Texture Synthesis Using VAEs

CMSC 726 Final Project, UMD -- Fall’17

Texture Synthesis

Figure from Wikipedia: Texture Synthesis

Texture Types

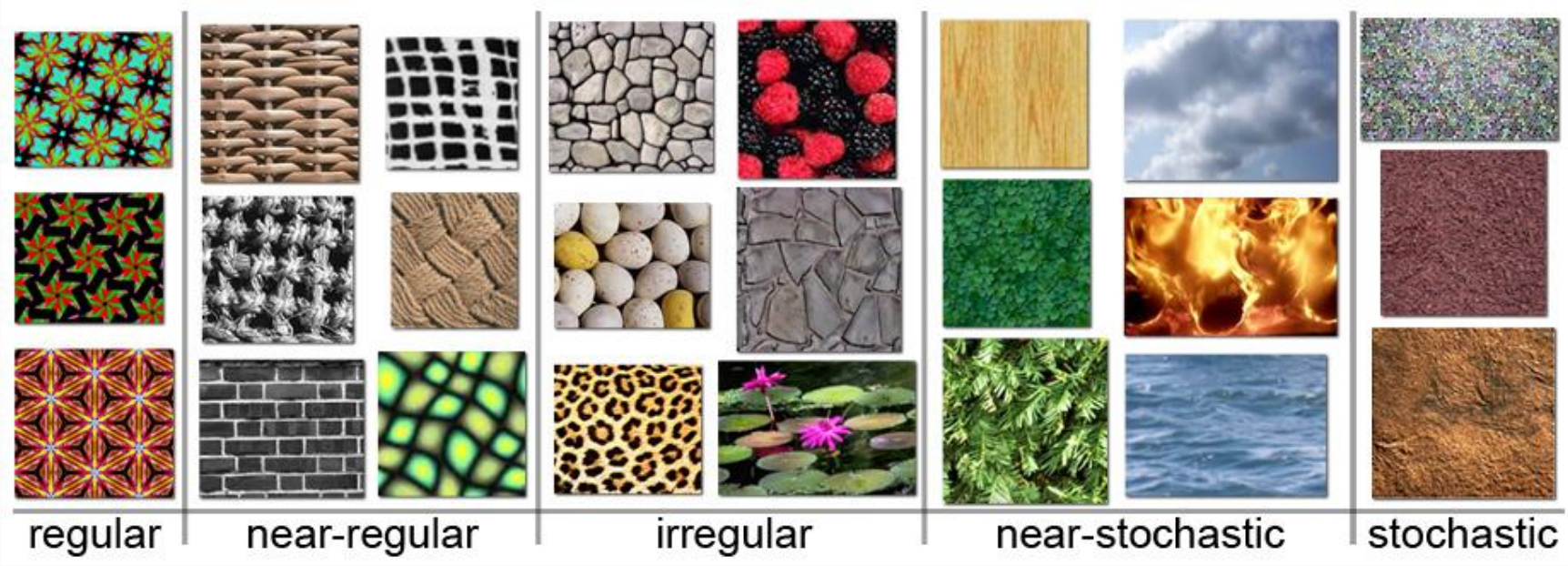


