Lightning-Fast Modulation Classification with Hardware-Efficient Neural Networks
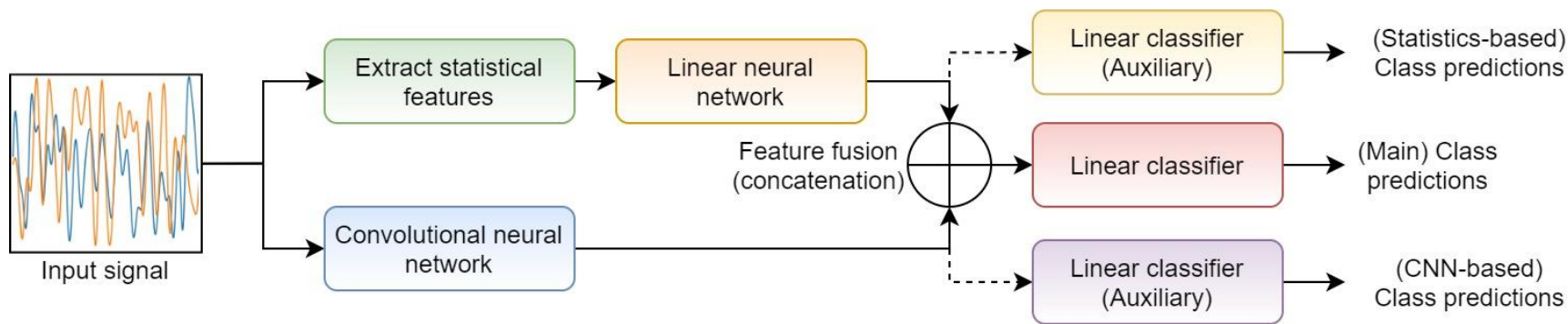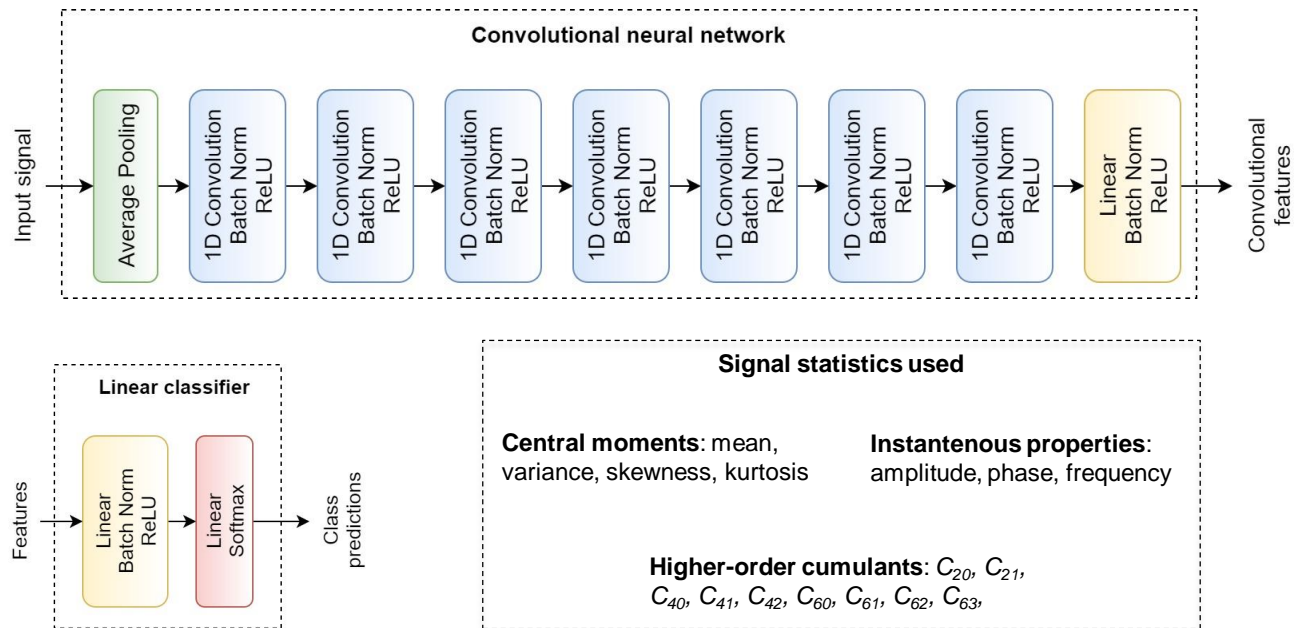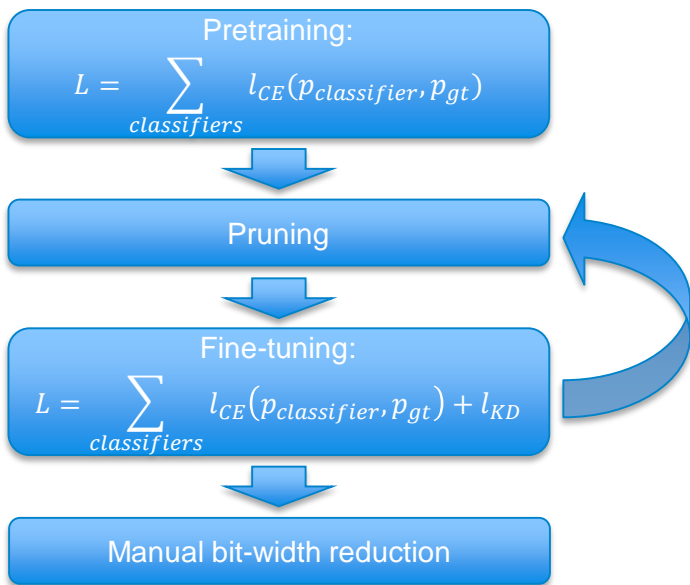
Archtecture details and signal preprocessing

A. Abdelmutalab, K. Assaleh, M. El-Tarhuni, "Automatic modulation classification based on high order cumulants and hierarchical polynomial classifiers," in Physical Communication.

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Training steps and results

Pretraining:

$$L = \sum_{classifiers} l_{CE}(p_{classifier}, p_{gt})$$

Pruning

Fine-tuning:

$$L = \sum_{classifiers} l_{CE}(p_{classifier}, p_{gt}) + l_{KD}$$

Manual bit-width reduction

Model	Accuracy	BitOps	BitMem	Final score
Baseline	59.47%	807699904	1244936	1.0
8 bits + pruning	60.42%	79588160	819328	0.378
6 bits + pruning	58.34%	30614424	312204	0.144
6 bits + pruning + bit reduction	56.40%	21084790	242983	0.1106

G. Hinton, O. Vinyals, J. Dean, "Distilling the knowledge in a neural network," arXiv preprint arXiv:1503.02531.