# Unsupervised image segmentation trained on a single image

Piotr Migdał (QF, ECC), Bartłomiej Olechno (ECC)

QUANTUM FLYTRAP

ECC GAMES®

**ML in PL**

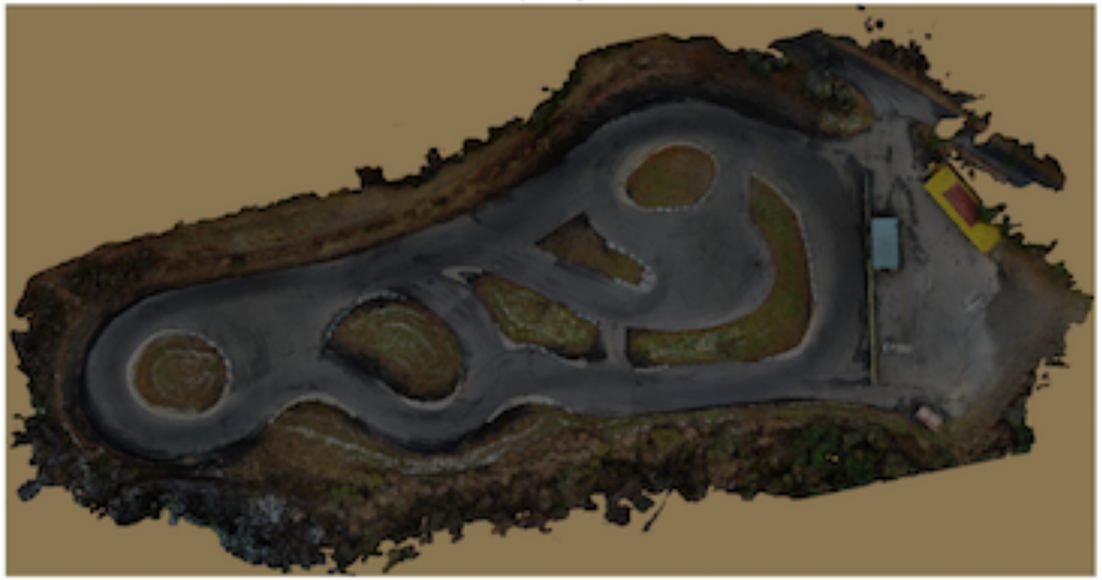
Virtual Event 2020

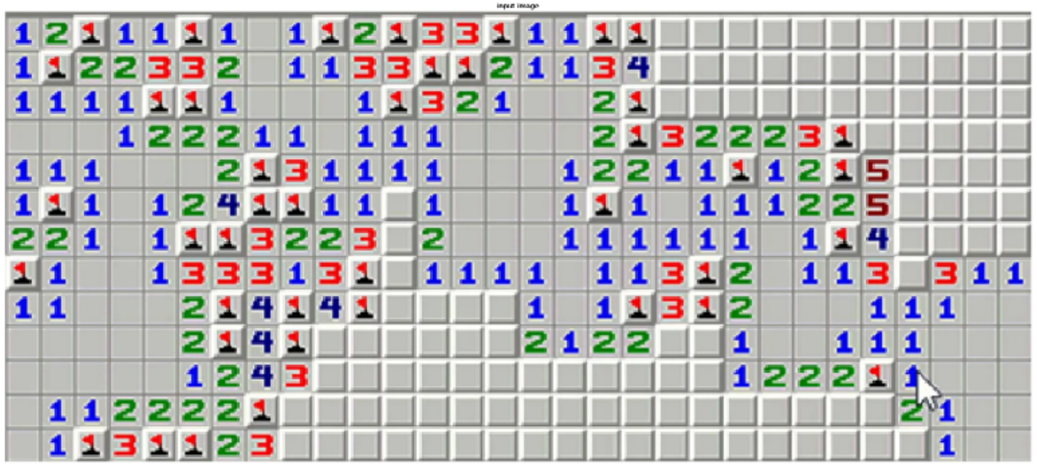
# Typical image segmentation

- Supervised
- Many similar images
- If transfer learning:
  similar as patterns
  in ImageNet or COCO

