

# Storm tracking using a dynamic mixture of Gaussians

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## DESCRIPTION

Tracking storm cells in satellite imagery is a difficult problem which has been studied extensively [1], [2]. The problem is very ill posed, as storm cells undergo frequent split and merge events, and their number and shape is often ambiguous. Since cold areas tend to be brighter in satellite images we can obtain a sample of these areas by sampling in proportion to image intensity. To identify storm cells, we cluster the sampled pixels using a novel Bayesian technique for the clustering of non-stationary data [3]. At a first search stage, many possible descriptions of the data as a mixture of Gaussians are computed for each frame. At a second stage, transition probabilities between candidate mixtures are computed, and a globally optimal clustering is found as the MAP solution of the resulting probabilistic model. Transition probabilities are computed using local stationarity assumptions and are based on a Gaussian version of the Jensen-Shannon divergence. The movie presents clustering results for the data of the hurricane Alex, which moved up the USA east coast in August 2004. Each pixel here keeps its original intensity, but is colored according to the clustering found. Alex's main storm cell is identified and tracked in blue.

## LINKS

- The Alex segmentation video can be downloaded from: [http://www.cs.huji.ac.il/~adams/papers/storm\\_tracking](http://www.cs.huji.ac.il/~adams/papers/storm_tracking)
- The original satellite video can be downloaded from: <http://rsd.gsfc.nasa.gov/goes/text/hotstuff.html>

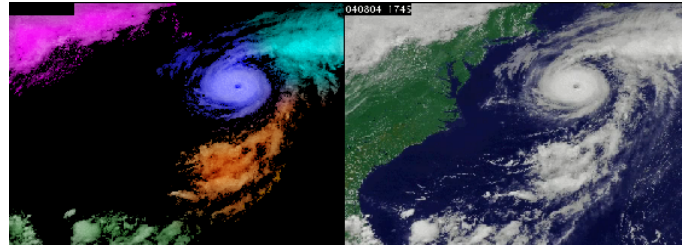


Fig. 1

A SAMPLE FRAME FROM THE MOVIE.

## REFERENCES

- [1] Lakshmanan, V., R. Rabin, and V. DeBrunner. Identifying and tracking storms in satellite images, in *Second Artificial Intelligence Conference*, American Meteorological Society, Long Beach, CA, 90-95, 2000.
- [2] Johnson J., P. Mackeen, A Witt, E. Mitchell, G. Stumpf, M Eilts, K Thomas. The storm cell identification and tracking algorithm: An enhanced WSR-88D algorithm, in *Weather and Forecasting*, 13, 263-276, 1998.
- [3] Bar-Hillel A., Spiro A., and Stark E. Spike sorting: Bayesian clustering of non-stationary data, in *Advances in Neural Information Processing Systems (NIPS)* 2004.