Module : C7082 Techniques in Machine Learning and AI

Student : A T Chamberlain, student number 223945

Associated GitHub: TomChamberlain61/Assessment-submission

The use of the Tensorflow Lite and TensorFlow Convoluted Neural Network models to classify up to four cattle feed types from small jpeg images.

Project Objectives

1. Determine if an adequately accuracy convoluted Neural Network could be developed from a small (n~1000 images) database such as that likely to be collected in the agricultural sector.
2. Use the TensorFlow and tensorFlow Lite models to develop suitable CNN.
3. Experience the full run of the project from collecting and curating suitable images to fine tuning of the final CNN.
4. Determine is a suitable TensorFlow Lite model could be developed that could be deployed through a simple microprocessor for deployment as an IoT device.
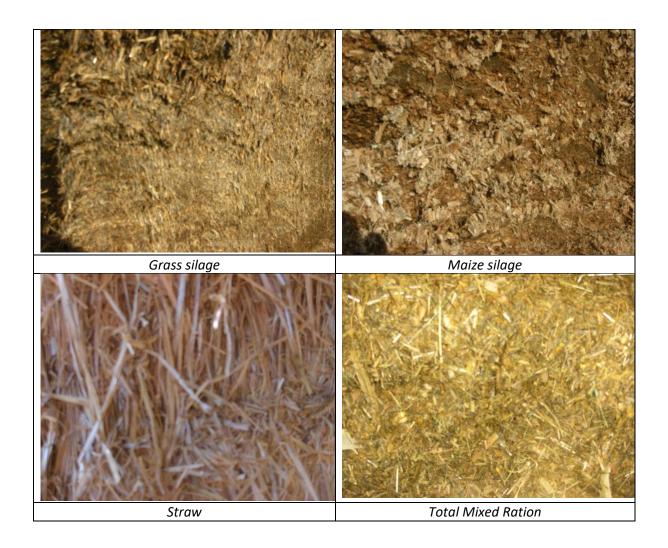
Images

Small jpeg files of feed stuffs taken from about 400mm focal distance on a simple digital camera. Four classes of feeds considered: Grass silage (GS), Maize silage (MS), Straw and total mixed ration (TMR). Sample images are shown below.

NOTE

The main branch in the Github Repo contains this readme file

Files required for each experiment (Expt01 – Expt05) are in branches within the Repo.

Grass silage	*Maize silage*
Straw	*Total Mixed Ration*

Summary of results

CNN results			Prediction accuracy on test data set							
	Classes	Training size	Naïve assumption	Initial CNN	Augmented CNN	Fast feature extract	Feature extraction with augmentation	Fine tuned CNN	CNN model used	Comments
Expt01, PoC	2	303	50.0%	100%	n/a	n/a	n/a	n/a	TensorFlow Lite	Only training and validation - no test set
Expt02	2	213	53.0%	80.0%	88.9%	89.0%	97.8%	97.8%	TensorFlow full	5 farms, poor stratification
Expt02b	2	291	55.0%	68.4%	88.4%	88.4%	100.0%	100.0%	TensorFlow full	7 farms, improved stratification
Expt03	3	439	33.0%	62.4%	83.2%	90.6%	100.0%	100.0%	TensorFlow full	7 farms, improved stratification
Expt04	4	578	28.0%	48.4%	87.0%	87.0%	97.9%	97.4%	TensorFlow full	7 farms, improved stratification
Expt05	4	771	25%	99.50%	n/a	n/a	n/a	n/a	TensorFlow Lite	Only training and validation - no test set

NOTE: these percentage accuracies will vary due to random nature of models.