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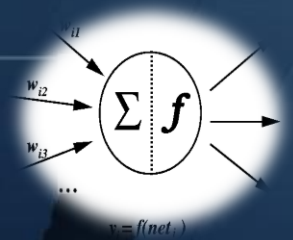

My Applications of Deep Learning

VI Workshop Internacional en
IMAGEN MÉDICA, CAPTURA E INTEGRACIÓN DE DATOS CLÍNICOS
A Coruña
6-7 Sept 2018

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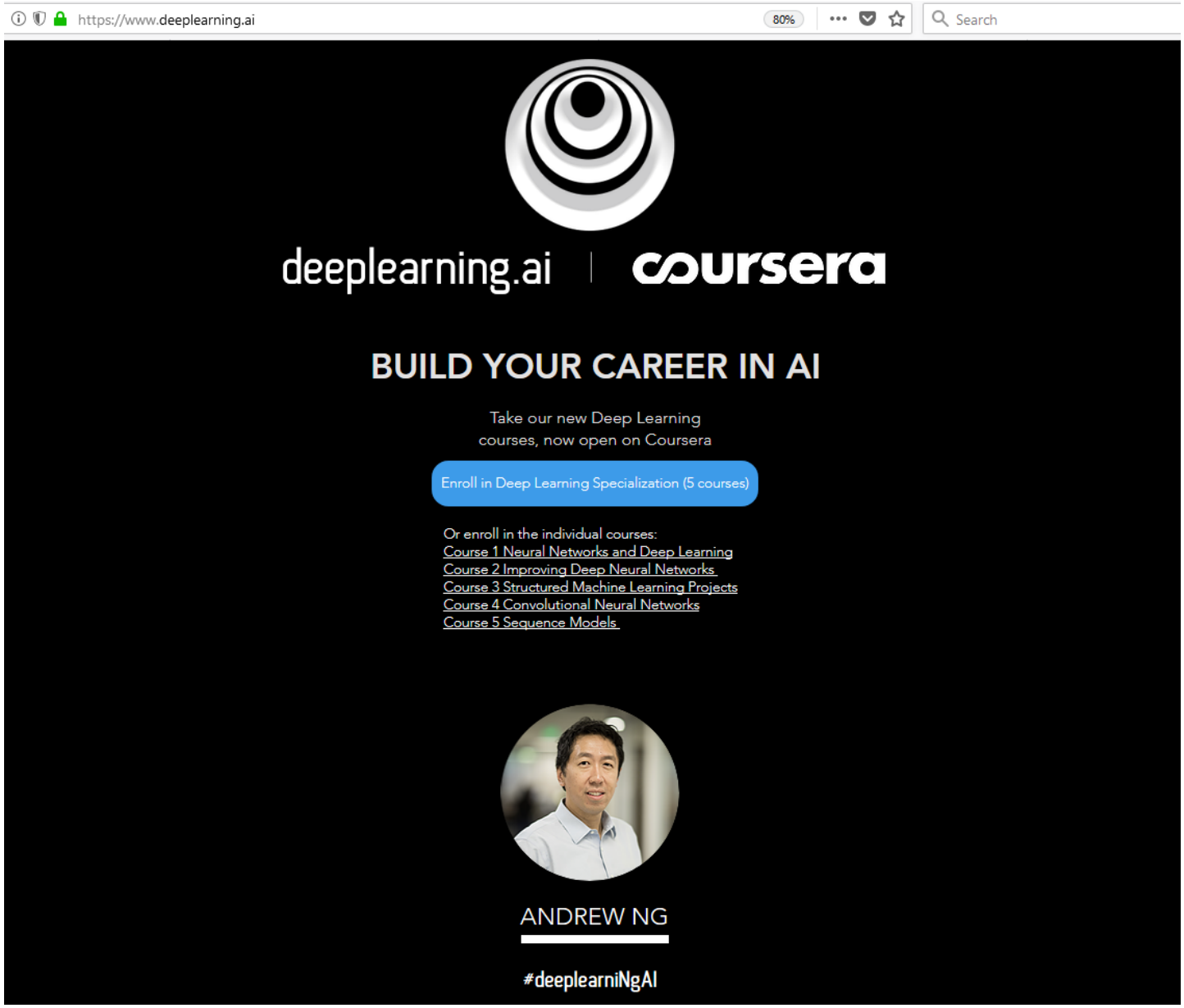
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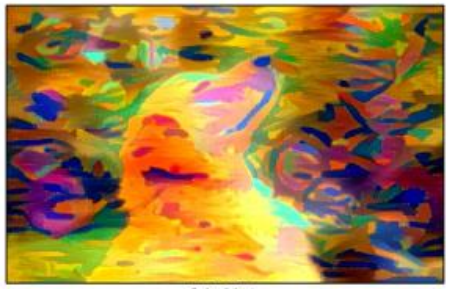
ANDREW NG
#deeplearniNgAI

DL Art Transfer

https://github.com/muntisa/mDL-ArtTransfer

- ✓ 2015 by Gatys *et all.*
- ✓ CNN
- ✓ Inputs: pixels
- ✓ Outputs: pixels
- ✓ Content + Style images
- ✓ **Pixel optimization**
- ✓ Applications in art, advertising, games, movies, etc.