Figure from Wikipedia: Texture Synthesis

Texture Types

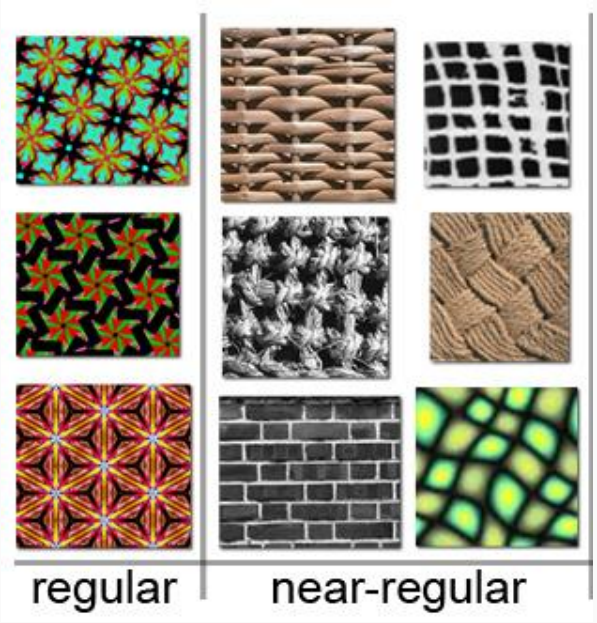
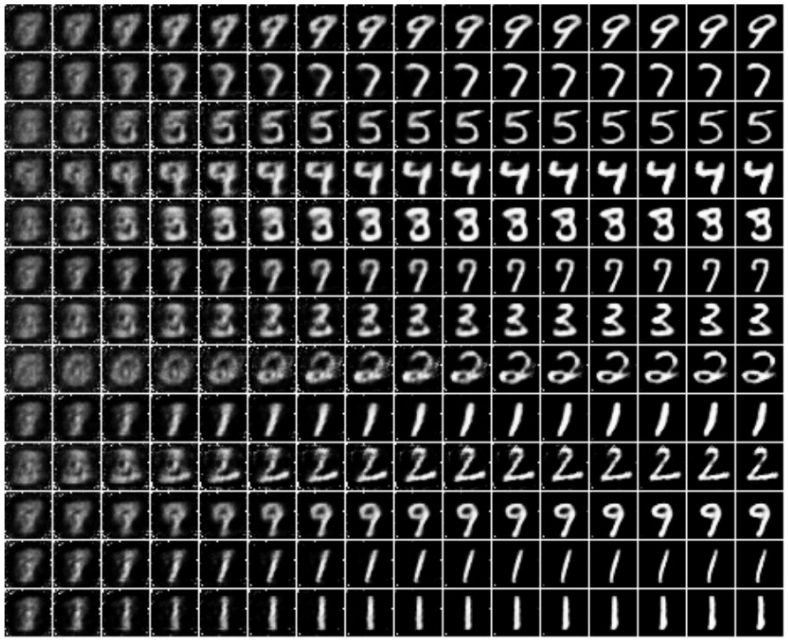


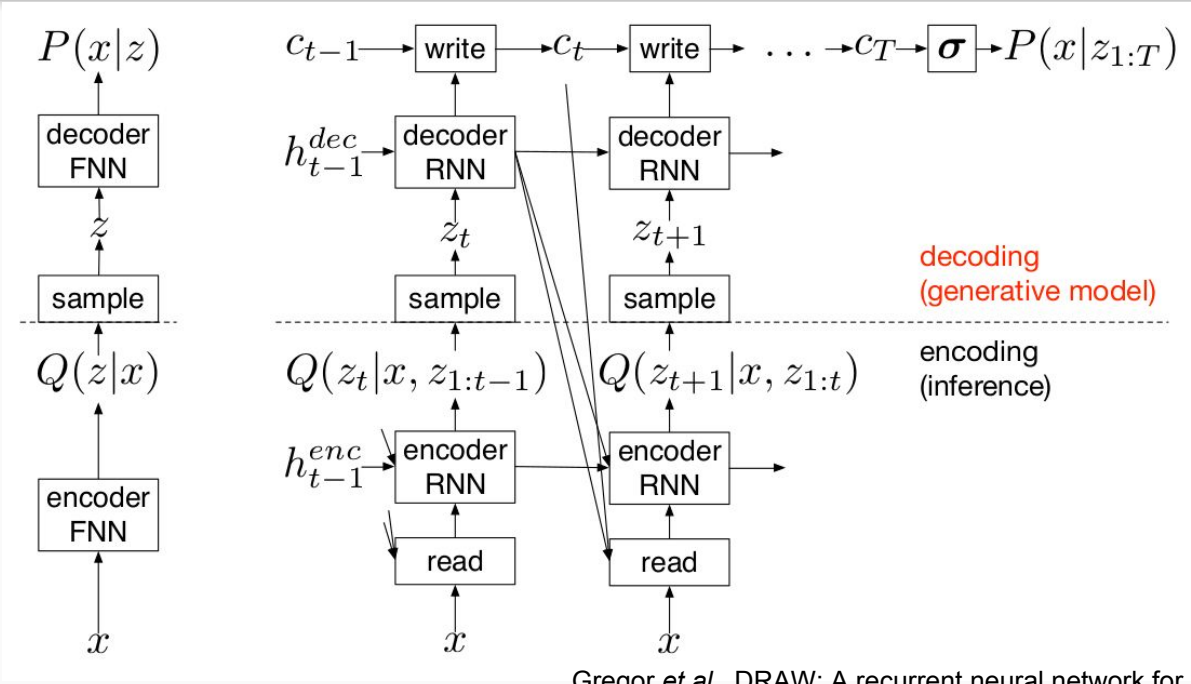
Figure from Wikipedia: Texture Synthesis

