Intelligent Abnormal Situation Awareness Platform (i-ASAP)

Biweekly Team Meeting
February 24, 2021

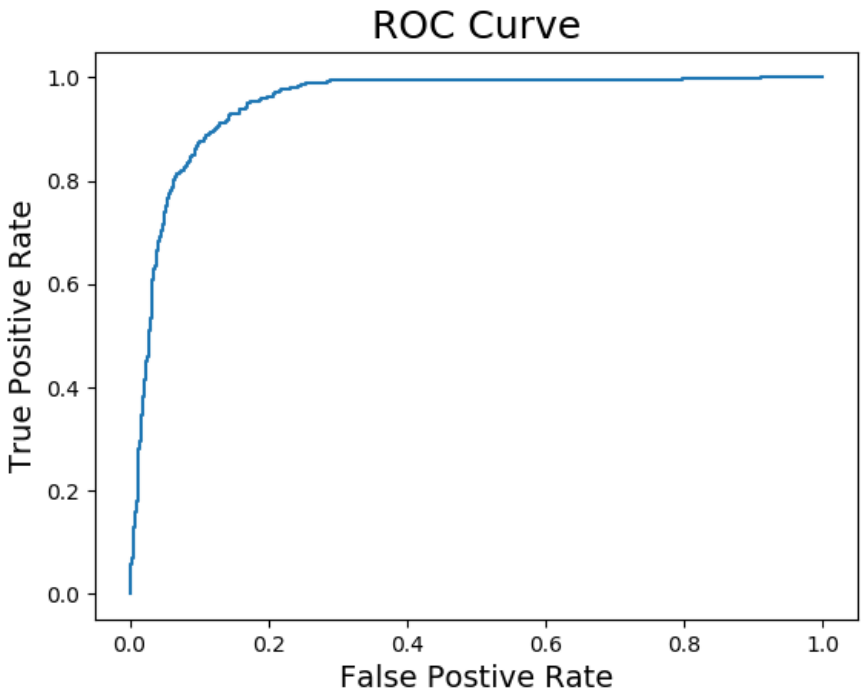
Audience
University of South Carolina, Columbia, SC

Performers
CFD Research Corporation, Huntsville, AL

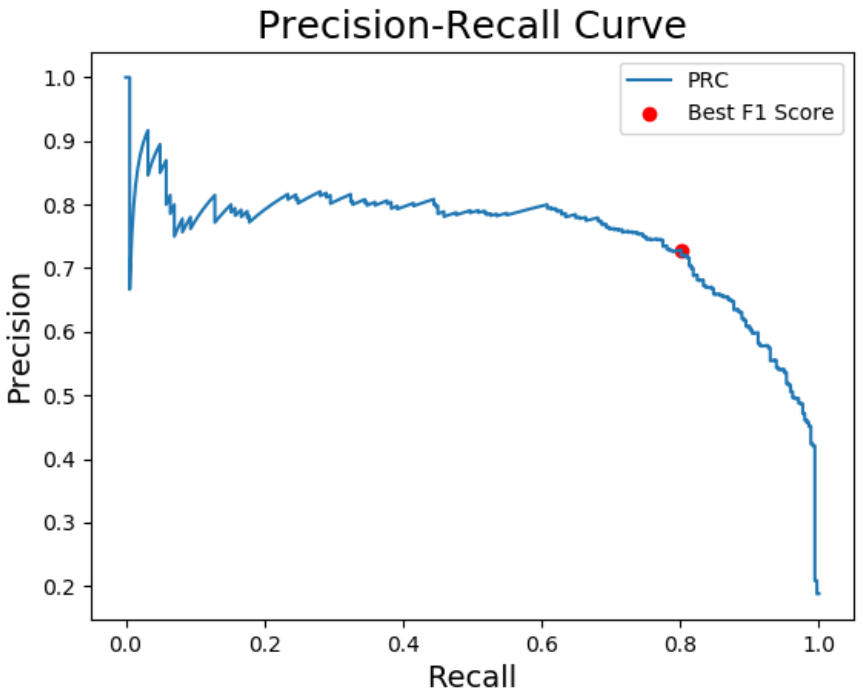
Progress

- Implemented latent feature difference method
- Compared results to basic reconstruction error method
- Started working on object tracking model
  - Optical flow methods

ROC and Precision-Recall Curves



Area under Curve (AUC) = **0.9497**
(default metric used in repo)