https://deepsense.ai/deep-learning-for-satellite-imagery-via-image-segmentation/

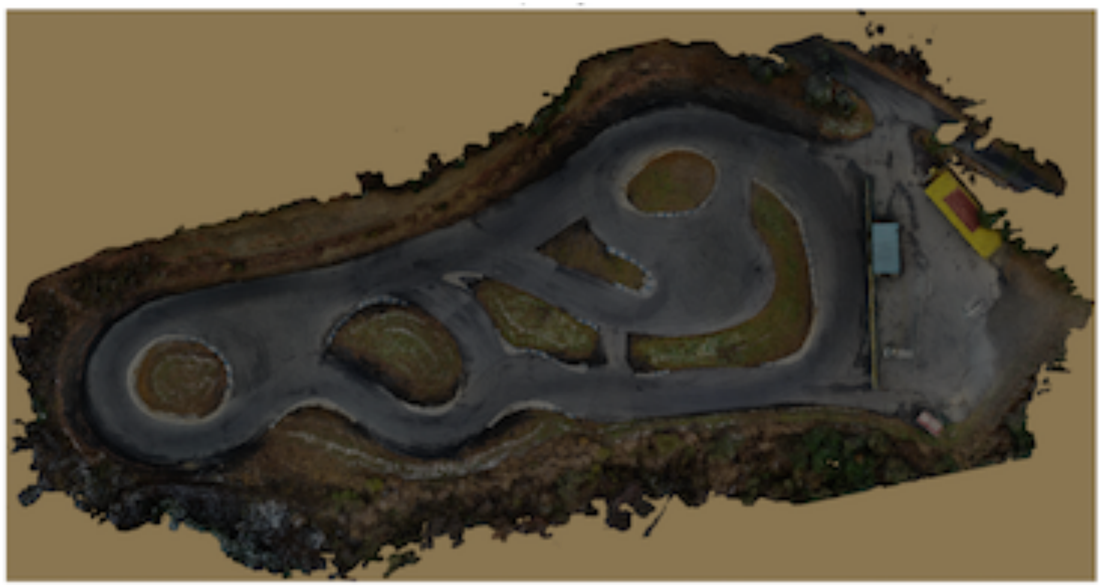
# But what if it is different?

