

Introduction to Image Generation

What we will be covering in this module?

- Introduction to Image Generation



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- Introduction to Image Generation
- What are Generative Models?



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- Introduction to Image Generation
- What are Generative Models?
- Understanding Generative Adversarial Networks



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- Introduction to Image Generation
- What are Generative Models?
- Understanding Generative Adversarial Networks
- Project on Texture Generation using GANs

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 - Better GAN Architectures

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- What are Generative Models?
- Understanding Generative Adversarial Networks
- Project on Texture Generation using GANs
 - Simple Implementation
 - Better GAN Architectures
- What's Next?

Recap on problems in Computer Vision



Recap on problems in Computer Vision

Q. What is the object present in the image?

There is a dog!

Formulate this as **image classification** problem



Recap on problems in Computer Vision

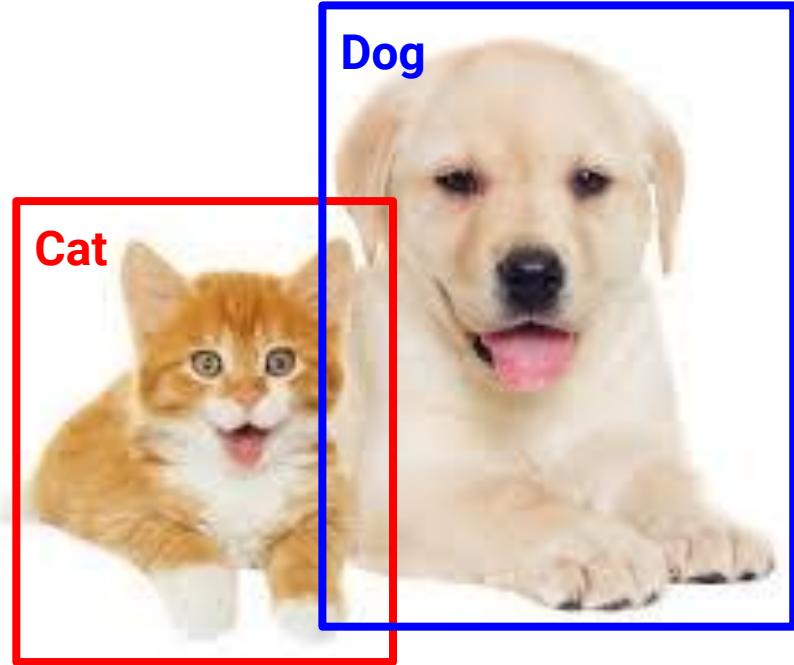
Q. What are the objects present in the image? Where are they?

There is a dog and a cat!

The dog → blue box

The cat → red box

Formulate this as **object detection** problem



Recap on problems in Computer Vision

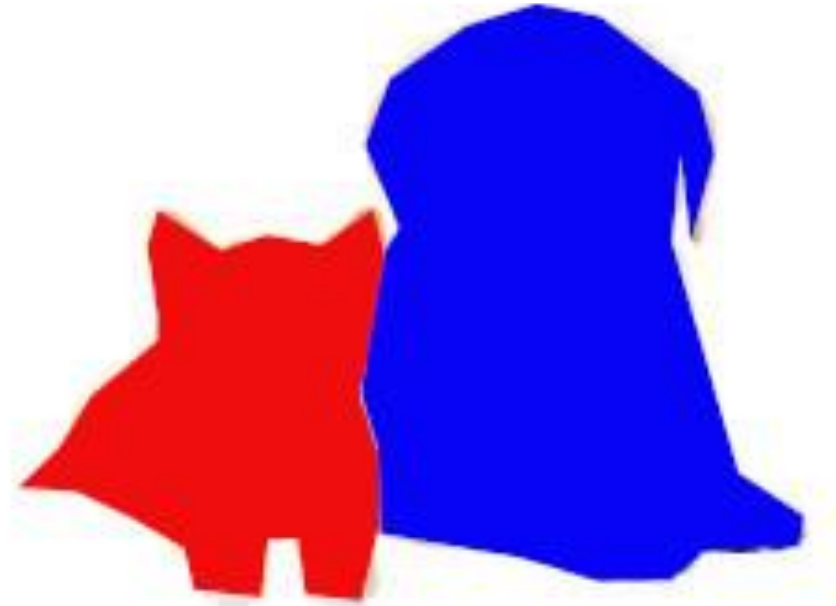
Q. What are the objects present in the image? Where are they exactly?

There is a dog and a cat!

The dog → coloured as blue

The cat → coloured as red

Formulate this as **image segmentation** problem

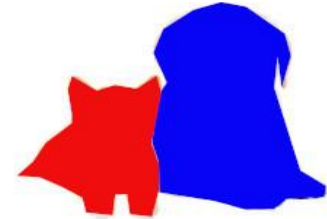
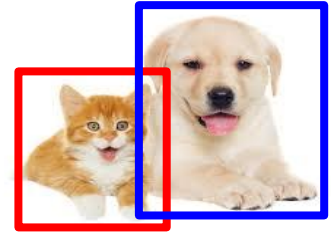


Recap on problems in Computer Vision

There is a Dog and a Cat!



Analytics
Vidhya

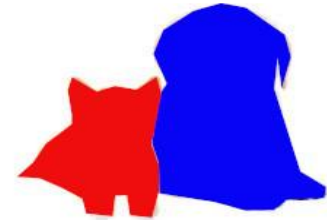
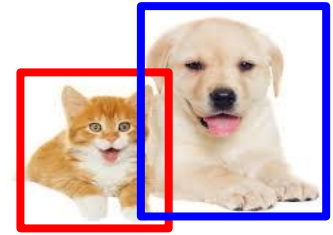


What is Image Generation?

