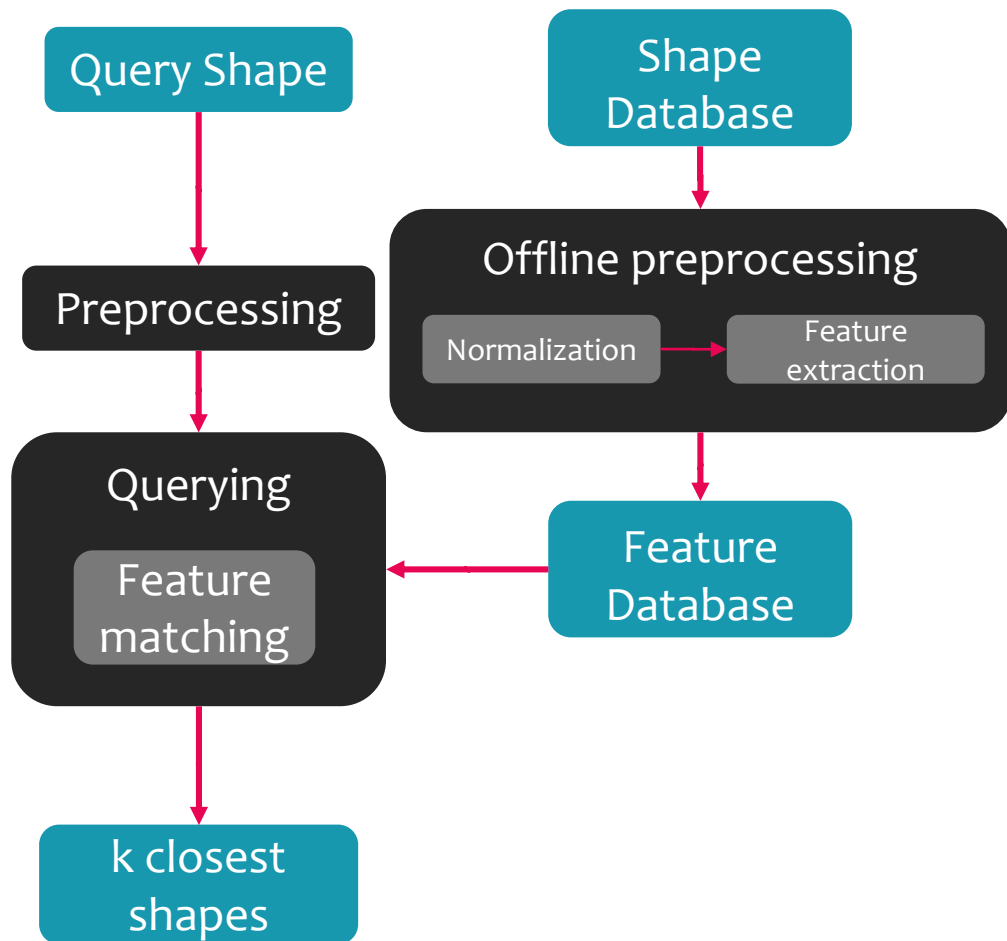


3D Shape Retrieval

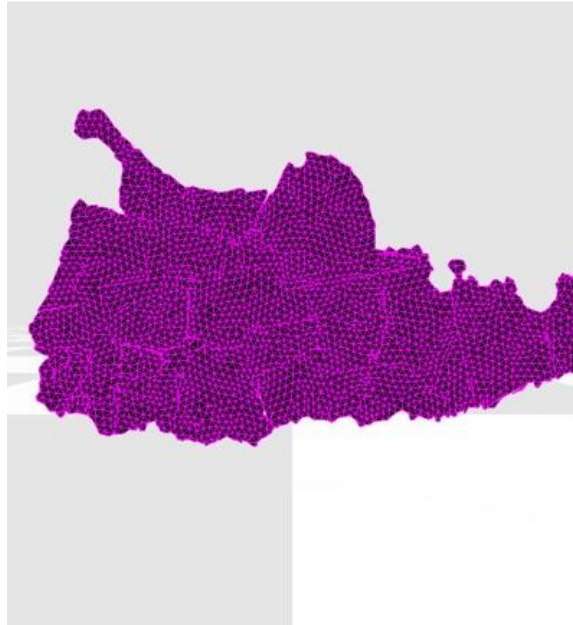
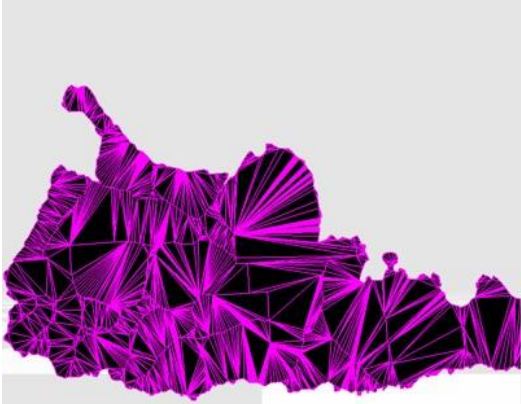
Multimedia Retrieval 2020

