

AUTOMATED PARKING SPACE DETECTION

JULIEN NYAMBAL (1439552), SCHOOL OF COMPUTER SCIENCE & APPLIED MATHEMATICS

WITS
UNIVERSITY



ABSTRACT

Finding a parking space nowadays becomes an issue that is not to neglect, it consumes time and energy. This paper presents an approach for a real-time parking space detection based on Convolutional Neural Networks(CNN) using Caffe and nVidia DiGITS frameworks. Our system checks a defined area whether a parking spot (bounding boxes defined at initialization of the system) is containing a car or not (occupied or vacant). Our system has been trained using the LeNet network with the Nesterov's Accelerated Gradient as solver and the AlexNet network with the Stochastic Gradient Descent as solver.

RESULTS

We have some good results with most of the architectures used. But for accuracy in detection, we would use the **AlexNet + SGD**. For speed in processing and high accuracy, we would want to use **LeNet + NAG**. The system have been tested on dataset that was totally foreign to the training set. The accuracy remained high, above 90%.

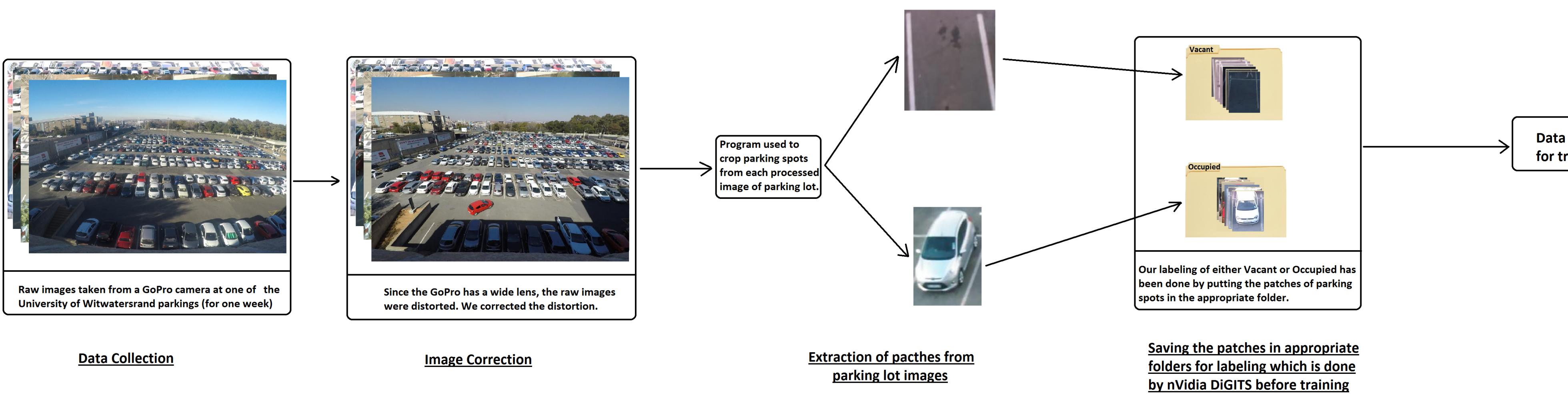
| Network | Accuracy |
|-------------------|-------------|
| AlexNet + SGD | 0.95 |
| AlexNet + NAG | Never Ended |
| AlexNet + AdaGrad | 0.89 |
| LeNet + SGD | 0.92 |
| LeNet + NAG | 0.93 |
| LeNet + AdaGrad | 0.89 |