There is a Dog and a Cat!



Analytics
Vidhya



What is Image Generation?

Give me an image of a Dog



What is Image Generation?

Give me an image of a Dog



Image Generation is the task of generating completely new realistic images which does not belong to the training dataset, but resembles them

Applications of Image Generation



Applications of Image Generation

- Synthetic Dataset Creation
 - For training DL models



Source: <https://arxiv.org/pdf/1612.07828.pdf>

Applications of Image Generation

- Synthetic Dataset Creation
 - For training DL models
- Image Editing
 - Reconstruct Variations

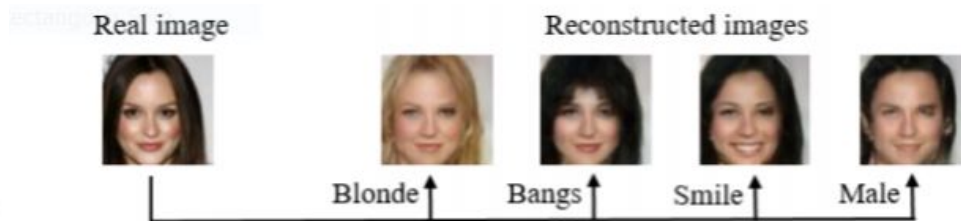


Figure 1: Example of how the IcGAN reconstructs and applies complex variations on a real image.

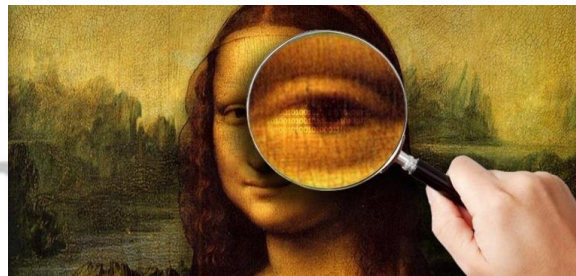
Source: <https://arxiv.org/pdf/1611.06355.pdf>



Source: <https://github.com/hezhangsprinter/ID-CGAN>

Applications of Image Generation

- Synthetic Dataset Creation
 - For training DL models
- Image Editing
 - Reconstruct Variations
- Cyber Security
 - Detecting forgery



How to solve an Image Generation problem?

Give me an image of a Dog

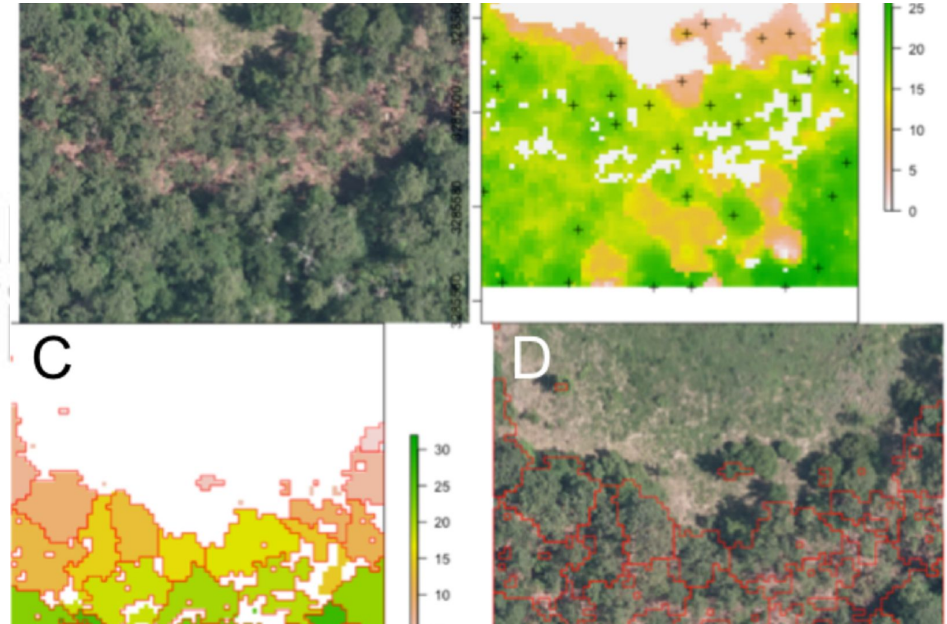




Thank you

Applications of Image Generation

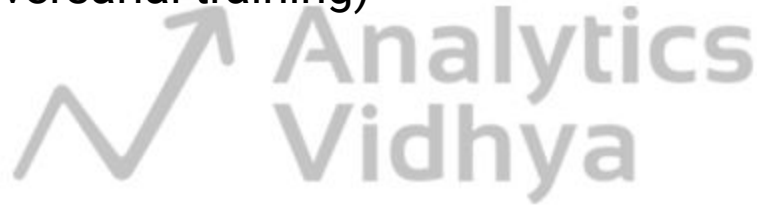
- Medical Imaging
 - Cancer Cell Segmentation
 - Brain Lesion Segmentation
- Self Driving Cars
 - Lane Segmentation
 - Pedestrian Identification
- Satellite imaging / Remote sensing
 - Forest Area Segmentation
 - Locating water bodies (lakes, rivers, oceans)



Source: McMahon CA. 2019. Remote sensing pipeline for tree segmentation and classification in a mixed softwood and hardwood system

Applications of Image Generation

- Synthetic Dataset Creation
- Image Editing
- Cyber Security (adversarial training)



Applications of Image Generation

- Synthetic Dataset Creation
 - For training DL models
- Image Editing
 - Reconstruct Variations
- Cyber Security
 - Addressing adversarial attacks

 Analytics
Vidhya