Resul Çelik, Julian Thijssen



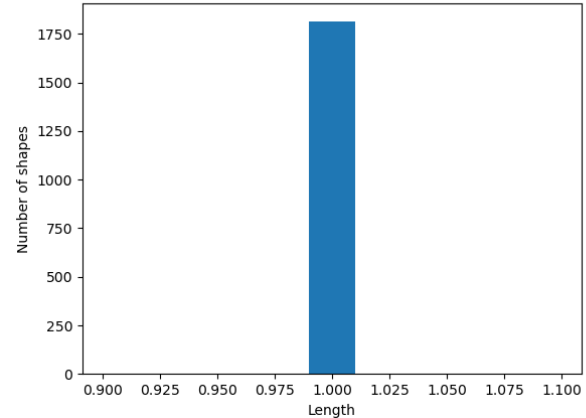
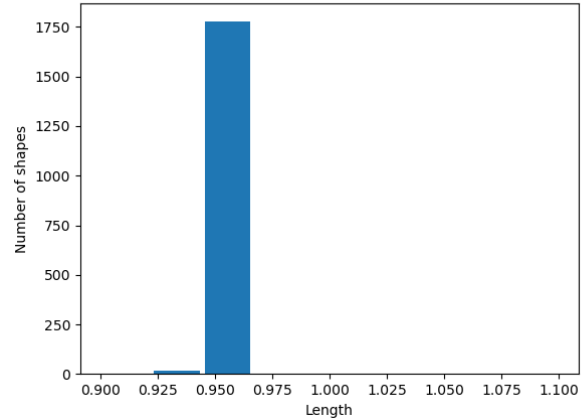
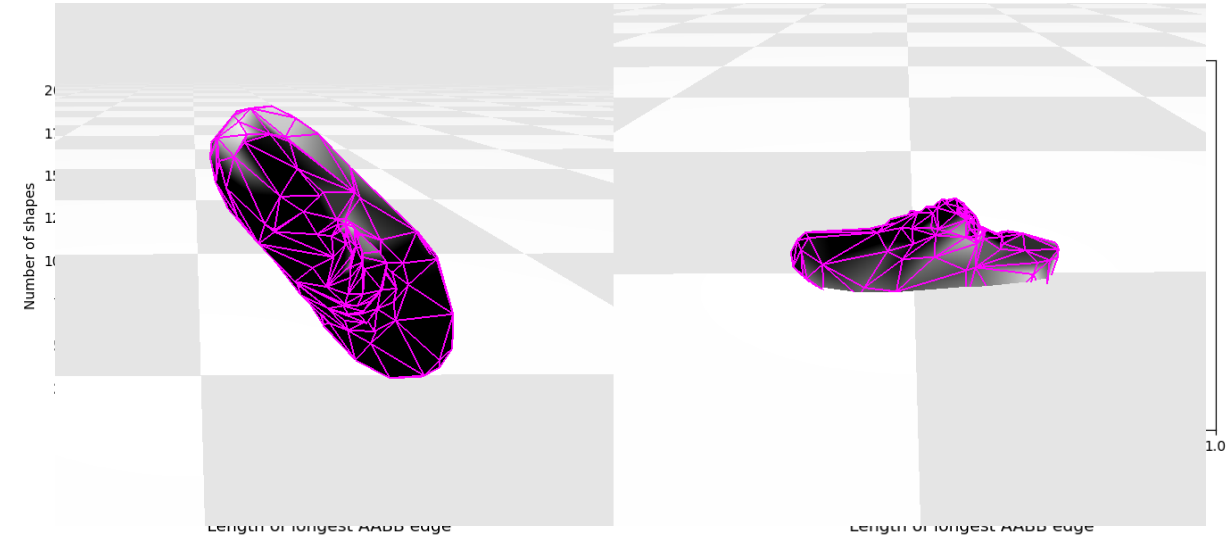
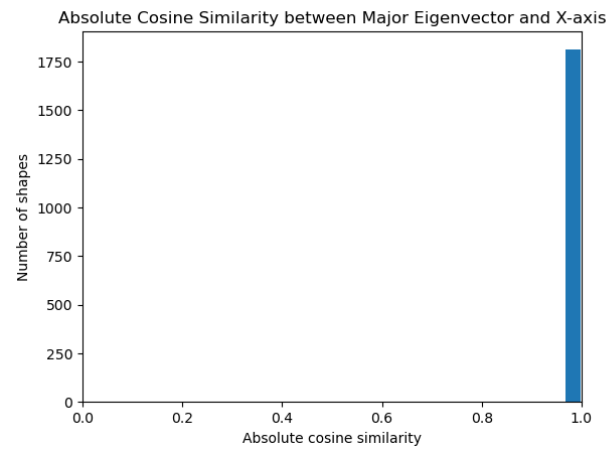
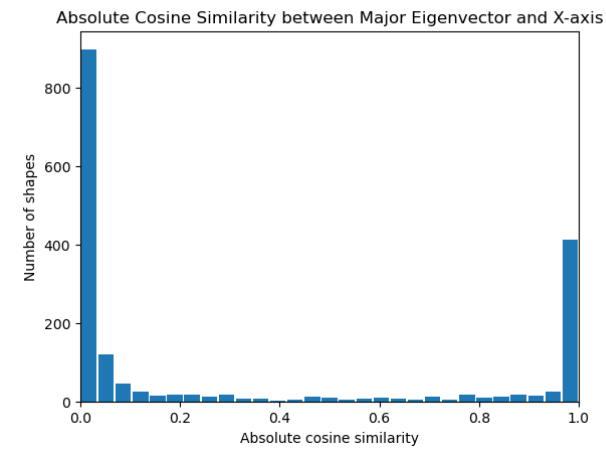
Top-Level Overview

