LOW-LIGHT ENHACEMENT

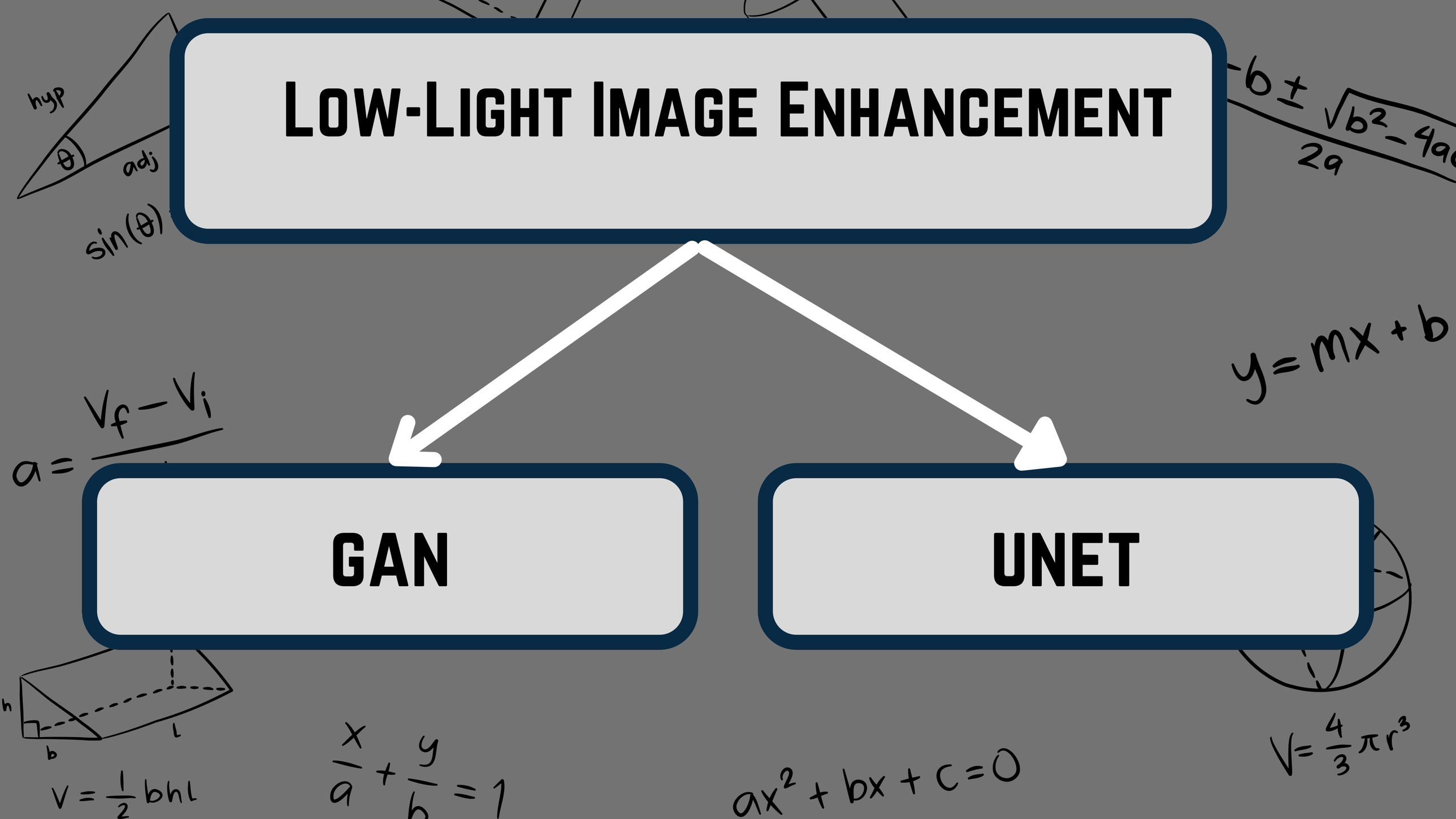
GAN VS UNET

LOL

Low-Light Image Enhancement

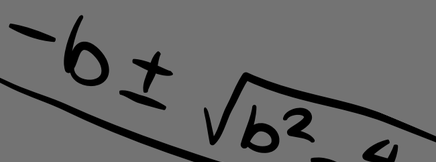
In many real-world scenarios, images are captured in low-light conditions, leading to poor visibility, high noise, and loss of crucial details. This can severely impact applications such as surveillance, autonomous driving, medical imaging, and photography, where clear and well-lit images are essential.