DRAW - VAEs Generative Models



Gregor *et al.*, DRAW: A recurrent neural network for image generation. ICML'15

Model



Gregor *et al.*, DRAW: A recurrent neural network for image generation. ICML'15

Approach

- Use the DRAW model to generate texture.
  - Generated images are small (28x28 only).

Approach

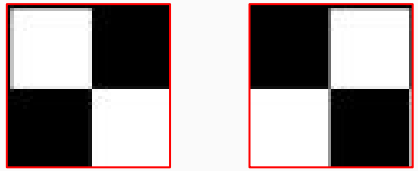
- Use the DRAW model to generate texture.
  - Generated images are small (28x28 only).
- Loss function:
  - Cross entropy

Approach

- Use the DRAW model to generate texture.
  - Generated images are small (28x28 only).
- Loss function:
  - Cross entropy → pixel-to-pixel correspondence is not suitable for texture

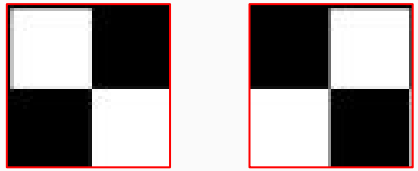
Approach

- Use the DRAW model to generate texture.
  - Generated images are small (28x28 only).
- Loss function:
  - Cross entropy → pixel-to-pixel correspondence is not suitable for texture



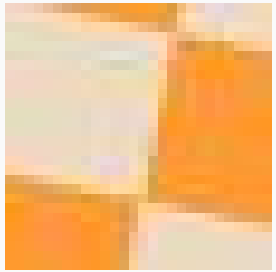
Approach

- Use the DRAW model to generate texture.
  - Generated images are small (28x28 only).
- Loss function:
  - Cross entropy → pixel-to-pixel correspondence is not suitable for texture

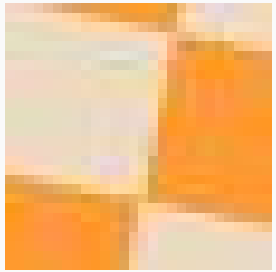


  - Filter-bank (FB) response.

