

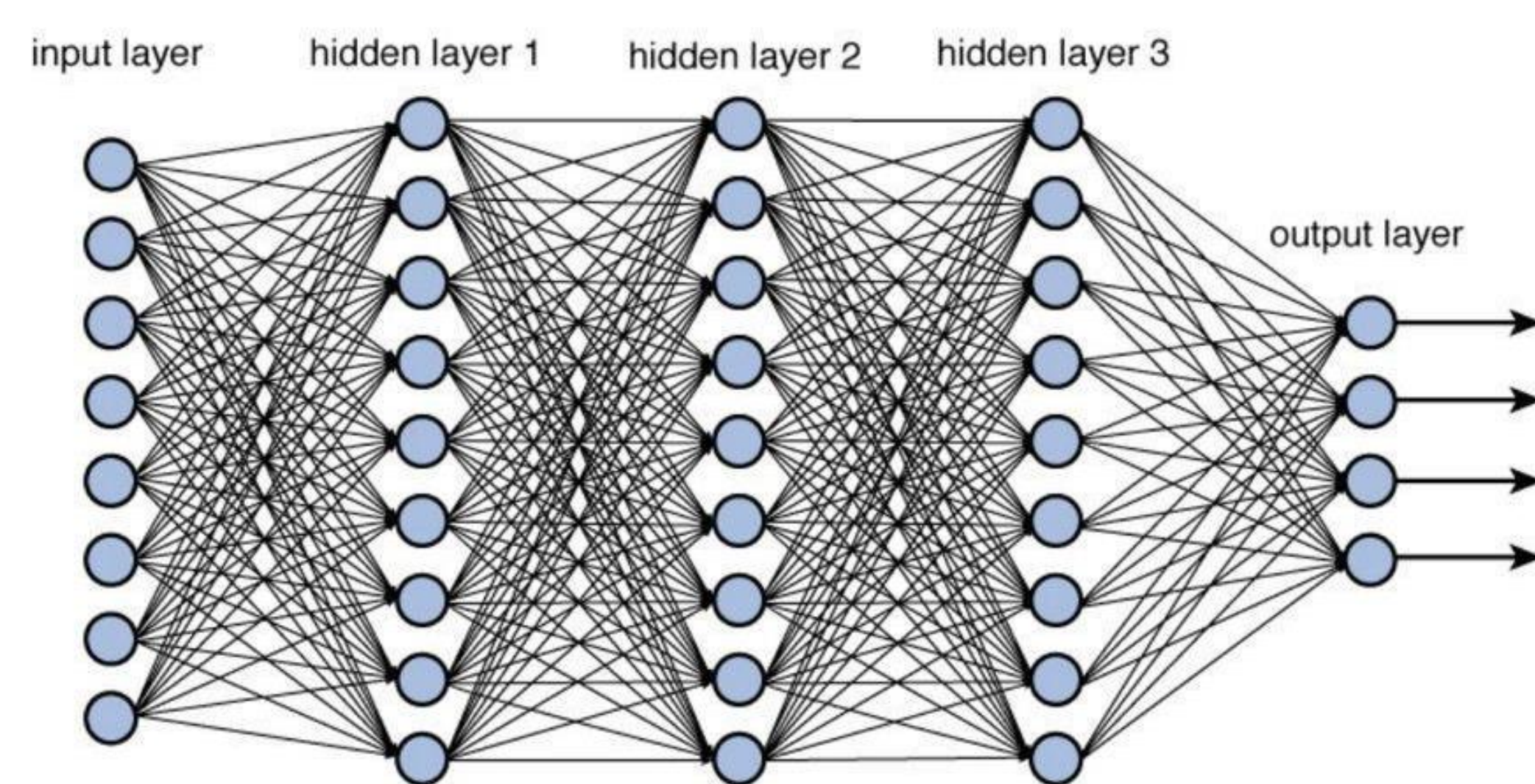
# Resolution exploration using Two-Dimensional Deep Learning Architectures for Infrared Data Captures

Jonathan Schierl, The University of Dayton, B.S in Computer Engineering, Junior  
 Advisor: Theus Aspiras



