


Photo picker

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Opt. semester project

A decorative light blue triangle is located in the bottom right corner of the slide, pointing towards the top right.

Agenda

Presentation of the problem

Related work

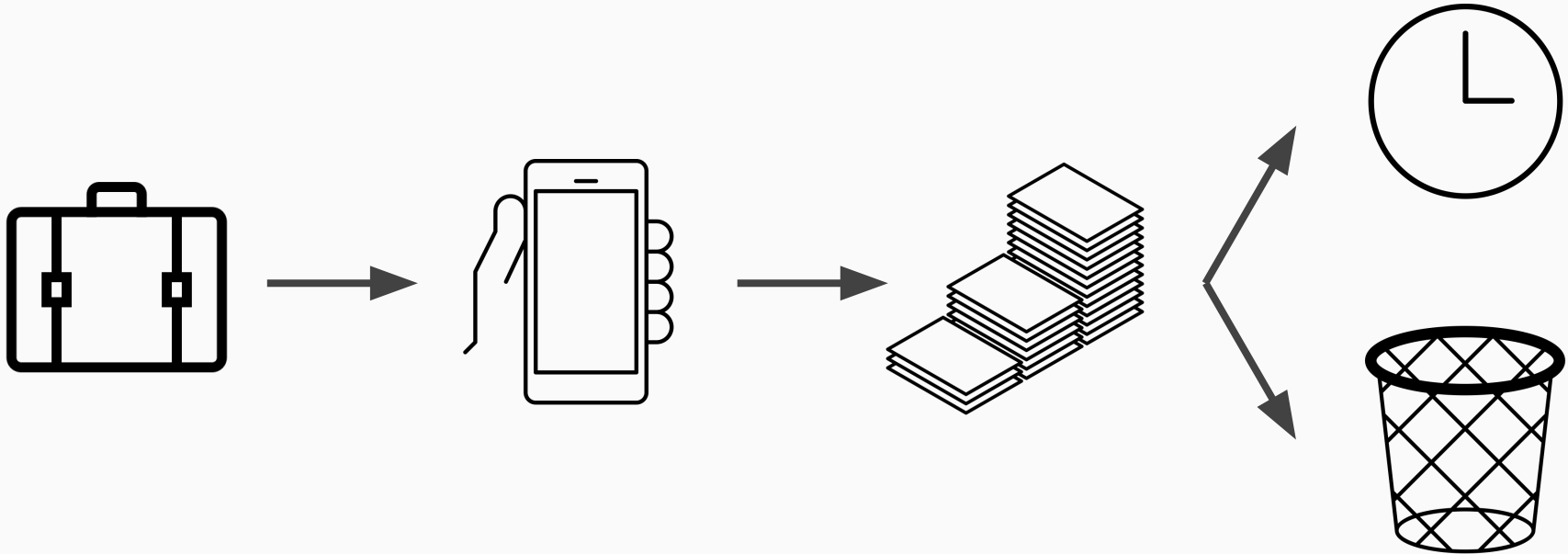
