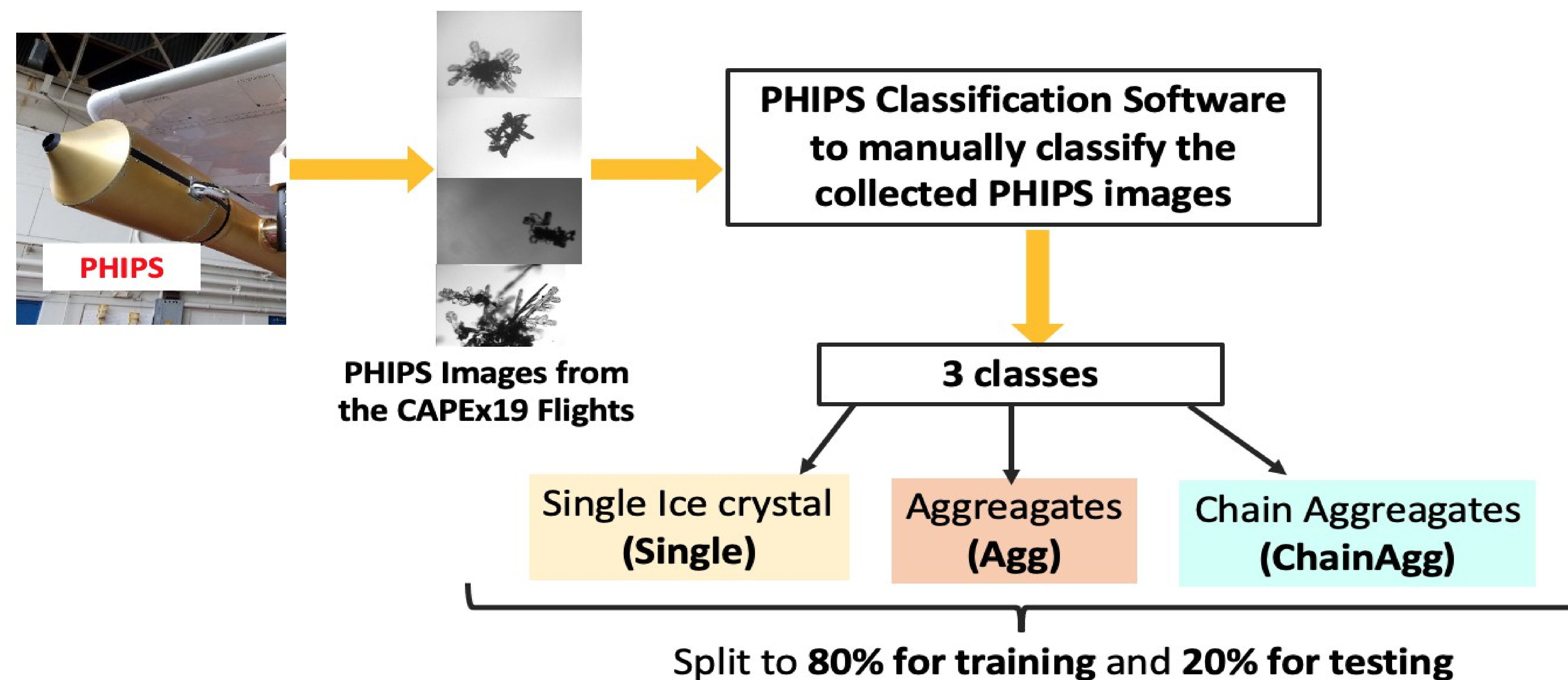


Motivation and Objective

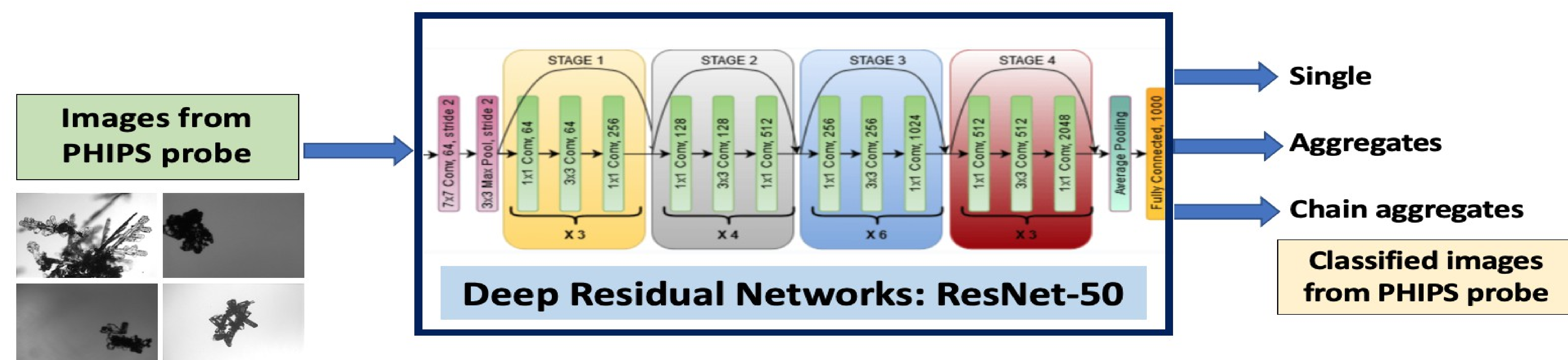
- Classifying ice crystals by habit provides information about their origins.
- Traditional classification methods require large amount of scientist's time.
- Given the sizable dataset collected from the Particle Habit Imaginary and Polar Scattering (PHIPS) during recent field projects such as CAPEX19 and IMPACTS 2022, there is a need for an automated classification approach.

