step 2: Build an Index

Since we might have thousands of images, we can't compare our search image to every single one. So we use something called Annoy (made by Spotify) to organize all the feature vectors in a smart way. It builds tree-like structures so we can search quickly.

### 3.3 Step 3: Find Matches

When someone uploads a new image, we:

1. Extract its 512 feature numbers

2. Use the Annoy index to find images with similar numbers

3. Return the closest matches

# 4 Why This Approach Makes Sense

From my research, this method works well because:

- It's fast - once you build the index, searches take milliseconds

- The features capture different types of similarity (color, texture, objects)

- You don't need to train your own model from scratch