SKIN LESION ANALYSIS TOWARD MELANOMA DETECTION

THE CHALLENGE

- Melanoma: very severe form of skin cancer
- Early detection is key to survival
- Only way to accurately diagnose melanoma is with a biopsy
- Dearth of deep learning efforts into this task

MELANOMA DETECTION

SEGMENTATION
Binary classification of pixels into Lesion and Non Lesion

FEATURE EXTRACTION
Identifying features such as globules and streaks

CLASSIFICATION
Classification of images into melanoma and non melanoma

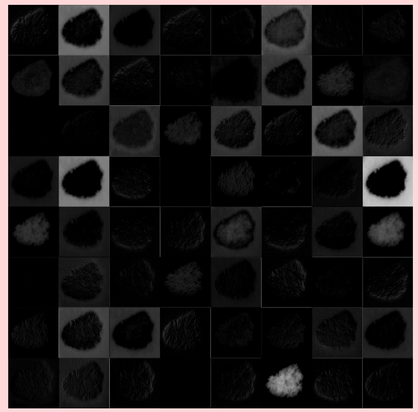
CLASSIFICATION

2nd

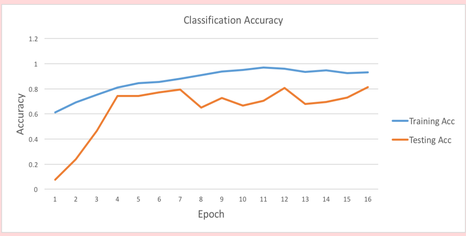
- Networks based on VGG_16 and VGG_19
- State-of-the-art in computer vision
- **Transfer learning** has proved to be highly efficient in visual recognition

ARCHITECTURAL CHOICES

- Lesser size of convolutional and pooling layer
- Three 3x3 conv. filters with unit stride has receptive field of 7x7, but advantages including **better discriminative ability of decision function** (multiple rectification units), **decreased number of parameters**

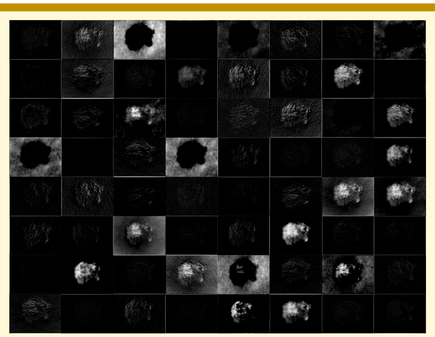


- Data Augmentation
- Hyperparameters: learning rate 1e-3, decay 1e-6, momentum = 0.1
- Adding dropout for tackling overfitting
- Activation function choice

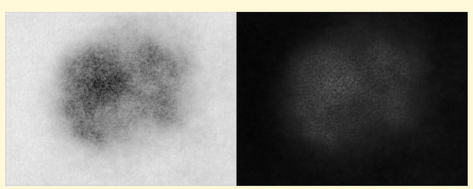


- **Achieved** 81.3% accuracy in as compared to base paper (78.6%) in ISBI Challenge

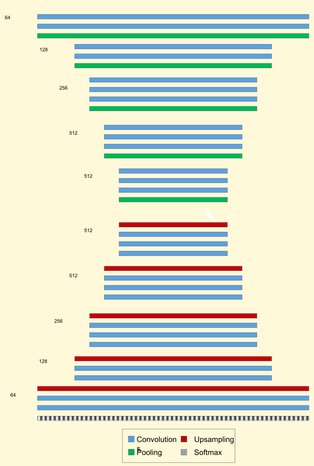
SEGMENTATION



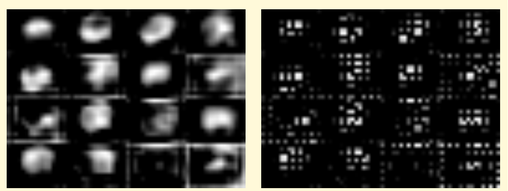
Second convolutional layer recognizes edges



Last convolutional layer classifying pixels into **Lesion** (left) and **Background** (right)

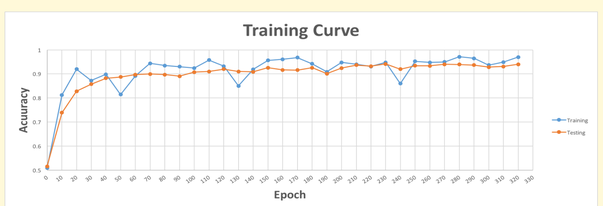


- **TRAINING ACCURACY : 0.972**
- **TESTING ACCURACY : 0.945**



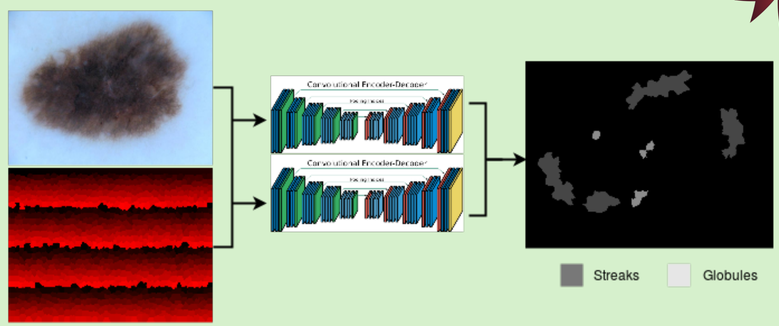
- Upsampling by memorizing maxpool indices
- Improves boundary delineation
- Reduces the number of parameters

- Data augmentation
- Island removal
- Edge Smoothing



FEATURE EXTRACTION

2nd



- Pixel-wise classification for feature extraction (globules and/or streaks)
- Challenges: unbalanced labels and superpixel level ground truth
- Used two separate networks, one for each feature
- 90.3% accuracy achieved in ISBI Challenge