Table 1: Accuracy calculated from a foreign parking lot

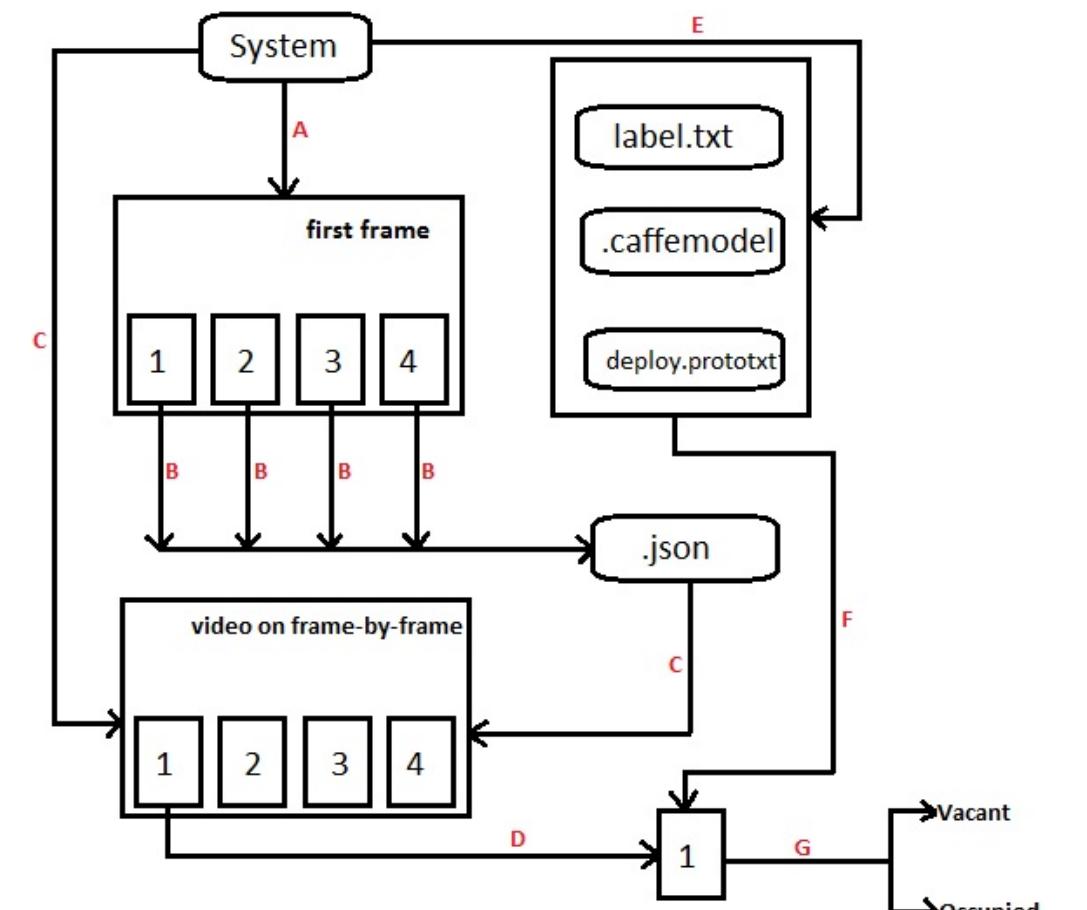


System in use

DATA PREPARATION AND DATASET



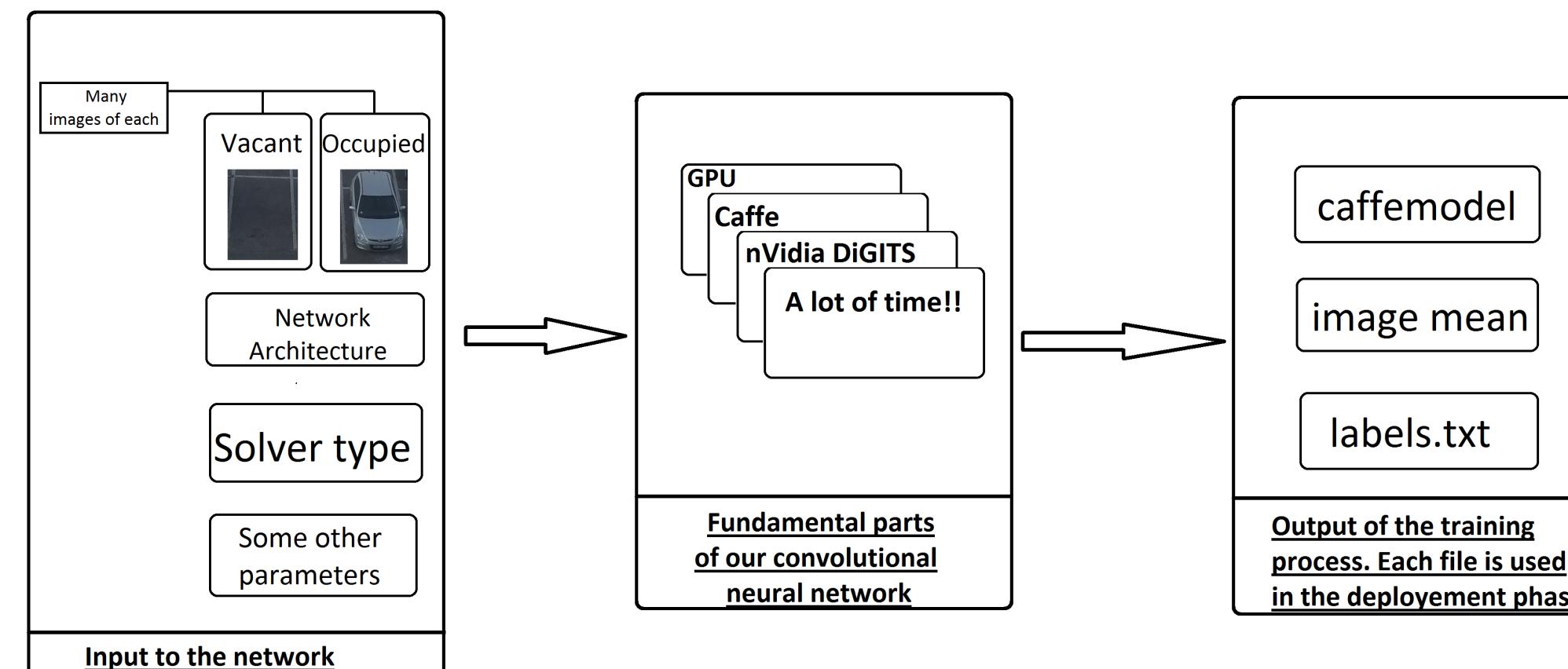
ALGORITHM



Algorithm of the System

Usage of the trained model, the database of parking spots coordinates on the frames to predict the state of the parking spot. We