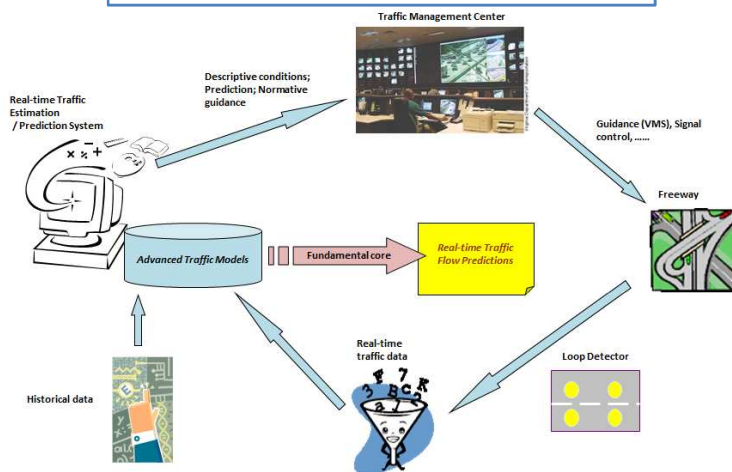


# Intelligent Transportation Systems: Prediction Modeling

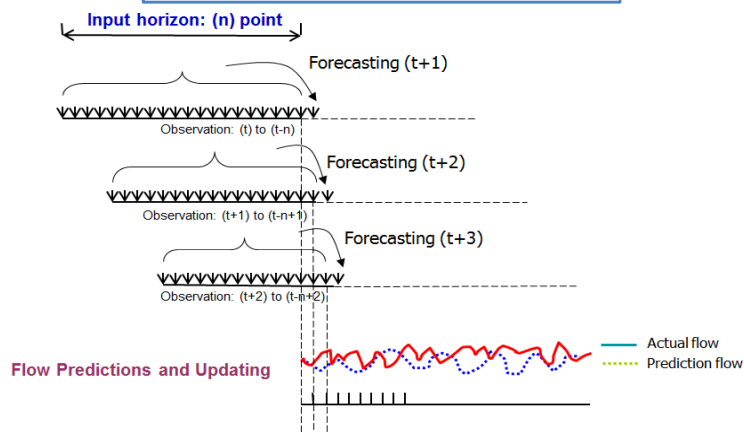
sponsored by USTA

- Short-term prediction for traffic flow
  - Need online training to reflect dynamic nature of current traffic situation
  - Receive severe influence of performance on unusual conditions such as unexpected road construction and stopping of broken car
  - Batch implementation is not efficient for short term prediction long training time without retraining the entire set

## Traffic Prediction Model Mechanism



## Traffic Flow Prediction Model

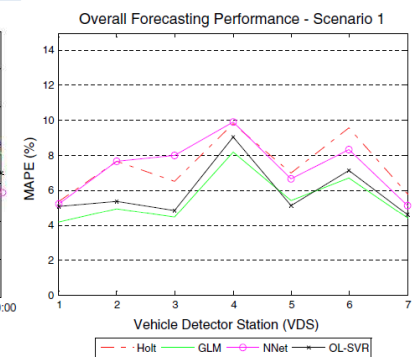
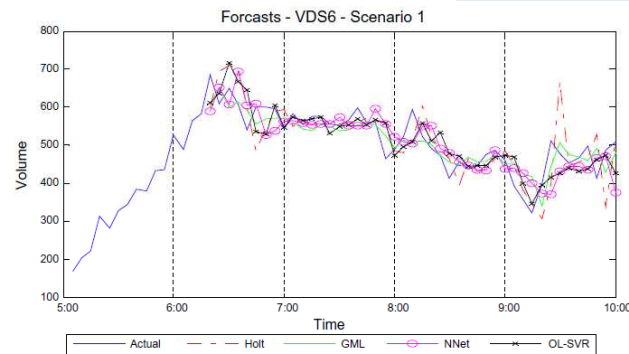


- Online Support Vector Machine Regression (Online SVR)
  - Online SVR allows adding or removing new data points from the training set without retraining the entire set

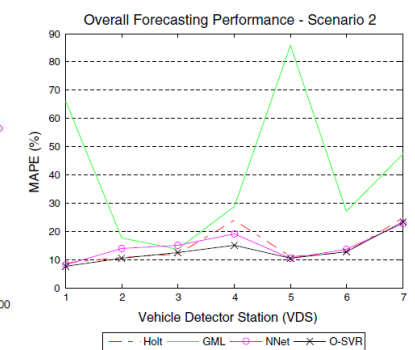
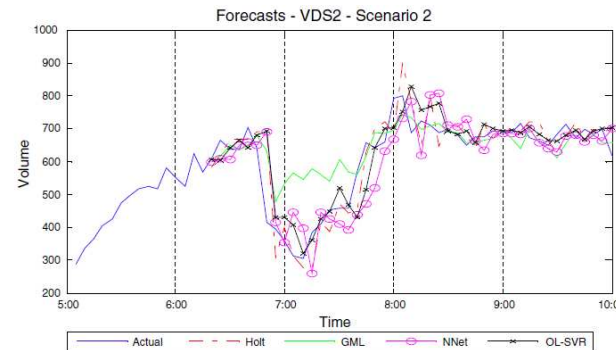
## Study of scenarios

Sc1) typical traffic conditions: no special occurrences that may significantly change the traffic pattern, such as vehicle collisions  
 Sc2) atypical traffic conditions: the testing day (16th day) either was a special day of traffic (holiday), or had an unexpected event (traffic incident)

