Photo picker

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Opt. semester project

Agenda

Presentation of the problem

Related work

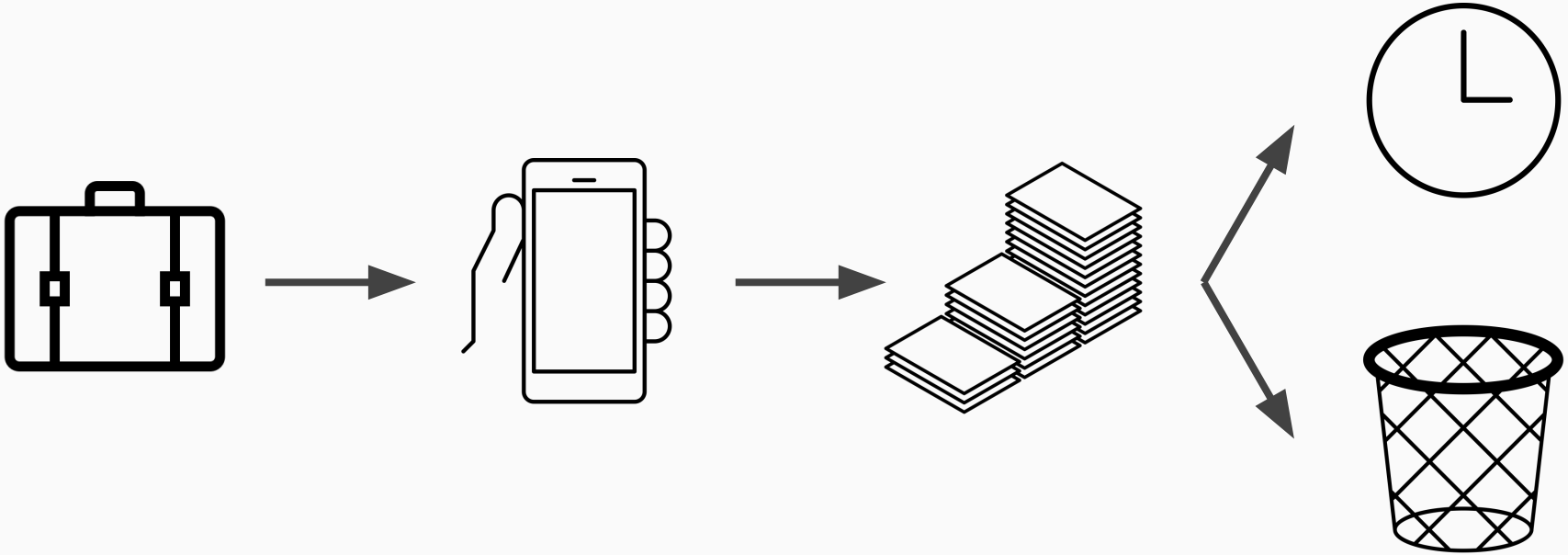
Application, flow & interface

Live demo

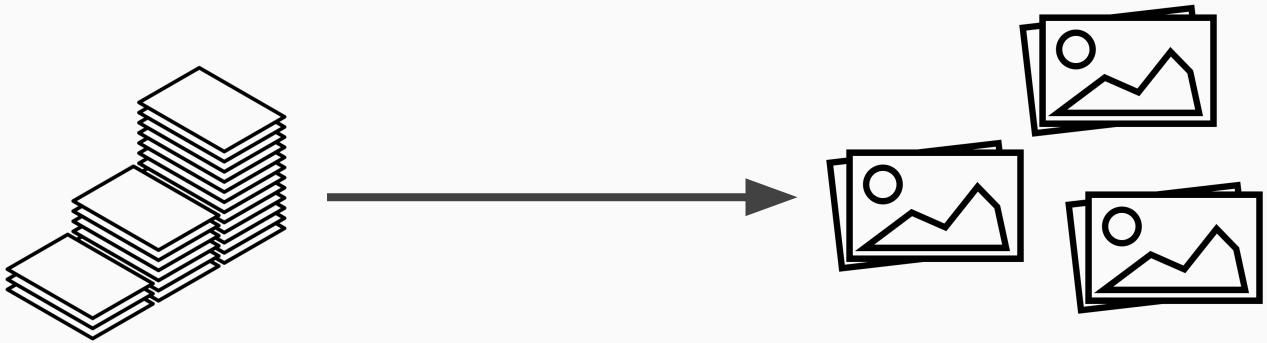
User tests

Improvement opportunities

When going on vacation...