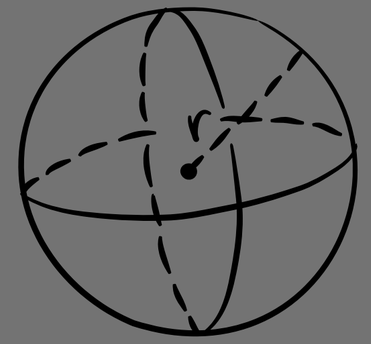
Low-Light Image Enhancement

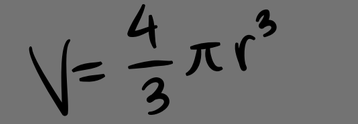


GAN

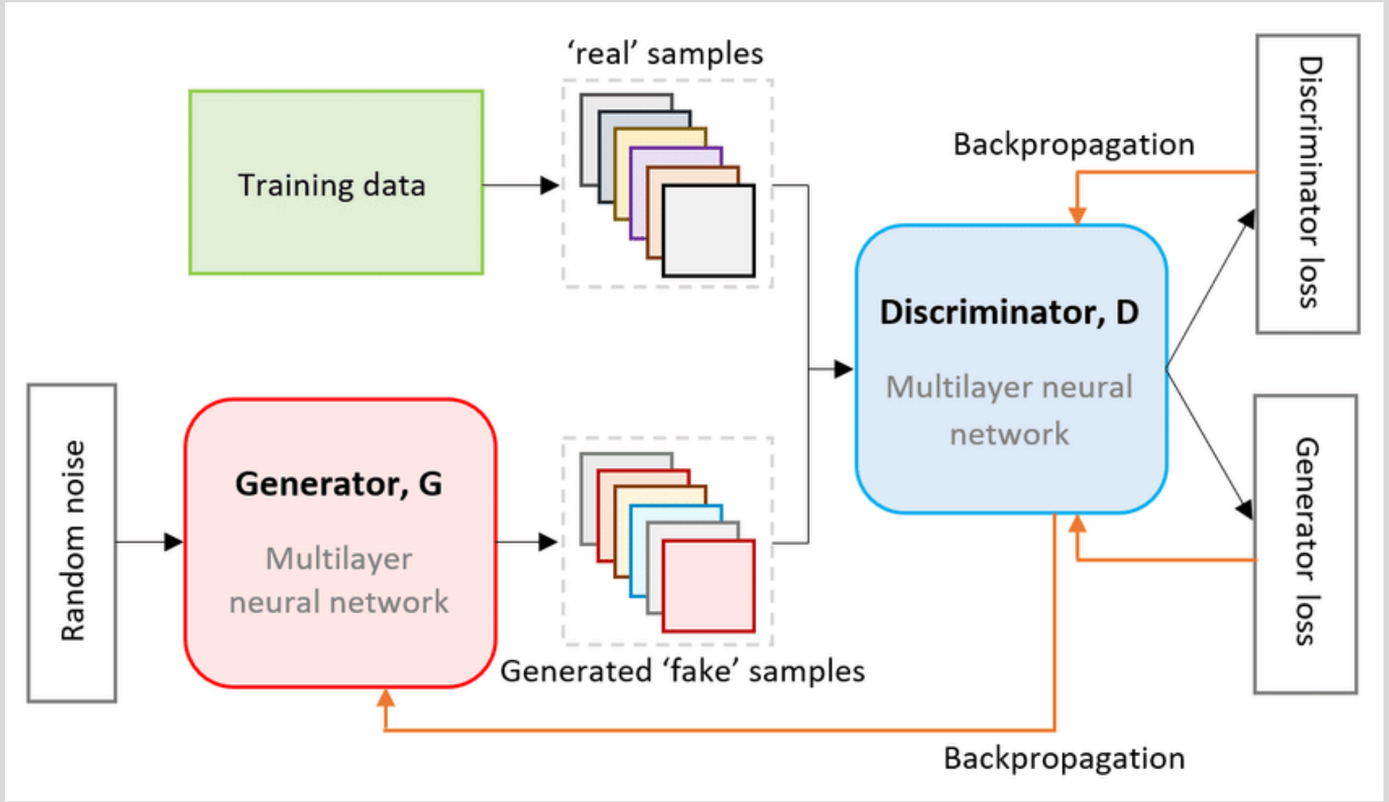
- Composed of a generator (which enhances the low-light image) and a discriminator (which distinguishes real vs. fake enhanced images).
- Learns to generate more realistic, high-quality images.
- Can introduce hallucinations or artifacts.