- ✓ Mixed 3(4) algorithms
- ✓ Added parameters
- ✓ Future: add complexity for automatic style search

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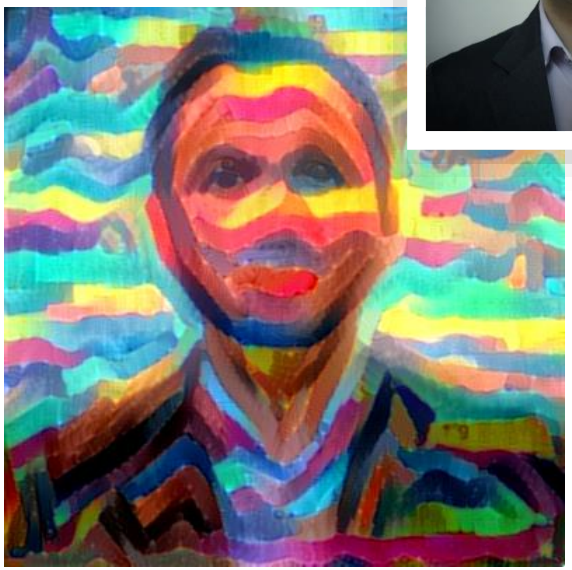
https://github.com/muntisa/mDL-ArtTransfer

Industrial
muntisa

The scream
Edvard Munch



Peisaj
muntisa

Enbu
Hayami_Gyoshu

Cristian Robert Munteanu
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Content image: Galician Wild horses
by @CristianRobertM (2017)

Style image: Cropped from
"Portrait of the poet Ilarie Voronca"
by Victor Brauner (1925)

Deeplearning.ai
Coursera
Course 4: Convolutional Neural Networks
Art Generation with Neural Style
Transfer (practice script)

1420 iterations

My first AI VGG16-based
Generated image

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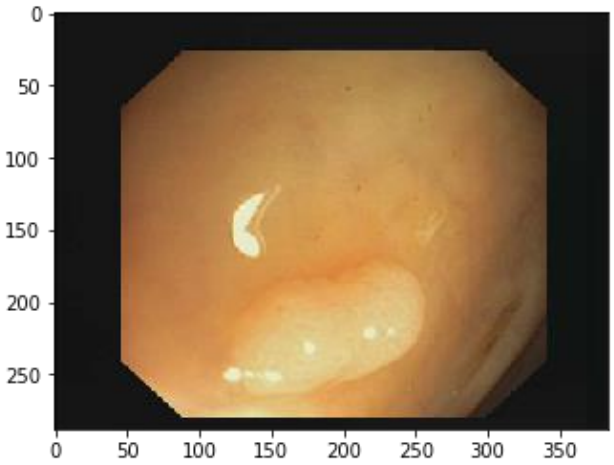
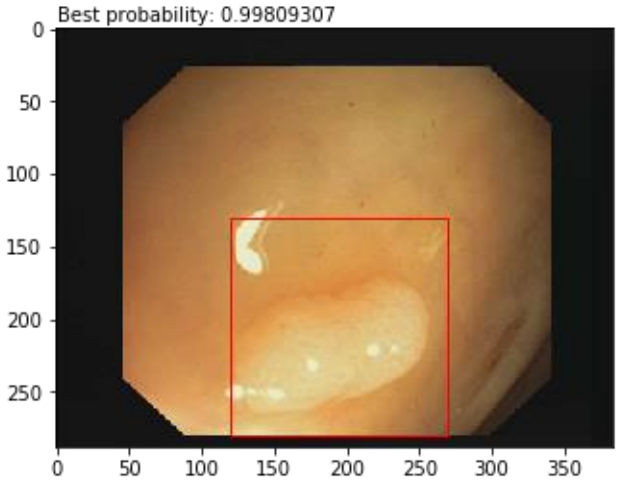
CNN4Polyps - Colonoscopy polyps detection with CNN

https://github.com/muntisa/Colonoscopy-polyps-detection-with-CNNs



CNN + localization



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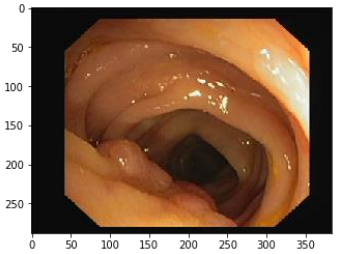
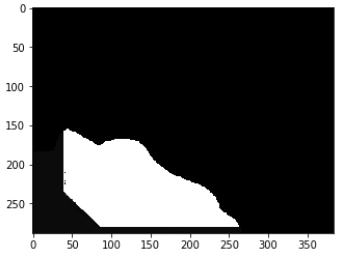