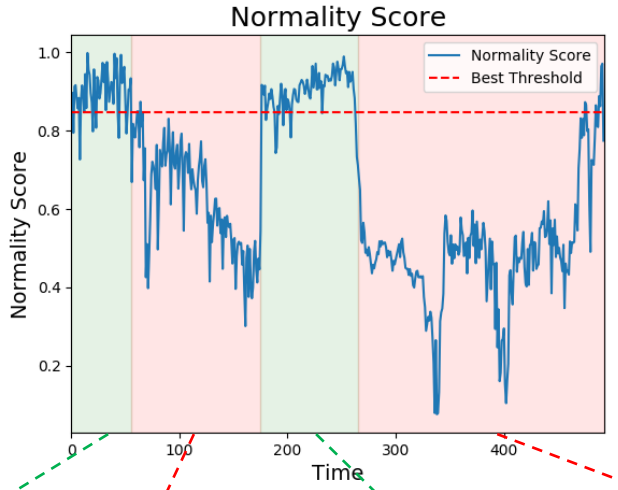


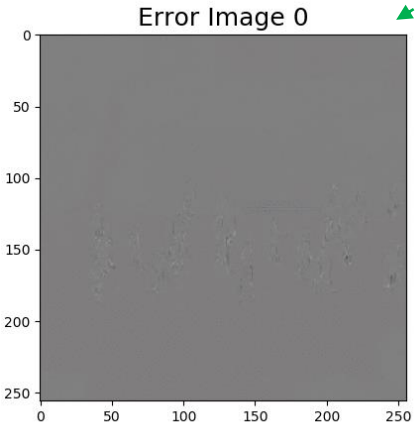
$$f_1 = 2\frac{PR}{P+R}$$

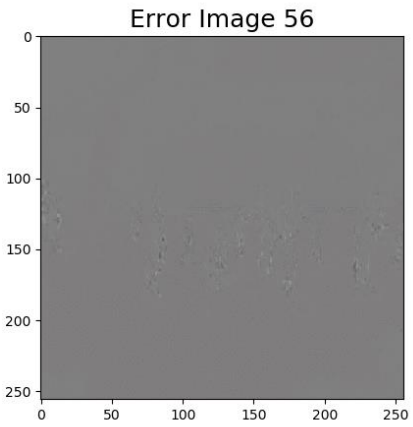
Best f_1 score = **0.7632**

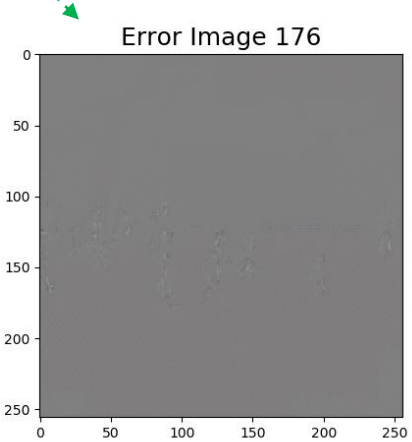
Reconstruction Error Images

Normality Curve and Truth

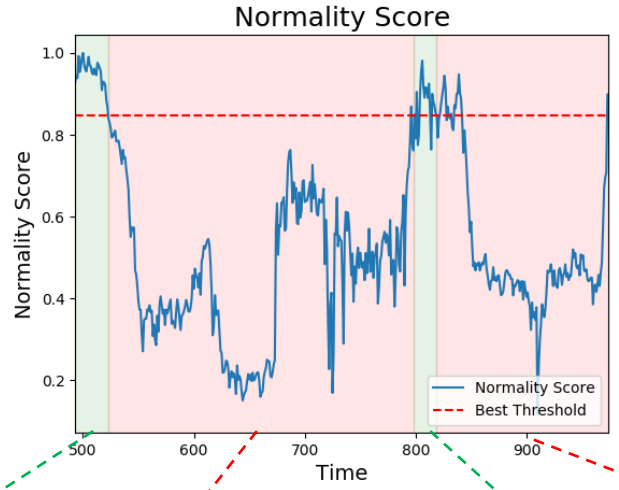


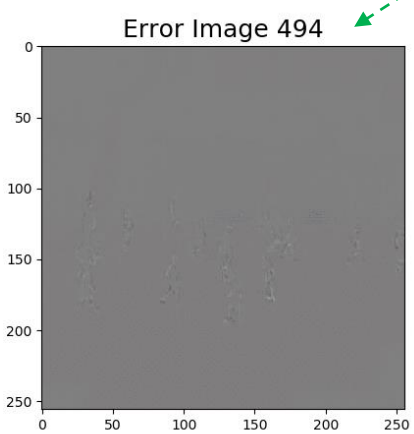


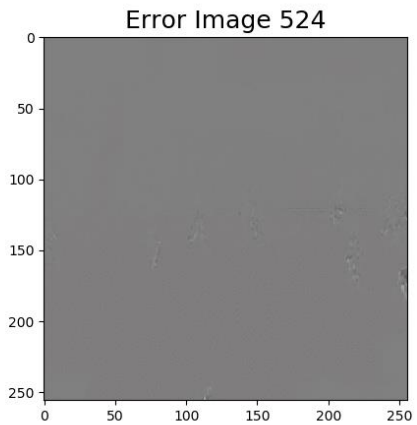


