

Welcome - Dirty GANcing

<https://tinyurl.com/amlid2020>

Follow the installation instructions to run the code on your laptop

Today's program

1. Convolutional Neural Networks
2. Pose Estimation
3. Generative Adversarial Networks
4. Motion Transfer

Welcome!

Machine Learning
Engineer

Gaetan



Engagement Manager

Axel



Machine Learning
Engineer

Thibault



Machine Learning
Engineer

Pelayo



Machine Learning
Engineer

Gianluca

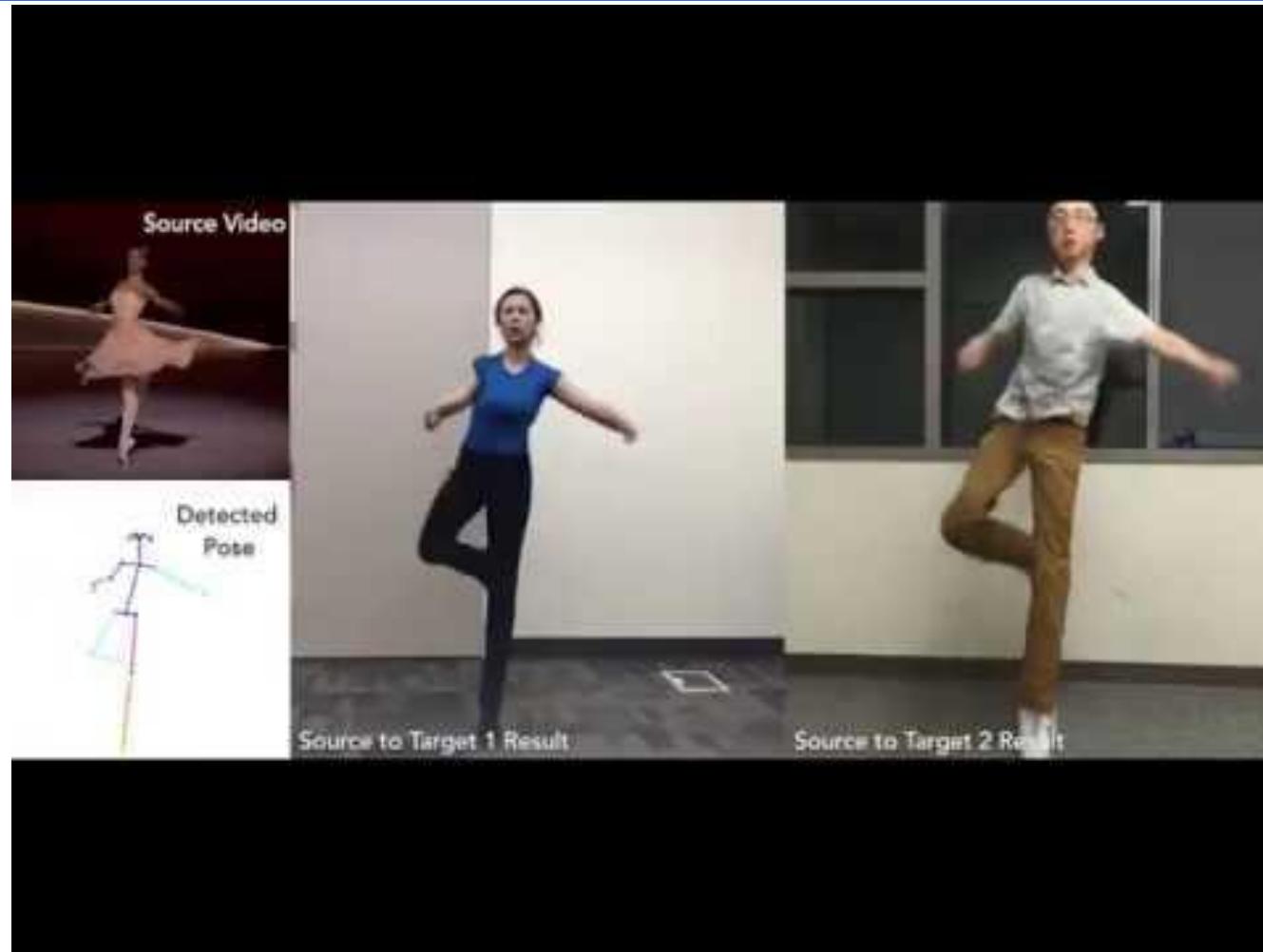


Machine Learning
Engineer

Guillaume



“Do as I do” Motion Transfer



Building Blocks

1



Convolutional Neural
Networks

2



Pose Estimation

3



Generative Adversarial
Networks

4



Motion Transfer

Building Blocks

1



Convolutional Neural
Networks

2



