One Size Does Not Fit All: Multi-Scale, Cascaded RNNs for Radar Classification

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1. IoT Requirements in The Smart City

- Resource efficiency
- Deployment feasibility
- Privacy preserving

2. N+1-class Radar Classification

- Example of N source classes + clutter class (N+1-class) classification
- Efficiency-Accuracy trade-off in existing solutions

3. MSC-RNN Solution for N+1 classes

- Multi-Scale Cascaded RNN (MSC-RNN) handles the two sub-problems of clutter rejection and source discrimination at different time scales of featurization
- MSC-RNN Components:
  (i) EMI-FastGRNN: works at instance-level and is continuously active
  (ii) FastGRNN: works at window-level
- Both the components are cascaded so that FastGRNN is invoked only when EMI-FastGRNN detects displacement source

4. Performance of MSC-RNN

- Performance comparison with SVM: Outperforms all-domain feature handcrafting at mote scale with purely time-domain feature learning
- Feature computation comparison with SVM: 3.5x more efficient than a competitive SVM solution
- Comparison with EMI: Outperforms monolithic EMI algorithms on all three metrics of accuracy, non-human and human recalls

5. References