Processing and cleaning



Processing and cleaning

1. Remeshing

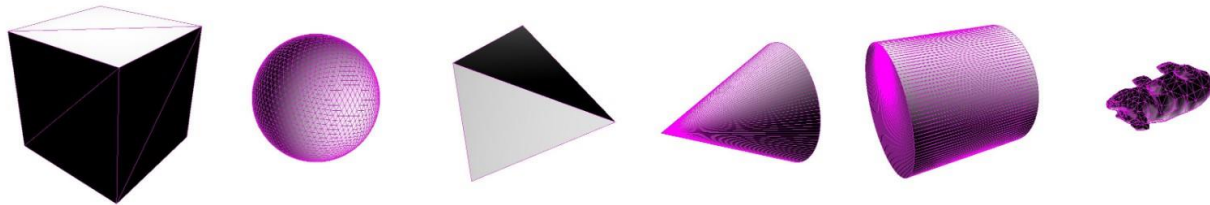


Processing and cleaning

2. Orientational normalization
3. Positional normalization
4. Scale normalization

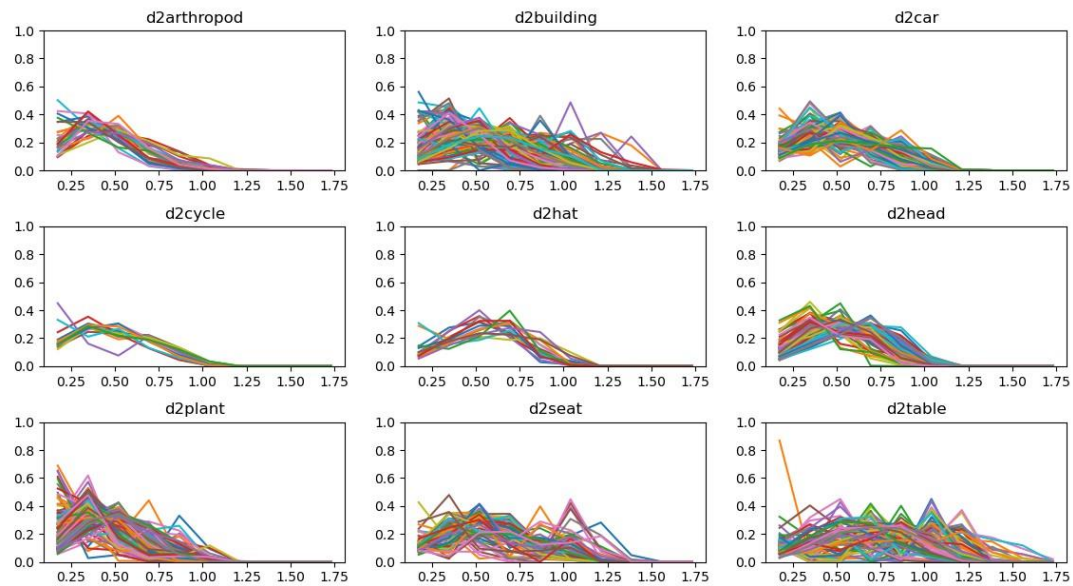
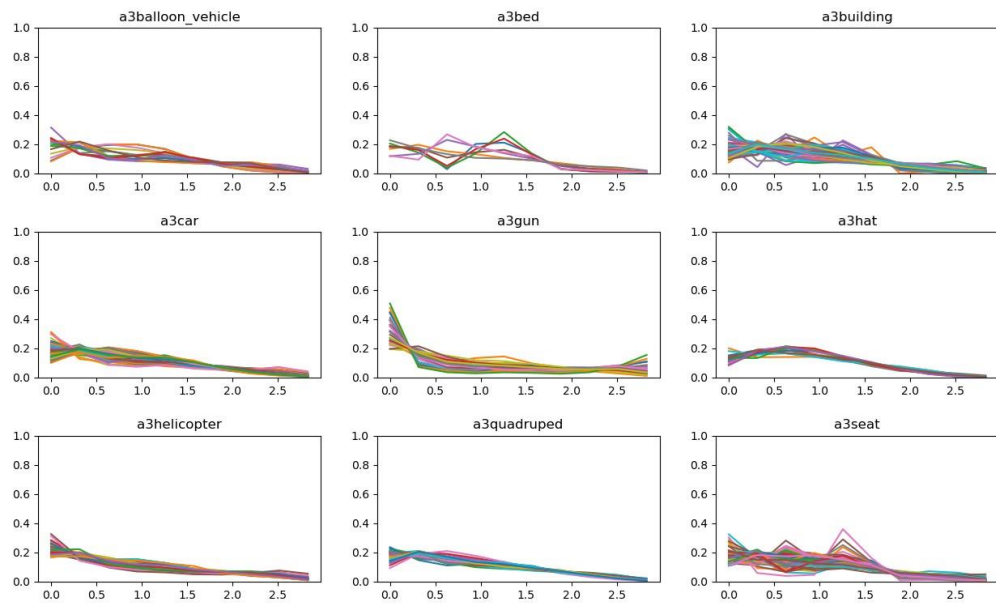
Feature extraction

Primitive feature values						
Feature	Cube	Sphere	Pyramid	Cone	Cylinder	Pig (m100)
Surface Area	6	3.142	3.236	2.541	4.712	1.15
Volume	1	0.524	0.333	0.262	0.785	0.07
Compactness	0.806	1	0.718	0.794	0.874	0.68



