IMAG/e

TU/e Technische Universiteit Eindhoven University of Technology

Image Analysis Project 8QA01

Part 1- Introduction

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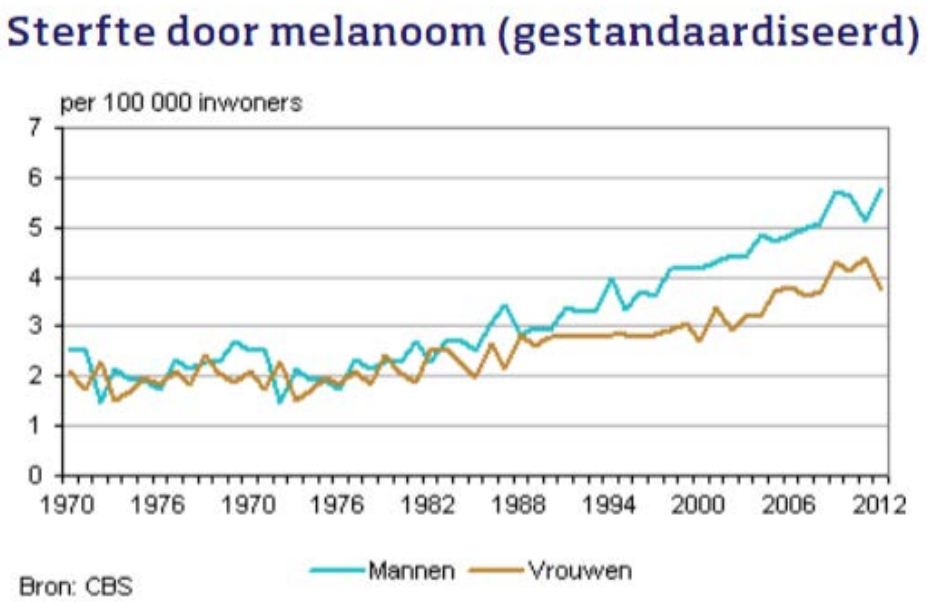
Skin cancer

- One of the most common cancers
- Different subtypes, for example
  - Basal cell carcinoma
  - Melanoma (rare but dangerous)



https://www.cbs.nl/nl-nl/nieuws/2013/38/toename-sterfte-door-huidkanker

Skin cancer

- Early detection improves survival
- People may be hesitant to see a doctor (UK survey shows 45% with cancer-related symptoms do not)
- But too many doctor's visits are also not desirable

"Many of the people we interviewed had red flag symptoms but felt that these were trivial and didn't need medical attention, particularly if they were painless or intermittent." - Dr Katriina Whitaker

http://www.cancerresearchuk.org/about-us/cancer-news/press-release/2015-01-26-patients-dismissing-trivial-symptoms-could-delay-cancer-diagnosis

Apps to evaluate skin cancer

- Examples:
  - OddSpot
  - SkinVision

- In Oddspot, answer 14 questions like
  - Age
  - “What is the color of the spot”
  - etc

- Outputs a score of 0 to 100 for two skin cancer subtypes

OddSpot

This app evaluates, based on your input, the likelihood of small, suspicious spots on the skin to be potential precursors to skin cancer: **actinic keratosis** and **basal cell carcinoma**.

We have made a serious effort to make sure the app delivers accurate predictions, but nevertheless: **when in doubt always consult your general physician or dermatologist**.

The app was created by the Human-Technology Interaction group at Eindhoven University of Technology (TU/e), in cooperation with the Jheronimus Academy of Data Science in Den Bosch (JADS).