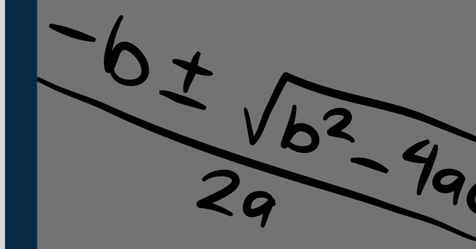




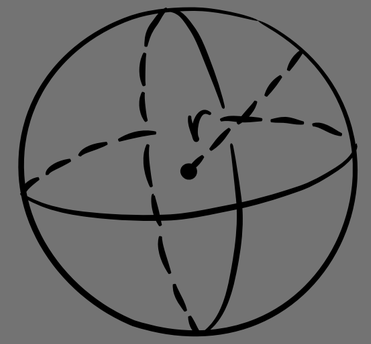


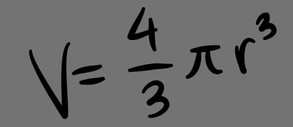
GAN


'real' samples
Training data
Backpropagation
Discriminator loss
Discriminator, D
Multilayer neural network
Random noise
Generator, G
Multilayer neural network
Generator loss
Generated 'fake' samples
Backpropagation


$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

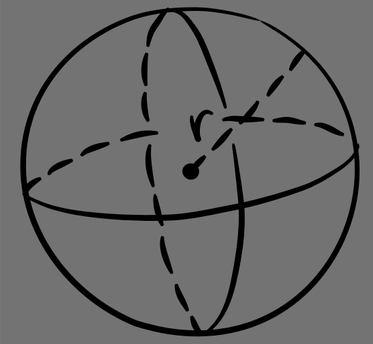

$y = mx + b$


r

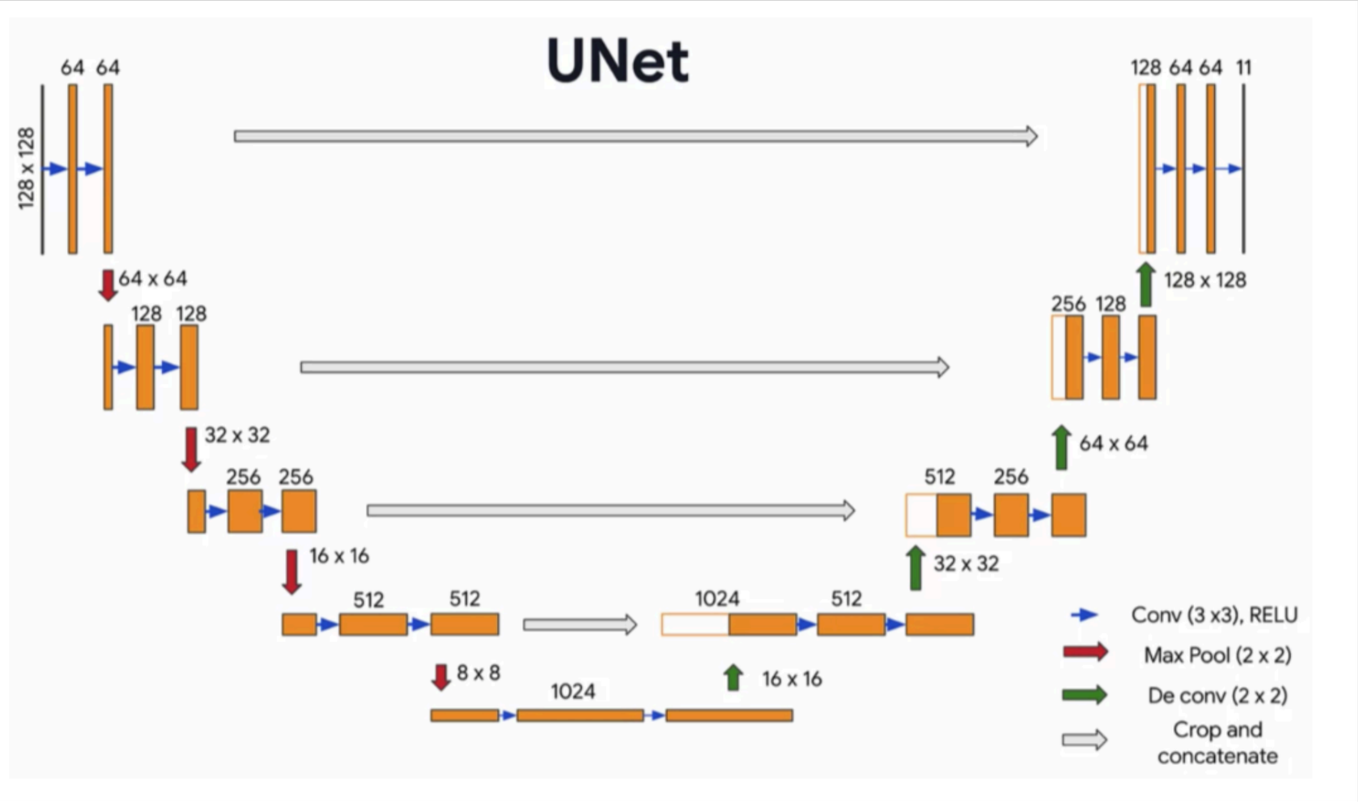

$V = \frac{4}{3}\pi r^3$

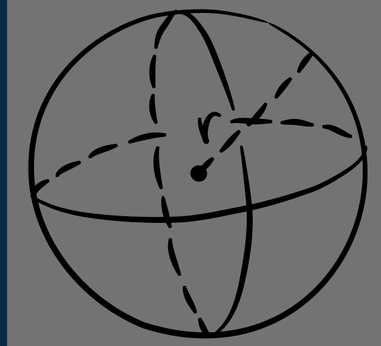
UNET