Pose Estimation

3



Generative Adversarial
Networks

4



Motion Transfer

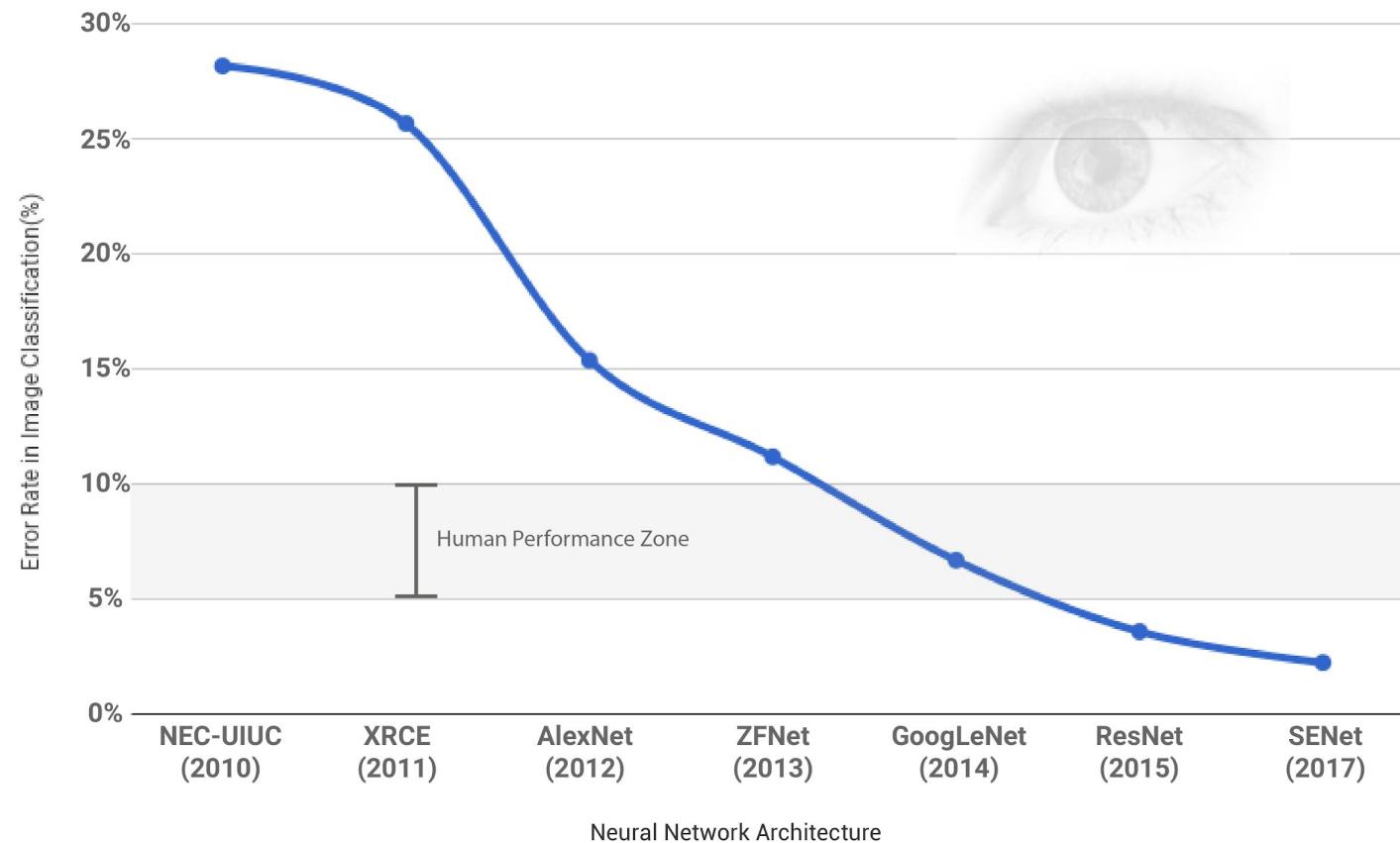
Convolutional Neural Networks

Classical Computer Vision: *exists*

ConvNets:

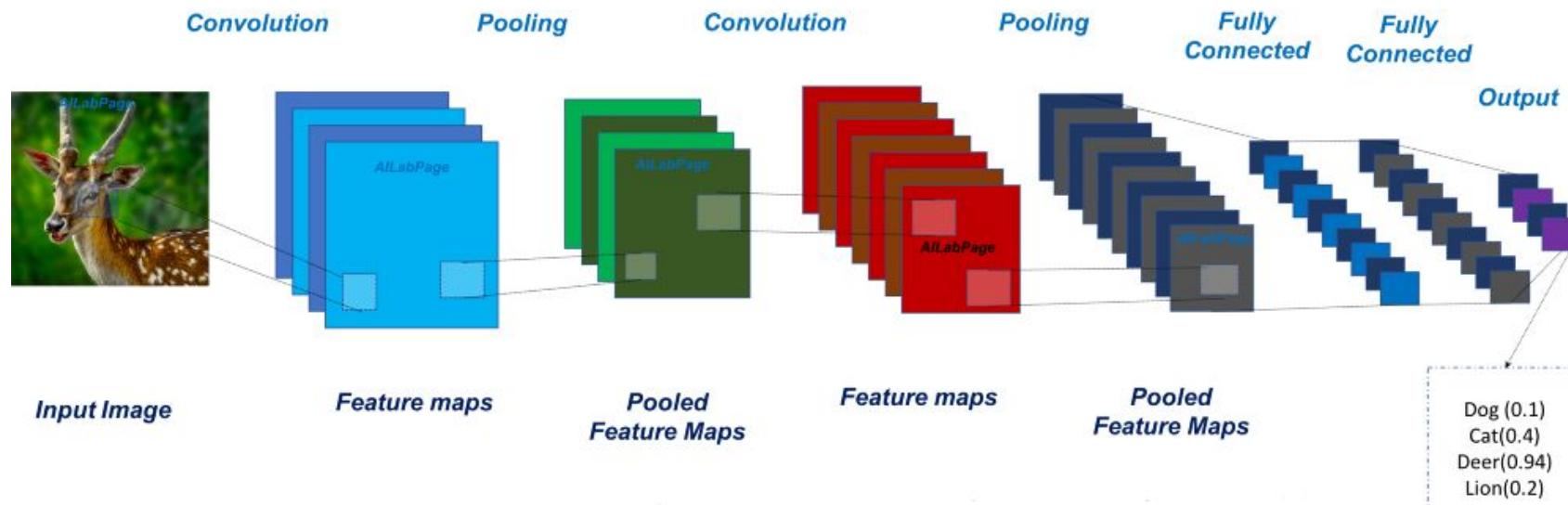


Convolutional Neural Networks



Convolutional Neural Networks

Class of deep neural networks, most commonly applied to analyzing visual imagery.



- 1) Convolution
- 2) Non Linearity (ReLU)

- 3) Pooling
- 4) Classification

Convolutions

1 <small>$\times 1$</small>	1 <small>$\times 0$</small>	1 <small>$\times 1$</small>	0	0
0 <small>$\times 0$</small>	1 <small>$\times 1$</small>	1 <small>$\times 0$</small>	1	0
0 <small>$\times 1$</small>	0 <small>$\times 0$</small>	1 <small>$\times 1$</small>	1	1
0	0	1	1	0
0	1	1	0	0