Original colonoscopy
(621 images)



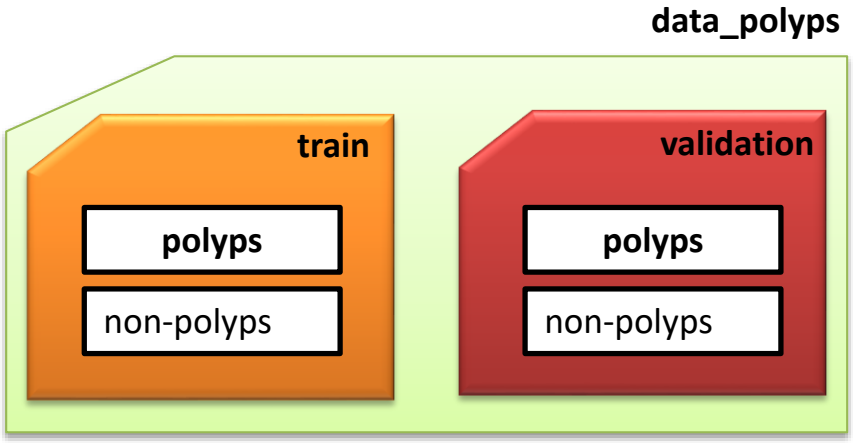
Ground Truth
(621 images)

1-Crop_polyps.ipynb

Polyps
(606 images)

Non-polyps
(606 images)

2-Spit_Dataset.ipynb



Model dataset folders

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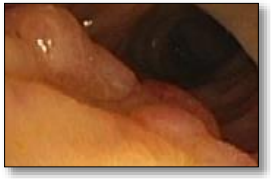
Polyps
(606 images)



Non-polyps
(606 images)

Model dataset folders

`3-Small_CNNs.ipynb`

Small Convolutional Neural Networks (CNNs)

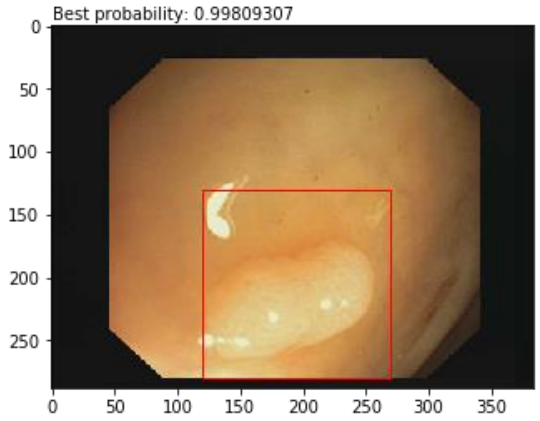
`4-TransferLearningVGG16.ipynb`

VGG16 Transfer Learning Classifiers

`5-FineTuningVGG16.ipynb`

VGG16 Fine Tuning Classifiers

`6-WindowsPolypsDetection.ipynb`



Polyp detection

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CNN4Polyps - Colonoscopy polyps detection with CNN

https://github.com/muntisa/Colonoscopy-polyps-detection-with-CNNs

Small CNNs= training the entire CNN with 2-3 Conv

- ✓ It is possible to obtain a **small CNN** classifier with **over 90% accuracy** in only **2 minutes** of training (CPU i7, 16G RAM, GPU Nvidia Titan Xp).

Transfer Learning = training only FC

- ✓ With VGG16 transfer learning for our current dataset, no better results were obtained than a small CNN (**over 90%** test accuracy). This could be explained by the training of VGG16 with the Imagenet dataset that is very different with the polyps. In addition, we used the original dataset, without data augmentation because of the transfer learning advantage.

Fine Tuning = training FC + Conv

- ✓ If you apply the fine tuning for the last conv block of VGG16 + FC (top model) you can obtain an accuracy **`over 98%`** (learning rate = 0.0002, momentum = 0.9, batch size = 64). This values is better compare with the small CNN results (`over 92%`).
- ✓ The search space was limited and possible additional hyperparameter combinations should be tested including drop rate, optimizer or the base model (not only VGG16, it could be Inception, etc.).

If you need a classifier to detect polyps in your colonoscopy images, you could try a small CNN with only few hidden layers. If you need accuracy over 98% you should try fine tuning!