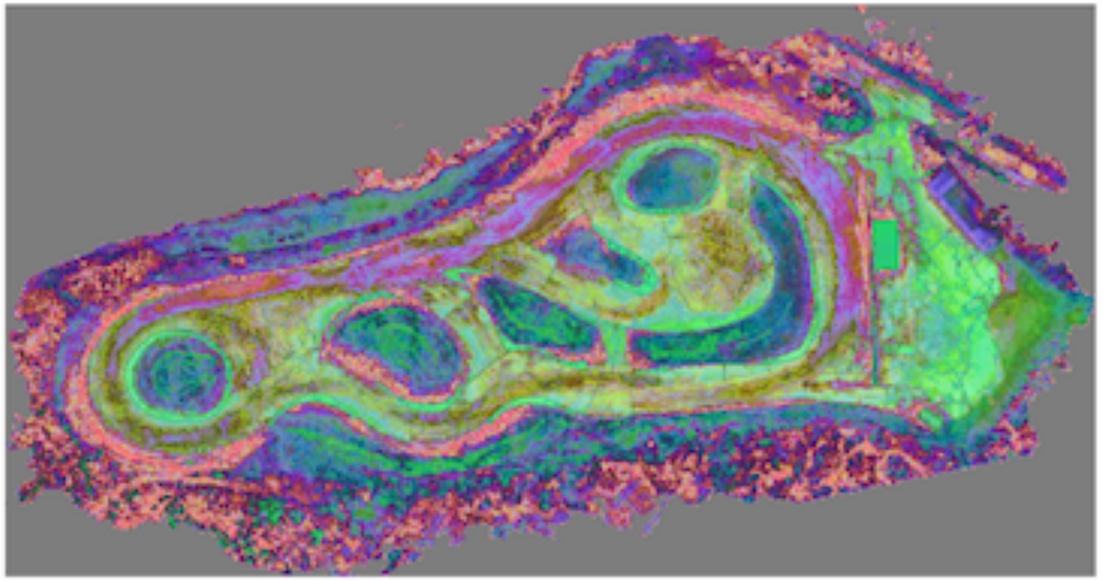




# Our case: scans of race tracks

- Each with various scaled, in different place (continent, foliage, season, etc)
- Yet, we want to exract subtle features (e.g. angle of tire tracks)