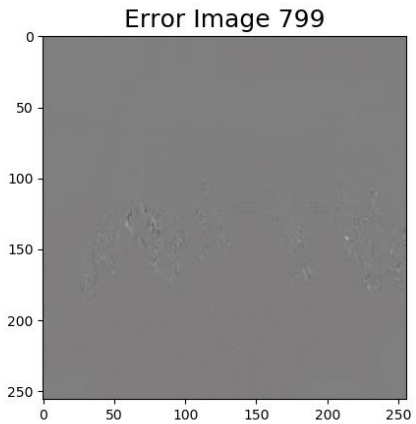


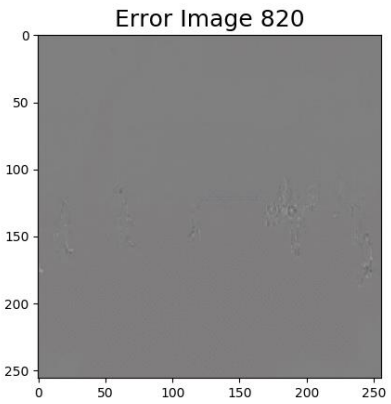
Normality Curve and Truth



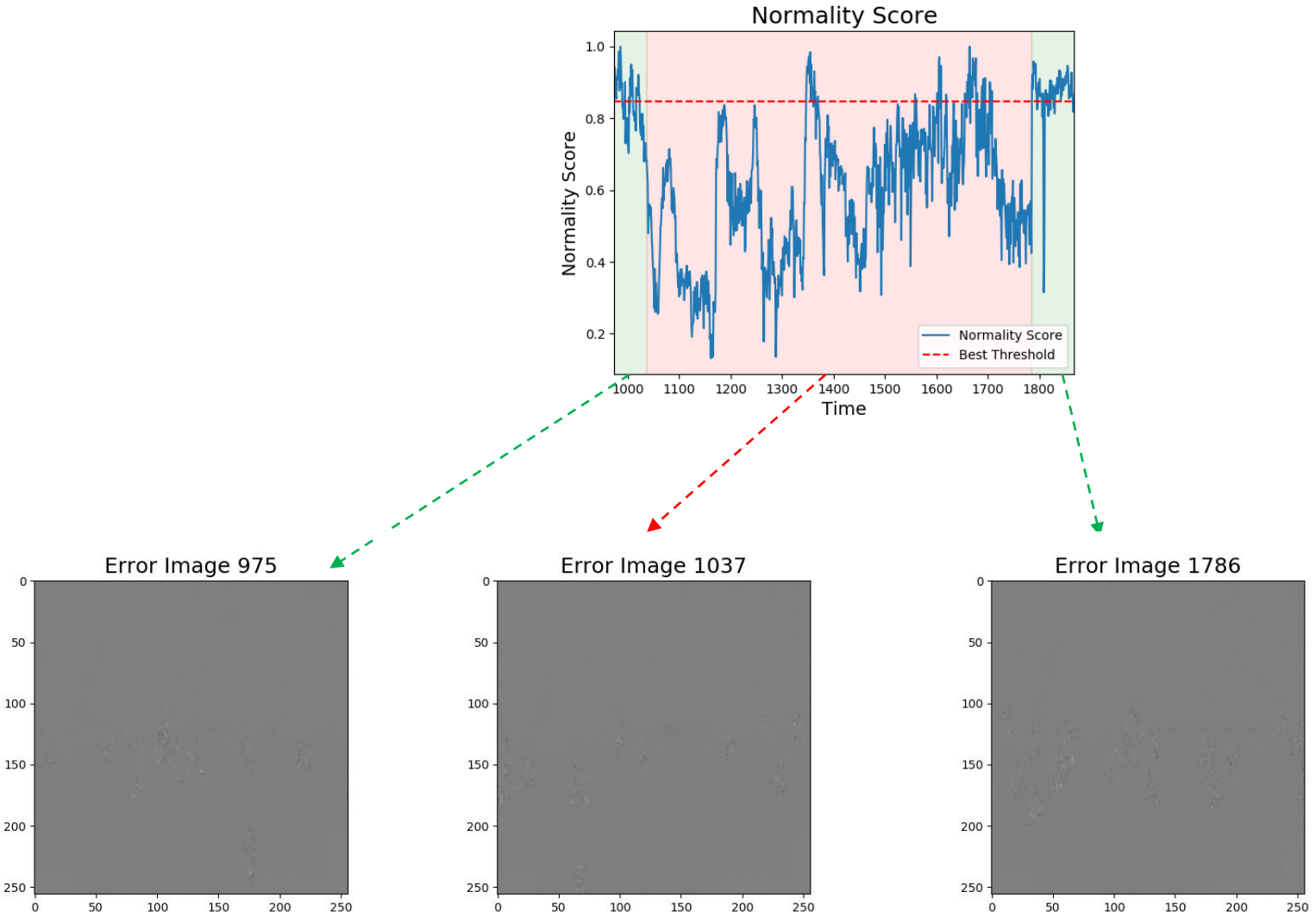








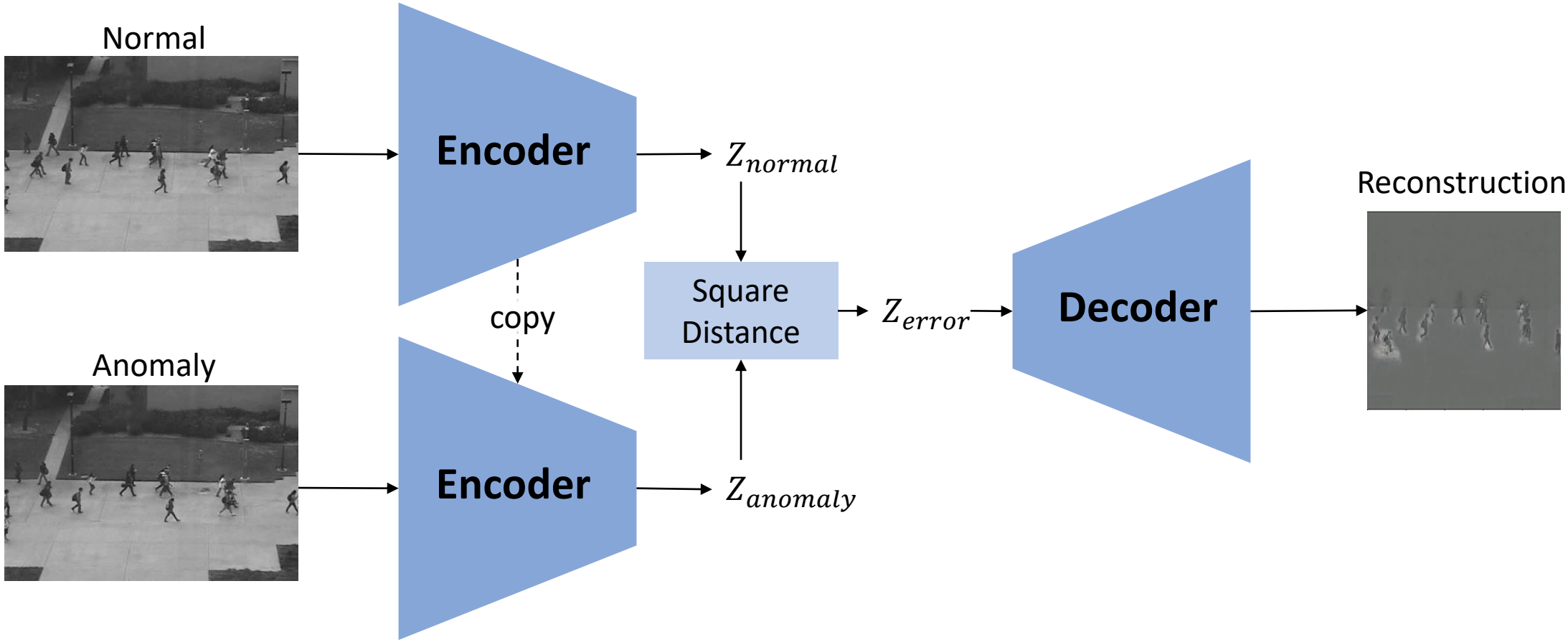
Normality Curve and Truth



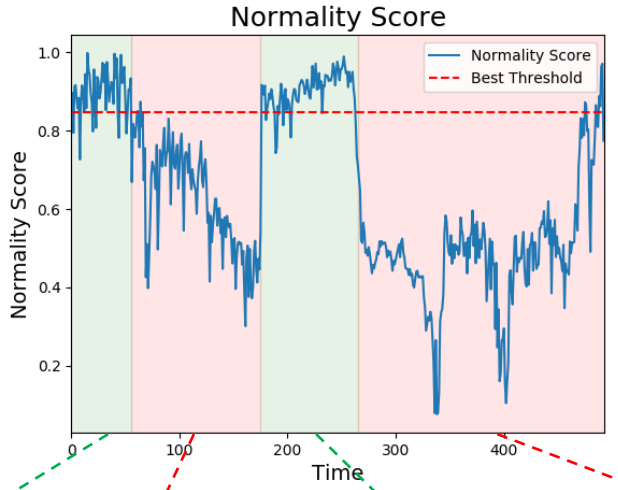
Square Distance Reconstructions

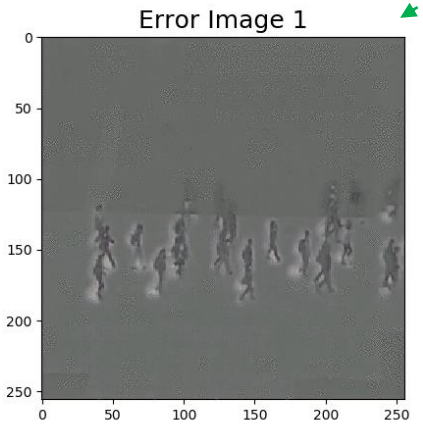
Anomaly Detection and Segmentation Concept