have to note that the detection is made sequentially. Spot 1, spot2 ...

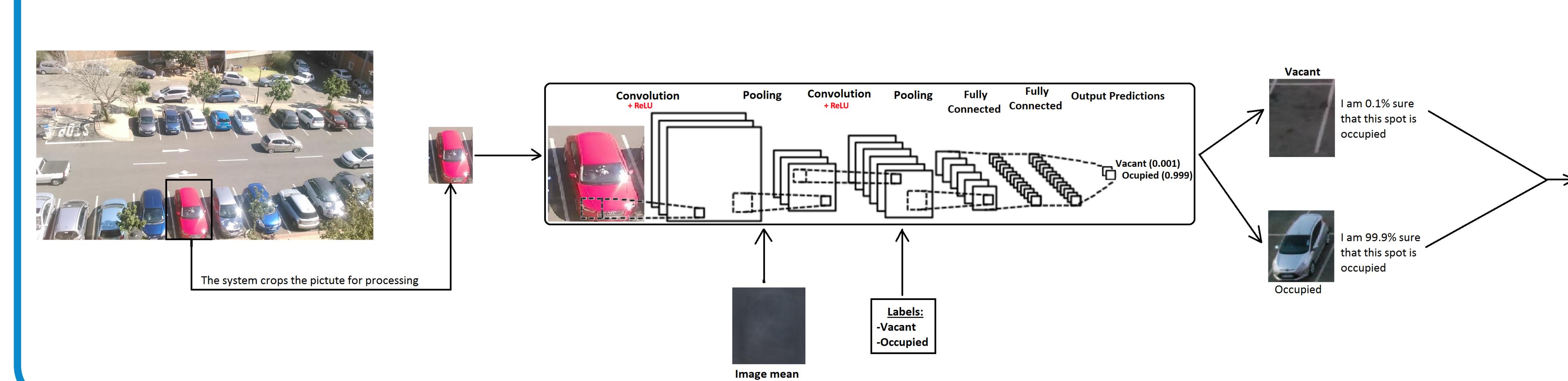
TRAINING



Training of the classifier

The classifier is trained from many instances of images of parking spots (vacant and occupied). Some parameters during training include the learning rate, the batch size or customization of the network.