What is the photo picker?



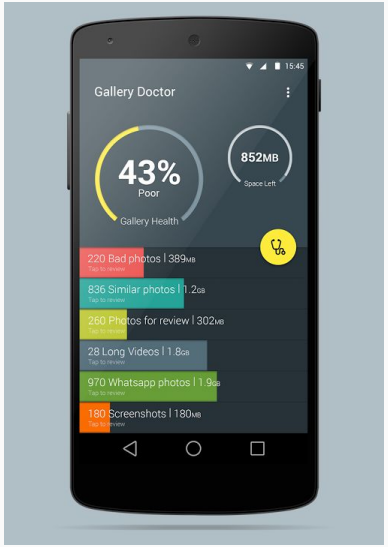
Related work

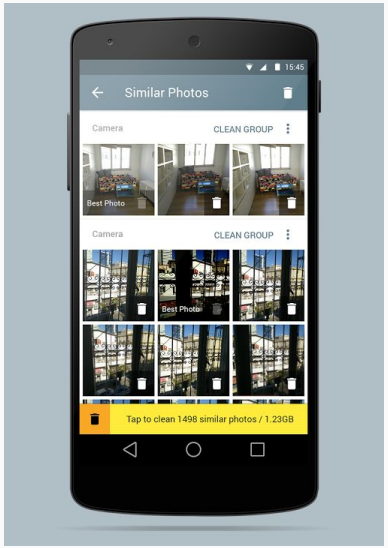
Mobile app

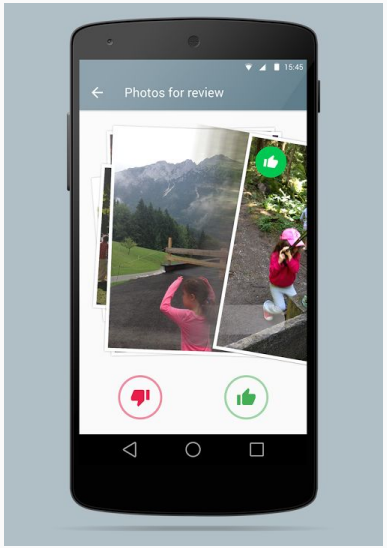
Gallery doctor

- Aims to free up space
- Analyzes image content

http://www.gallerydoctor.com/





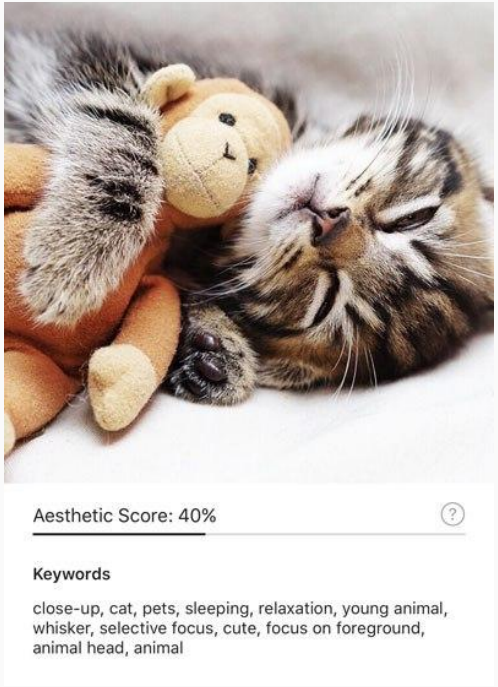


Mobile app

The Roll

- Aesthetics score
- Content description
- Focus on quality

http://theroll.eyeem.com/

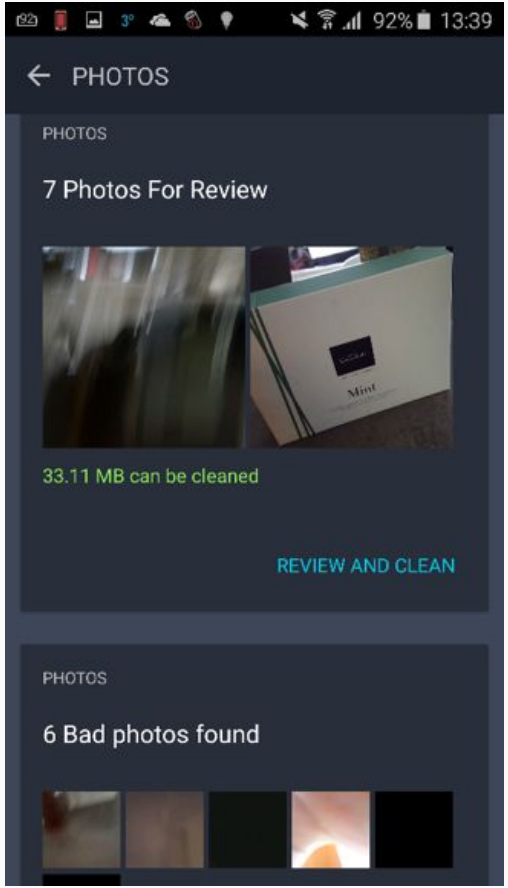


Mobile app

AVG Cleaner

