TIAM+

extending the Tool for Integrative Analysis of Motility
https://github.com/r-medina/TIAM-

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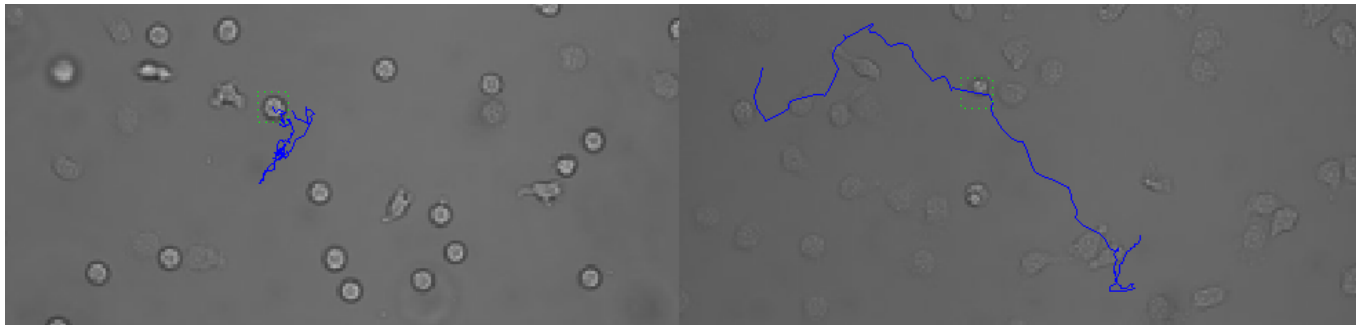
Task



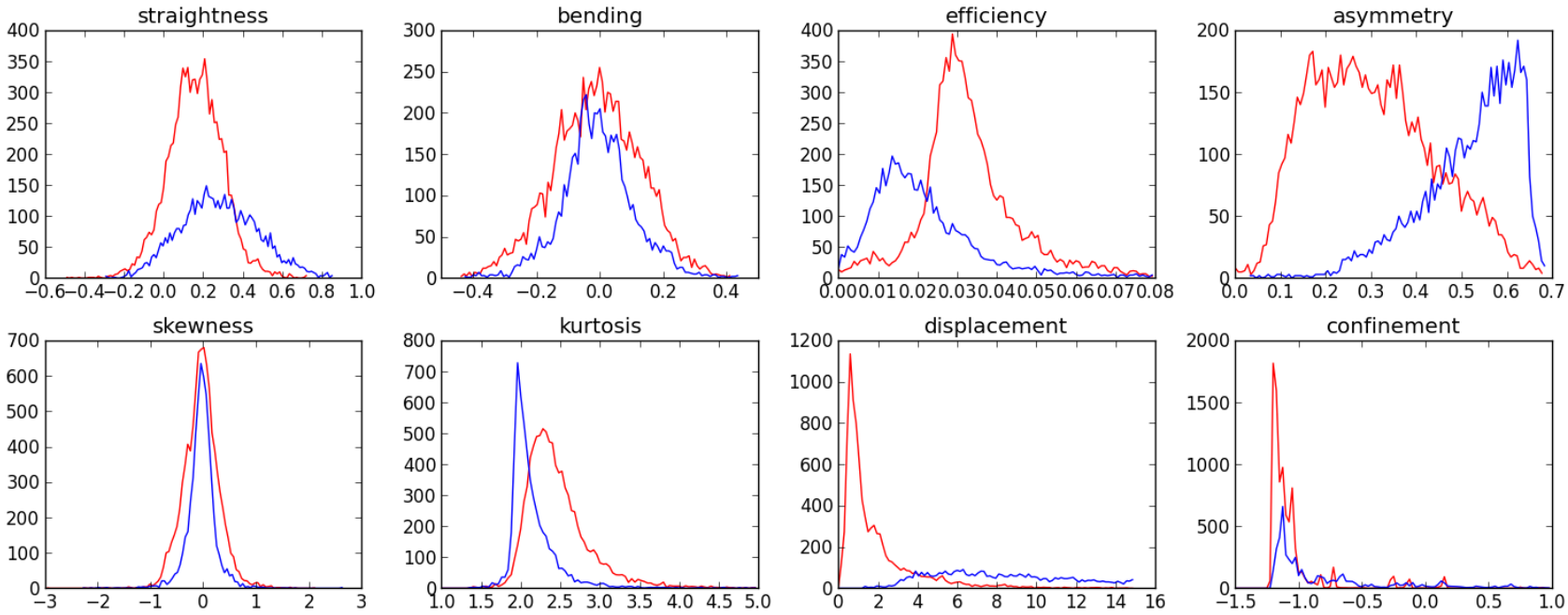
Using data from Vivek Mayya and Willie Neiswanger's TIAM tool, which performs detection and tracking of cells from multi-channel time lapse microscopy videos, build an algorithm that will classify track segments. Two initial decisions:

- 2 classes
- $\therefore$ supervised

Goals:

- ✓ collect supervised data
  - Vivek used GUI Ricardo Medina developed to label each position of 126 cell tracks with IRM channel data as being in one of the two classes
- ✓ engineer/discover useful features for trajectory classification
- ✓ find a supervised machine learning model that will work for the task at hand *and* that will properly segment the cell tracks
- ✓ develop an unsupervised generative model (HMM) with the help of Sakellarious Zairis and Jan-Willem van de Meent

Supervised Histograms



"Confined" "Not Confined"

SVM Performance

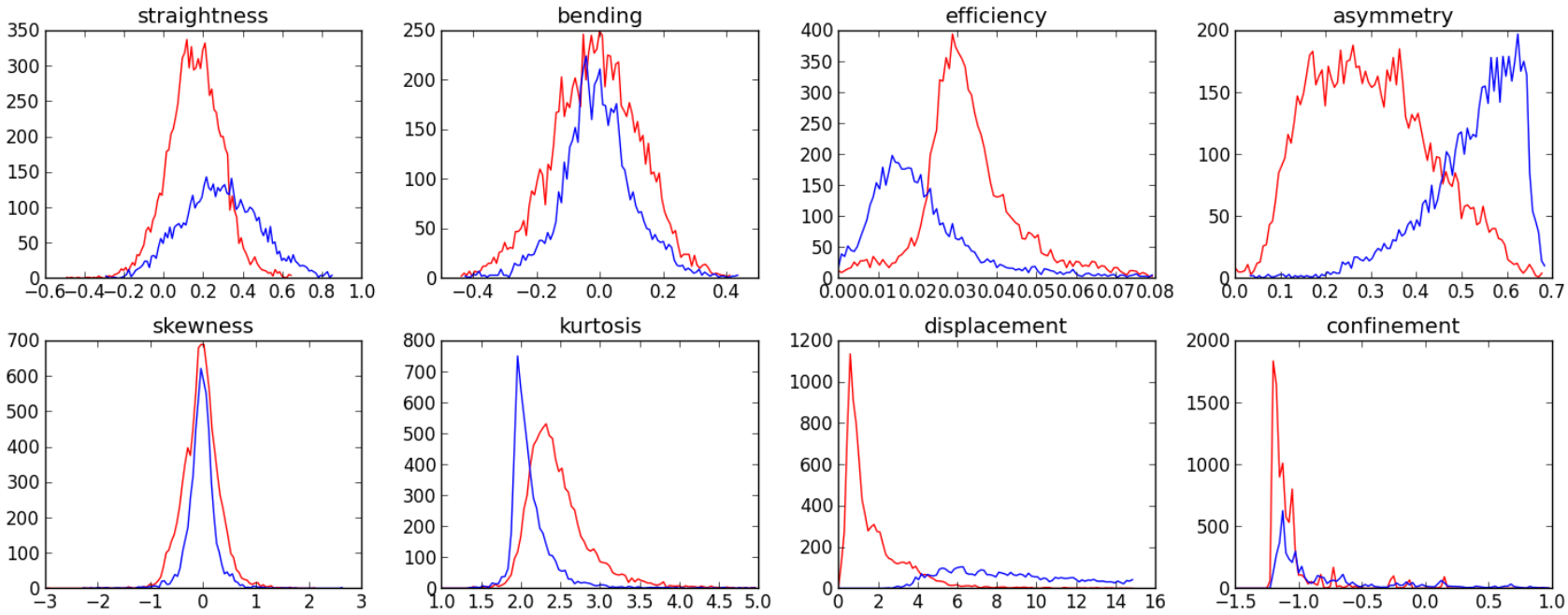
Running an SVM classifier on all data for which we have supervised labels (110 full trajectories with IRM channel data) gives the following result:

true unconfined	5048	454	false confined
false unconfined	487	8714	true confined

- sensitivity: 0.917
- specificity: 0.947
- accuracy: 0.936

Woo!

SVM Histograms



"Confined" "Not Confined"

HMM Performance

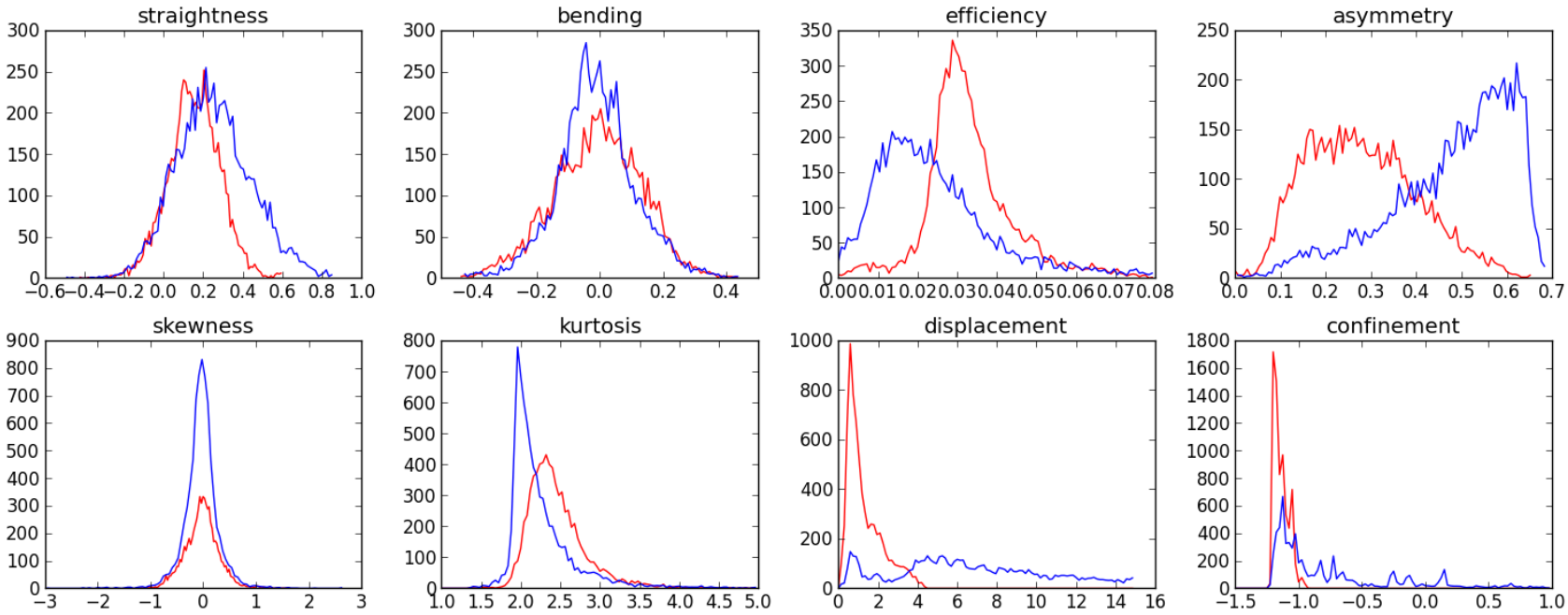
Using an HMM on all data for which we have supervised labels (110 full trajectories with IRM channel data) gives the following result:

true unconfined	5280	2348	false confined
false unconfined	255	6822	true confined

- sensitivity: 0.692
- specificity: 0.964
- accuracy: 0.823

Woo!

HMM Histograms



"Confined" "Not Confined"