Image

4		

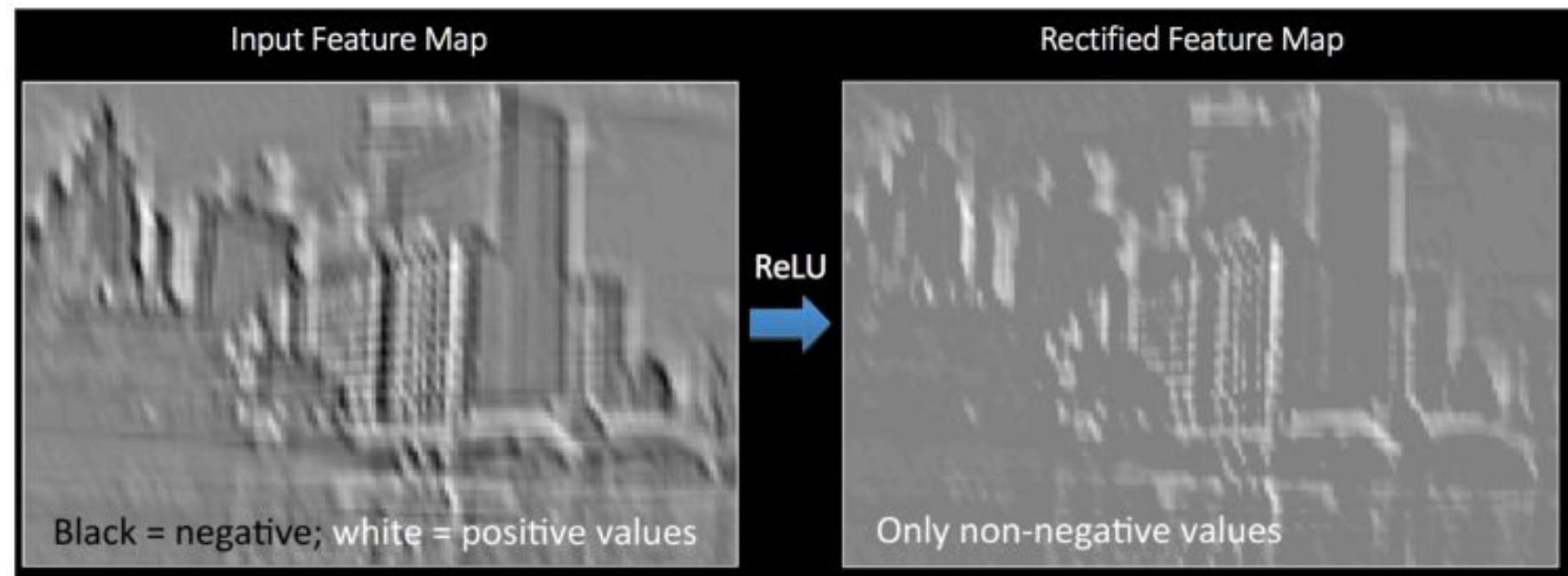
Convolved
Feature



Non Linearity (ReLU)

ReLU is an element wise operation and replaces all negative pixel values in the feature map by zero.

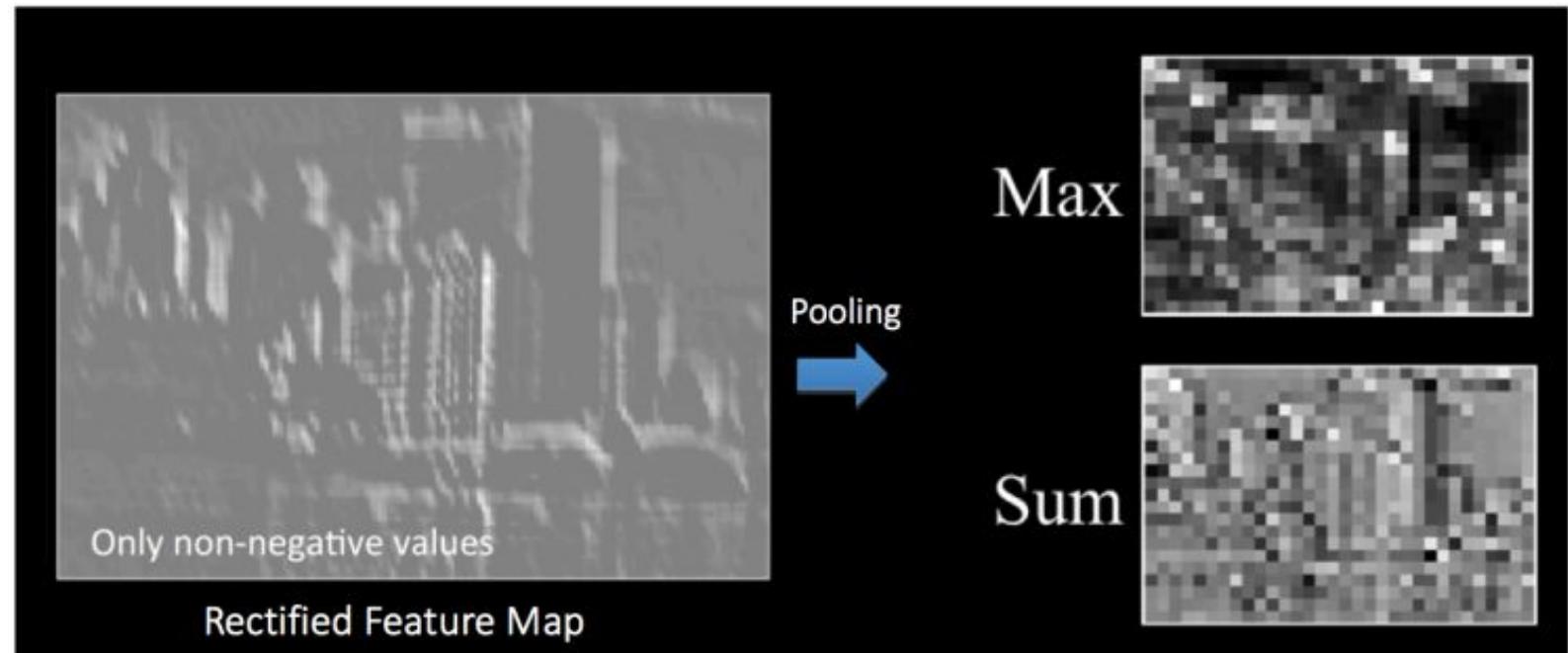
→ Introduce non-linearity in the ConvNet.



