# Run-time Assurance for UAVs using Stochastic Modeling and Reachability Analysis

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FMCAD'18 Student Forum · October 31, 2018

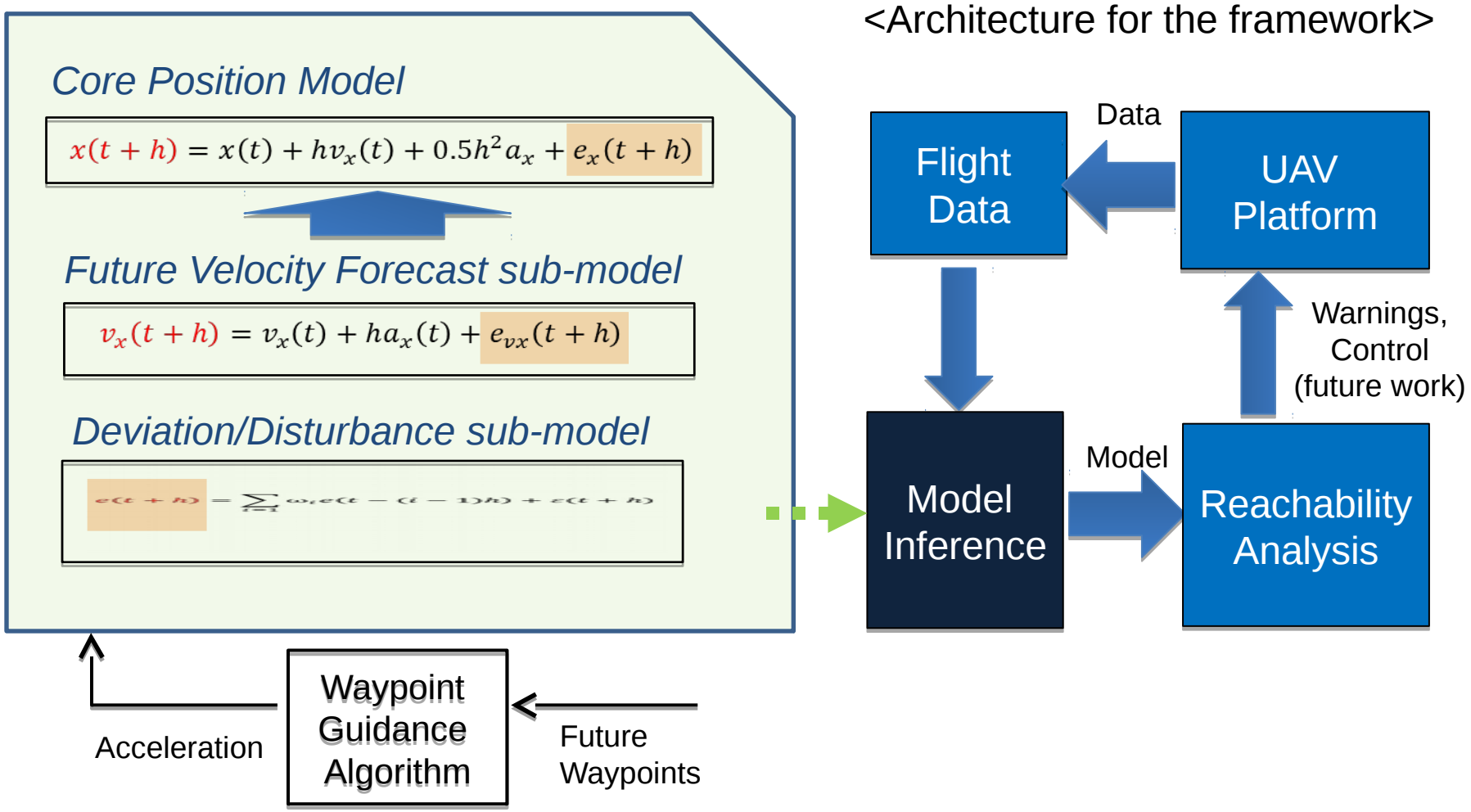
* Unmanned Aerial Vehicles

# Motivation & Objective

- UAVs are increasingly common in crowded urban spaces with risks to life and property due to disturbances such as wind.
- Forecasts future UAVs positions to predict and avoid collisions.
- Quantify risk of collisions with fixed obstacles.


# Predictive Monitoring Framework

<Architecture for the framework>



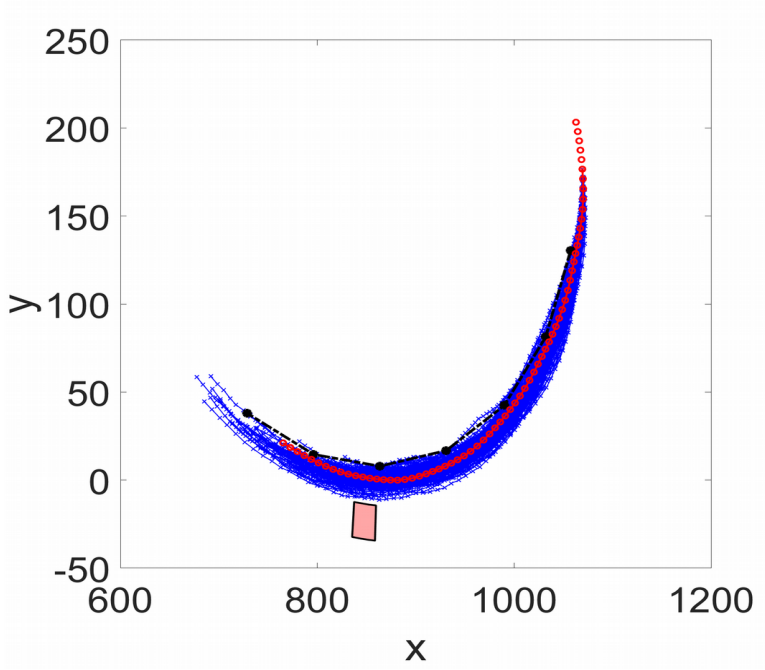
# Collision Prediction Results

- **Evaluation on Talon UAV Flight Test Data**

| Real / Prediction | SAFE | COLLISION |
|---|---|---|
| SAFE | 94 | 0 |
| COLLISION | 5 | 94 |
| NOT SURE | 1 | 6 |

Test conditions:

1. Probability of collision >=0.4
2. Prediction time horizon: 25 secs
3. The distance of the center of an obstacle
   - 25 m for SAFE tests
   - 0 m for COLLISION tests
4. Wind: 3 m/s




Square: Obstacle
Red line: Ground truth trajectory
Blue lines: Predicted trajectories