SYSTEM



REFERENCES

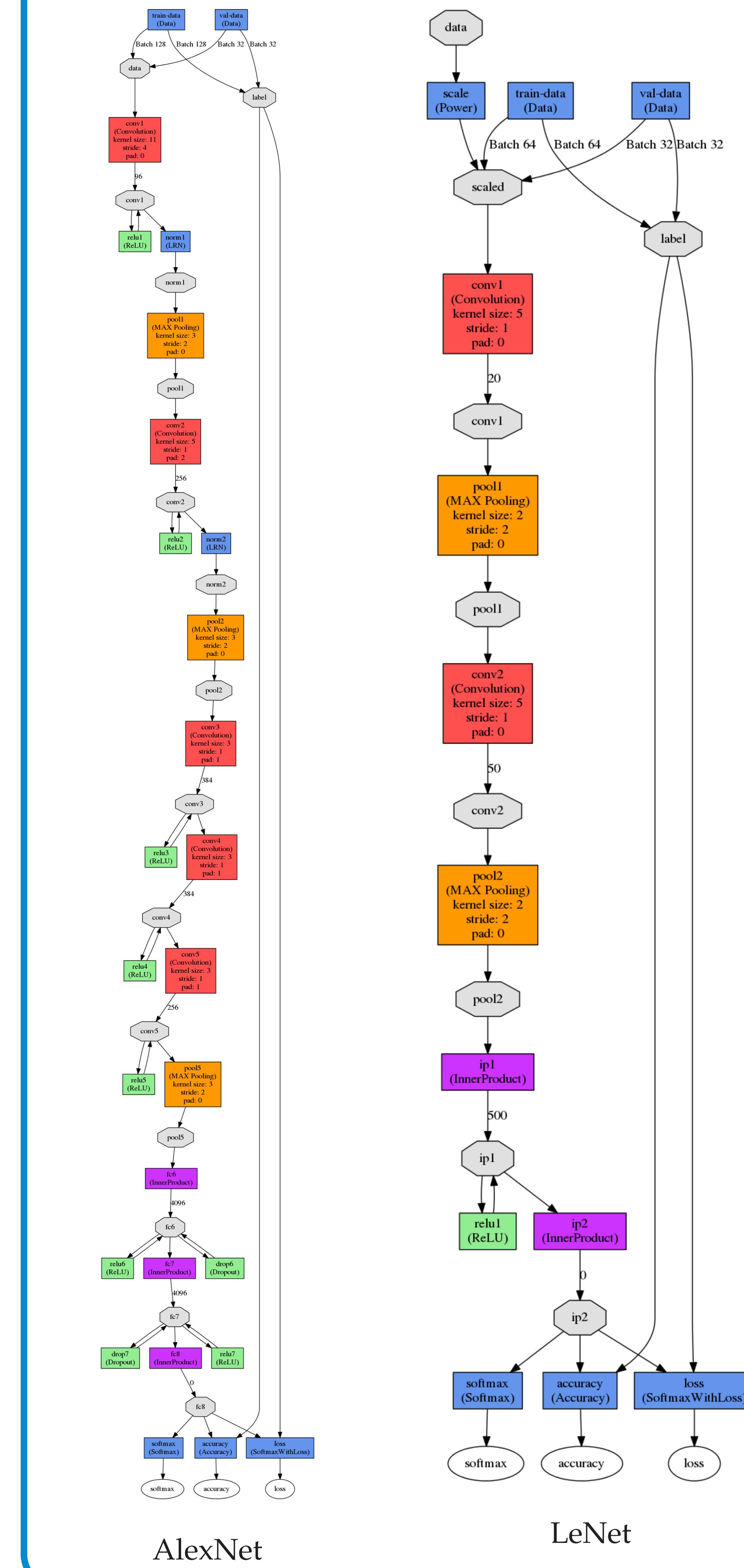
- [1] J. M. Smith and A. B. Jones. *Book Title*. Publisher, 7th edition, 2012.
- [2] A. B. Jones and J. M. Smith. Article Title. *Journal title*, 13(52):123–456, March 2013.

CONCLUSION AND FUTURE WORK

Our work has been shown to be very productive and we have produced better results than some other authors. We are planning to improve the parking detection with some perceptive correc-

tions and temporal data to improve accuracy. We will also use artificial intelligence techniques to guide the driver to the closest available parking spot.

NETWORK STRUCTURES



CONTACT

Email Julien.nyambal1@students.wits.ac.za
Phone +27 83 398 9020
Supervisor Mr. Richard Klein