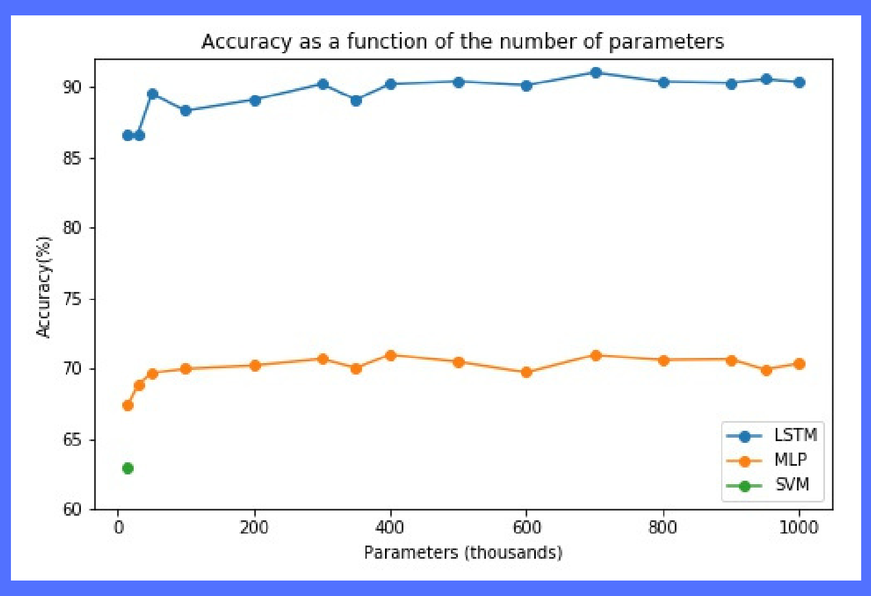
Deep Learning for Community Network Traffic Classification

Community networks have emerged as a promising solution to providing internet connectivity in low-resource rural areas around the world. In order to improve the network experience for the members of community networks, **network traffic packet classification** can be used to assign different priorities to different applications (e.g. Zoom) through quality of service (QoS) algorithms. We thus investigate the suitability of three different **deep learning** architectures for real-time network traffic packet classification in the context of the resource constraints of community networks.

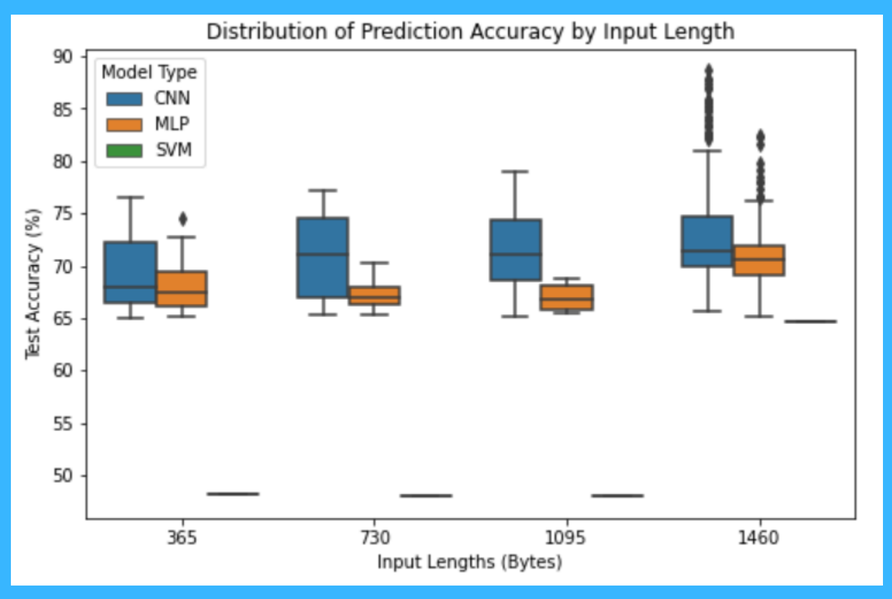
LSTM



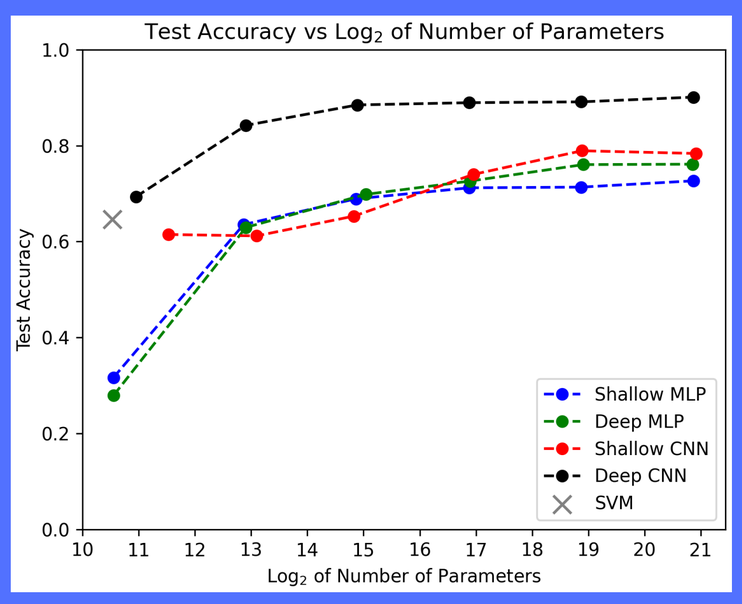
Objectives: Evaluate the accuracy and prediction speeds of the MLP and LSTM models, across a range of parameter levels. Moreover, compare the deep learning architectures to an SVM.
Conclusions: The deep learning models outperformed the SVM across all parameter levels. Furthermore, the LSTM proved to significantly improve the test accuracy when compared to the MLP. However, the LSTM's prediction speeds were far slower than the MLP and SVM.

1D CNN

Objectives: Build 1200 1D CNN and MLP models with varying input lengths, hyperparameters, and model architectures and compare models across classification rate and accuracy.
Conclusions: The SVMs are generally faster than the MLPs, which were generally faster than the 1D CNNs. The 1D CNNs generally produced higher accuracy than MLPs, which were generally more accurate than the SVMs.



2D CNN



Objectives: Compare accuracy and prediction speed of shallow and deep 2D-CNNs, shallow and deep MLP models and an SVM across varying number of parameters. Additionally, evaluate the effect of varying input length on the 2D-CNN's performance.
Conclusions: The deep 2D-CNN clearly attained the best test accuracy across parameter levels, however the 2D-CNNs are significantly slower than the other models. This effect can be mitigated, though, by reducing the 2D-CNN's input size, without significantly reducing its accuracy advantage.

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