Application, flow & interface

Live demo

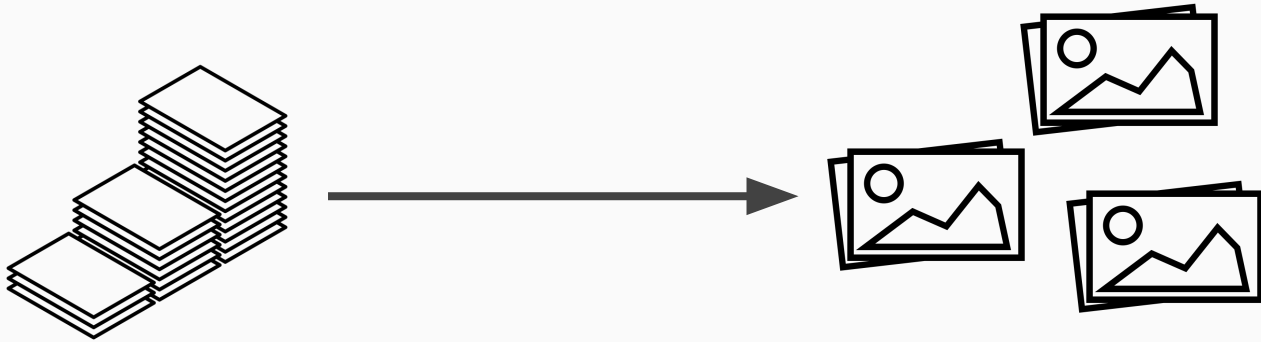
User tests

Improvement opportunities

When going on vacation...



What is the photo picker?



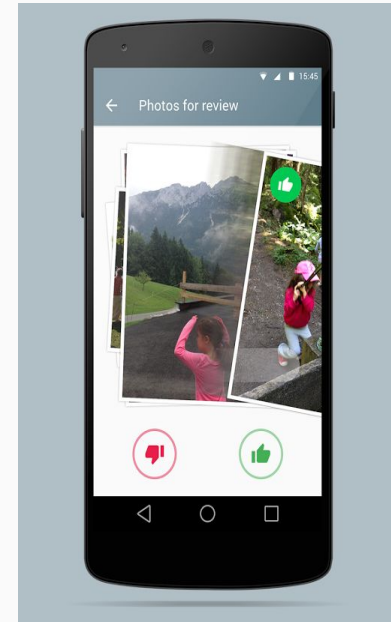
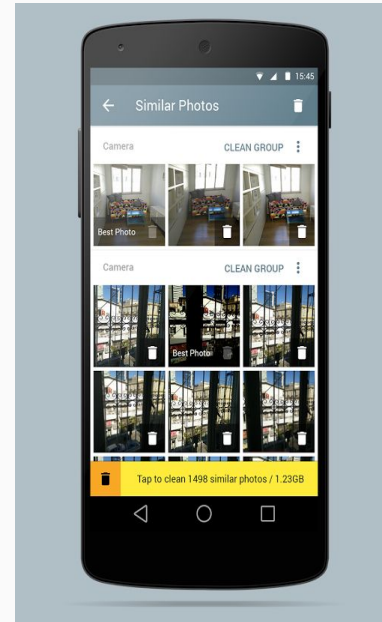
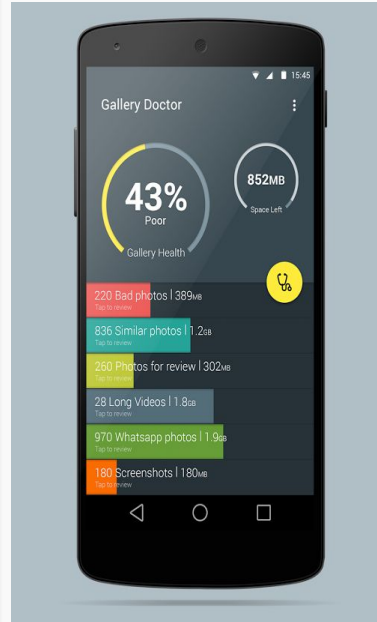
Related work