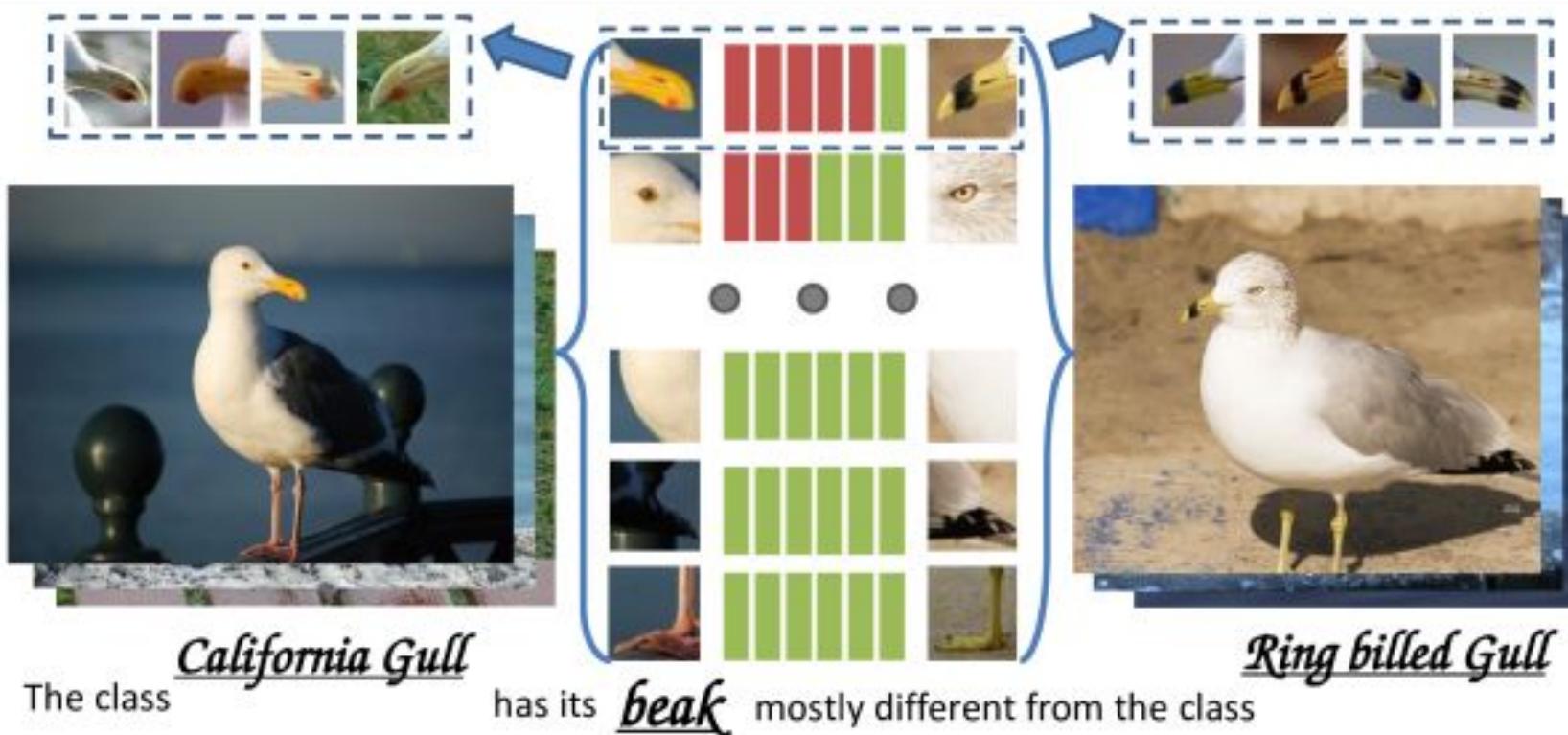
Pooling

Spatial Pooling reduces the dimensionality of each feature map but retains the most important information.

→ Progressively reduce the spatial size of the input representation



Classification



Building Blocks

1



Convolutional Neural
Networks

2



Pose Estimation

3



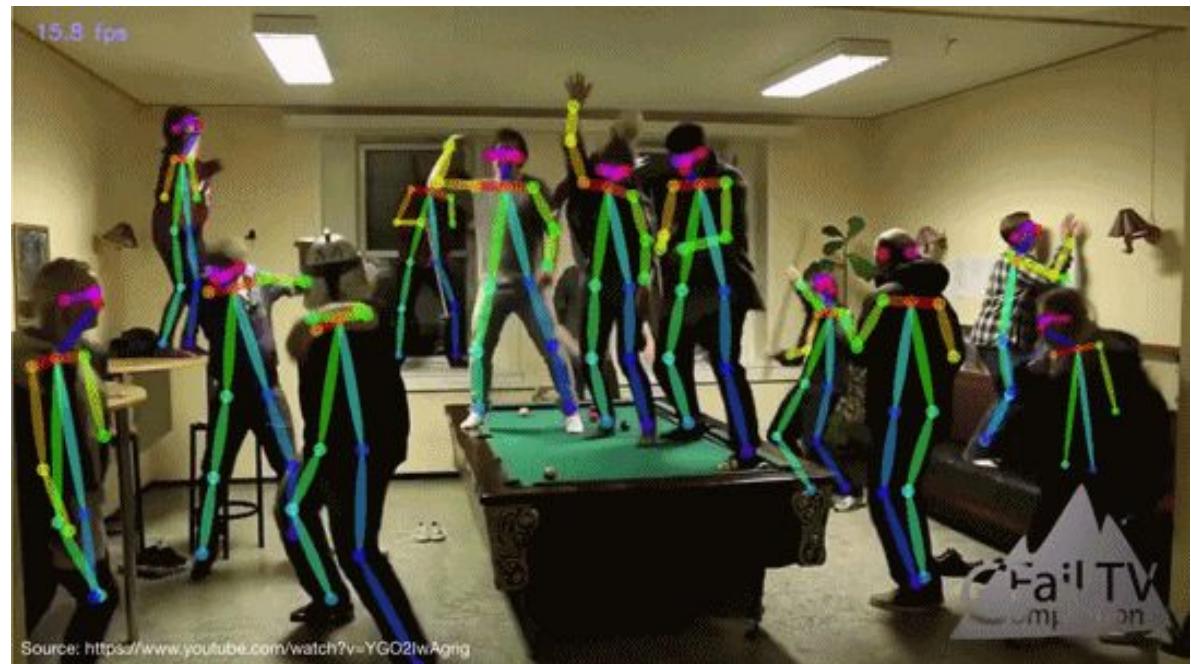
Generative Adversarial
Networks

4



Motion Transfer

Pose Estimation

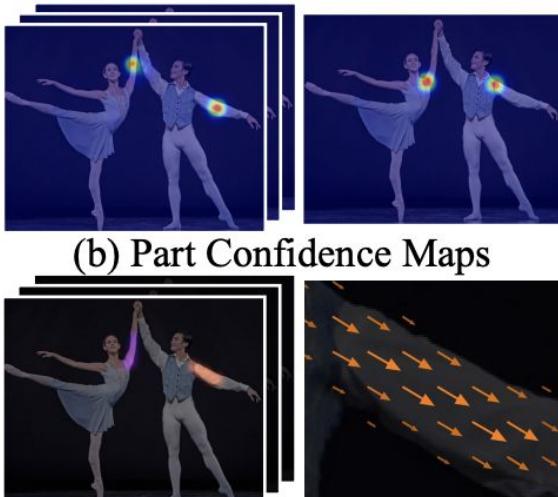


Cao et al., “Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields” (2017)

