

# Deep Learning Helicopter Dynamics Models

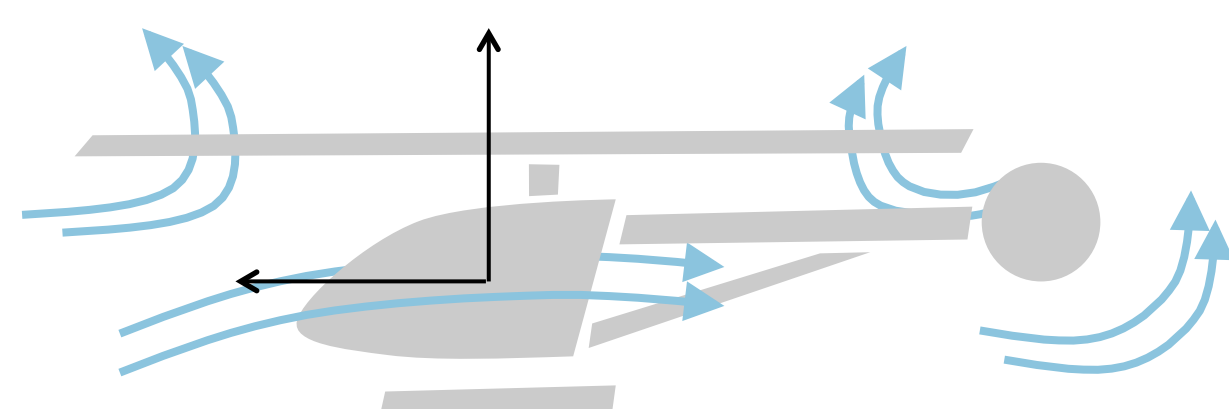
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