- Similar photos
- Bad photos

https://play.google.com/store/apps/details?id=com.avg.cleaner&hl=en



Research (image clustering)

Then

- Lots of image distance functions
- Use of low-level features

e.g. [Haralick73] - Texture based

Now

- Machine-learning
- Classification
- Fuzzy clustering

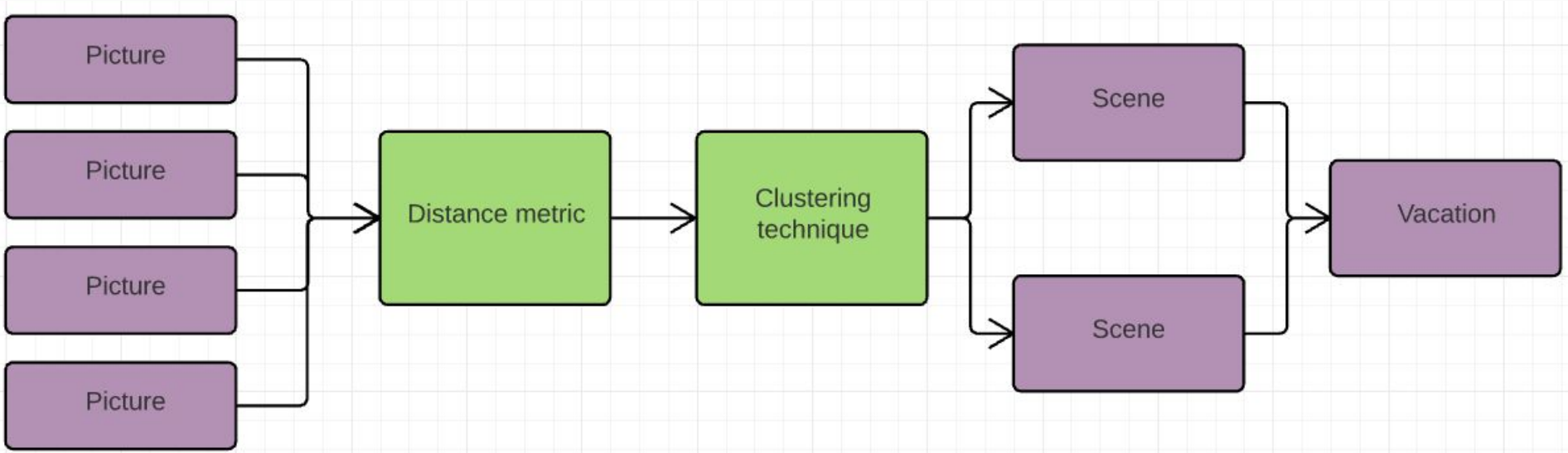
e.g. [Krizhevsky12] - Deep learning

Application, flow & interface

The app

- ➔ Android application
- ➔ ~14’000 lines of code
- ➔ Modular and reusable
- ➔ Relies on latest APIs

