



Skin lesion  
classification using  
deep neural networks

# Skin cancer and effects

- >10000 cases of highly dangerous types of skin cancer in Sweden 2016
  - Of which roughly 4000 were malign melanoma
- Annual growth of 4.7% between 2006 and 2016
  - Fastest growing type of cancer in the period

# Task and ISIC2018

- Dataset: HAM10000
  - Created by Tschandl et al. From the department of dermatology at the medicinal University of Vienna
  - And Cliff Rosendahl from the faculty of medicine at the University of Queensland.
- The dataset was used in the competition: ISIC2018.

# Dataset: 10k pictures of 7 lesions

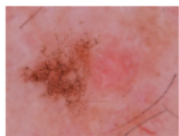


Figure 1: Actinic keratosis. Labeled: 'akiec'

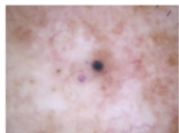


Figure 2: Basal cell carcinoma. Labeled: 'bcc'

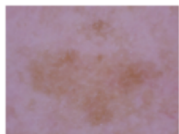


Figure 3: Benign keratosis. Labeled: 'bkl'



Figure 4: Dermatofibroma. Labeled: 'df'

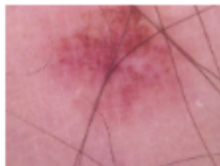


Figure 5: Melanocytic nevi. Labeled: 'nv'

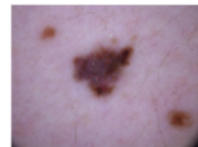


Figure 6: Melanoma. Labeled: 'mel'

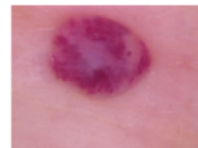


Figure 7: Vascular skin lesion. Labeled: 'vasc'

# Dataset: 10k pictures of 7 lesions

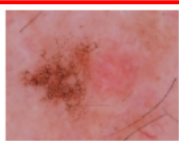


Figure 1: Actinic kerosis. Labeled: 'akiec'



Figure 2: Basal cell carcinoma. Labeled: 'bcc'

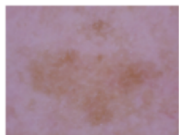


Figure 3: Benign keratosis. Labeled: 'bkl'



Figure 4: Dermatofibroma. Labeled: 'df'

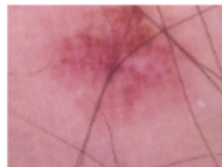


Figure 5: Melanocytic nevi. Labeled: 'nv'

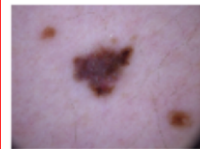
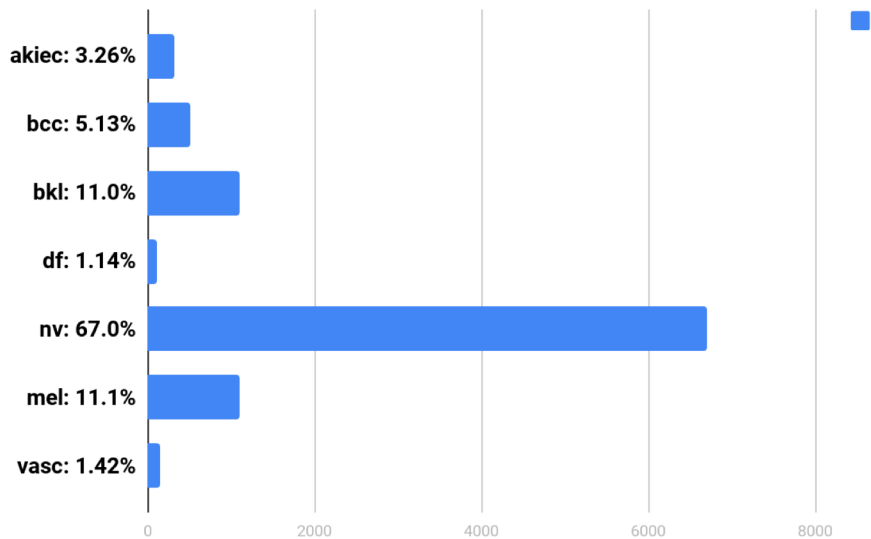