Pose Estimation



(a) Input Image



(b) Part Confidence Maps

(c) Part Affinity Fields



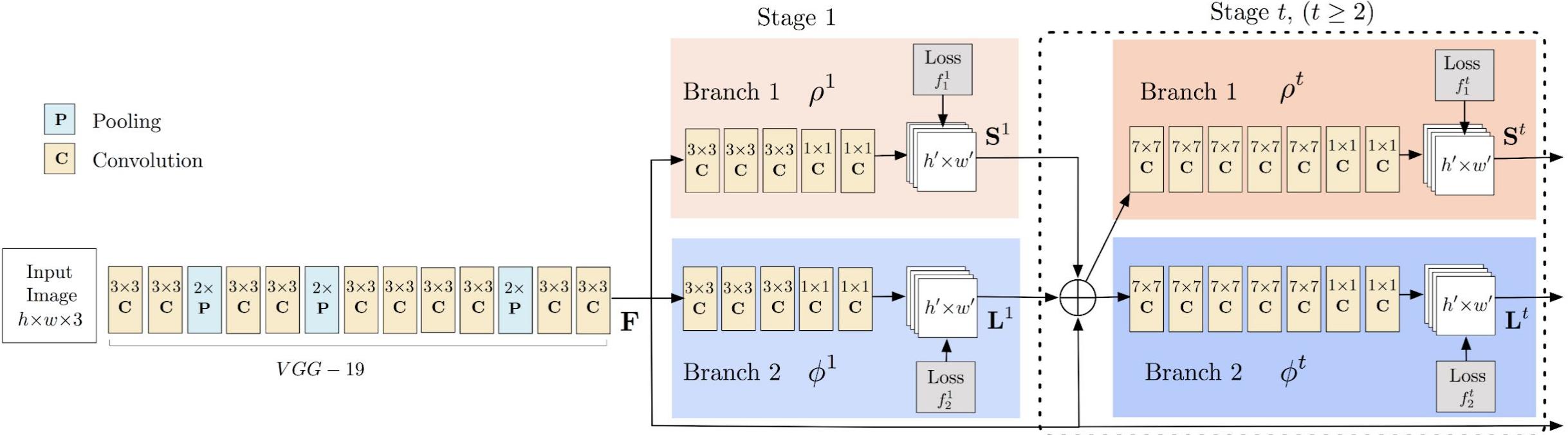
(d) Bipartite Matching



(e) Parsing Results

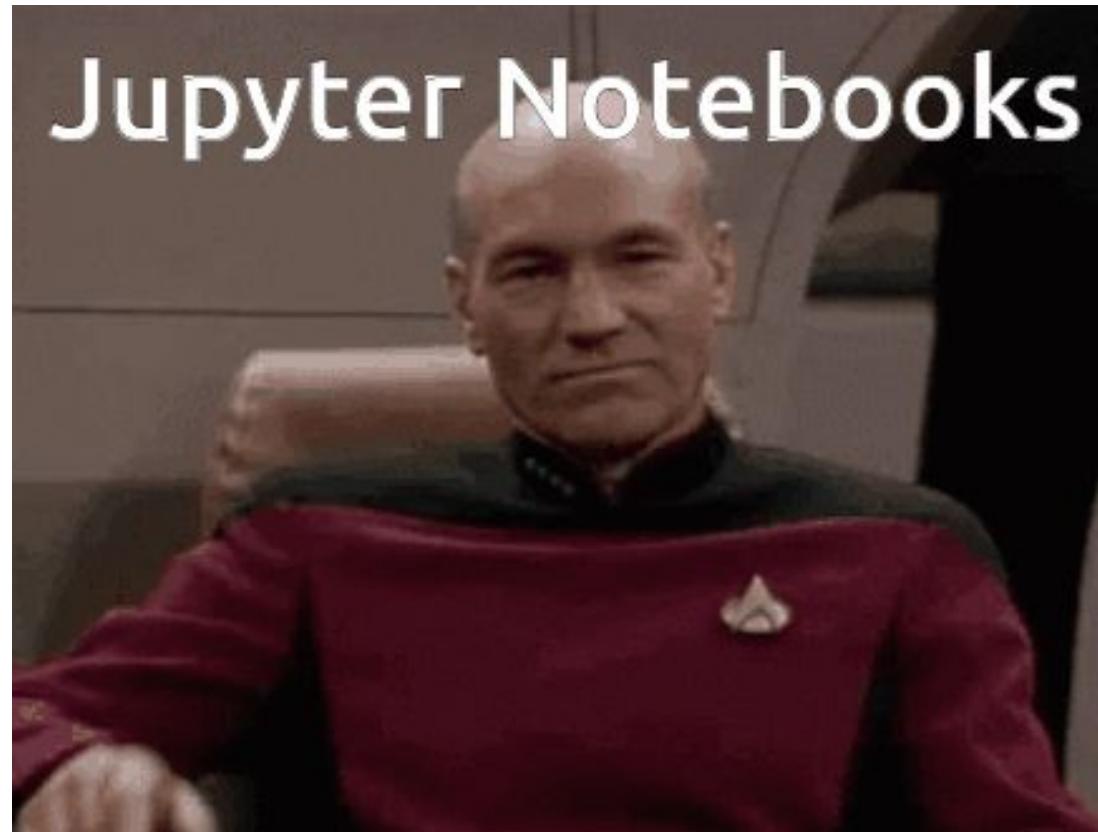
Cao et al., "Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields" (2017)

Architecture



Cao et al., "Realtime Multi-Person 2D Pose Estimation using Part Affinity Fields" (2017)

Pose Estimation



Jupyter Notebooks

[/notebooks/position_estimation/Pose-Estimation.ipynb](#)