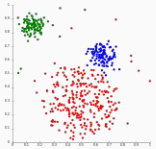
Process flow



Algorithms used

Time-based distance metric

- Currently based on file creation time
- Could be based on EXIF data

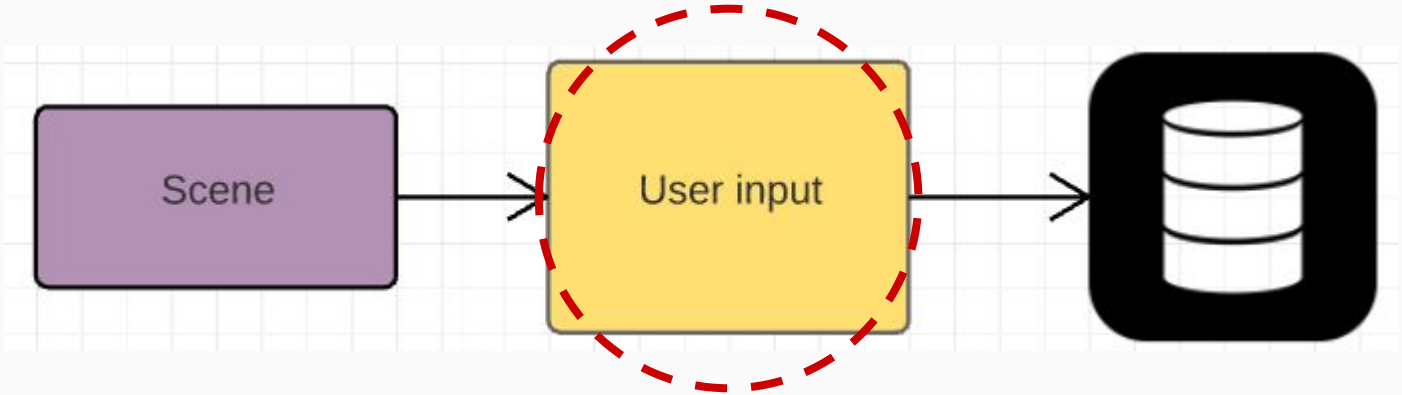


Density-based clustering: DBSCAN

- Distance threshold
- Minimum count

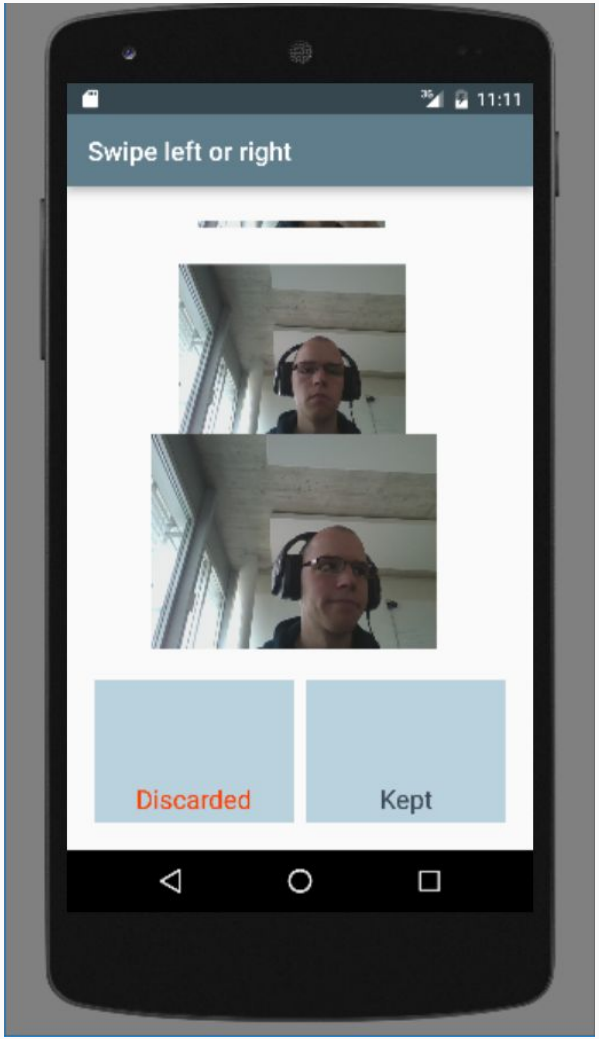
Looks for clusters of sufficient size and density