- Originally designed for biomedical image segmentation.
- Encoder-decoder architecture with skip connections.
- Works as a deterministic model - produces a single output given an input.
- Suitable for pixel-wise regression tasks.

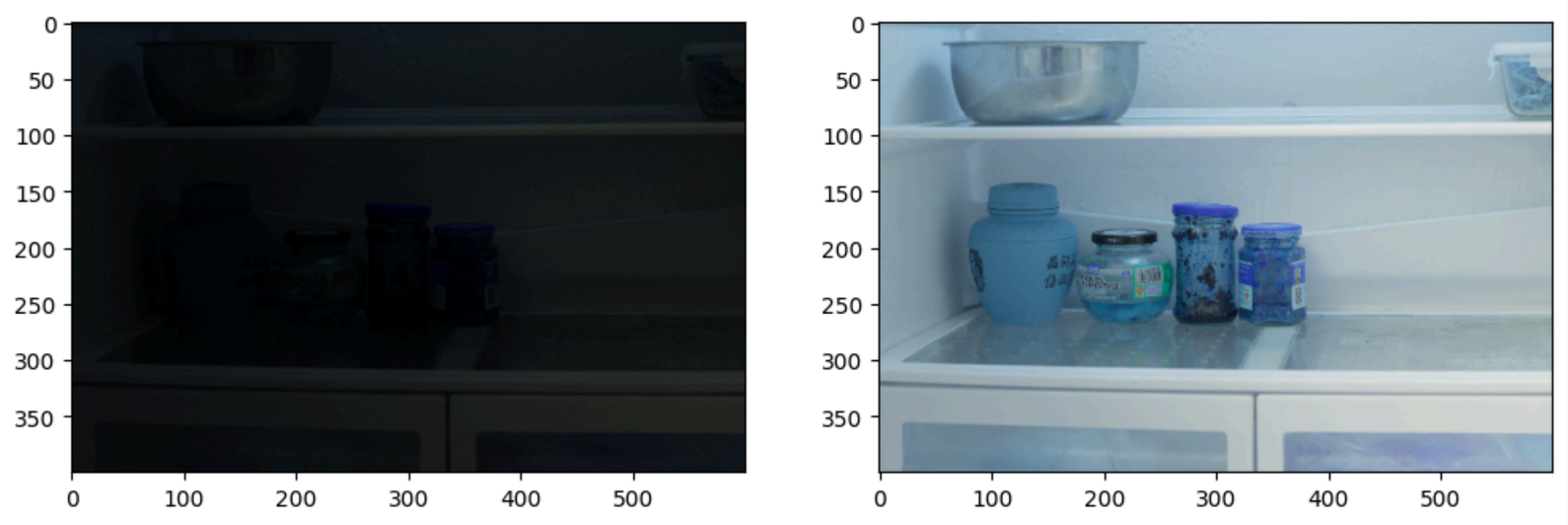


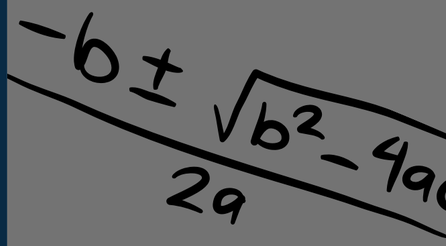
UNET

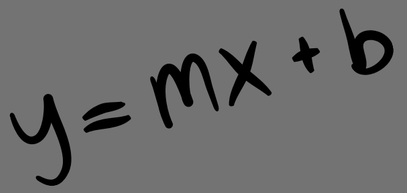

UNet
64 64
128 x 128
64 x 64
128 128
32 x 32
256 256
16 x 16
512 512
8 x 8
1024
1024 512
512 256
256 128
128 64 64 11
128 x 128
64 x 64
32 x 32
16 x 16
Conv (3 x3), RELU
Max Pool (2 x 2)
De conv (2 x 2)
Crop and concatenate