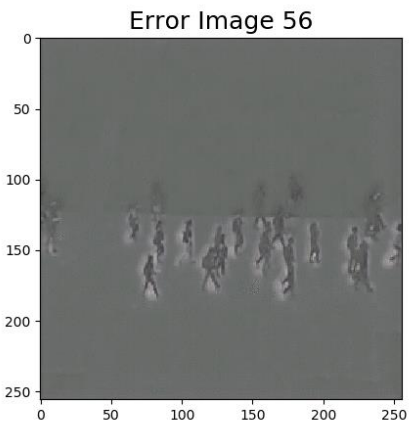
Segmentation Phase

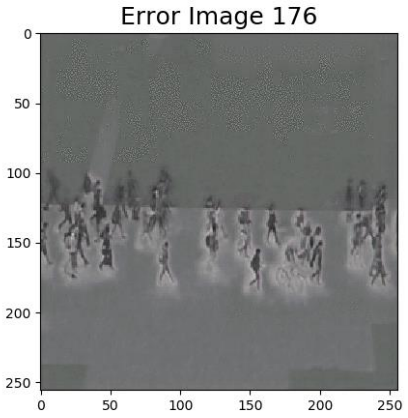


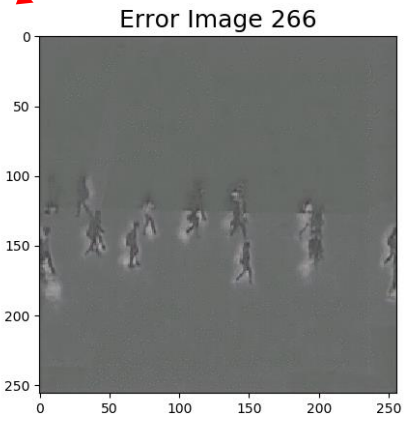
Normality Curve and Truth



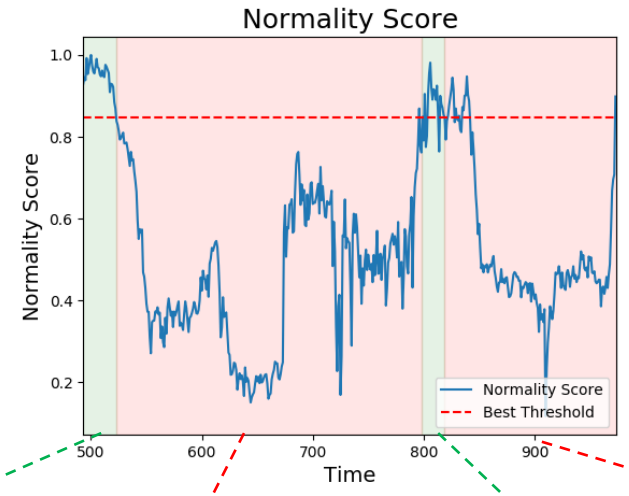


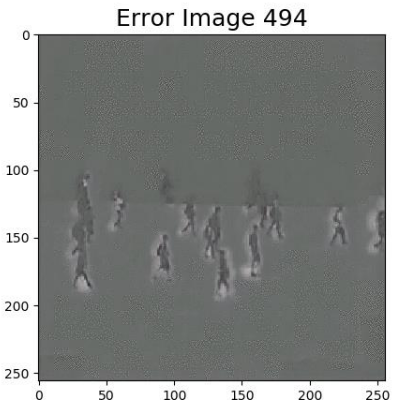


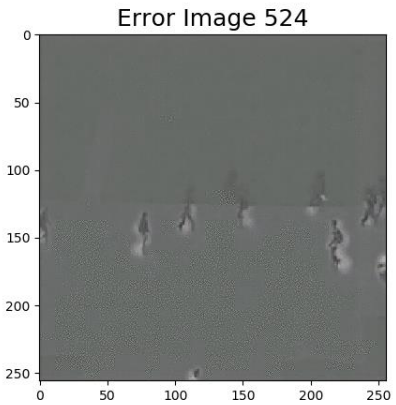


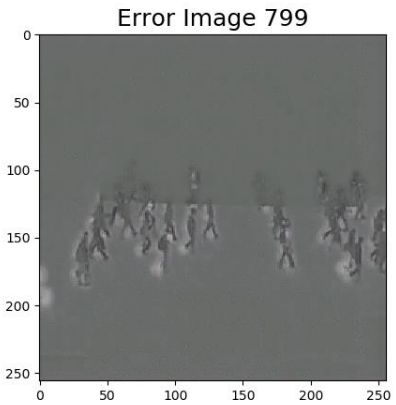


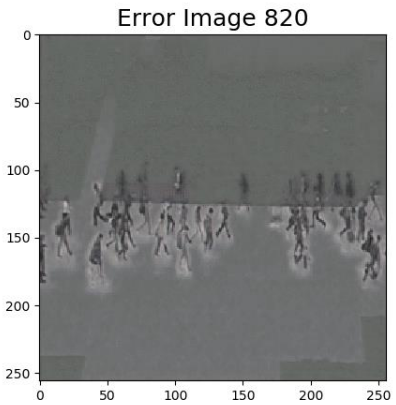