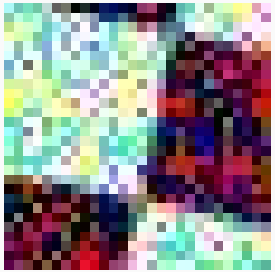
Texture Reconstruction



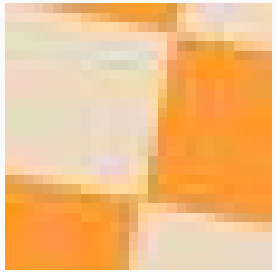
Texture Reconstruction



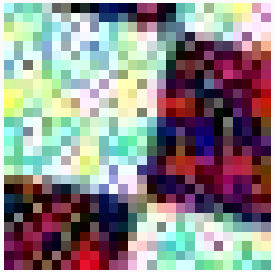
FB - no regularization



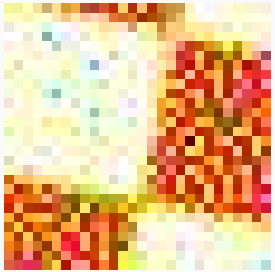
Texture Reconstruction



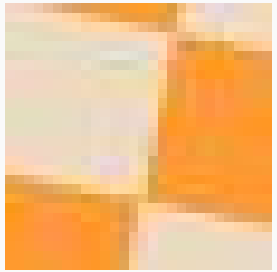
FB - no regularization



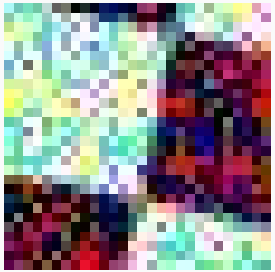
FB + color



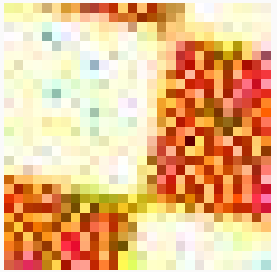
Texture Reconstruction



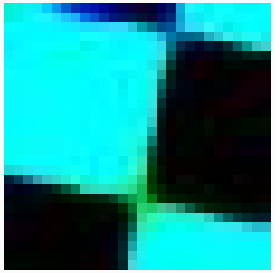
FB - no regularization



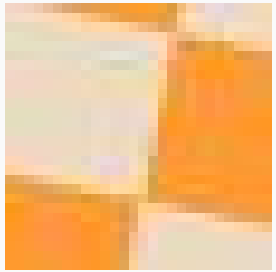
FB + color



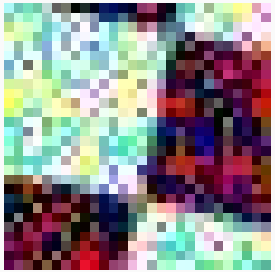
FB + TV



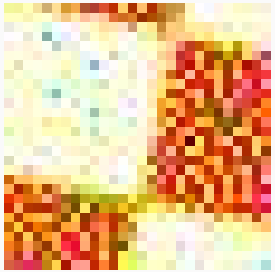
Texture Reconstruction



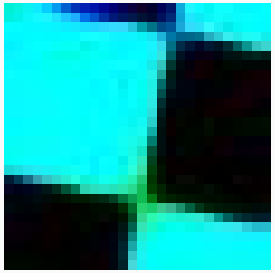