Feature extraction

- Elementary Shape Descriptors
- Primitive shapes

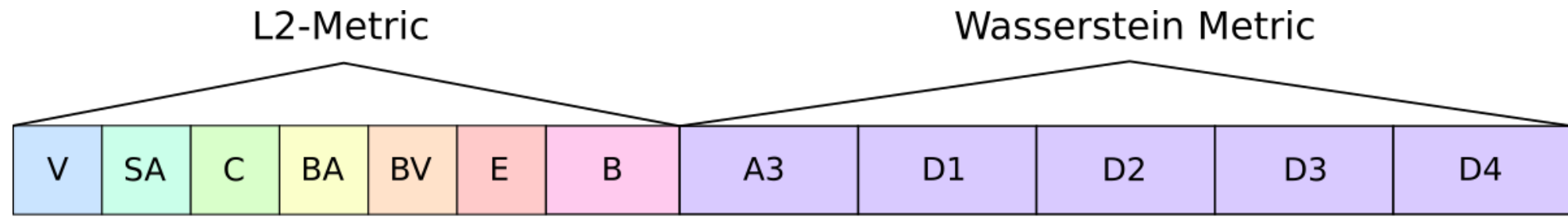


Feature extraction

- Shape Property Descriptors
- Histograms

Querying

Feature Vector



Single features

V = Volume

SA = Surface Area

C = Compactness