Normality Curve and Truth



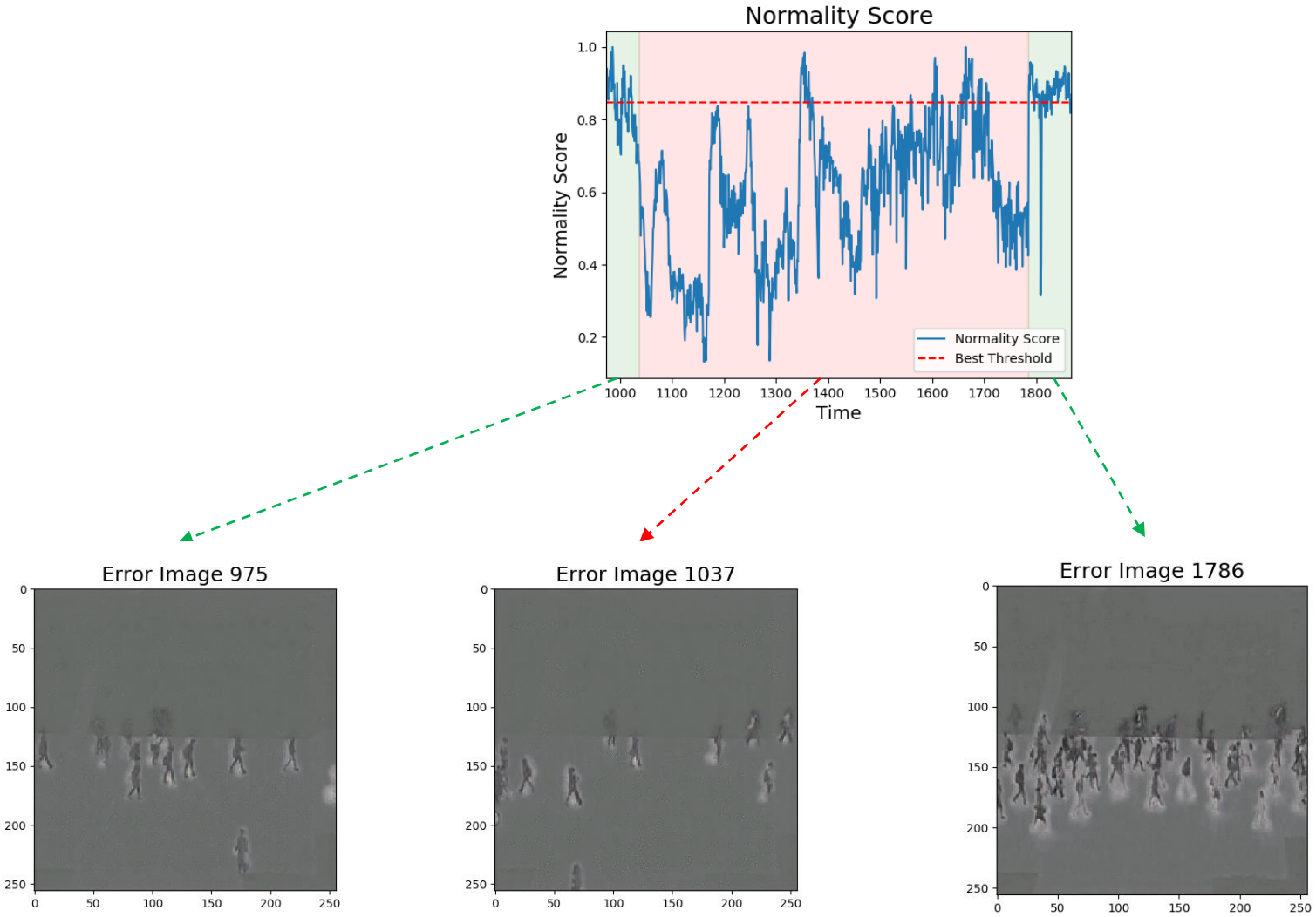




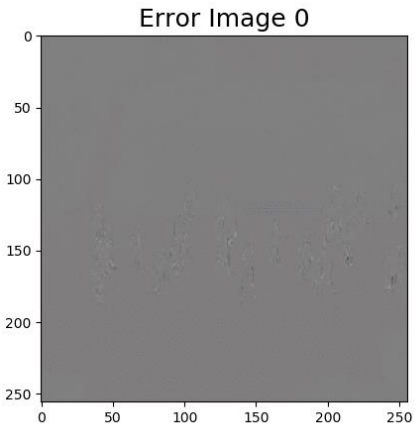
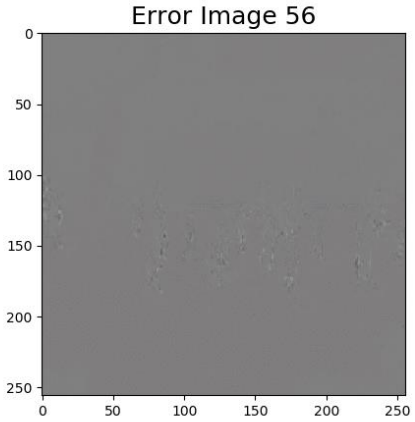
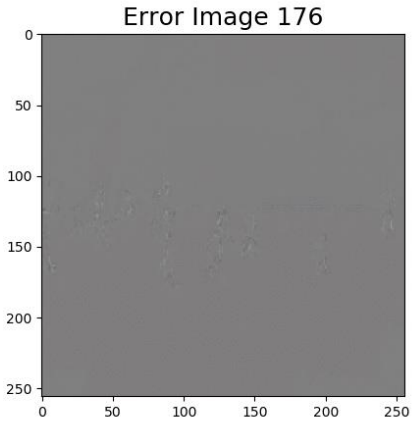
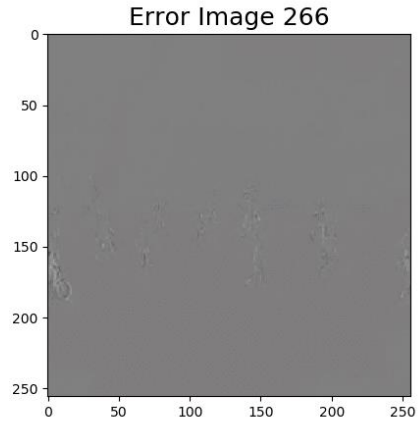
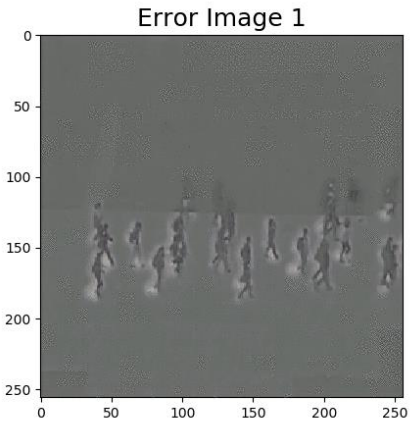
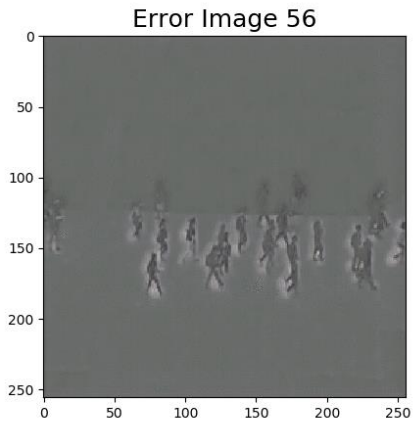
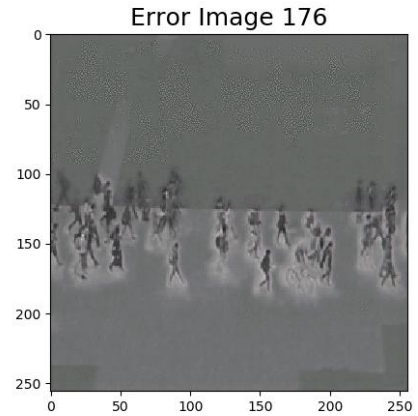
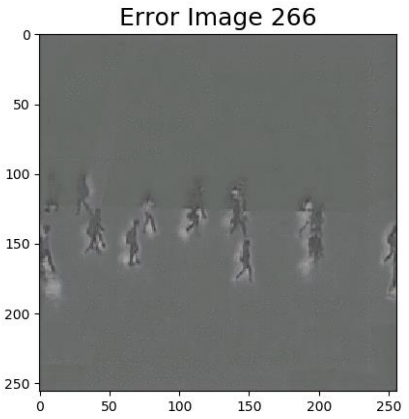