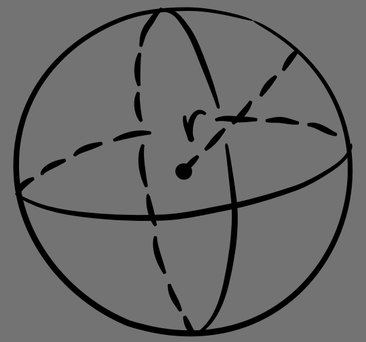

r

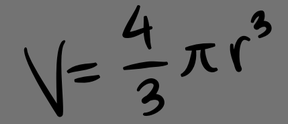
TRAINING DATA



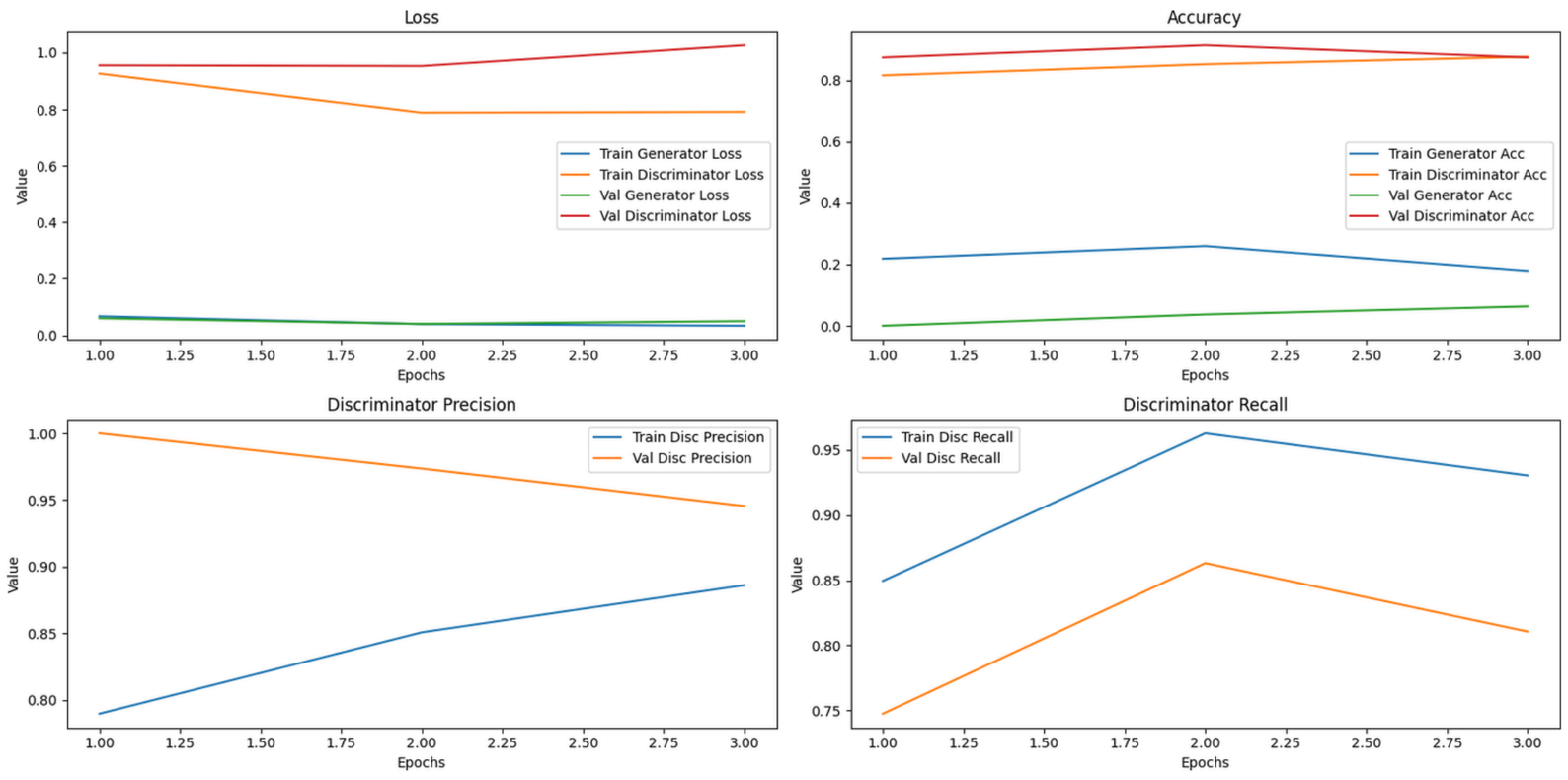


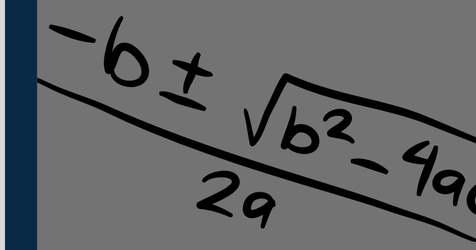


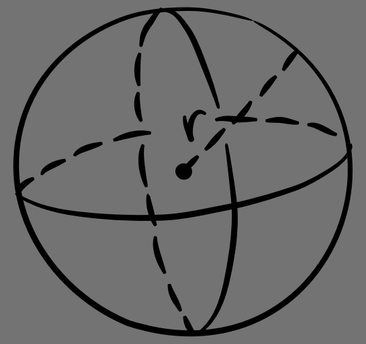