Building Blocks

1



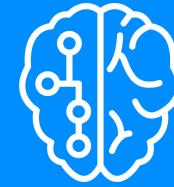
Convolutional Neural
Networks

2



Pose Estimation

3



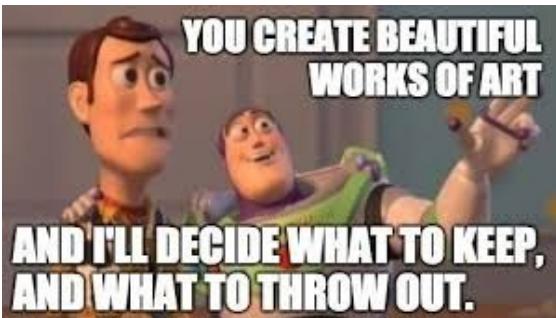
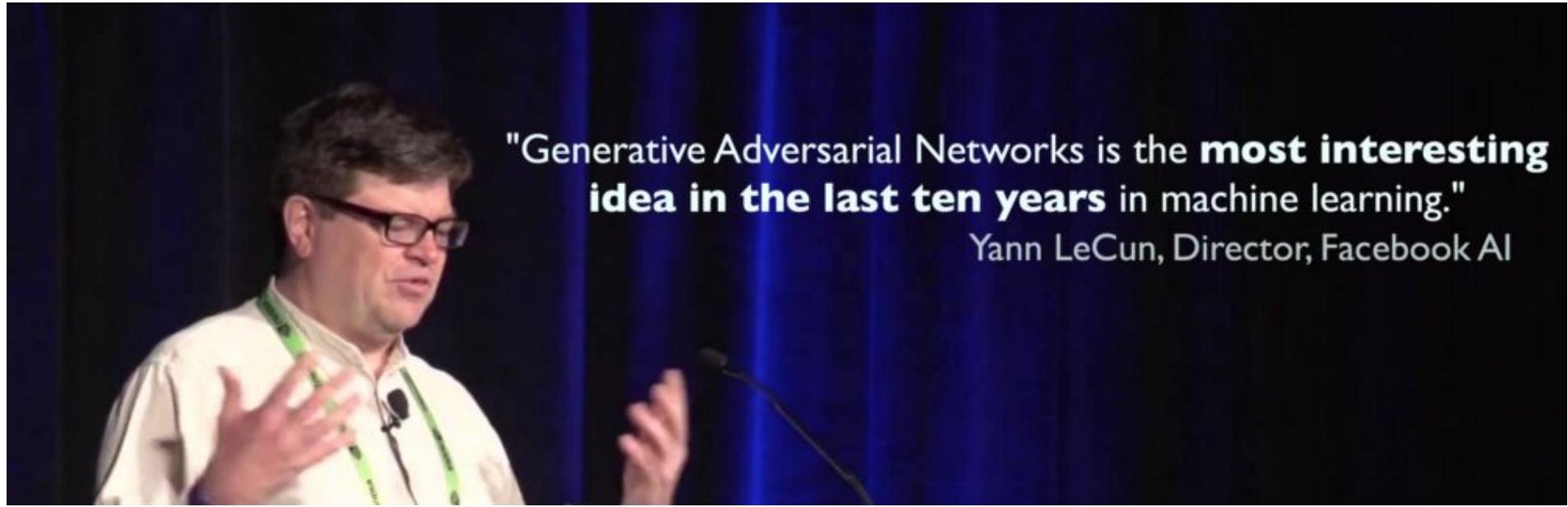
Generative Adversarial
Networks

4



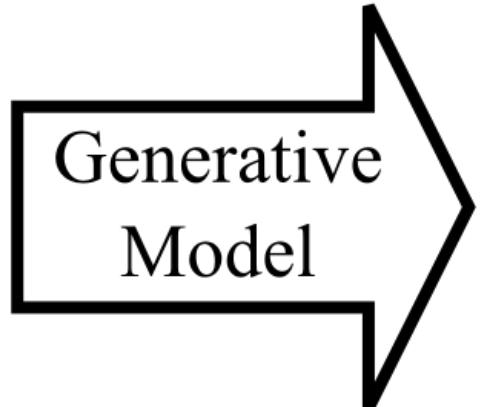
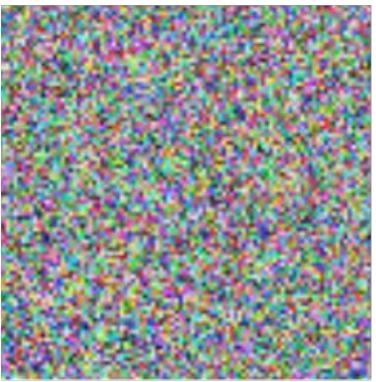
Motion Transfer