### Scenario 1



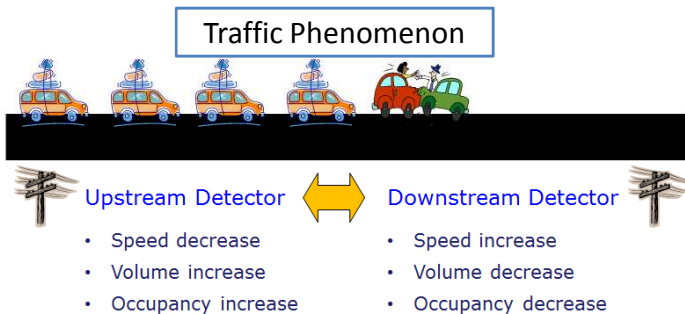
### Scenario 2



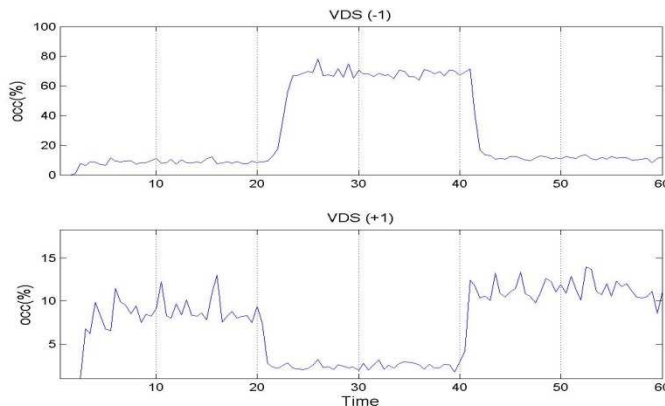
- "Online-SVR for short-term traffic flow prediction under typical and atypical traffic conditions", *Expert Systems with Applications* (2009)
- "AADT prediction using support vector regression with data-dependent parameters", *Expert Systems with Applications* (2009)

# Intelligent Transportation Systems: AID algorithms

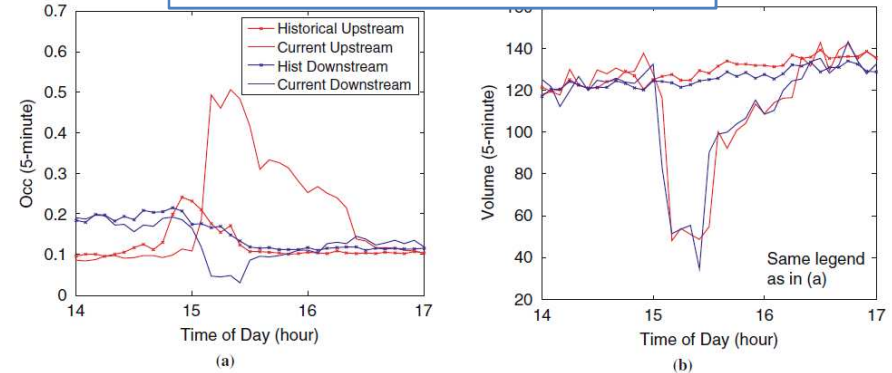
- Automatic incident detection (AID) on freeways
  - Non-recurrent event that causes a severe reduction in the traffic capacity
  - Many models typically are configured to perform under very specific operational conditions for which they were calibrated makes their implementation not only difficult, but also inefficient when the operational condition drifts from the assumed norm
- Automatic freeway incident detection based on loop sensor data
  - Develop an efficient and accurate incident detection algorithms based on the traffic phenomenon



**Example of Traffic Phenomenon**



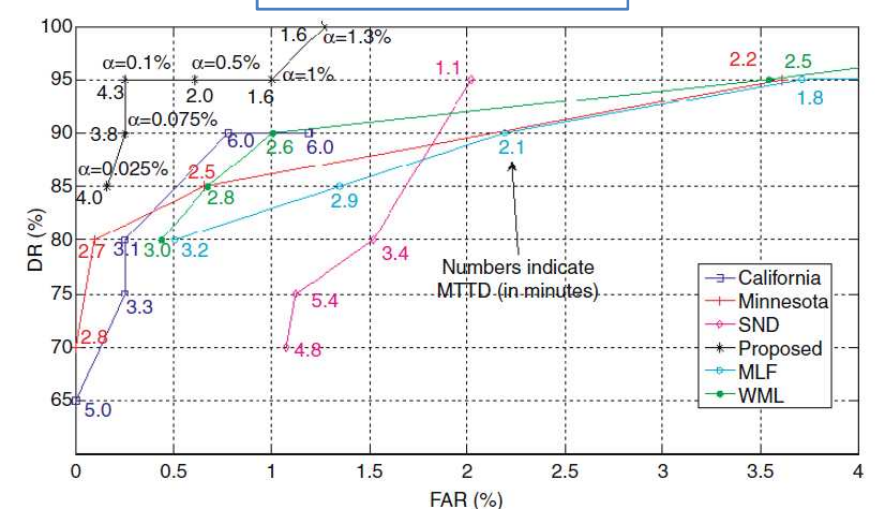
**Visualization of Incident Occurrence**



• **Advantages**

- 1) Algorithm is simple that it requires no training
- 2) It is self-learning, as it needs practically no human intervention and becomes more powerful with time
- 3) Its detection is based on a dynamic traffic-demand-sensitive threshold

**Detection Performance**



- “Toward Training-Free Automatic Detection of Freeway Incidents”, *Journal of the Transportation Research Board* (2012)
- “A wavelet-based freeway incident detection algorithm with adapting threshold parameters”, *Transportation Research Part C Emerging Technologies* (2011)