Figure 6: Melanoma. Labeled: 'mel'



Figure 7: Vascular skin lesion. Labeled: 'vasc'

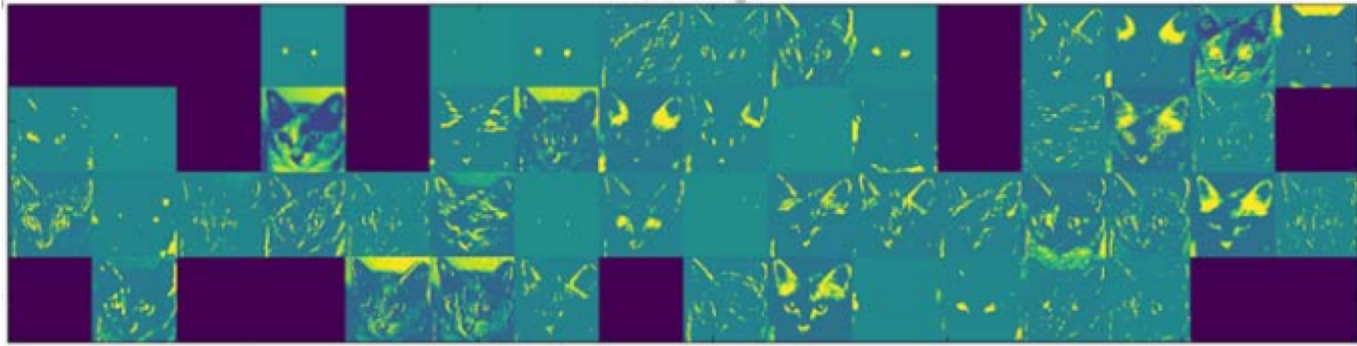
# Data imbalance



Dangerous lesions:

- akiec
- bcc
- mel

# Convolutional neural networks



Credit: F. Chollet

- Takes shape of picture into account
- Many layers can combine simple shapes into more advanced features

# How we handled lack of data and data imbalance

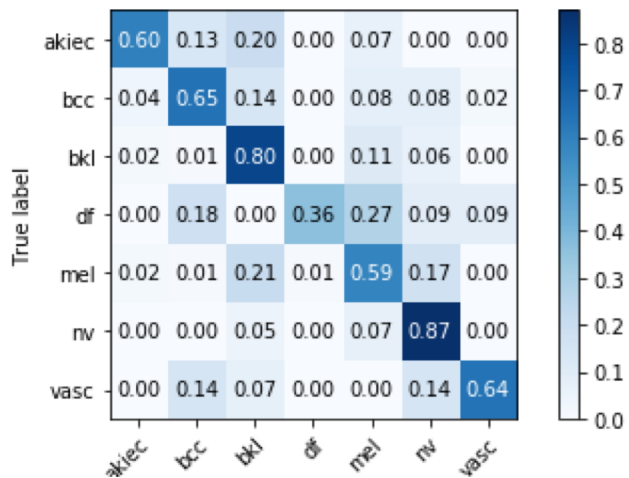
- Small amount of data means risk of overfitting
- Imbalance causes a risk of the larger classes dominating classifications



# Methods to deal with the problems

- Image augmentation
  - Only symmetrical flips improved performance
- Class weights in the loss function
- Transfer learning

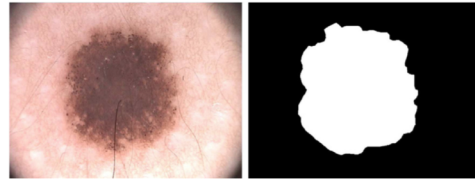
# Final result



- Our balanced accuracy: 64%
- Best ISIC2018 with the same data: 84%
- Best with similar approach: 76%

# Future work

- Image segmentation (Cropping)
- Ensemble: Combining multiple classifiers.
- Try more image augmentation methods.



Credit to: Domenico Daniele Bloisi