Process flow



Keep / Discard interface

A **yes-no** interface where one swipes left or right to indicate that the picture is bad or good to her.



Live demo

User tests

Questionnaire

10 test subjects

14 questions taken from [Lund01]

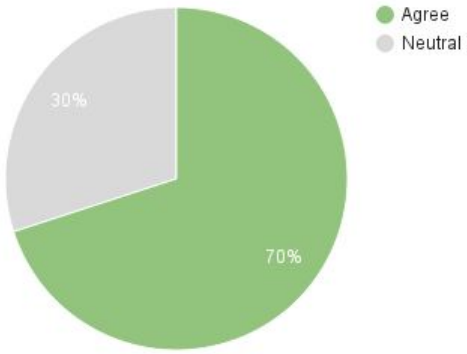
→ *Usefulness*
→ *Ease of use*
→ *Ease of learning*
→ *Satisfaction*

Answers: “Disagree” - “Neutral” - “Agree”

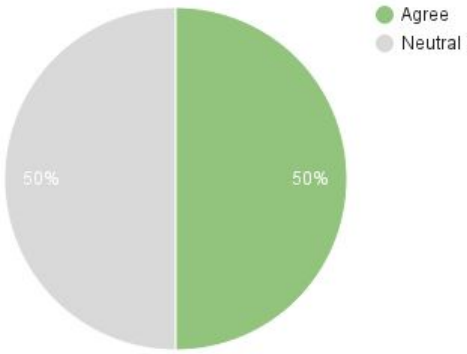
Lund, A. M. (2001). Measuring Usability with the USE Questionnaire12.

Usefulness

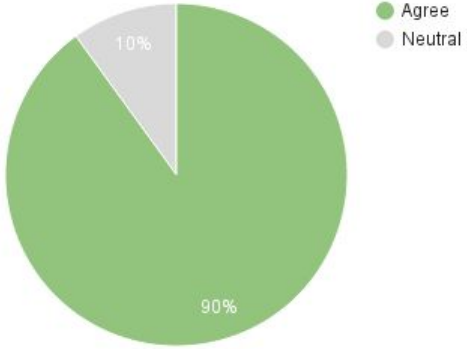
It helps me be more effective.