Mobile app

Gallery doctor

- Aims to free up space
- Analyzes image content

<http://www.gallerydoctor.com/>

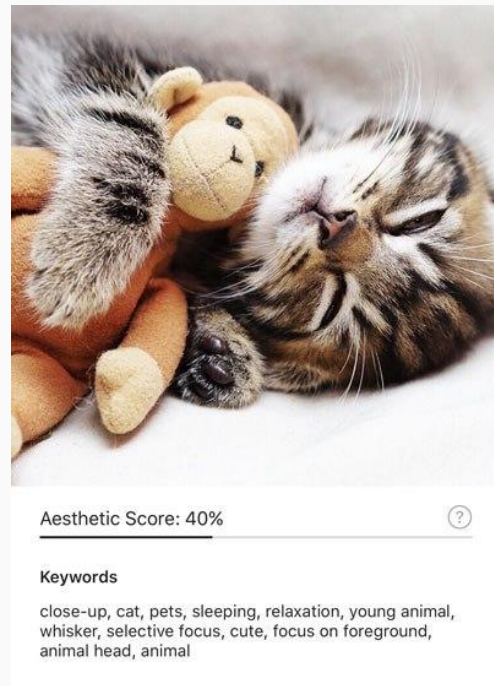
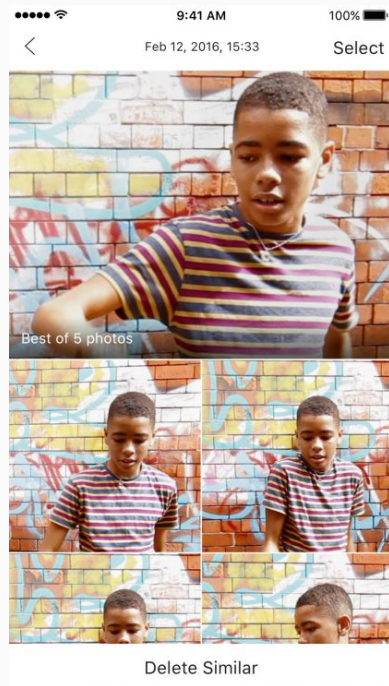


Mobile app

The Roll

- Aesthetics score
- Content description
- Focus on quality

<http://theroll.eyeem.com/>

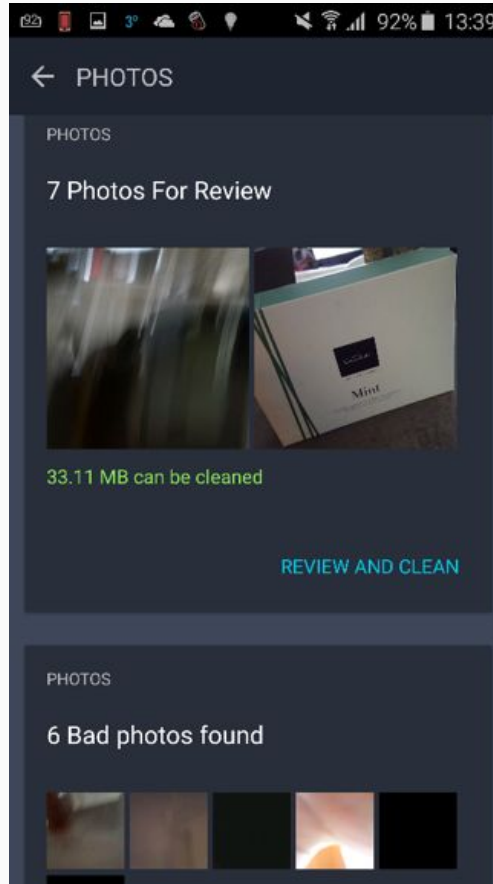


Mobile app

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

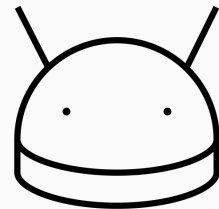
- Machine-learning
- Classification
- Fuzzy clustering