Generative Adversarial Networks

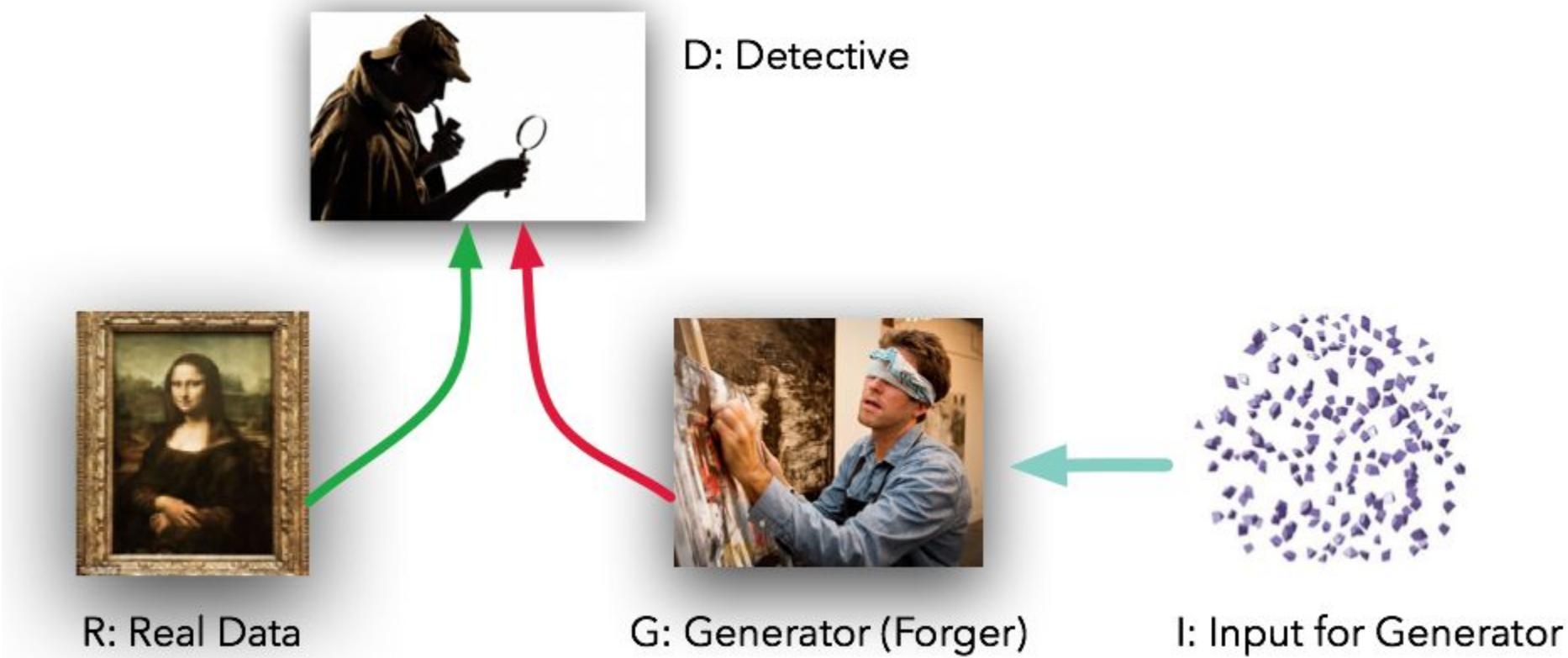


Generative Models

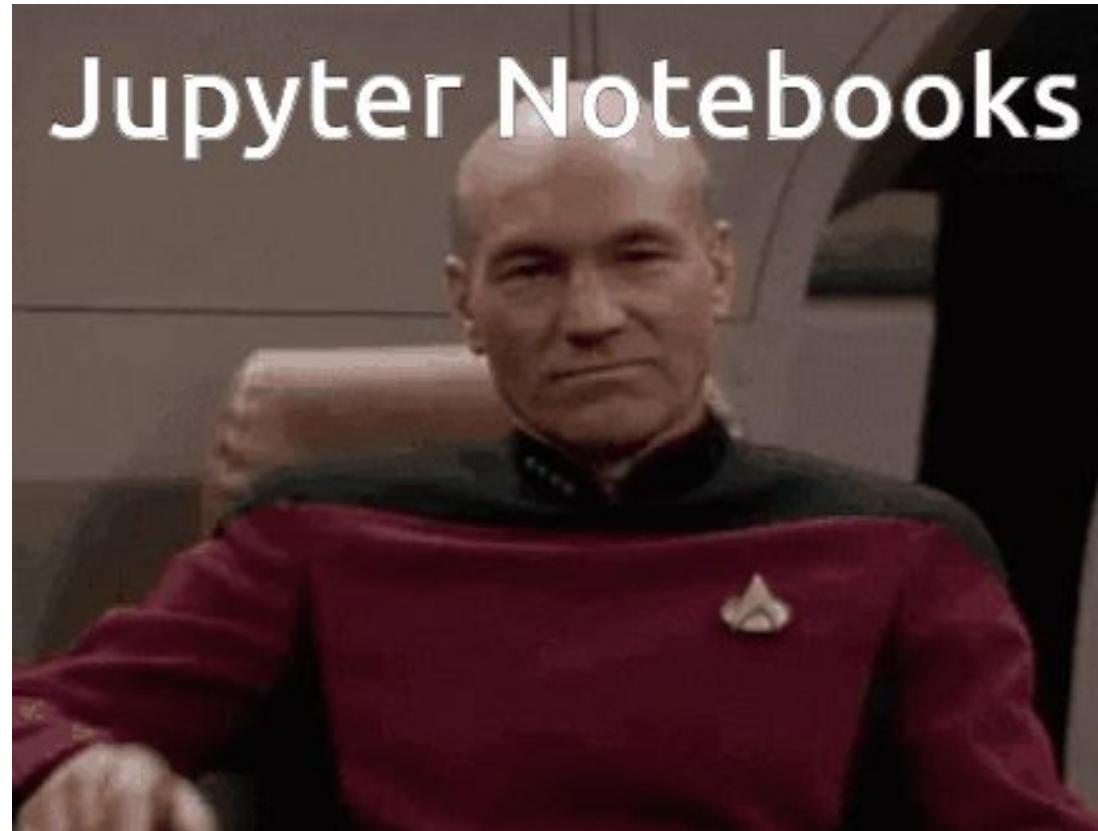
Noise $\sim N(0,1)$



Generative Adversarial Networks



Generative Adversarial Networks



[`/notebooks/position_estimation/Pose-Estimation.ipynb`](#)

Generative Adversarial Networks



[This Person Does Not Exist](#)

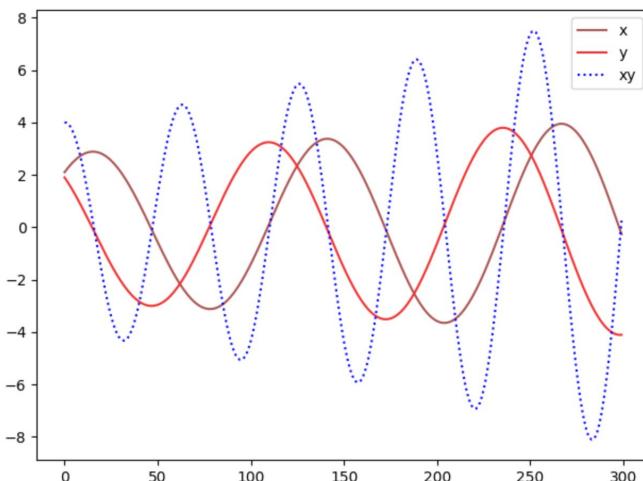
Goodfellow et al., "Generative Adversarial Nets" (2014)

Karras et al., "Analyzing and Improving the Image Quality of StyleGAN" (2019)