BA = AABB Area

BV = AABB Volume

E = Eccentricity

B = AABB Dimensions

Histogram features

A3 = Angle between 3 random vertices

D1 = Distance to random vertex

D2 = Distance between 2 random vertices

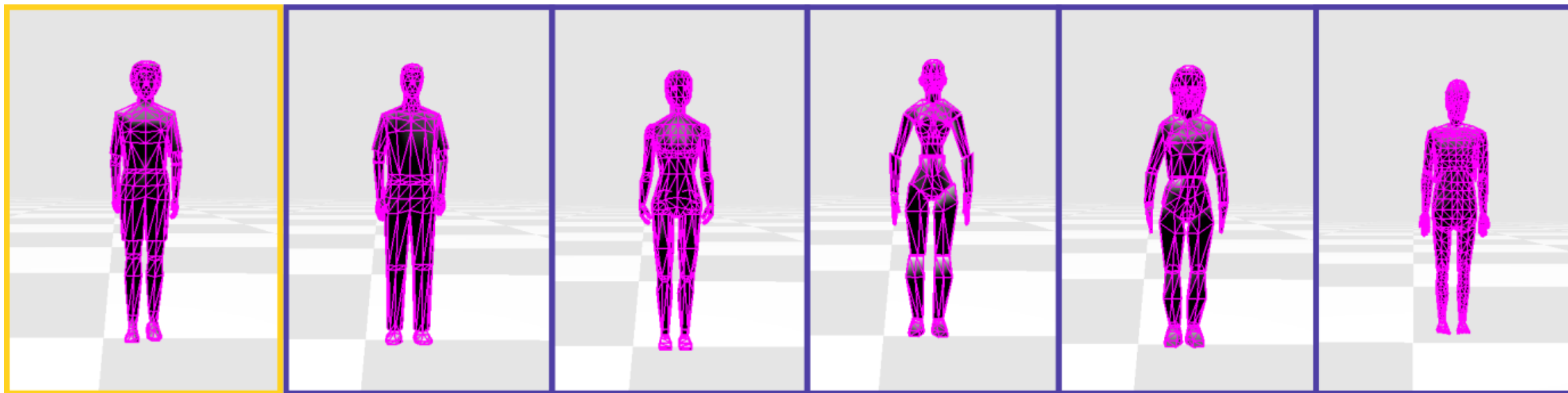
D3 = Sqrt(Area) of random triangle