e.g. [Krizhevsky12] - Deep learning

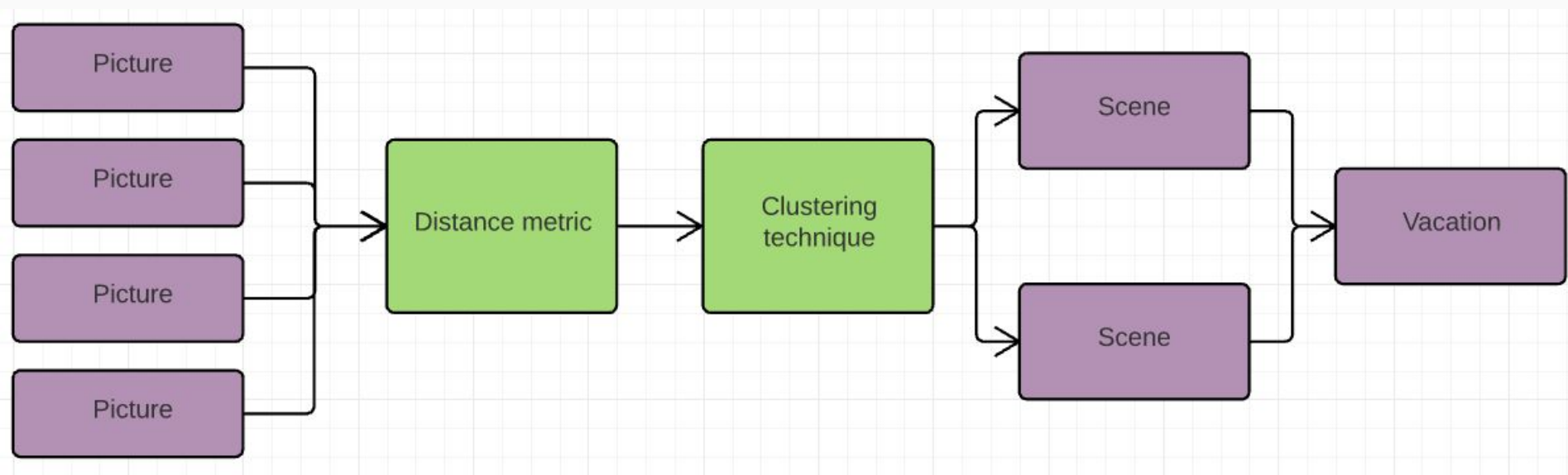
Application, flow & interface

The app

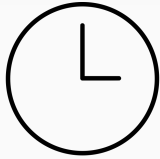
- Android application
- ~14'000 lines of code
- Modular and reusable
- Relies on latest APIs