https://www.jads.nl/oddspot.html

- Use data from previous (cancer/non-cancer) spots to create a scoring system

- Transform 14 **features** from app user into a score

Q1: Age	…	Q7: Color	…
20		Brown	
25		Brown	
40		Light red	
70		Red	

→

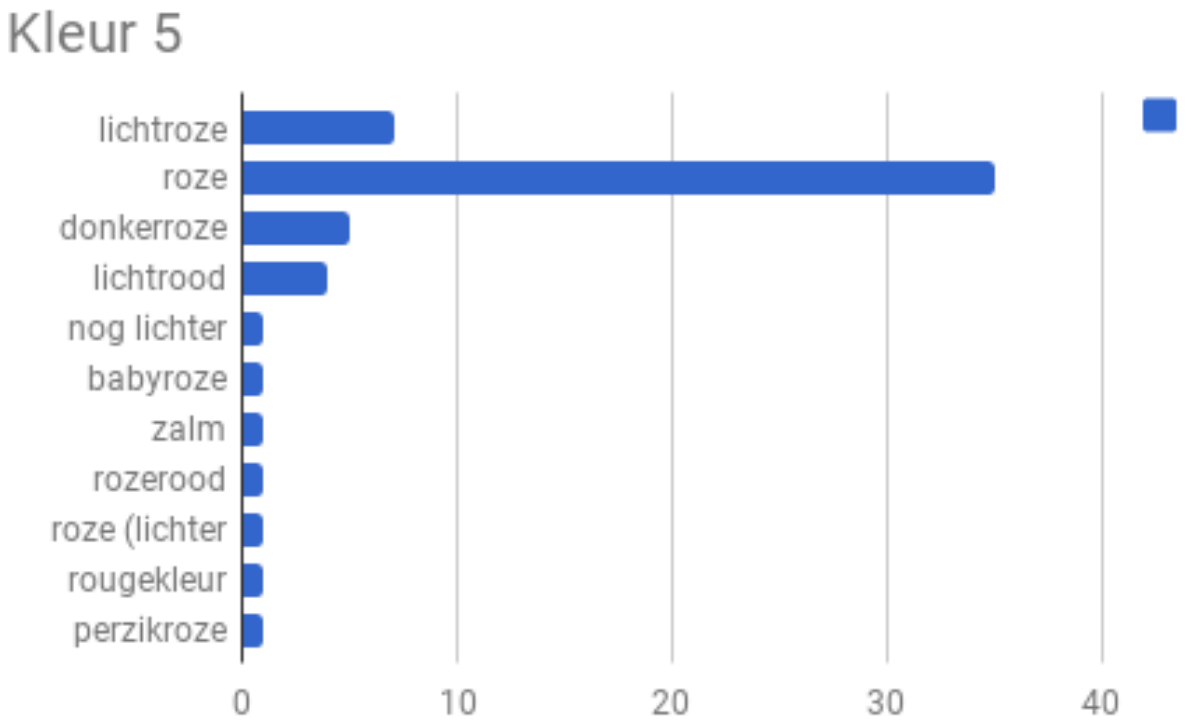
Score
0
5
25
80

- Some answers may be subjective

https://www.jads.nl/oddspot.html

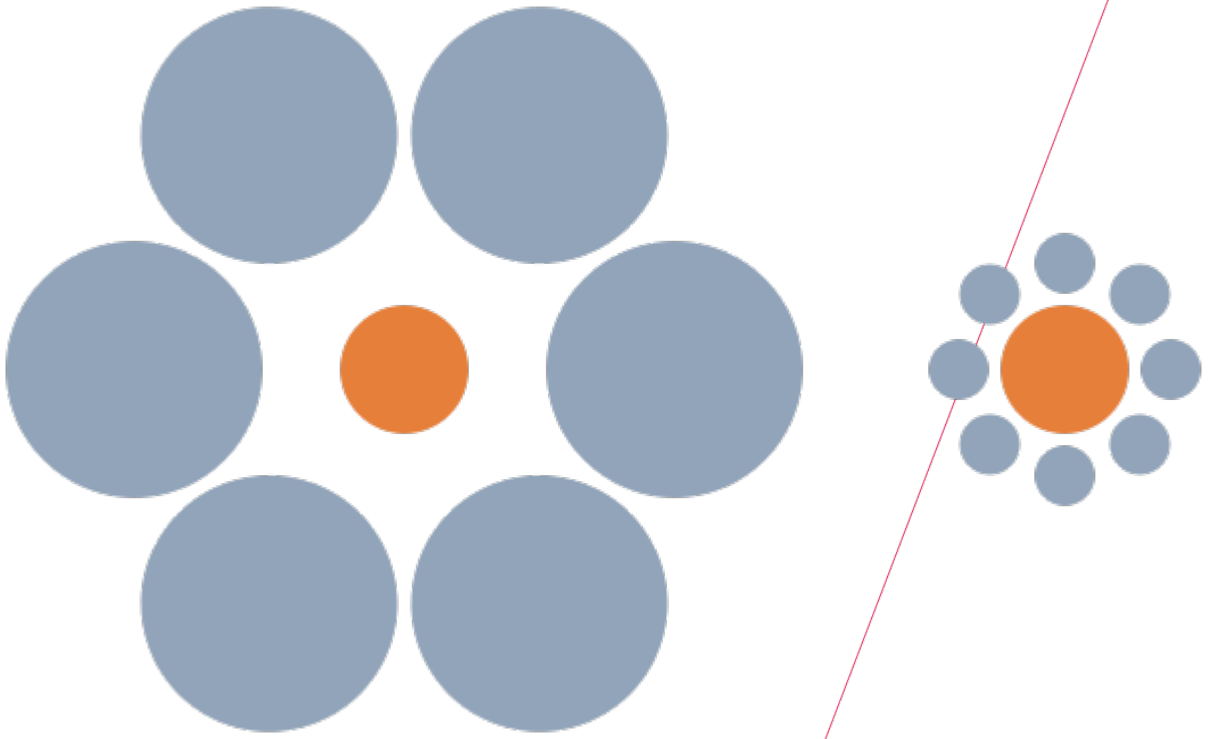
Our vision is subjective

- Previous students called this color both “light pink” and “dark pink”