D4 = Cuberooot of volume of tetrahedron

Good Query Results

Query

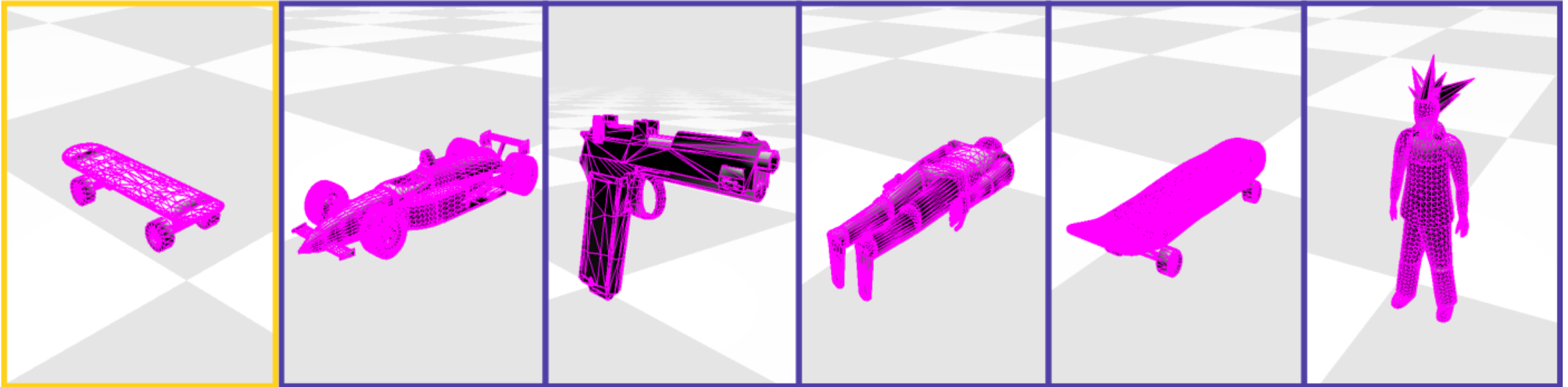
First 5 results



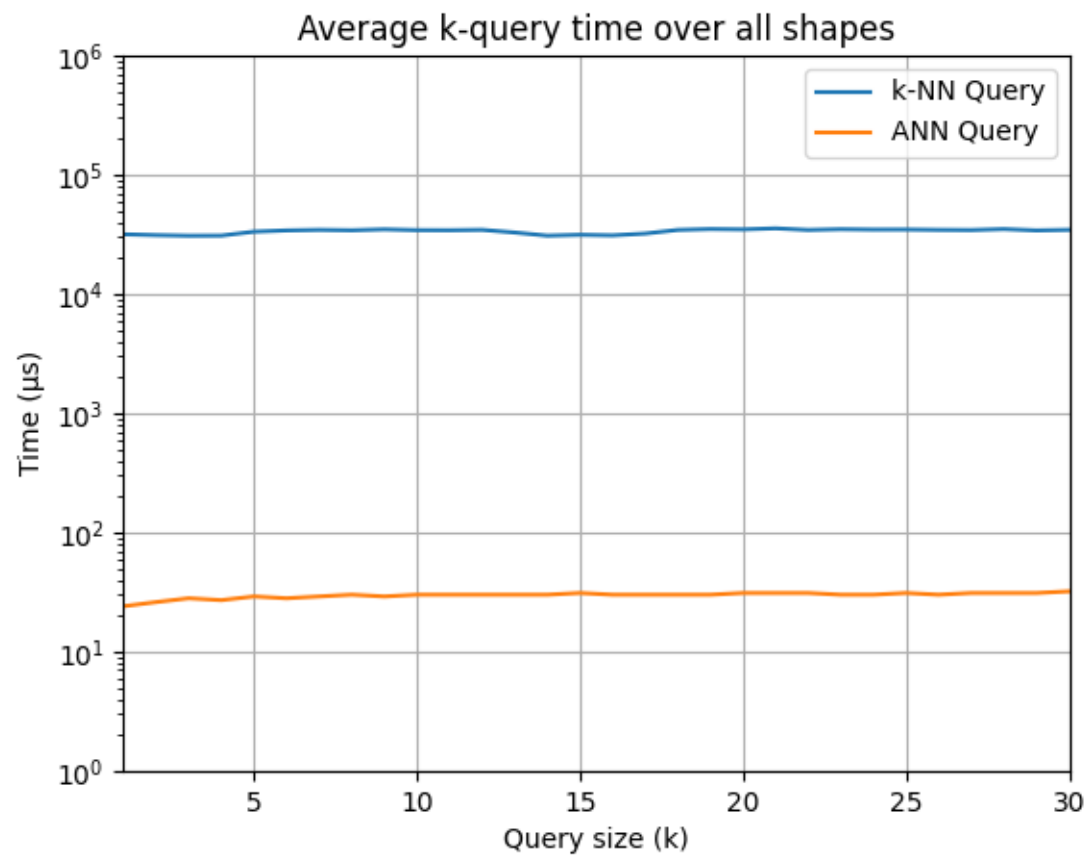
Bad Query Results

Query

First 5 results

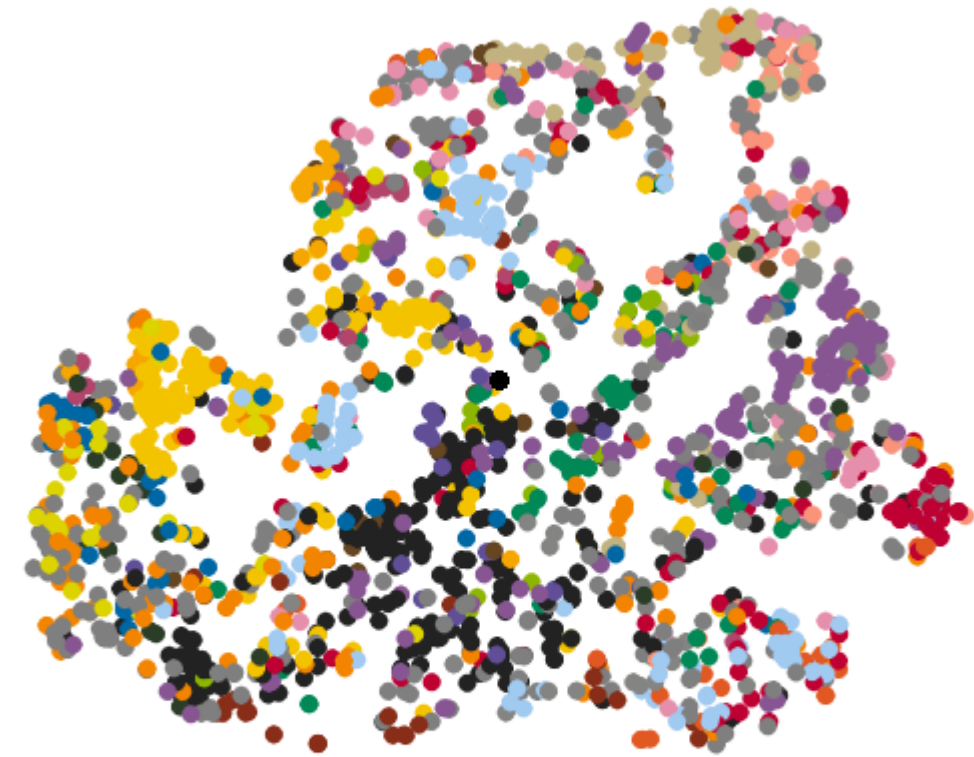


Scalability