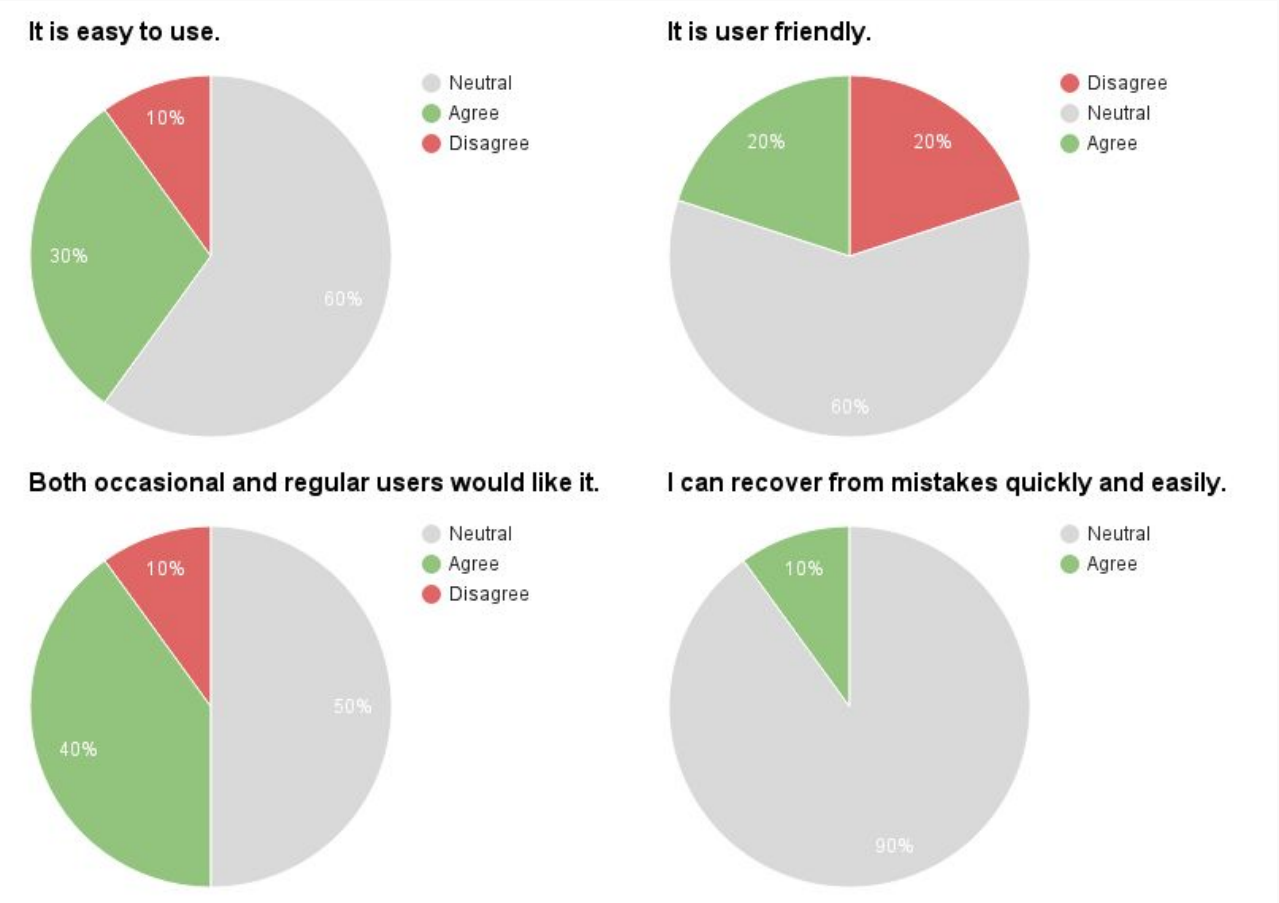
It makes the things I want to accomplish easier to get done.



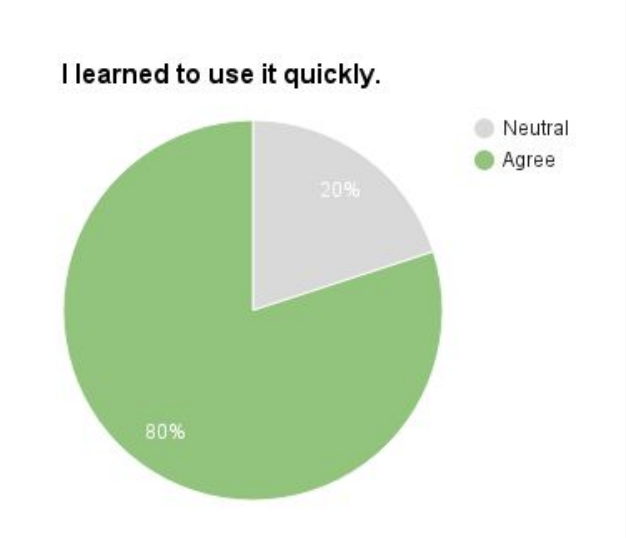
It is useful.