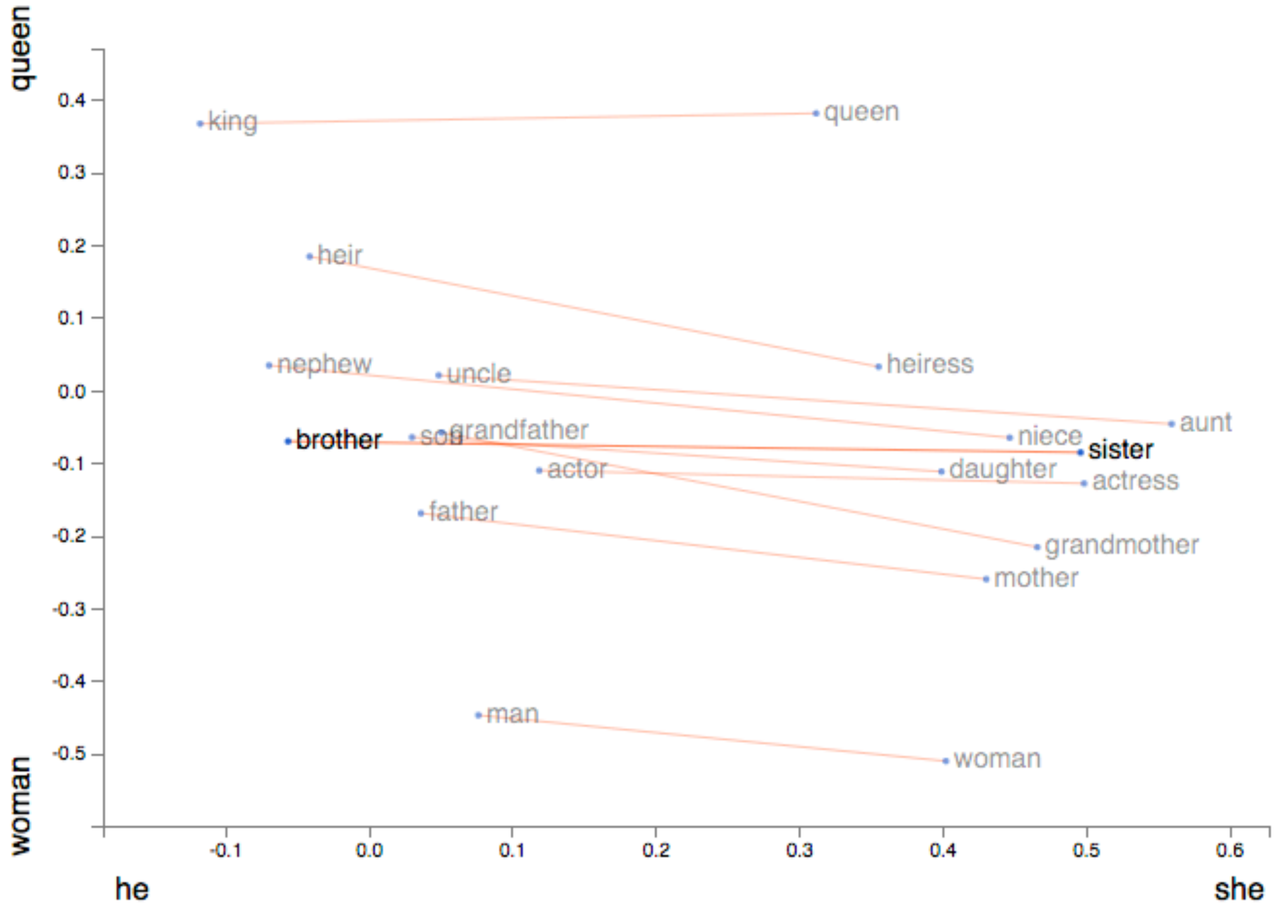


# Motivation: word2vec

*“A word is characterized by the company it keeps”* - John Rupert Firth

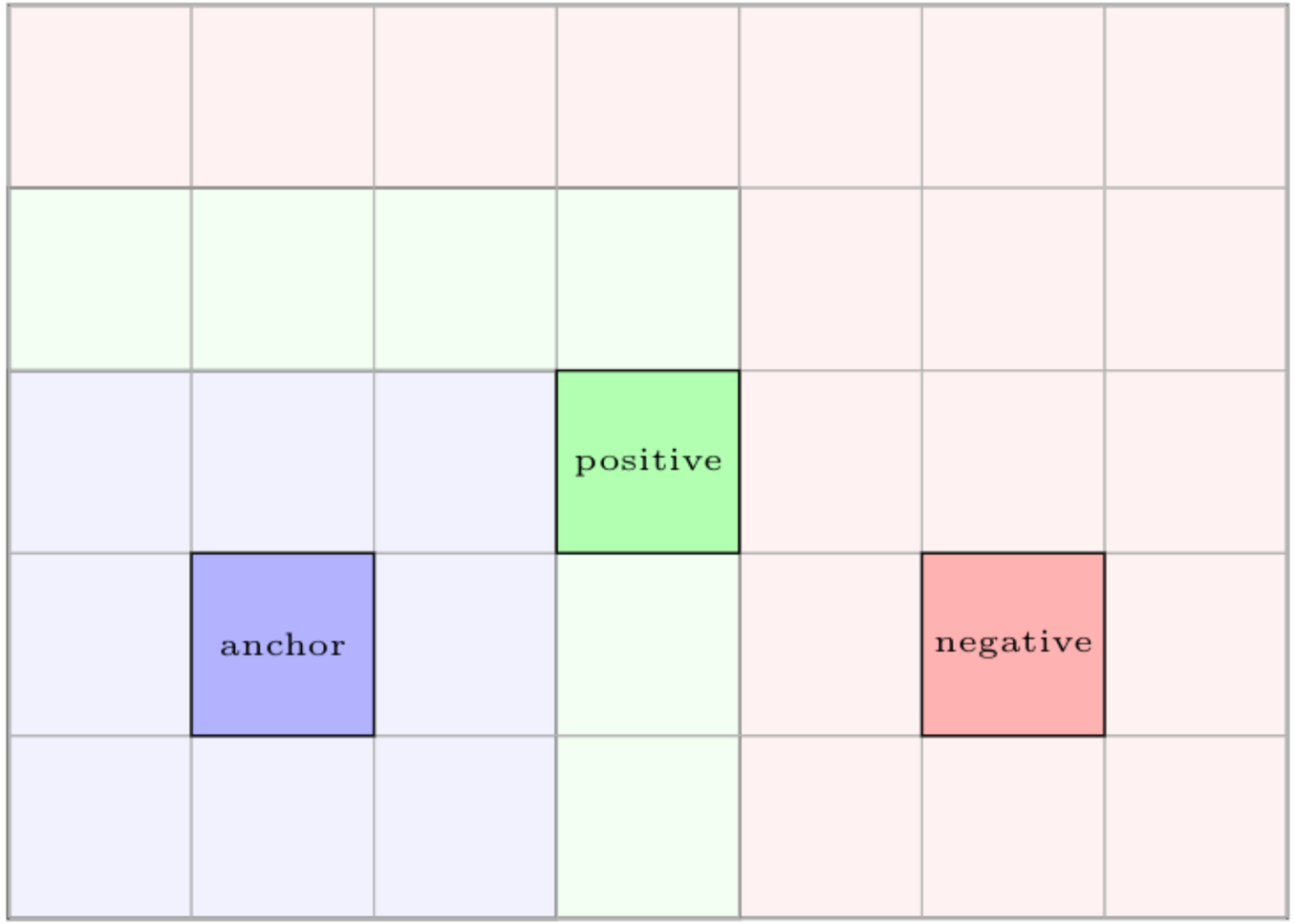
$$\overrightarrow{v}_{dog} \cdot \overrightarrow{v}_{cat} \approx \log \frac{P(\text{dog AND cat})}{P(\text{dog})P(\text{cat})} = PMI(\text{dog}, \text{cat})$$