Normality Curve and Truth



Normality Curve and Truth

	Normal	Anomaly	Normal	Anomaly
Reconstruction Error				
Distance Reconstruction				

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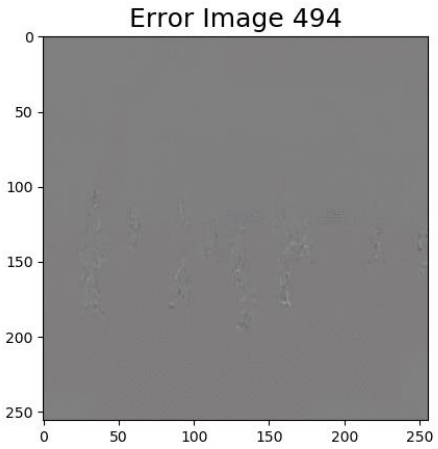
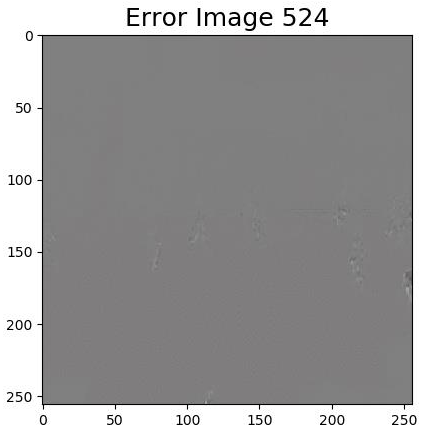
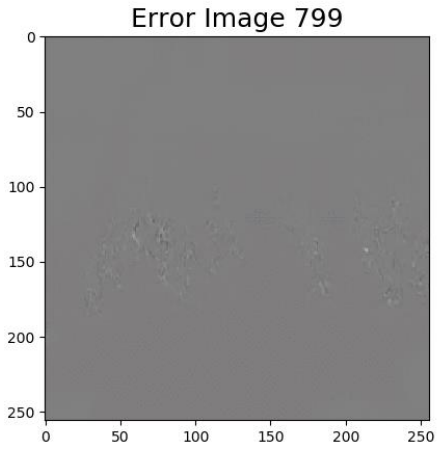
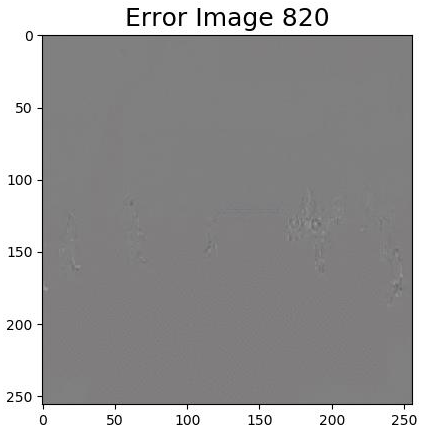
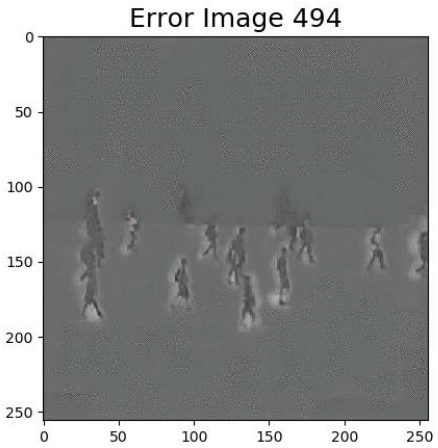