Ease of use

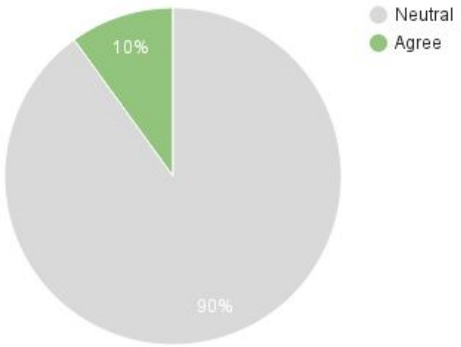

It is easy to use.
Neutral
Agree
Disagree
10%
30%
60%
It is user friendly.
Disagree
Neutral
Agree
20%
20%
60%
Both occasional and regular users would like it.
Neutral
Agree
Disagree
10%
40%
50%
I can recover from mistakes quickly and easily.
Neutral
Agree
10%
90%

Ease of learning

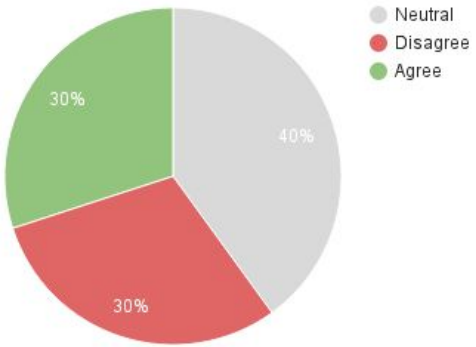


Satisfaction

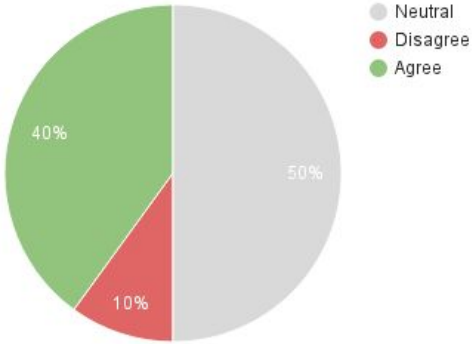
I am satisfied with it.



I would recommend it to a friend.



It is fun to use.



Improvements opportunities

Improvements on the UI

- Animation on swipe gestures
- Provide alternative buttons instead of a swipe gesture
- Simple “undo” button or swipe up gesture
- Store selected photos on e.g. Google Drive

Improvements on the algorithms

- Refine image clustering
  - Downsampling
  - Keypoint detection
- Pre-screen images using image quality metrics
- Use machine learning to predict preferences (and more)
  - Image quality as input
  - Local or global

Image quality

Thank you!

Icons credits:

Vacation - BraveBros
Phone - Jaap Knevel
Papers - Tony Michiels
Rubbish bin - Shirley Wu
Clock - misirlou
Gallery - João Paulo
Swipe L/R - Lloyd Humphreys
from Noun Project

Questions?

Research

[Haralick73]	Image comparison using texture features.
[DiGesu99]	Proposes four image distance functions.
[Wang05]	Spatial relationship-based Euclidian distance.
[Krizhevsky12]	Deep learning method for image classification.

Haralick, R. M., Shanmugam, K., & Dinstein, I. H. (1973). Textural features for image classification. *Systems, Man and Cybernetics, IEEE Transactions on*, (6), 610-621.

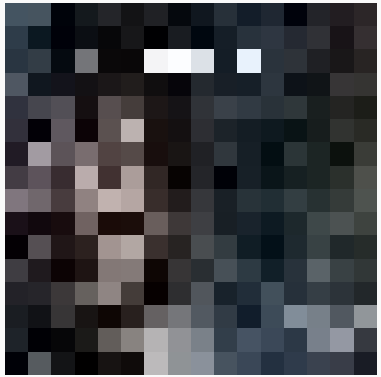
Di Gesu, V., & Starovoitov, V. (1999). Distance-based functions for image comparison. *Pattern Recognition Letters*, *20*(2), 207-214.