Process flow

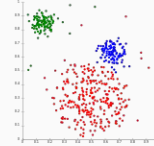


Algorithms used



Time-based distance metric

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

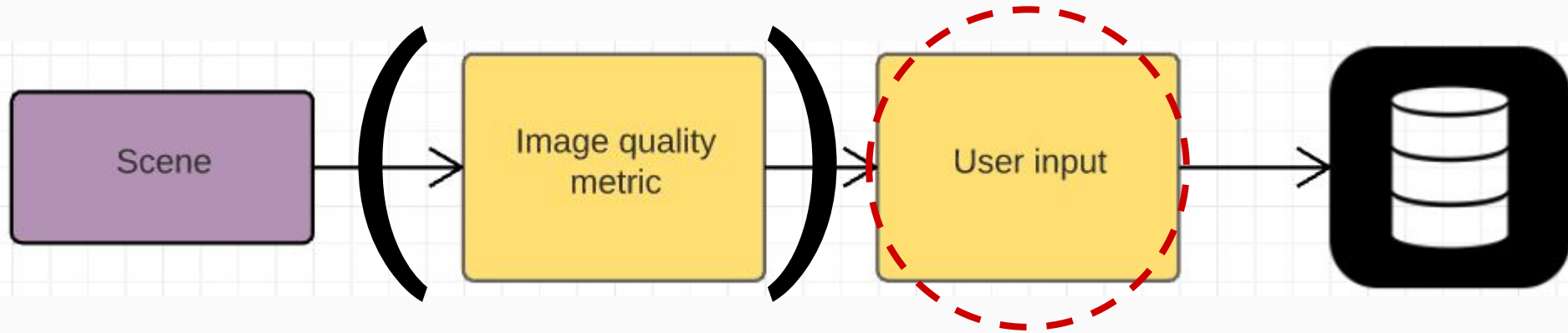


Density-based clustering: DBSCAN

- Distance threshold
- Minimum count

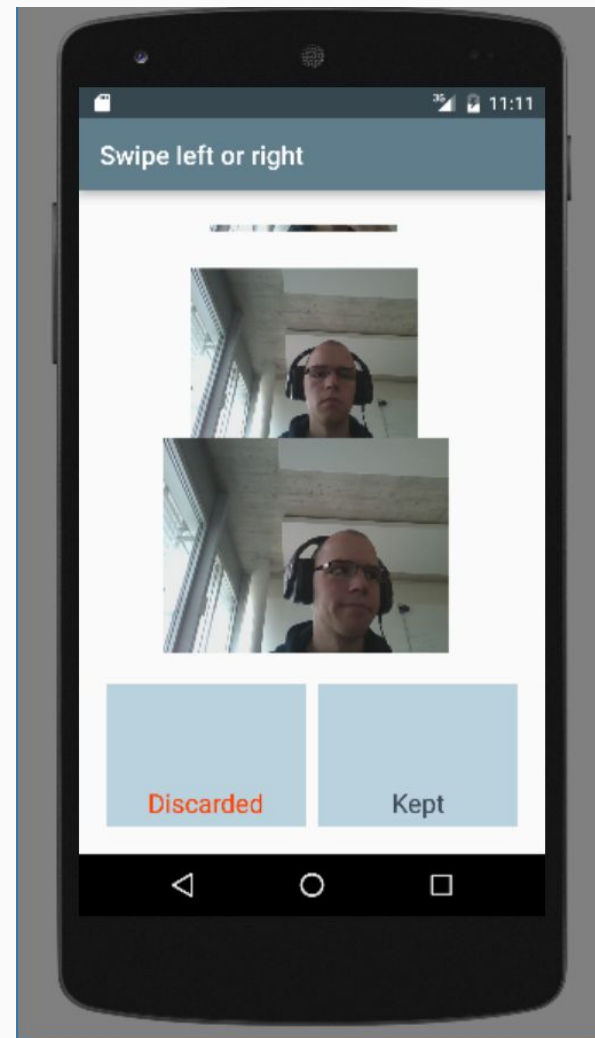
Looks for clusters of sufficient size and density

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*

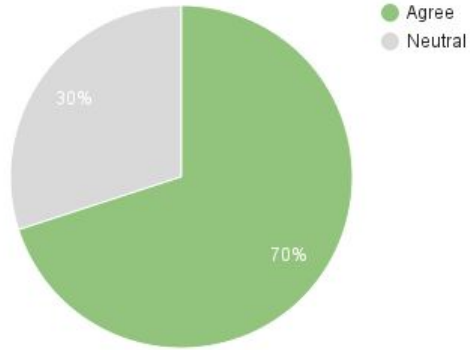
→ *Ease of learning*

→ *Satisfaction*

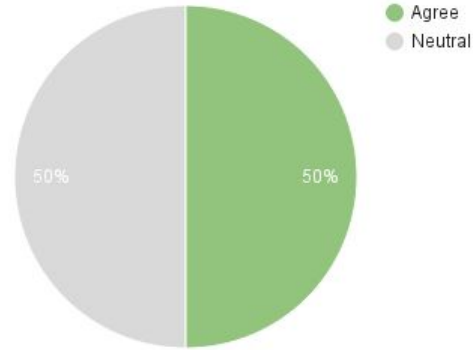
Answers: “Disagree” - “Neutral” - “Agree”

Usefulness

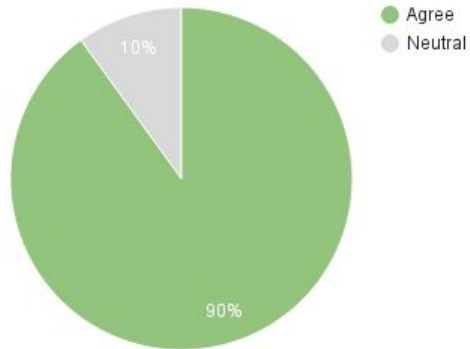
It helps me be more effective.