FB - no regularization

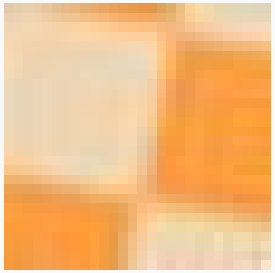


FB + color



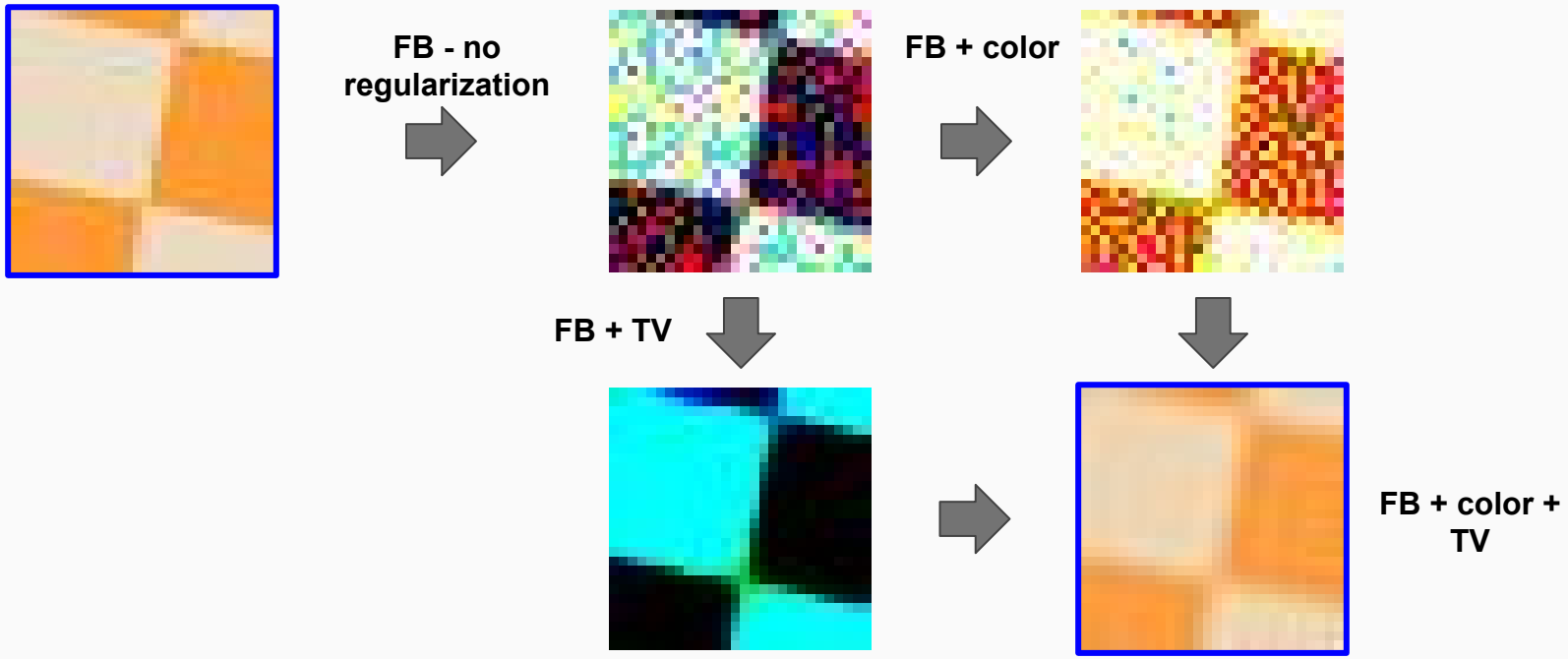
FB + TV





FB + color + TV

Texture Reconstruction

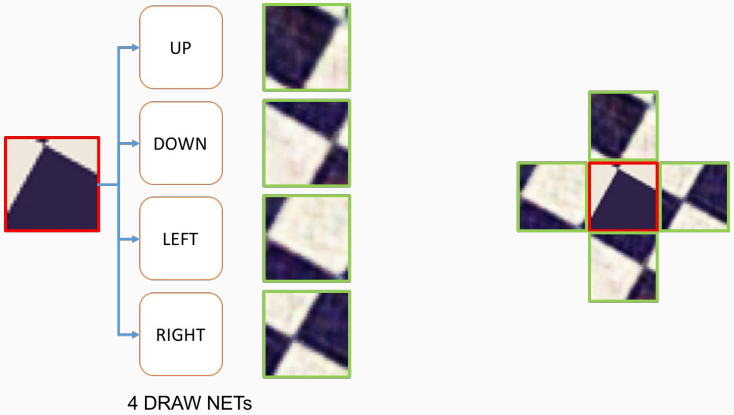


Synthesizing Larger Texture

How can we synthesize larger texture?

Synthesizing Larger Texture

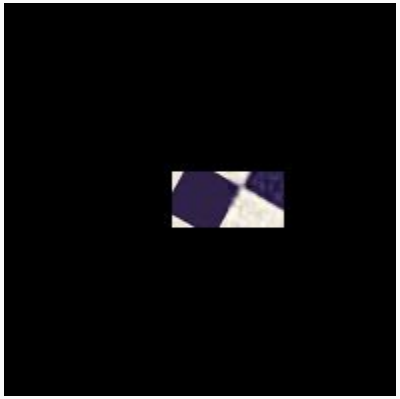
- Train networks to generate immediate neighbors.



- Feed generated neighbors as input to generate more tiles, and so on...

Synthesizing Larger Texture

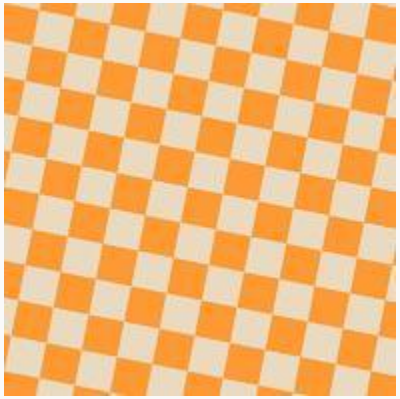
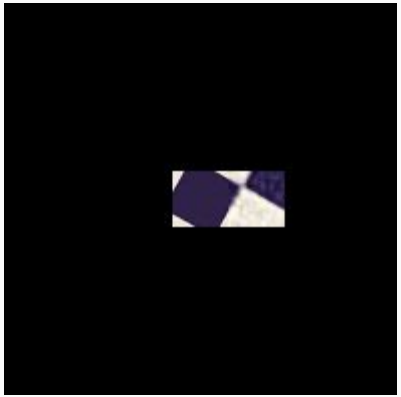
Synthesizing Larger Texture



Synthesizing Larger Texture

Synthesizing Larger Texture

Synthesizing Larger Texture



Synthesizing Larger Texture