## Helicopter System

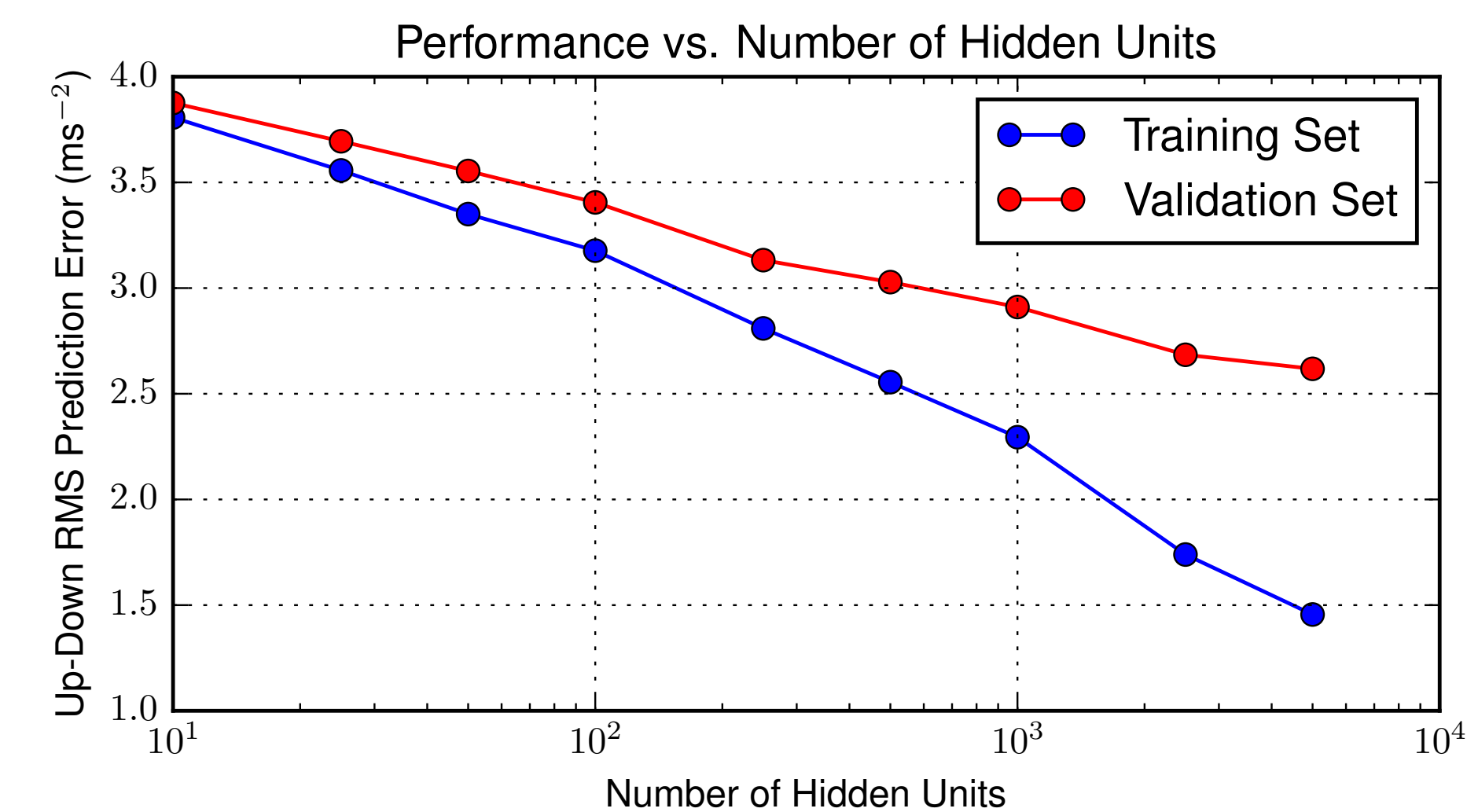
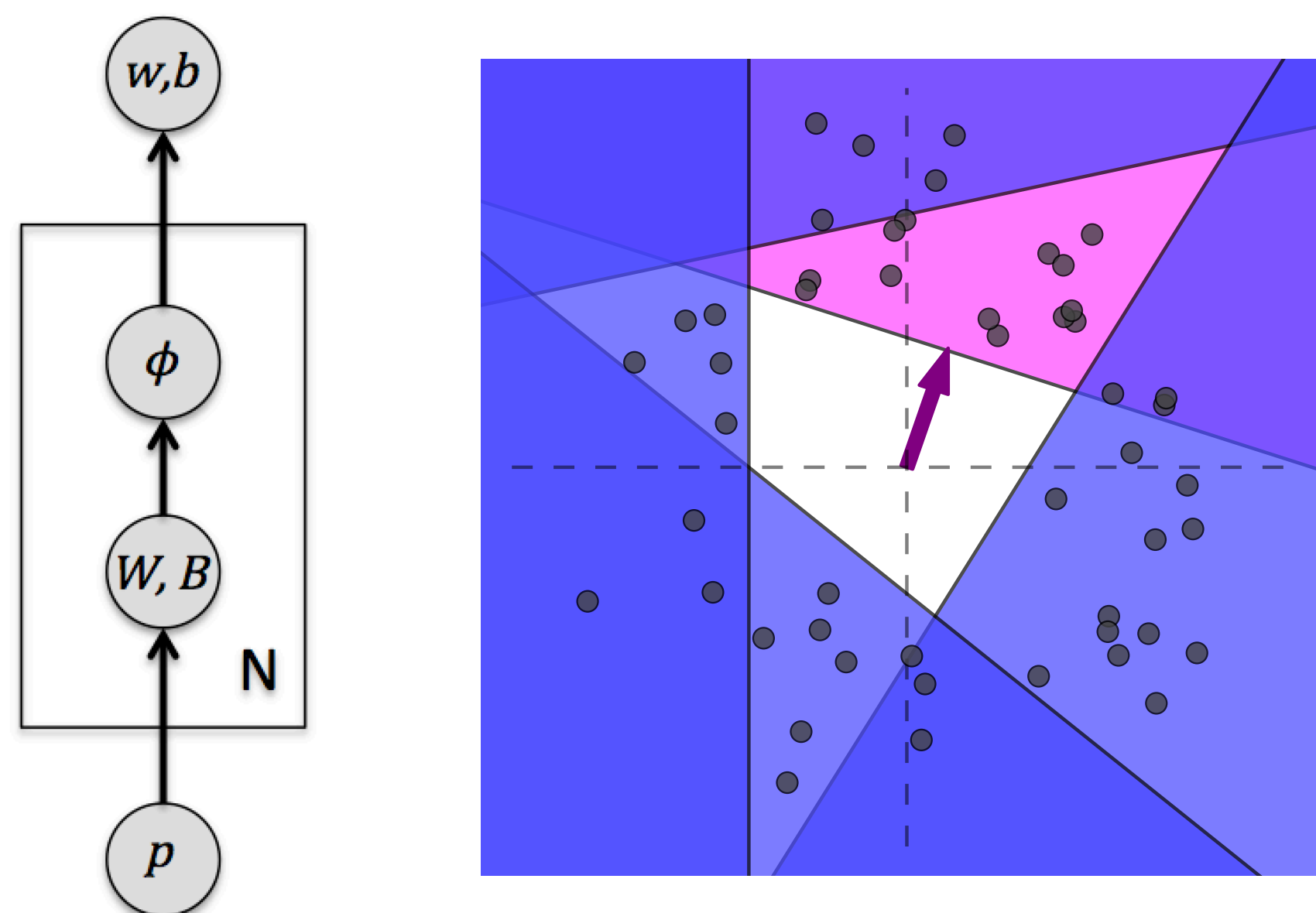