# Motivation: word2vec




https://p.migdal.pl/2017/01/06/king-man-woman-queen-why.html

# Tiles, prediction

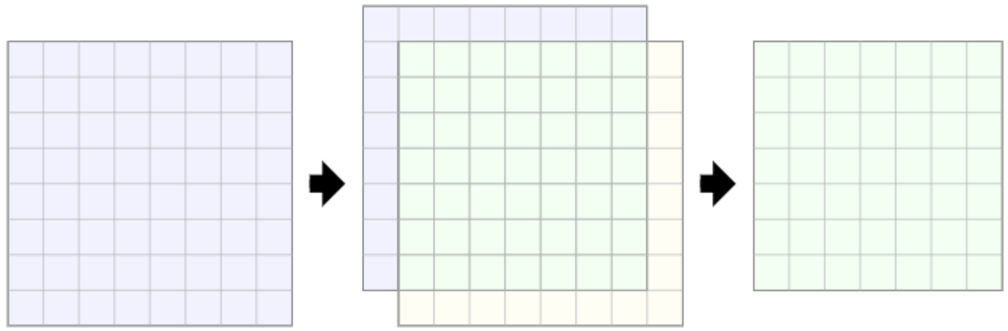


# Loss function

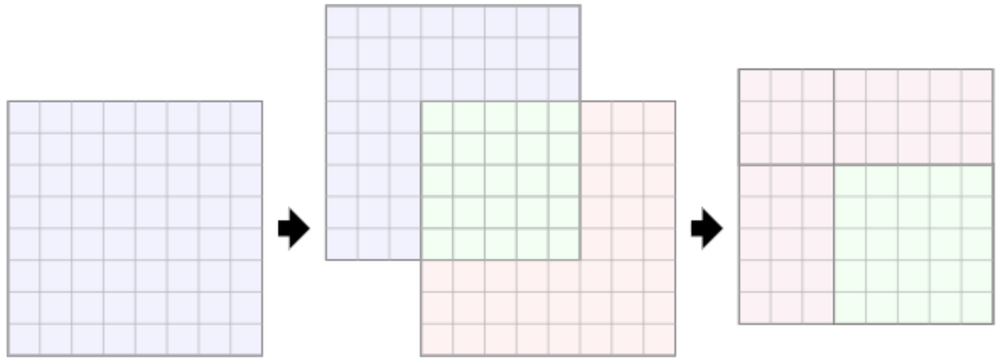
- Noise Contrastive Estimation
- Triplet loss
- Linear loss function (does not work well)