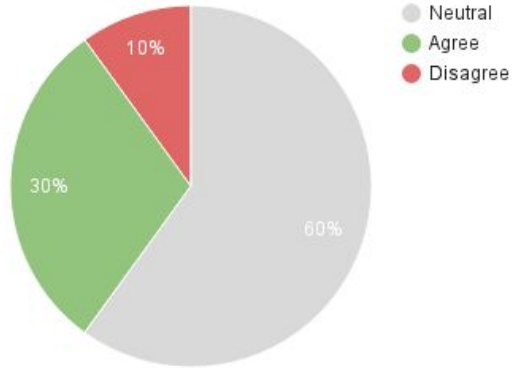
It makes the things I want to accomplish easier to get done.



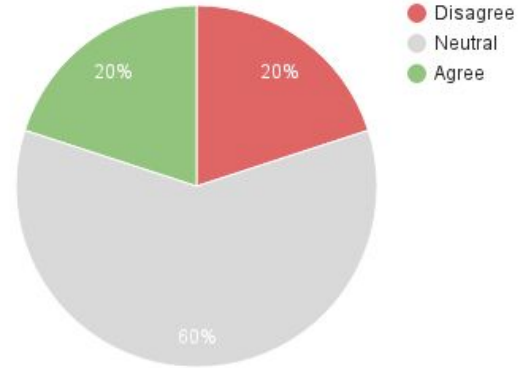
It is useful.



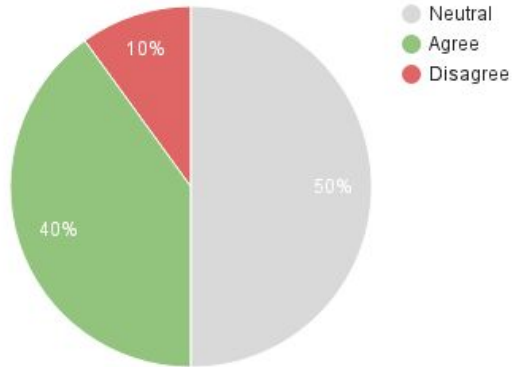
It is easy to use.



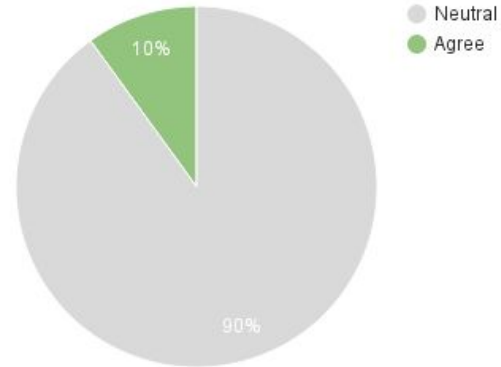
It is user friendly.

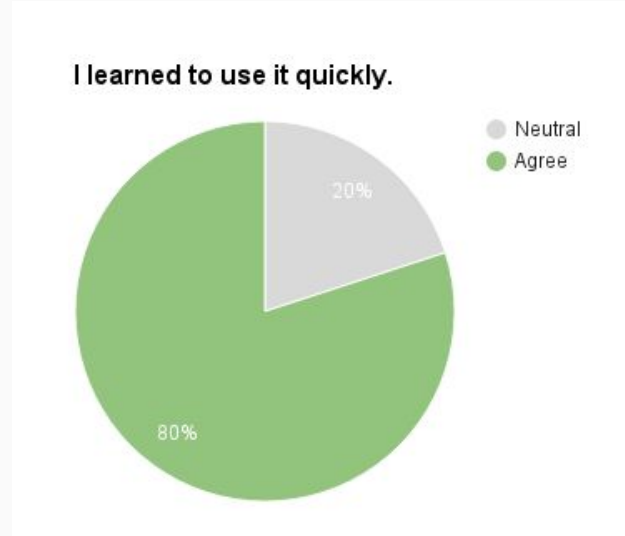


Both occasional and regular users would like it.