Objective: Develop a Convolutional Neural Network model to classify the PHIPS images gathered during the CAPEX19 and IMPACTS 2022 field projects with an attributed confidence and evaluate its performance.

Dataset

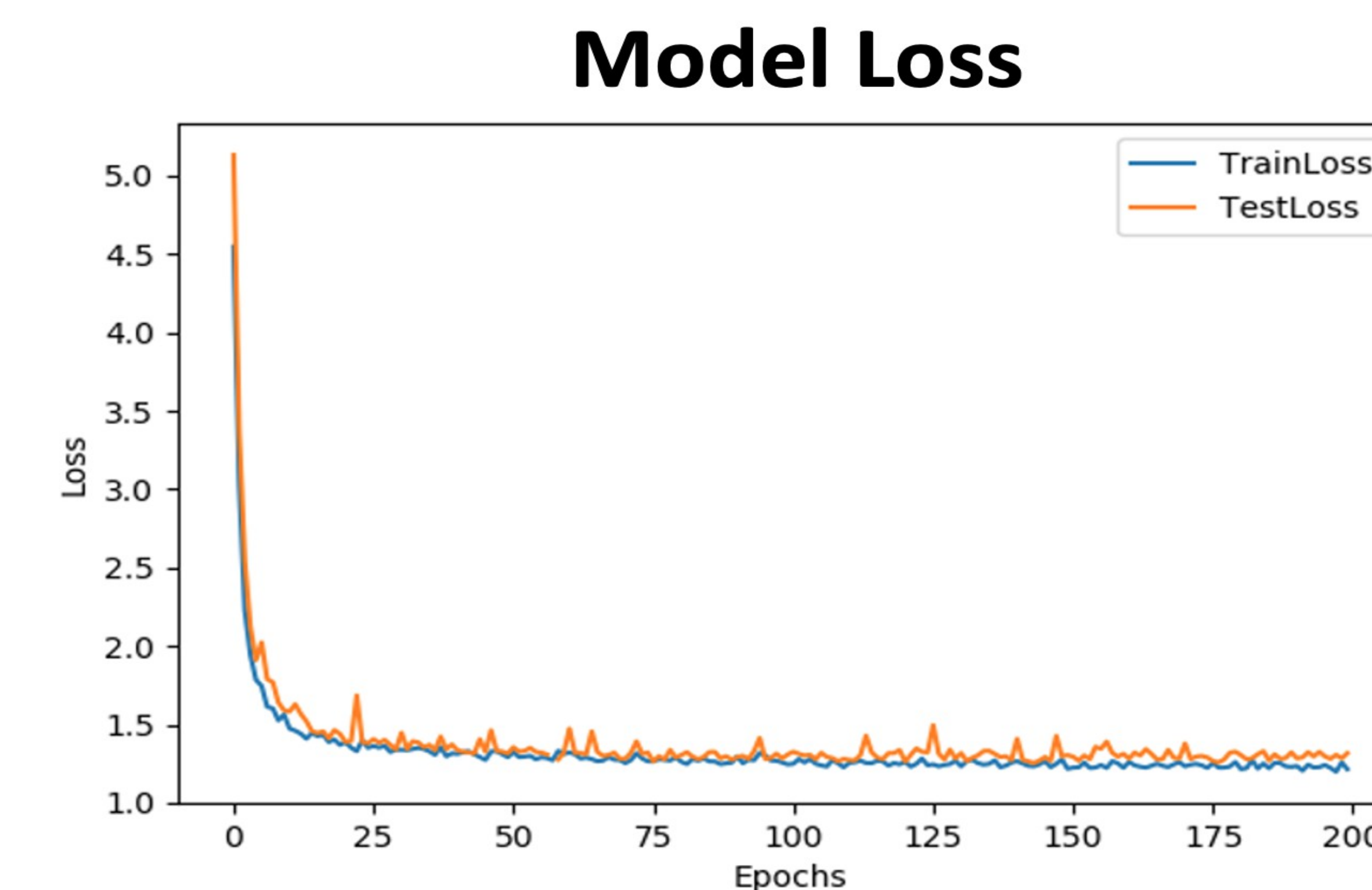


Method



Results

Model Metrics: Loss function



Model Evaluation per Class: Confusion Matrix and Statistical measures

Multiclass Confusion Matrix

	Single	Agg	ChainAgg
Predicted label			
Single	1143	0	0
Agg	0	167	1
ChainAgg	0	300	59
	Single	Agg	ChainAgg
	True label		

Class	True Positive	True Negative	False Positive	False Negative	Sensitivity (%)	Specificity (%)	Accuracy (%)
Single	1143	527	0	0	100	100	100
ChainAgg	59	1710	0	1	98.3	100	99.9
Agg	167	1203	0	300	35.7	100	82

Conclusion

- A good fit: training and test loss decrease to a point of stability with a minimal gap between two final loss values.
- Global good agreement between true label and predicted label for all classes except for the Aggregates.
- The model shows a good performance for single ice crystal followed by chain aggregates.
- Model's sensitivity and accuracy for aggregates are still low comparing to the other classes.

Future Work

- Train the developed model with more PHIPS images collected during the IMPACTS field project flights with more aggregates images.
- Refine the dataset considered to train the model to include several other classes.
- Generalize the model to classify ice crystal images from different type of probes.