## Background

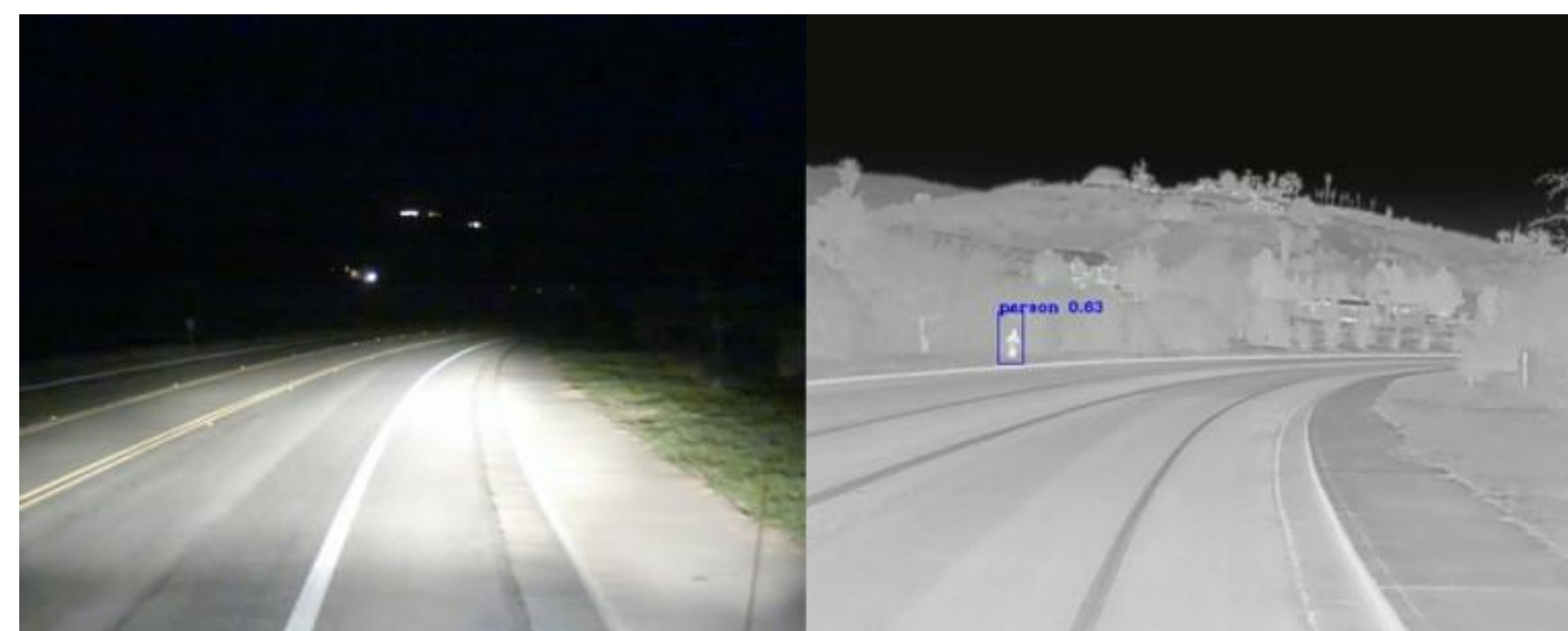
- Object Detection is a field of computer science that trains computers to identify given objects
- Training can be done using deep learning, which uses software modeled as a neural network
- With lots of training data, the neural network develops patterns, useful in detecting objects



Deep Neural Network

## Detection Data

- Infrared Spectrum: short-wave and mid-wave infrared (1 – 5µm wavelength)
- Aerial view (taken from an airplane)
- Detection objects: Bus, Car, Truck, Train, Armored Vehicle



Visible spectrum vs FLIR infrared spectrum

## Preliminary Results

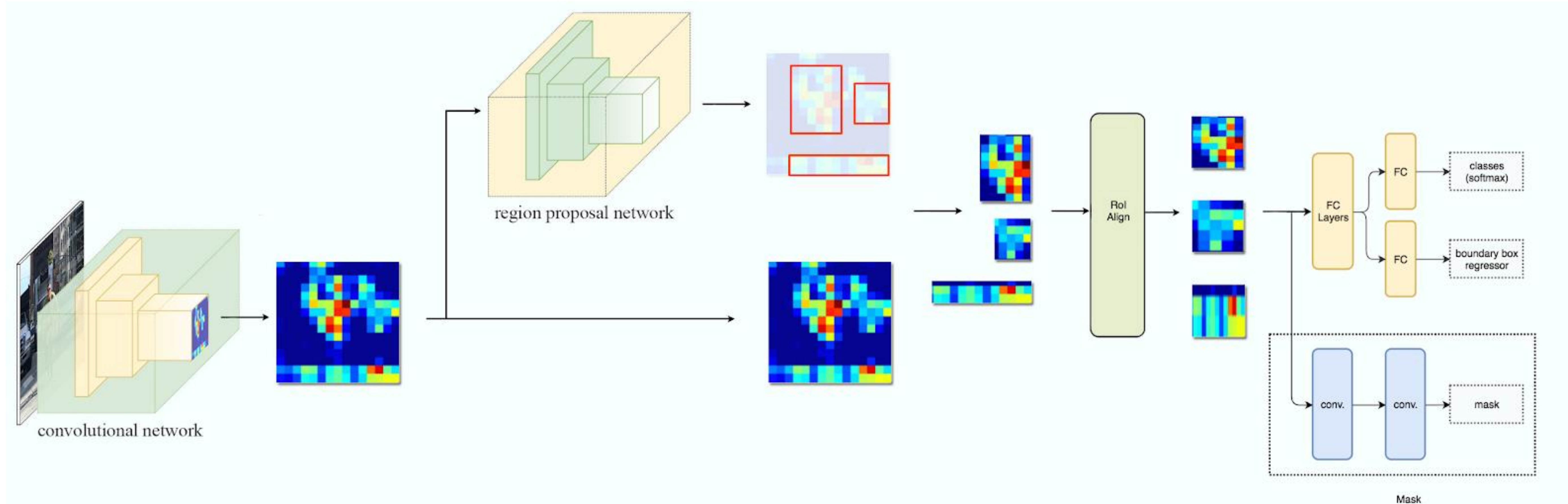
- Implementation of Mask RCNN sample object detection
- Gun classification with 98.491% accuracy with solely training data



Mask RCNN Sample Detection

## Deep Learning Architecture: Mask RCNN

- Mask RCNN is the deep learning convolutional neural network used in this project
- It was developed to not only detect objects, but differentiate these from one another



Mask RCNN Architecture

## Future Work

- Establish a source for data, using AFRL datasets as well as publicly available datasets
- Use multiple resolutions to subsample/upsample same network
- Testing and evaluation
- Compare and merge with 3D deep learning
- Determine metrics: accuracy and timing related to image resolution