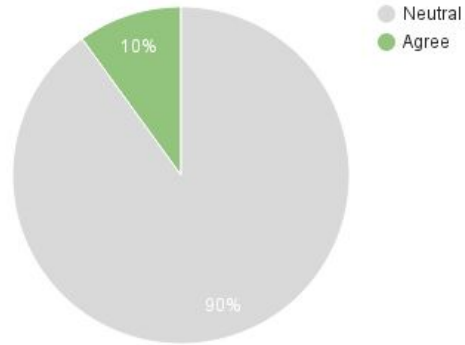
I can recover from mistakes quickly and easily.



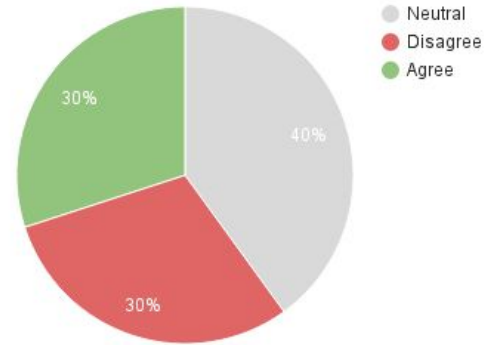


Satisfaction

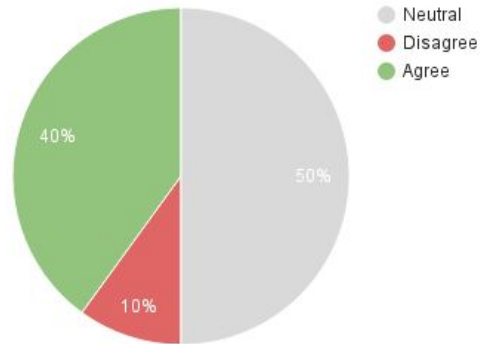
I am satisfied with it.



I would recommend it to a friend.



It is fun to use.



Improvements opportunities

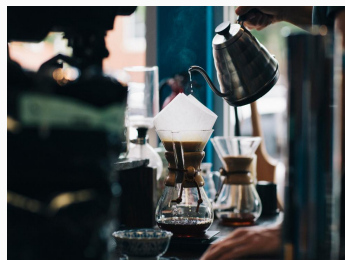
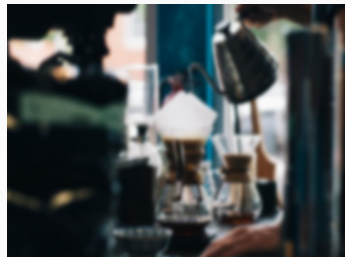
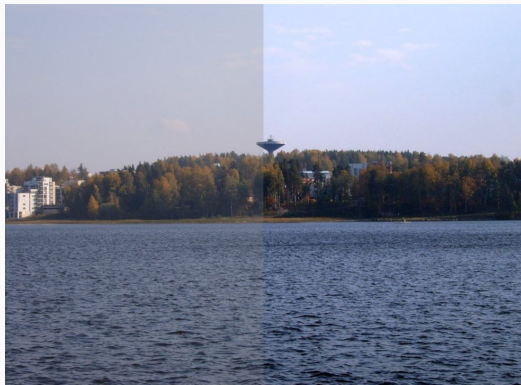
Improvements on the UI

- Animation on swipe gestures
- Provide alternative buttons instead of a swipe gesture
- One-step date picker
- 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?

- [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.

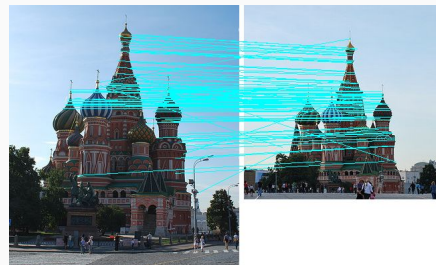
Di Gesu, V., & Starovoitov, V. (1999). Distance-based functions for image comparison. *Pattern Recognition Letters*, 20(2), 207-214.

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).