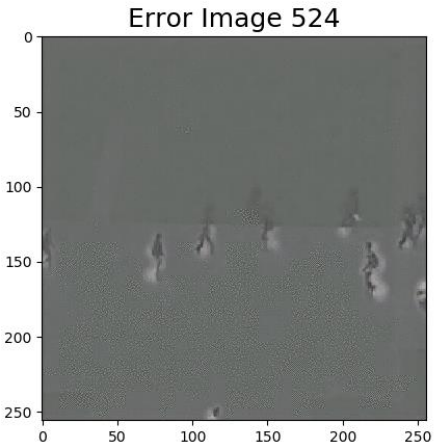
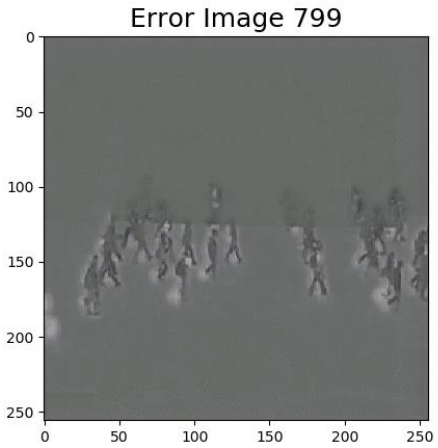
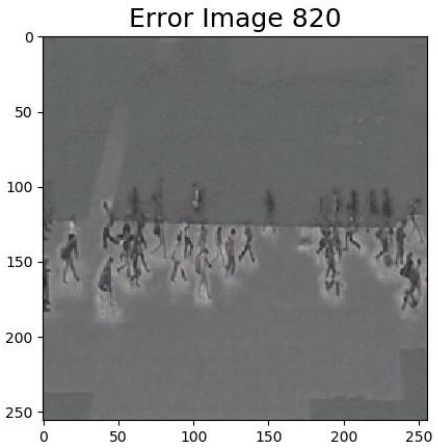
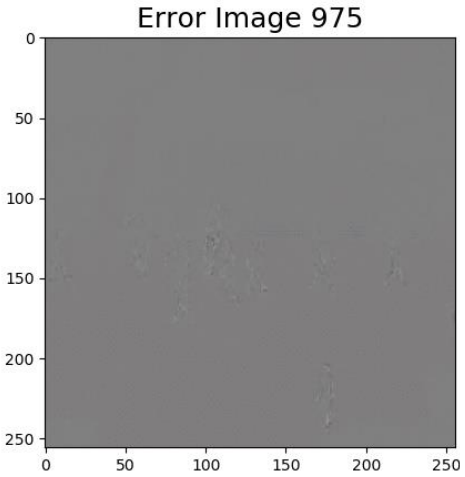
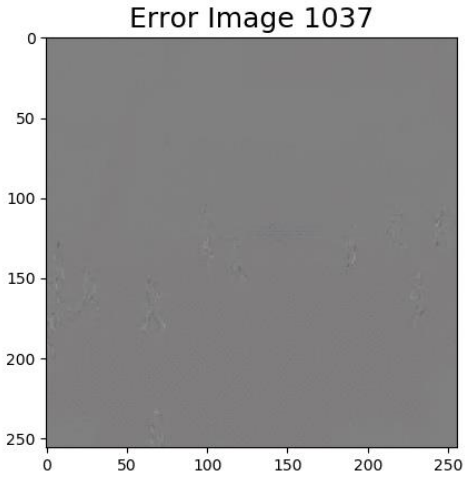
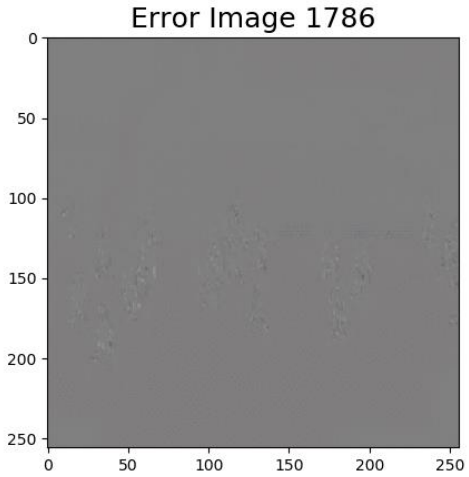
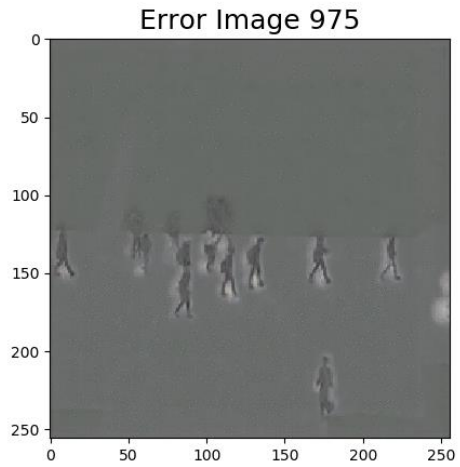
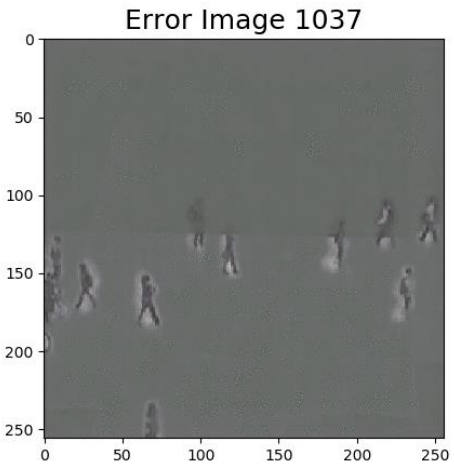
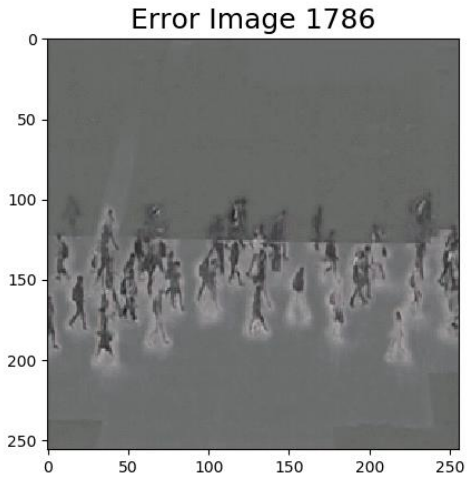
Reconstruction Error				
Distance Reconstruction				