# Serialized

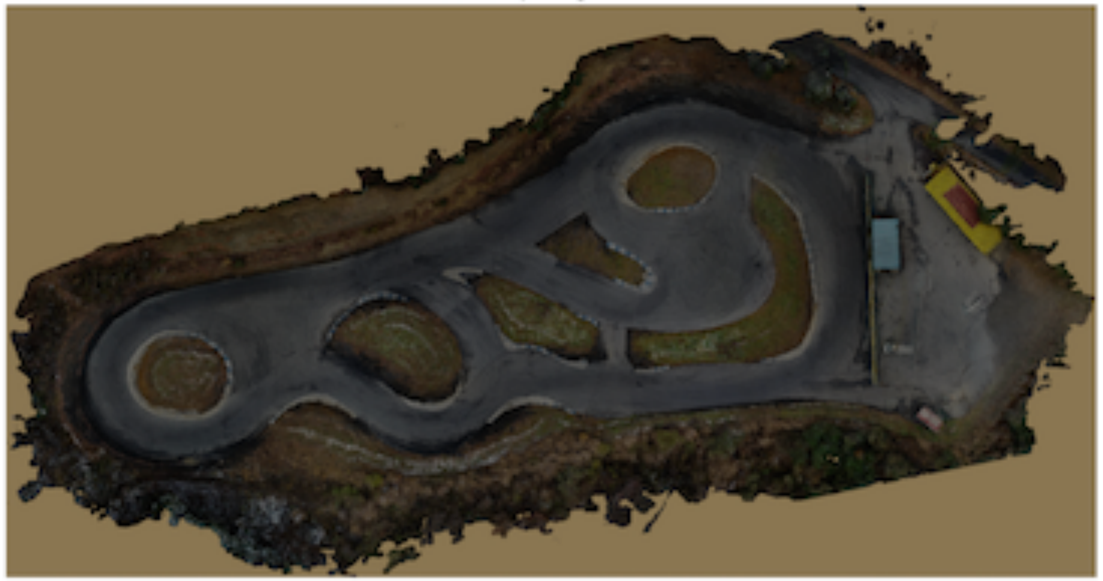
Neighbors

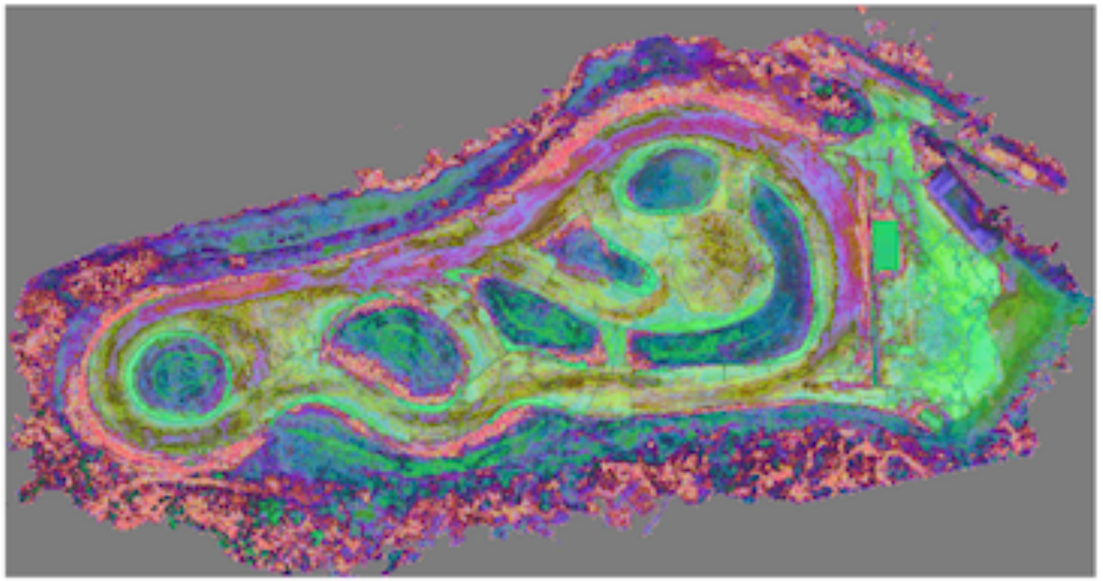


Not-neighbors

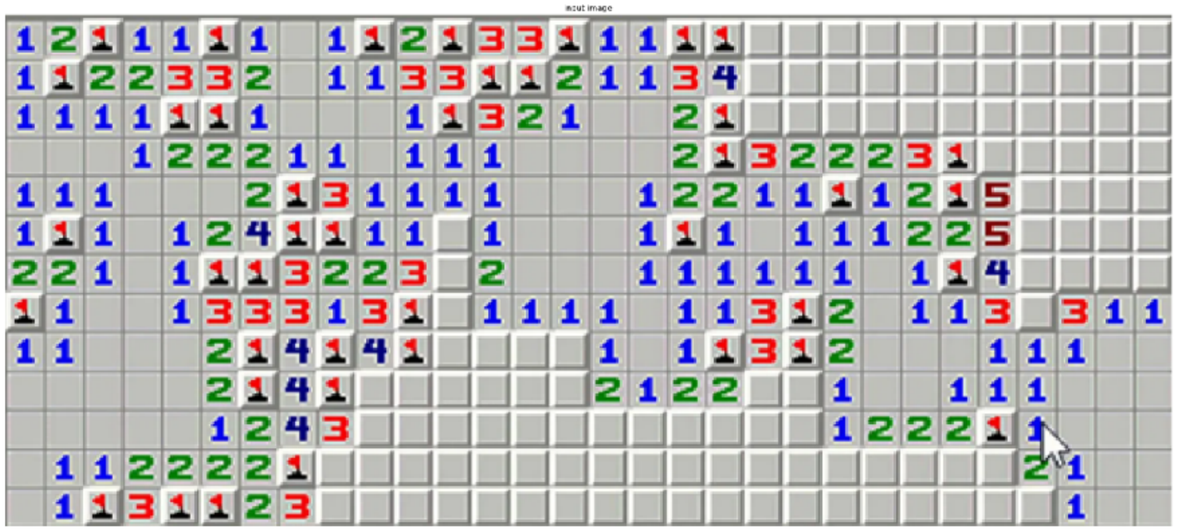