Computed on
Intel® Core™ i7-4790K

Nearest Neighbor Search

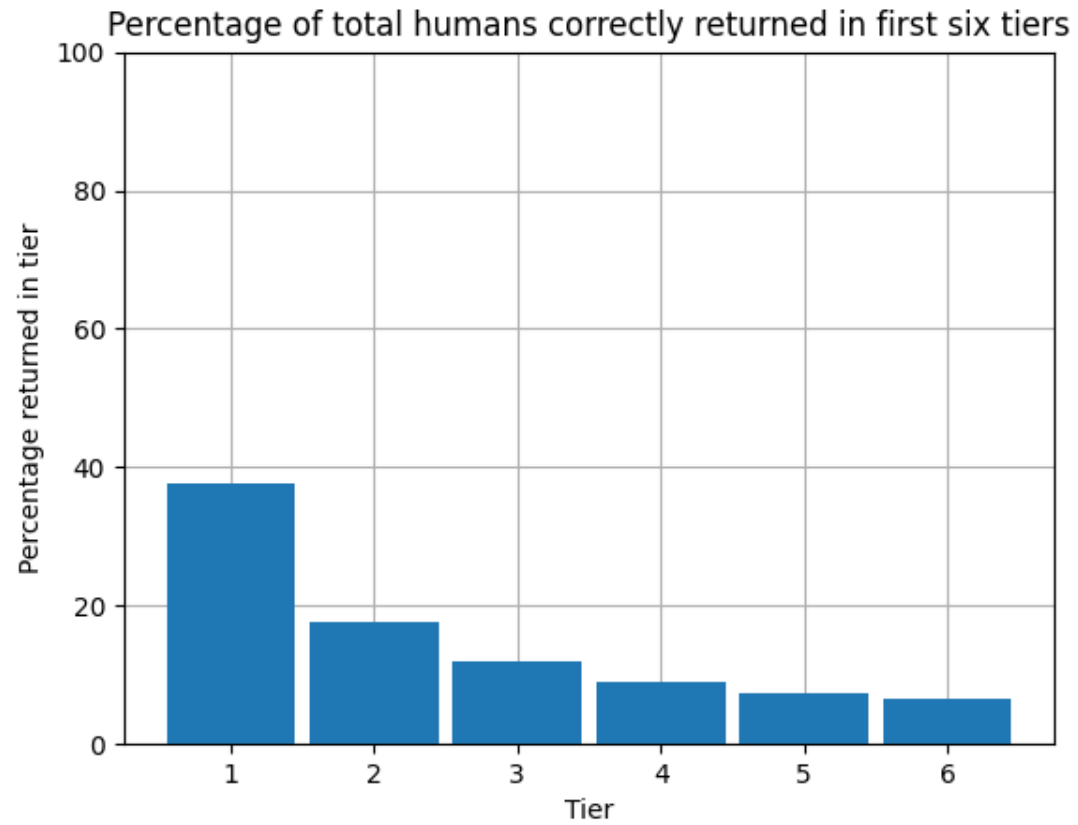


Dimensionality Reduction

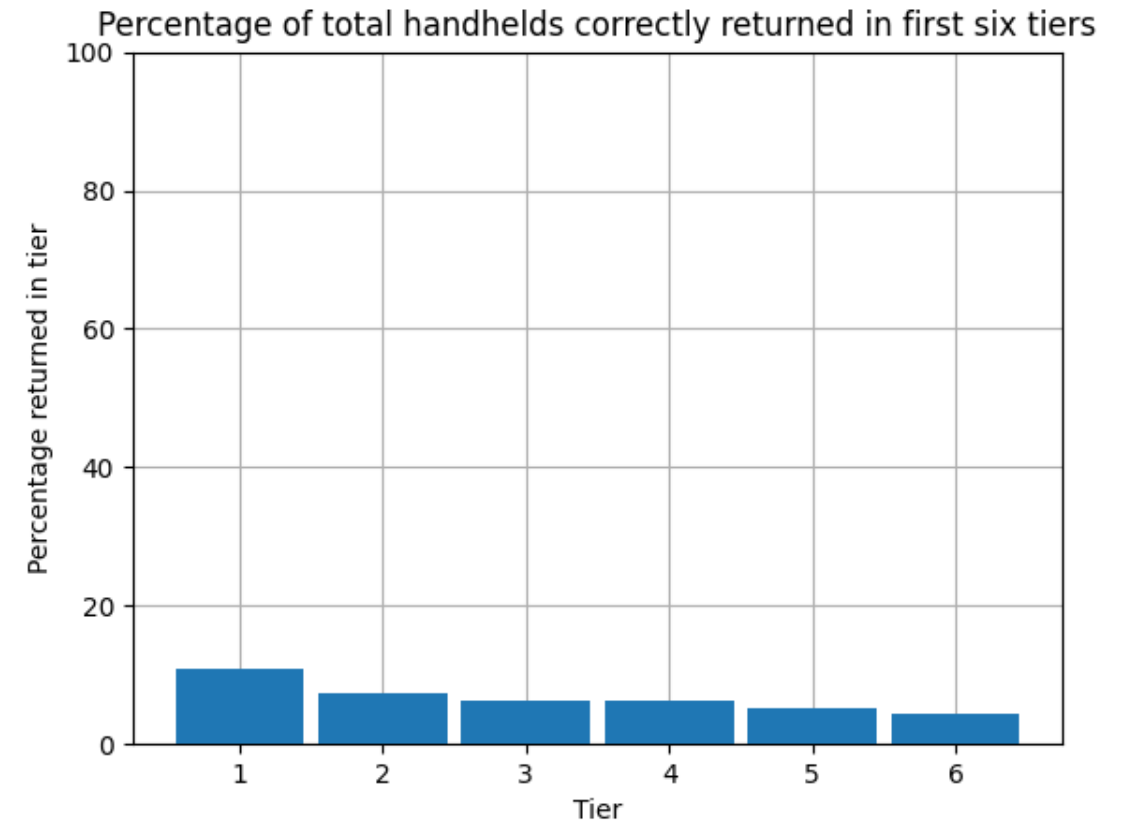
- Linear GPGPU t-SNE Embedding
 - 2000 Iterations
 - 30 Perplexity
 - Computed on-the-fly in 1 second