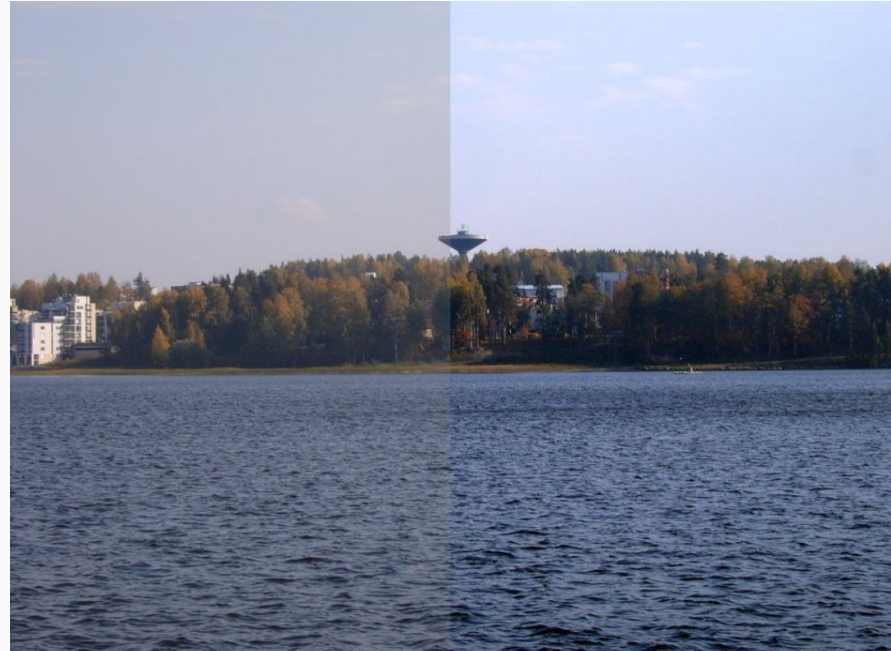
Image distance alternatives

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



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

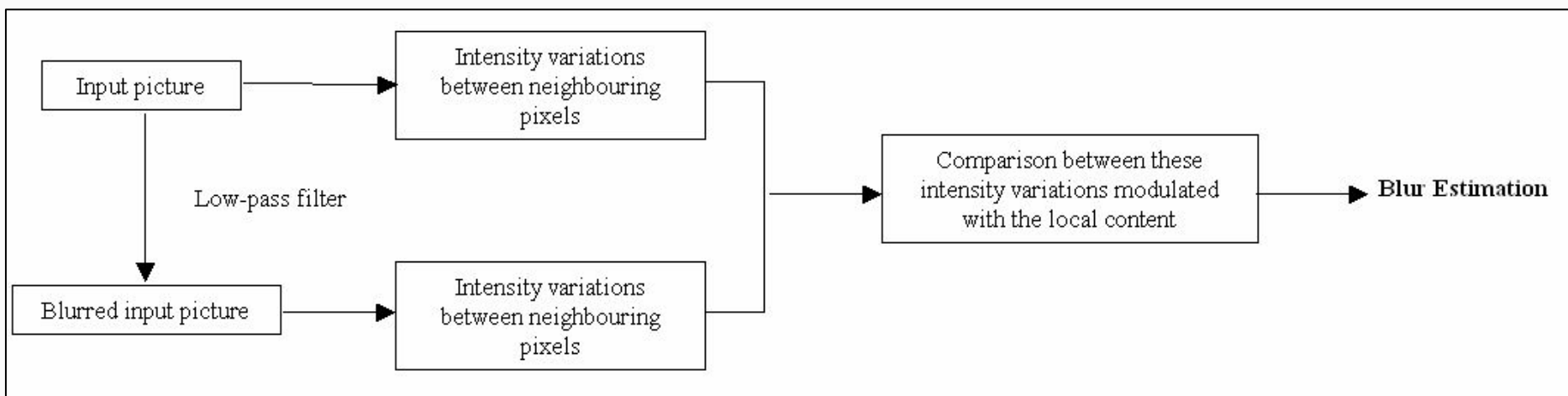


Blur

Research has been made around a no-reference subjective blur metric¹.



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.



DBSCAN

$$n = 4$$

$$\varepsilon = 1$$