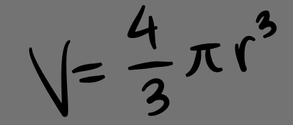


GAN TRAINING

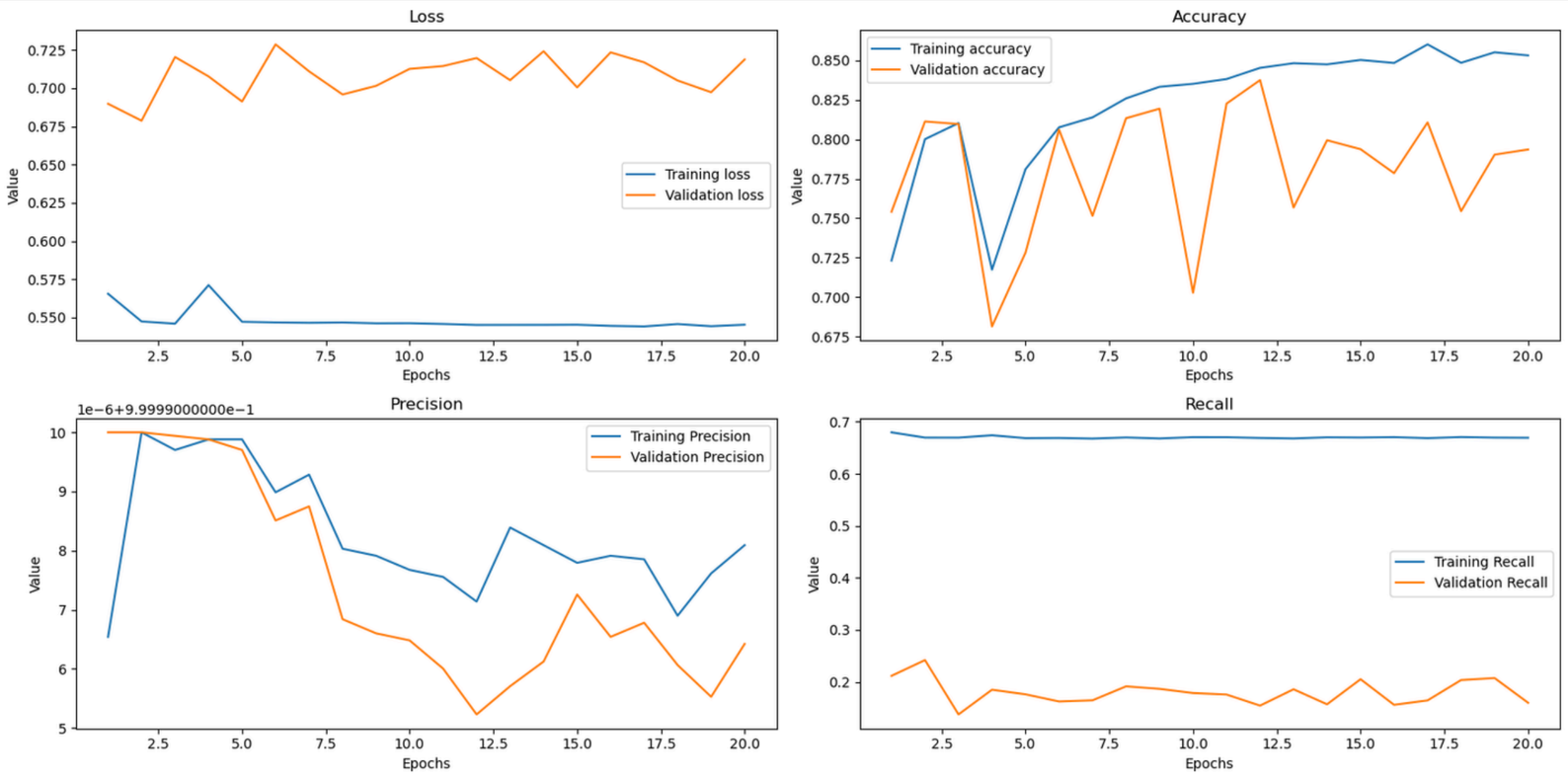


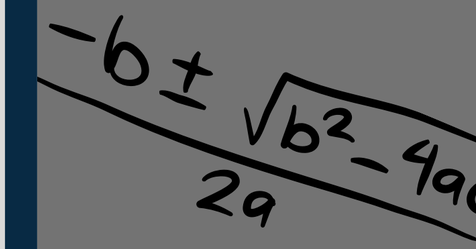


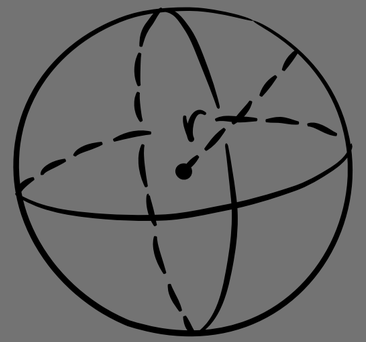


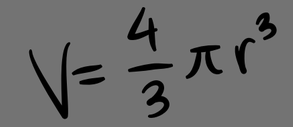


UNET TRANING