Deep Neural Networks Are More Accurate Than Humans at Detecting Sexual Orientation From Facial Images

By Michal Kosinski, Yilun Wang

Journal of Personality and Social Psychology. February 2018, Vol. 114, Issue 2, Pages 246-257.
Organizational Behavior

View Publication Download

We show that faces contain much more information about sexual orientation than can be perceived and interpreted by the human brain. We used deep neural networks to extract features from 35,326 facial images. These features were entered into a logistic regression aimed at classifying sexual orientation. Given a single facial image, a classifier could correctly distinguish between gay and heterosexual men in 81% of cases, and in 74% of cases for women. Human judges achieved much lower accuracy: 61% for men and 54% for women. The accuracy of the algorithm increased to 91% and 83%, respectively, given five facial images per person. Facial features employed by the classifier included both fixed (e.g., nose shape) and transient facial features (e.g., grooming style). Consistent with the prenatal hormone theory of sexual orientation, gay men and women tended to have gender-atypical facial morphology, expression, and grooming styles. Prediction models aimed at gender alone allowed for detecting gay males with 57% accuracy and gay females with 58% accuracy. Those findings advance our understanding of the origins of sexual orientation and the limits of human perception. Additionally, given that companies and governments are increasingly using computer vision algorithms to detect people's intimate traits, our findings expose a threat to the privacy and safety of gay men and women.

Related

Michal Kosinski
Assistant Professor, Organizational Behavior
@michalkosinski

Deep Political Affinity

Spanish Political Affinity with DNN: Socialist vs People's Party

(to be published after the event)

Question

The political affinity is could be read from our face?

Why

I know only few Spanish politicians. But watching Spanish TV, I started to guess the political party of people. So, I was thinking: if my brain can predict with enough accuracy the political party of people, let's try the same task, but using DNN.

Deep Political Affinity

Spanish Political Affinity with DNN: Socialist vs People's Party

(to be published after the event)

Photos with politician portraits from PSOE & PP

- ✓ 50 random photos for PSOE + 50 random photos for PP + **data augmentation**
- ✓ Script to randomly split the dataset -> 40 photos for training + 10 photos for test (for each class)
- ✓ Keras, Tensorflow, Jupter notebooks, CNNs, VGG for transfer learning / fine tuning
- ✓ Input images: 150 x 150 pixels
- ✓ Total training = 80 photos
- ✓ Total test = 20 photos
- ✓ Inputs = portraits
- ✓ Outputs = PSOE / PP

Disadvantages

- very short dataset
- only one random split of dataset
- only 10% validation
- no details about the fillter/activation details (we dont know that exactly in our photos is used to separate the images in 2 classes)

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Deep Political Affinity

Spanish Political Affinity with DNN: Socialist vs People's Party

(to be published after the event)

RESULTS

Small CNNs

- If you want a classifier to predict the political affinity of a person, you could get a small dataset with Internet images, and using keras augmented data and a small CNN (*Conv-Conv-Conv-FC*, similar with LeCun), you can obtain an accuracy **over 80% in few minutes**.

VGG16 transfer learning

- If we try to use VGG16 transfer learning for our current dataset, no better results will be obtained than small CNNs (**over 80% test accuracy**). Remember we used the original dataset of only 100 images, **without data augmentation** because of the transfer learning advantage.

VGG16 fine tuning

- If you apply the fine tuning for the last conv block of VGG16 + FC (top model), you can obtain an accuracy of 75%. This values is no better compare with the small CNN and the Transfer Learning results (over 80%).
- But if you train the last 2 Conv block of VGG16 + FC (top model), you can obtain test accuracy of **85%**!

Deep Political Affinity

Spanish Political Affinity with DNN: Socialist vs People's Party

(to be published after the event)

Applications

- Targeting people in social networks with specific advertising
- Political affinity screening for statistics or recruitment
- Improvement of business deals using related affinities with political preferences (preference for religion, war, traditional family, etc.)
- Mix with other information to create a person model to predict future behavior
- Extend the model to multiple political parties or general political affinity such as right vs left vs center (or other levels)
- Extend the model to international politics
- Create mobile apps for live screening for augmented reality applications

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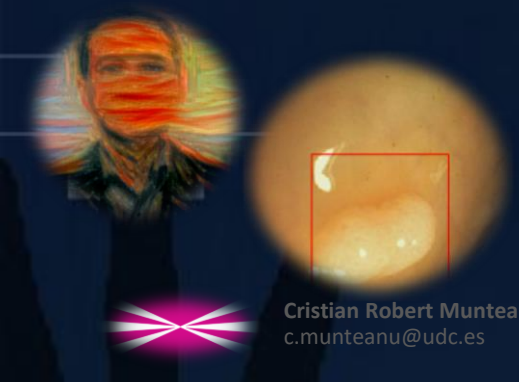

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