Difficult because of latent unmeasured state like airflow



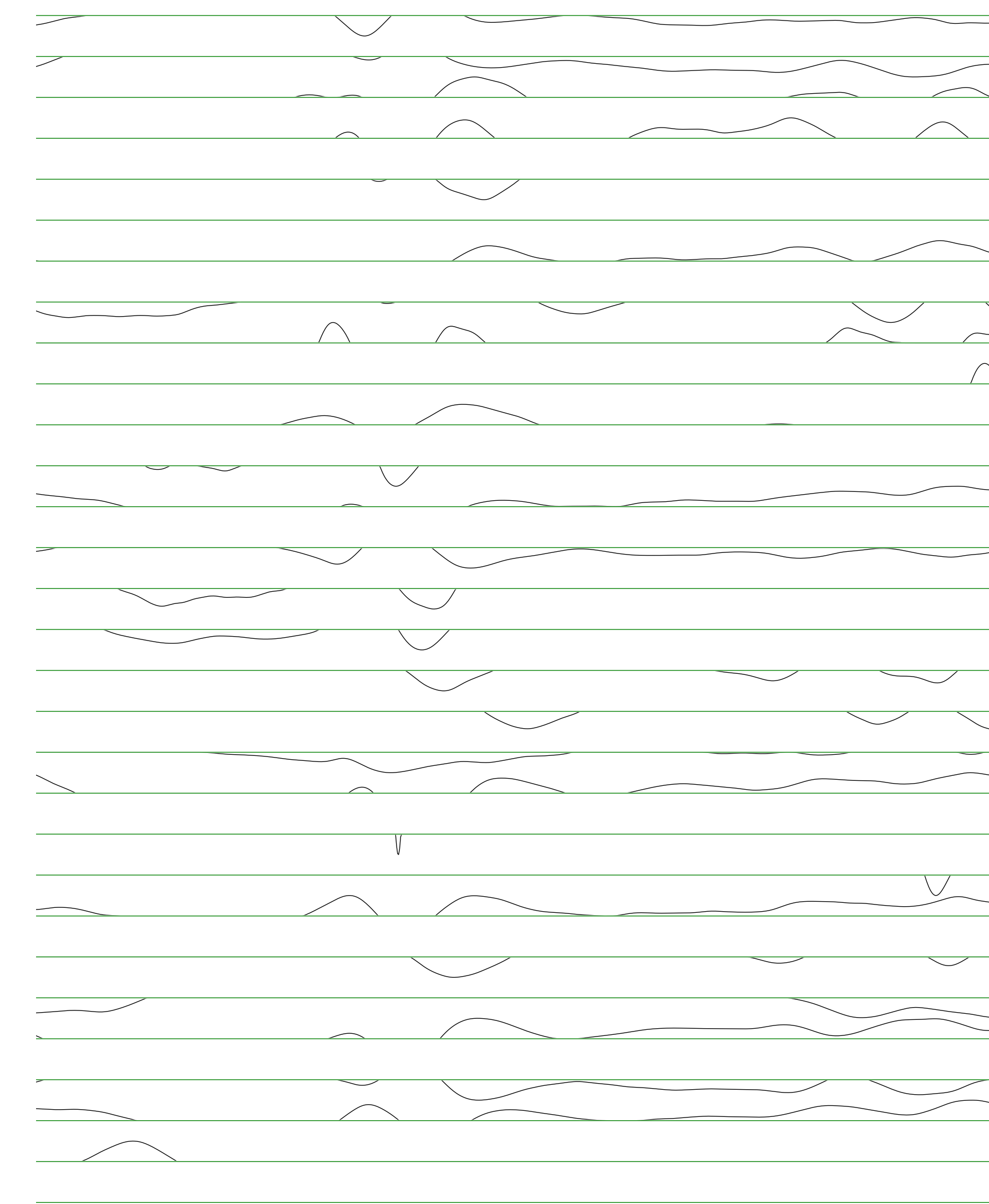
