Hybrid Quantum-Classical Neural Network for Semantic Segmentation

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- Hybrid quantum-classical neural network for classifying the road in an image taken from the viewpoint of a car

- Hybrid neural network will run through a Segnet with a VGG-16 encoder but the final Softmax layer for the decoder will be a quantum circuit

- Current Segnet with classical Softmax layer and 12 classes has a frequency-weighted IU of .751, mean IU of .420

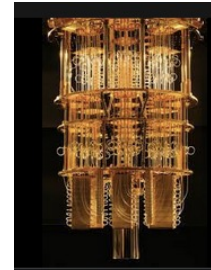- Will compare classical Segnet result to hybrid neural network
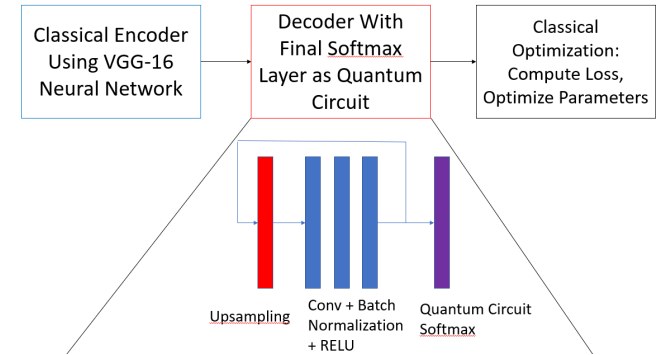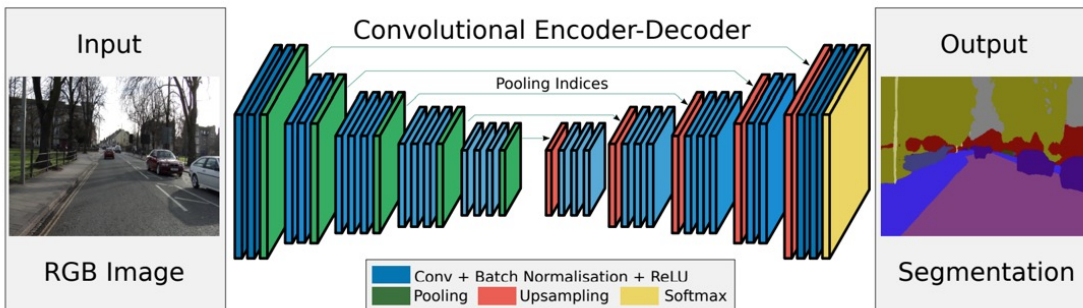

Fig 2: Quantum Computer

| Classical Encoder Using VGG-16 Neural Network | → | Decoder With Final Softmax Layer as Quantum Circuit | → | Classical Optimization: Compute Loss, Optimize Parameters |

Upsampling   Conv + Batch Normalization + RELU   Quantum Circuit Softmax

Fig 3: Structure of Hybrid Segnet

Convolutional Encoder-Decoder

Pooling Indices

Input — RGB Image

Output — Segmentation

Conv + Batch Normalisation + ReLU
Pooling   Upsampling   Softmax

Fig 1: Diagram of Classical Segnet
From: arXiv:1511.00561

Sky
Building
Pole
Road
Pavement
Tree
SignSymbol
Fence
Car
Pedestrian
Bicyclist

Fig 4: Result from VGG-16 Classical Segnet

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