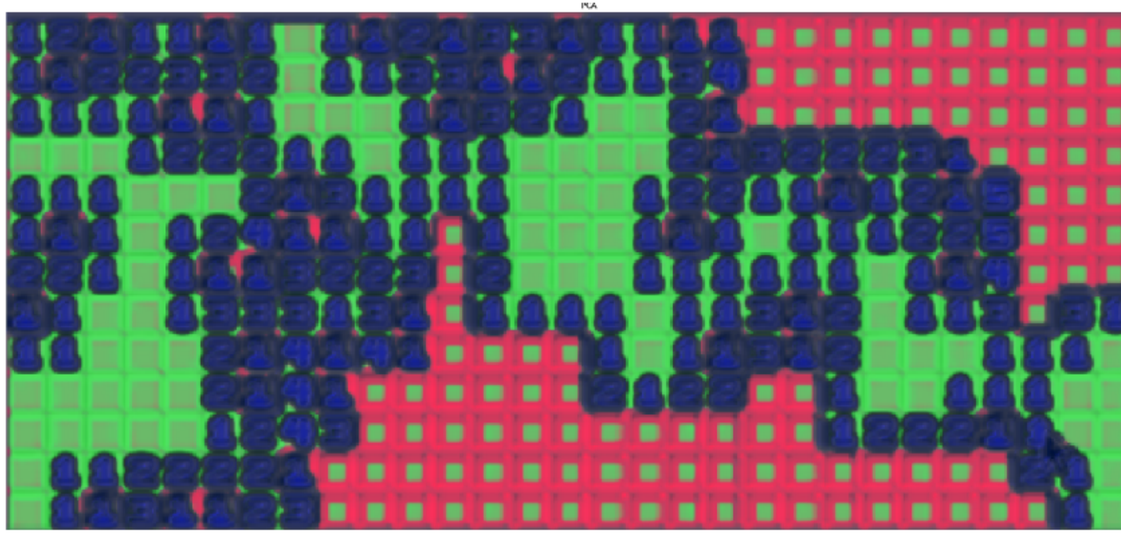
# Our case





# Other nice examples



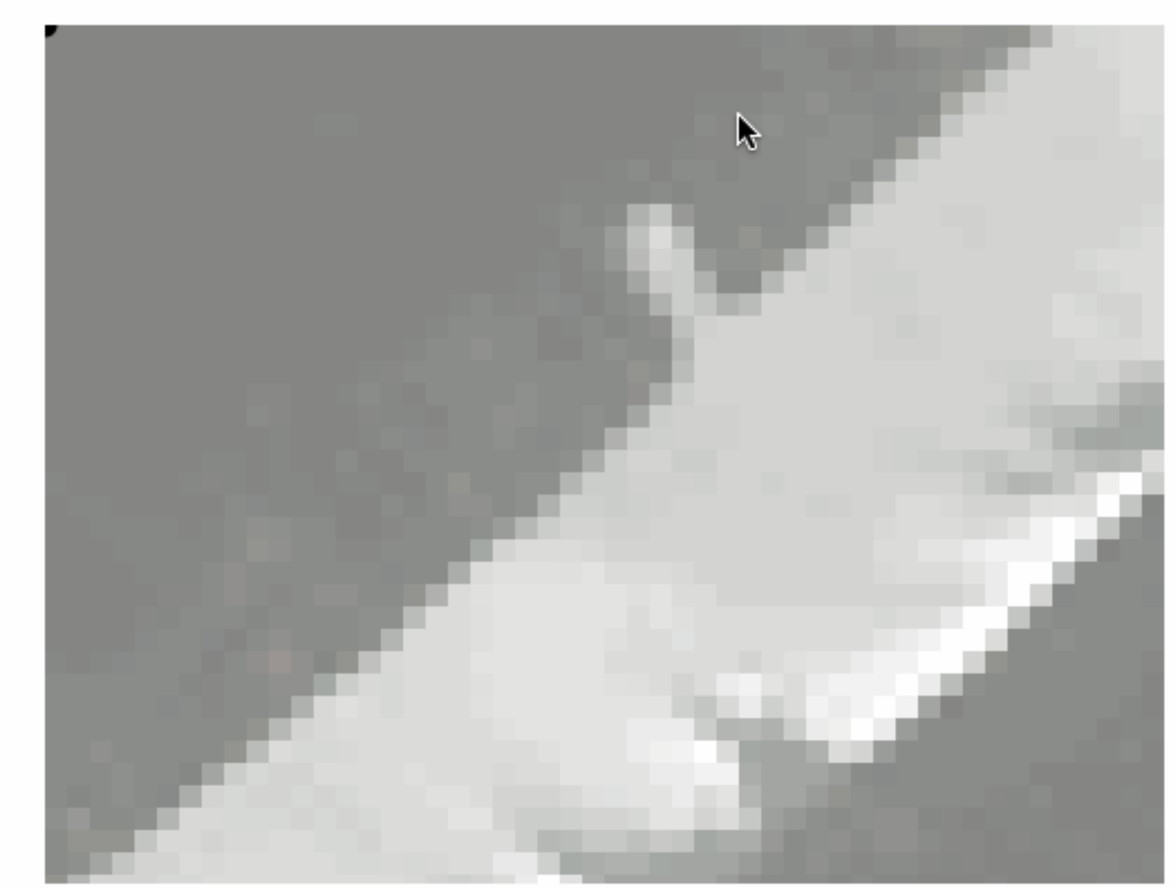


# Other nice examples

# Interactive

GREEN:
close

RED:
far



https://www.w3.org/2020/Talks/mlws/piotr_migdal/slides.html

# Thanks you!

pmigdal@gmail.com