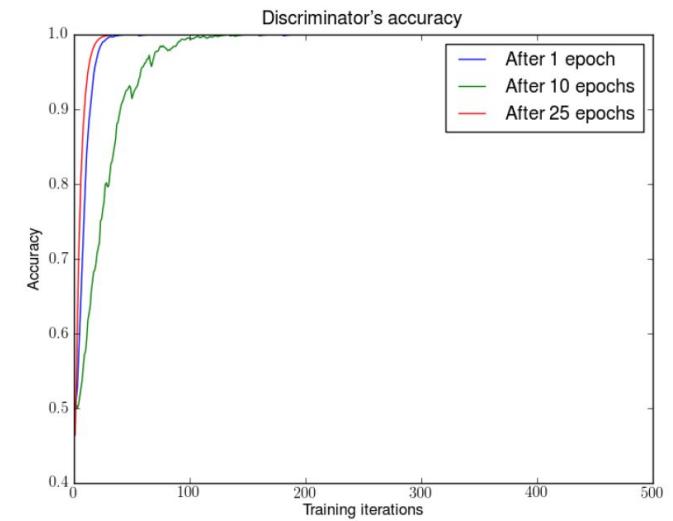
Generative Adversarial Networks Issues



Mode Collapse



Non-Convergence



Diminished Gradient

Building Blocks

1



Convolutional Neural
Networks

2



Pose Estimation

3



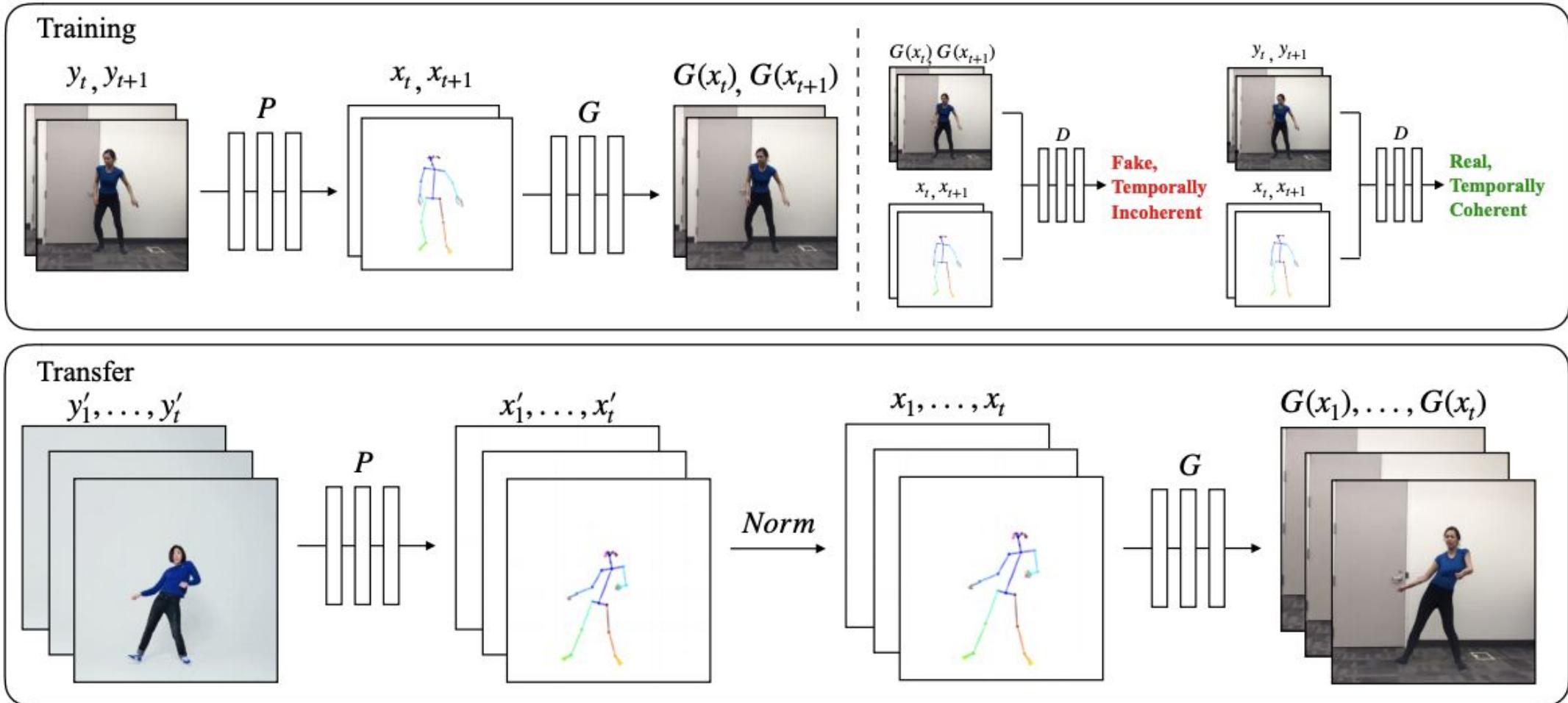
Generative Adversarial
Networks

4

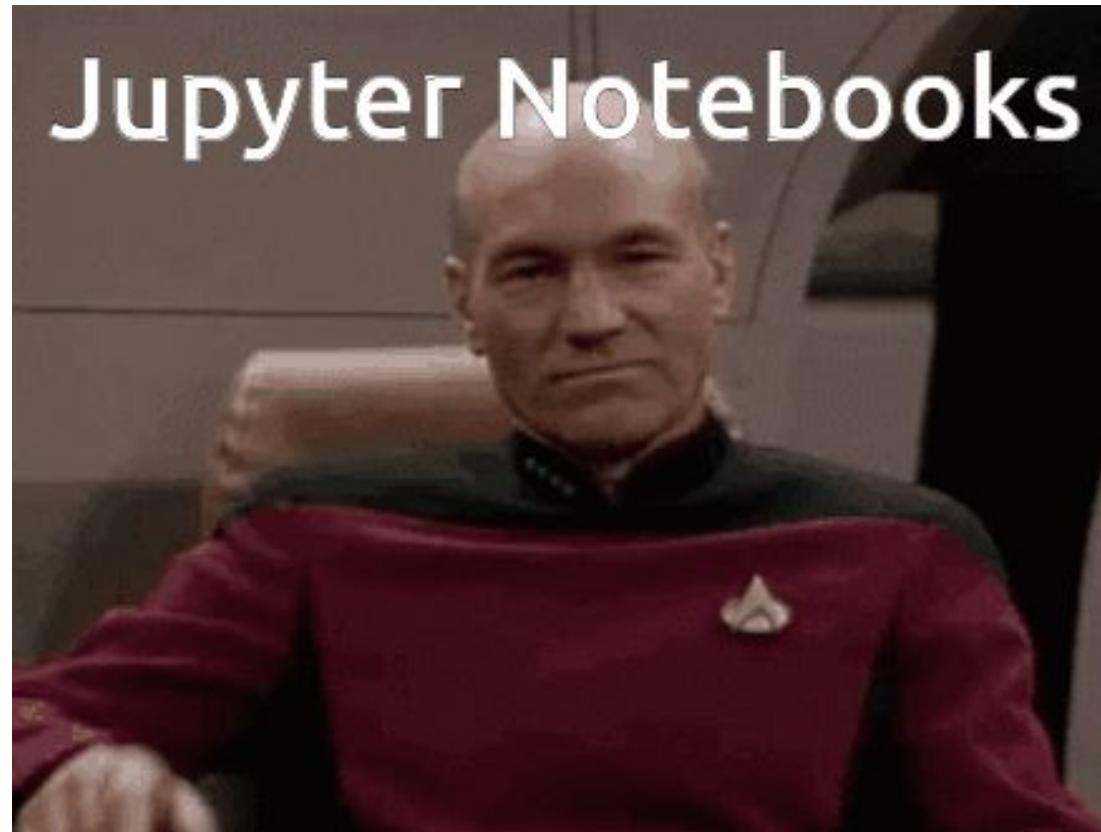


Motion Transfer

Motion Transfer



Motion Transfer



Jupyter Notebooks

[`/notebooks/position_estimation/Pose-Estimation.ipynb`](#)

Take Aways

- Always break down complex problems into digestible parts
 - *Machine Learning is fun!*

Thank you!

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