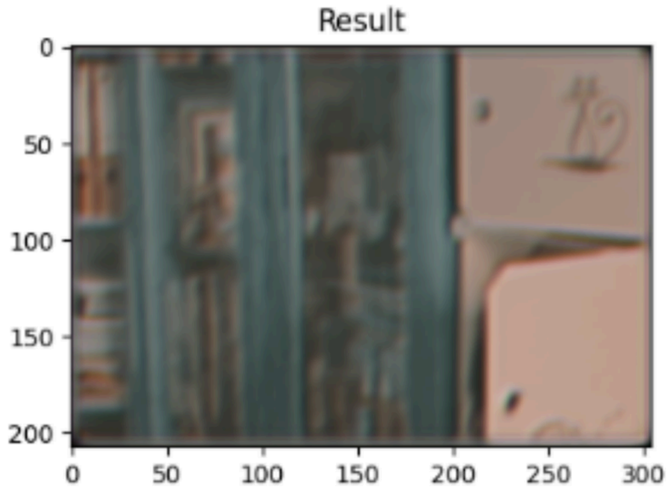


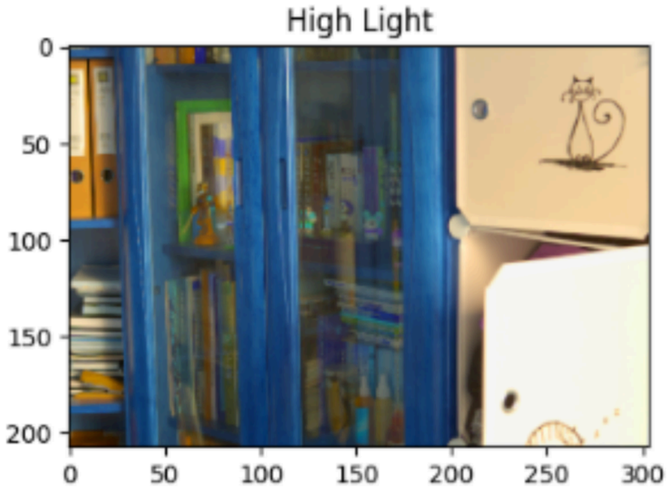


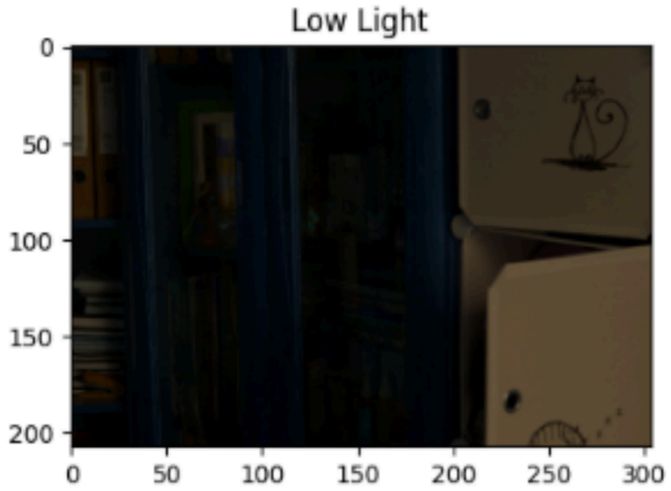


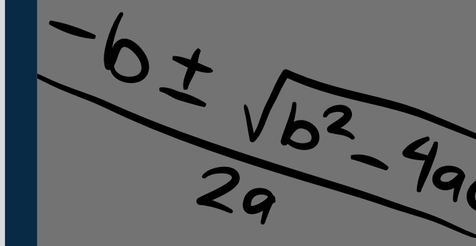


GAN RESULTS

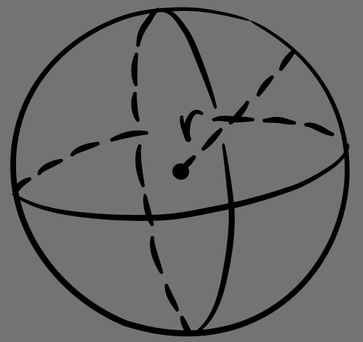