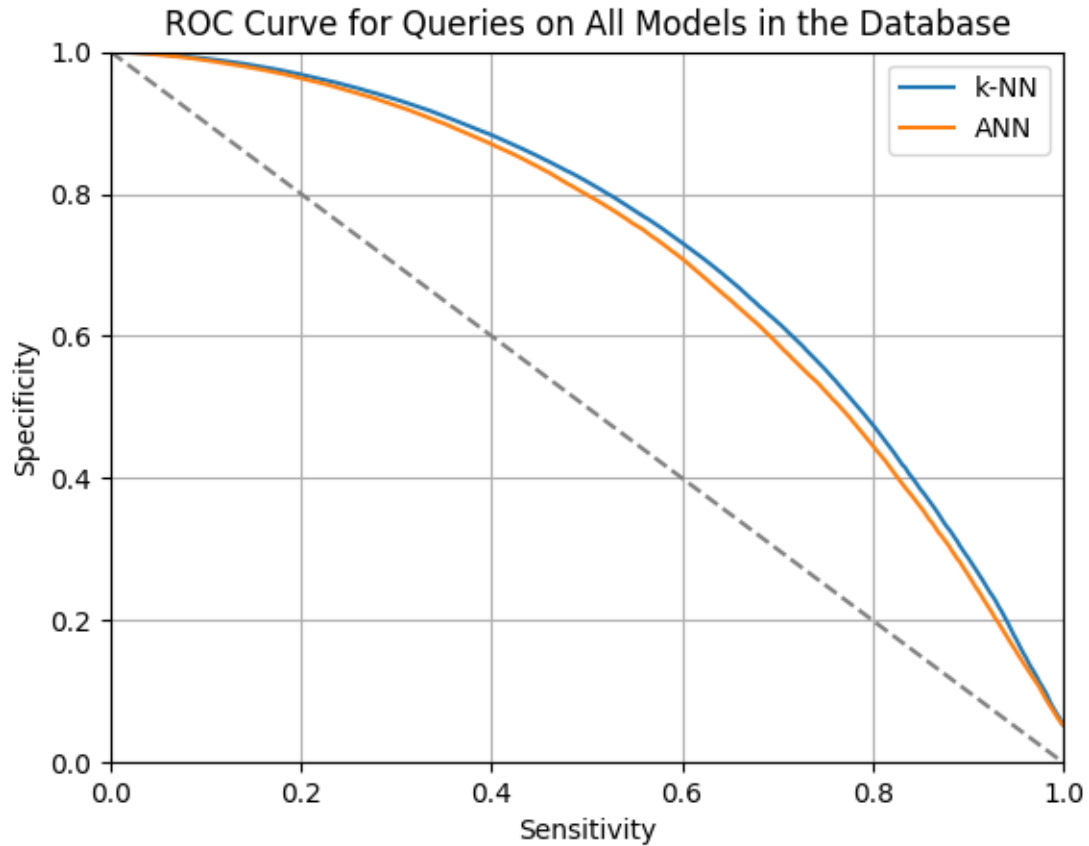
Evaluation

Human



Handheld





Evaluation

- ROC curve
 - Computed for all query sizes
 - Averaged over all possible queries

Demo