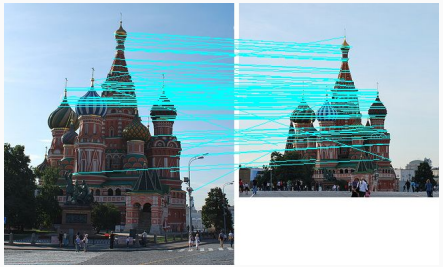
Wang, L., Zhang, Y., & Feng, J. (2005). On the Euclidean distance of images. *Pattern Analysis and Machine Intelligence, IEEE Transactions on*, *27*(8), 1334-1339.

Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). Imagenet classification with deep convolutional neural networks. In Advances in neural information processing systems (pp. 1097-1105).

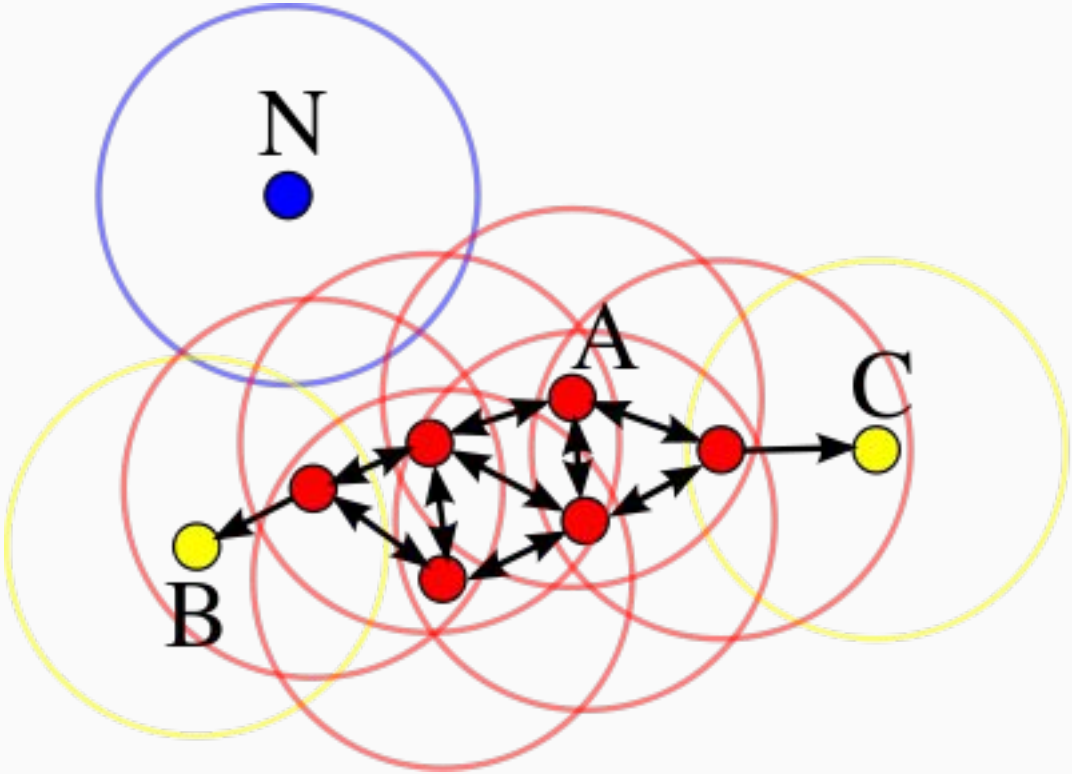
Image distance alternatives

- Downsample the images to 16x16 pixels (768D vector)
- Use key point detection algorithms and align the images





n = 4
ε = 1



Contrast

Use image histogram properties, such as its width.

Noise

1. Compare the intensity of each pixel to the neighboring ones
2. De-noise image (e.g. Wavelet Noise Removal) and estimate difference between the two images

Blur

Research has been made around a no-reference subjective blur metric[1].

1. Crete, Frederique, et al. "The blur effect: perception and estimation with a new no-reference perceptual blur metric." Electronic Imaging 2007. International Society for Optics and Photonics, 2007.

Crete et al. - Blur estimation algorithm