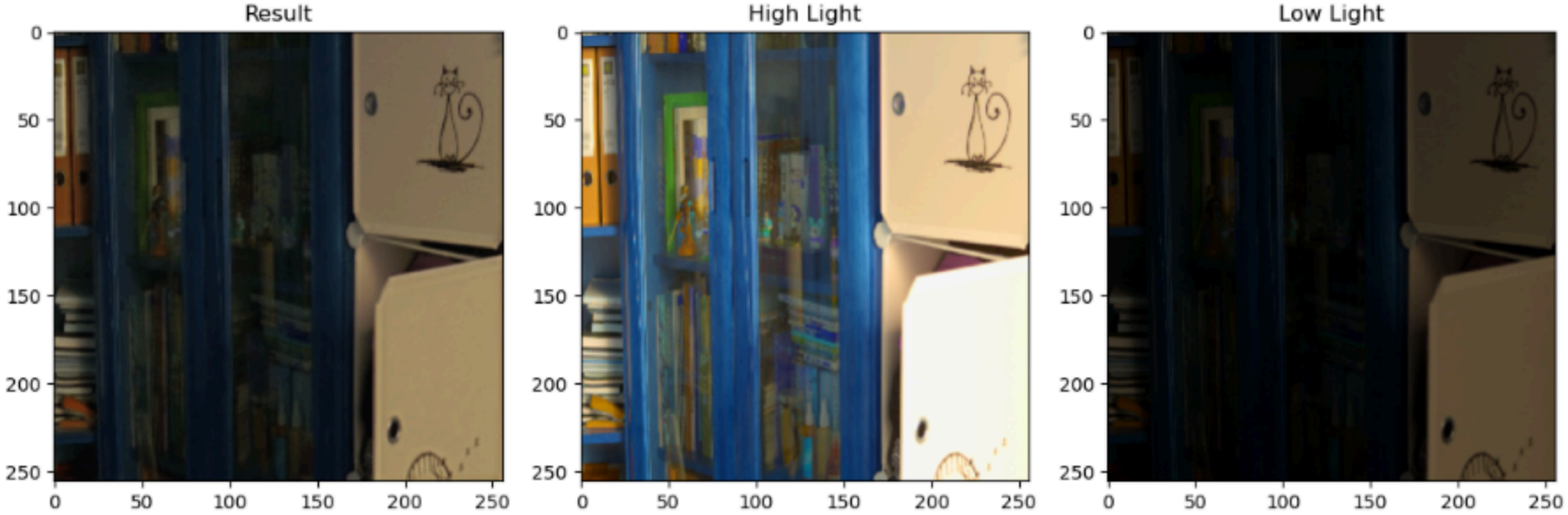


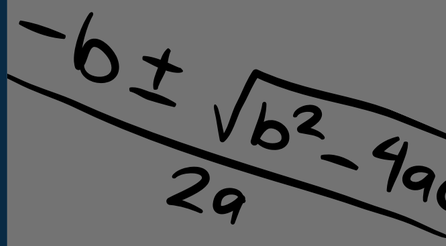
$y = mx + b$



$V = \frac{4}{3}\pi r^3$

UNET RESULTS





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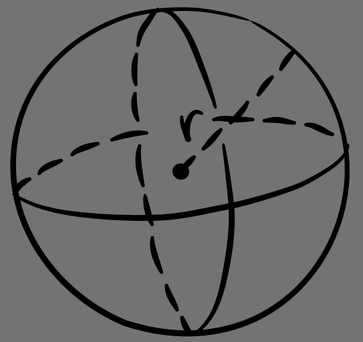

$V = \frac{4}{3}\pi r^3$