Our vision is subjective

- Surrounding context changes our perception of size



https://commons.wikimedia.org/wiki/File:Mond-vergleich.svg

Algorithms can be more objective

- A color image has 3 numbers per pixel – Red, Green, Blue
- Black = [0 0 0], red = [255 0 0], white= [255 255 255]
- For the same pixel, the value stays the same

https://challenge.kitware.com/#challenge/n/ISIC_2017%3A_Skin_Lesion_Analysis_Towards_Melanoma_Detection

Algorithms have other problems with context

- Changing one pixel changes the algorithm decision if it's a cat or a dog

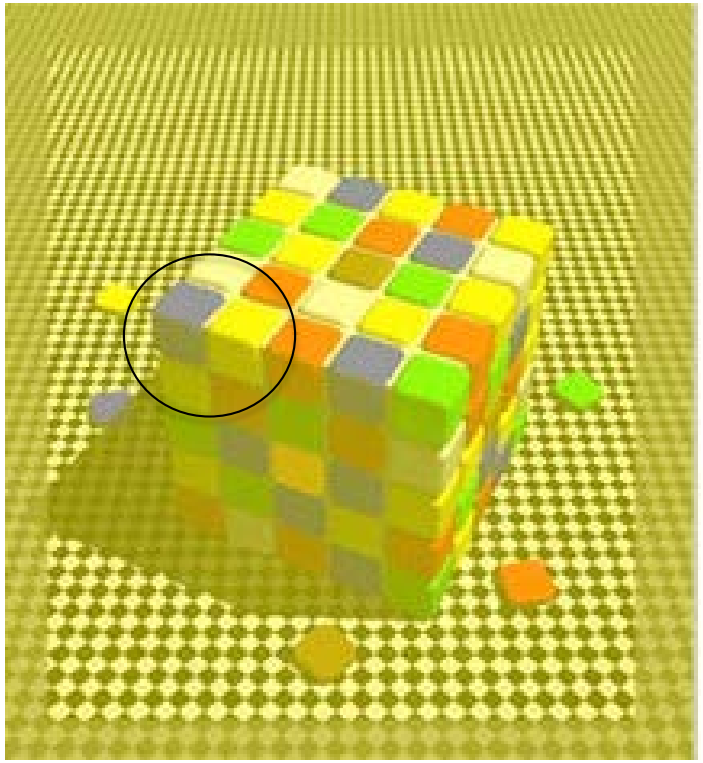
Cat(Dog)

Dog(Cat)

Su, J., Vargas, D. V., & Kouichi, S. (2017). One pixel attack for fooling deep neural networks. arXiv preprint arXiv:1710.08864.

Algorithms have other problems with context

- We expect to have a blue block and a yellow block



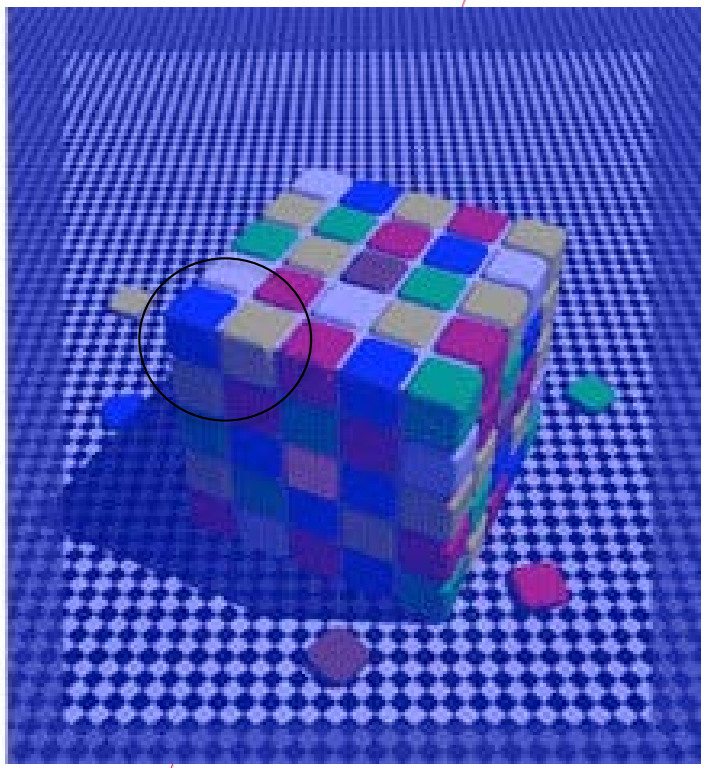


Image R. Beau Lotto http://www.labofmisfits.com/articles/illusionsoflight.asp

Algorithms have other problems with context

- “Blue” in the left image is the same as “yellow” in the right!