Normality Curve and Truth

	Normal	Anomaly	Normal
Reconstruction Error			
Distance Reconstruction			

Optical Flow

Tracking Workflow

- Run anomaly detector
  - If anomaly is detected
    - Extract features from scene
    - Run optical flow tracking
  - Else
    - Move to next frame

Dense Optical Flow

Input video	Dense Optical Flow All Channels	Dense Optical Flow Red Channel	Dense Optical Flow Green Channel	Dense Optical Flow Blue Channel
				

Lucas-Kanade Optical Flow Tracking

Next Steps

- Push code updates to i-ASAP GitHub
  - Distance reconstruction code
  - Optical flow tracking code
- Develop anomaly detection and tracking model
  - Unsupervised region proposals method
  - Blob detection
  - Deep learning-based detection models

Unsupervised

Yang, Y., Loquercio, A., Scaramuzza, D., & Soatto, S. (2019). Unsupervised moving object detection via contextual information separation. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 879-888).

Supervised + Transfer learning

Redmon, J., & Farhadi, A. (2018). Yolov3: An incremental improvement. *arXiv preprint arXiv:1804.02767*.

He, K., Gkioxari, G., Dollár, P., & Girshick, R. (2017). Mask r-cnn. In *Proceedings of the IEEE international conference on computer vision* (pp. 2961-2969).

Questions and Discussion