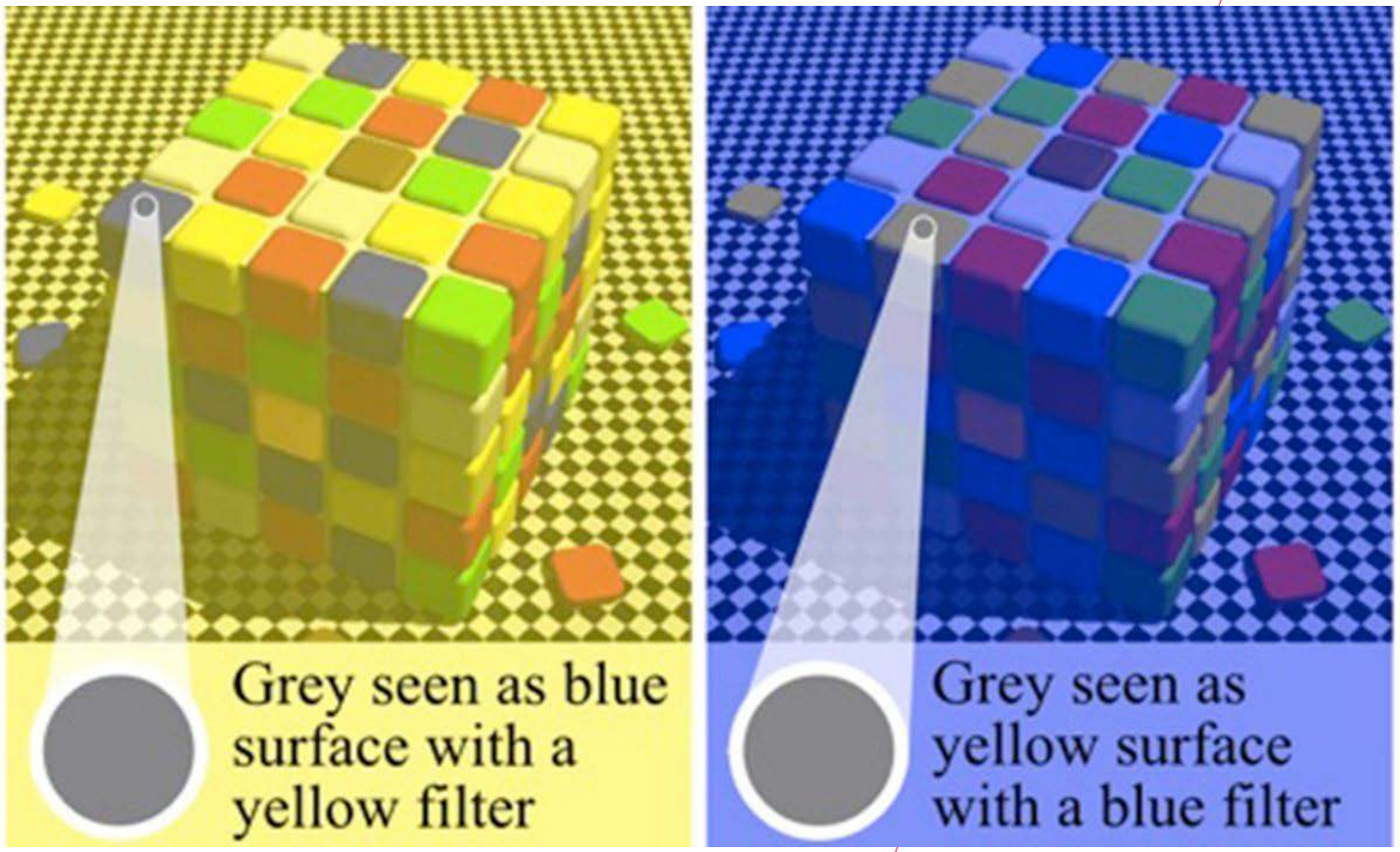


Image R. Beau Lotto http://www.labofmisfits.com/articles/illusionsoflight.asp

Apps can be unreliable

- SkinVision reported to have problems in an external study

06 juni 2018 14:33
Laatste update: 06 juni 2018 16:51

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De Nederlandse smartphoneapp SkinVision zou ongeschikt zijn om een betrouwbaar oordeel te vellen over het risico op huidkanker, stelt de beroepsvereniging voor dermatologen NVDV in een onderzoek.

Project goals

- Should skin cancer apps use image processing (like SkinVision) or not (like Oddspot)?
- To answer this question, you will use a public skin lesion dataset, and learn to:
  - Measure features from an image (video 2)
  - Classify an image as suspicious or not (video 3)
  - Evaluate your results (video 4)