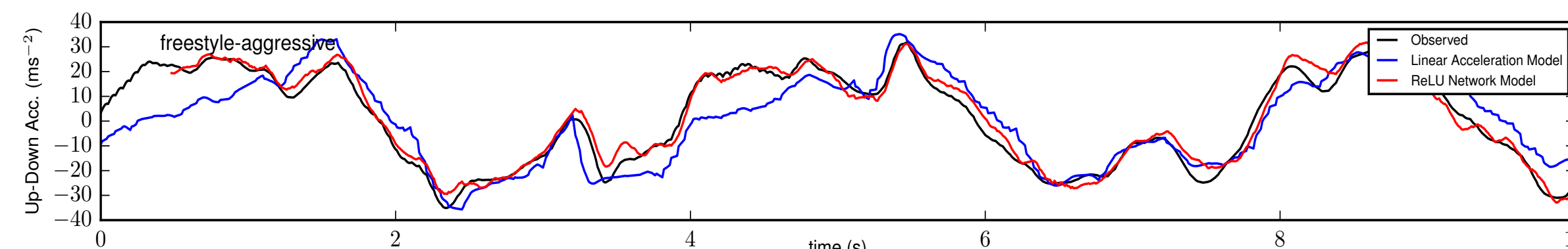
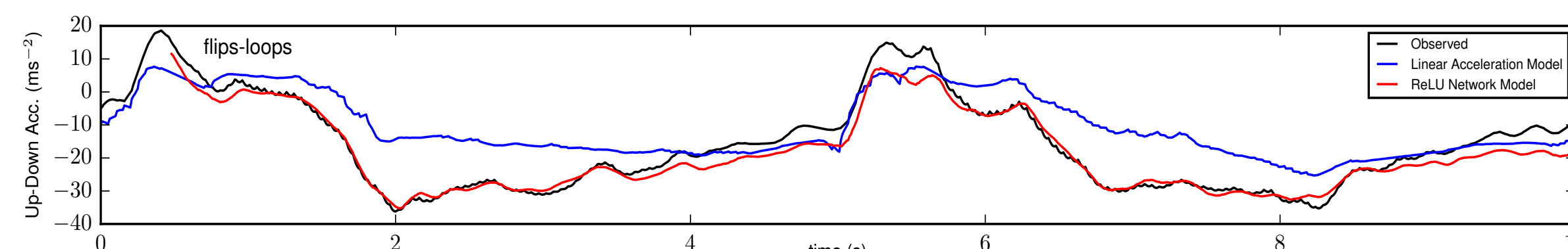
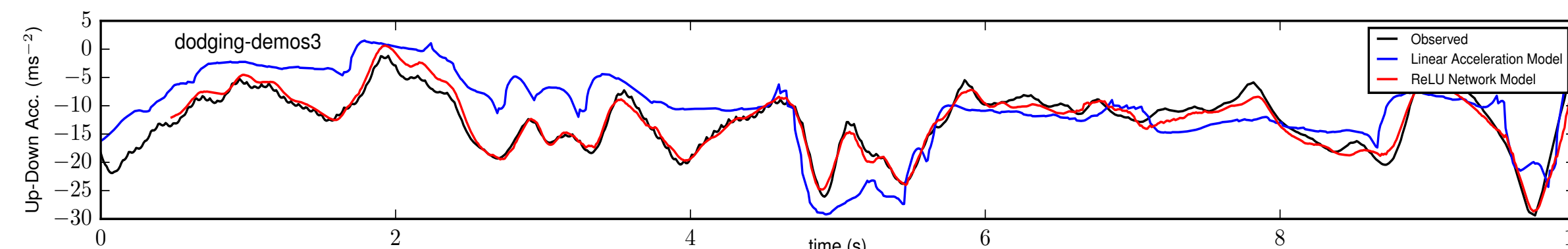
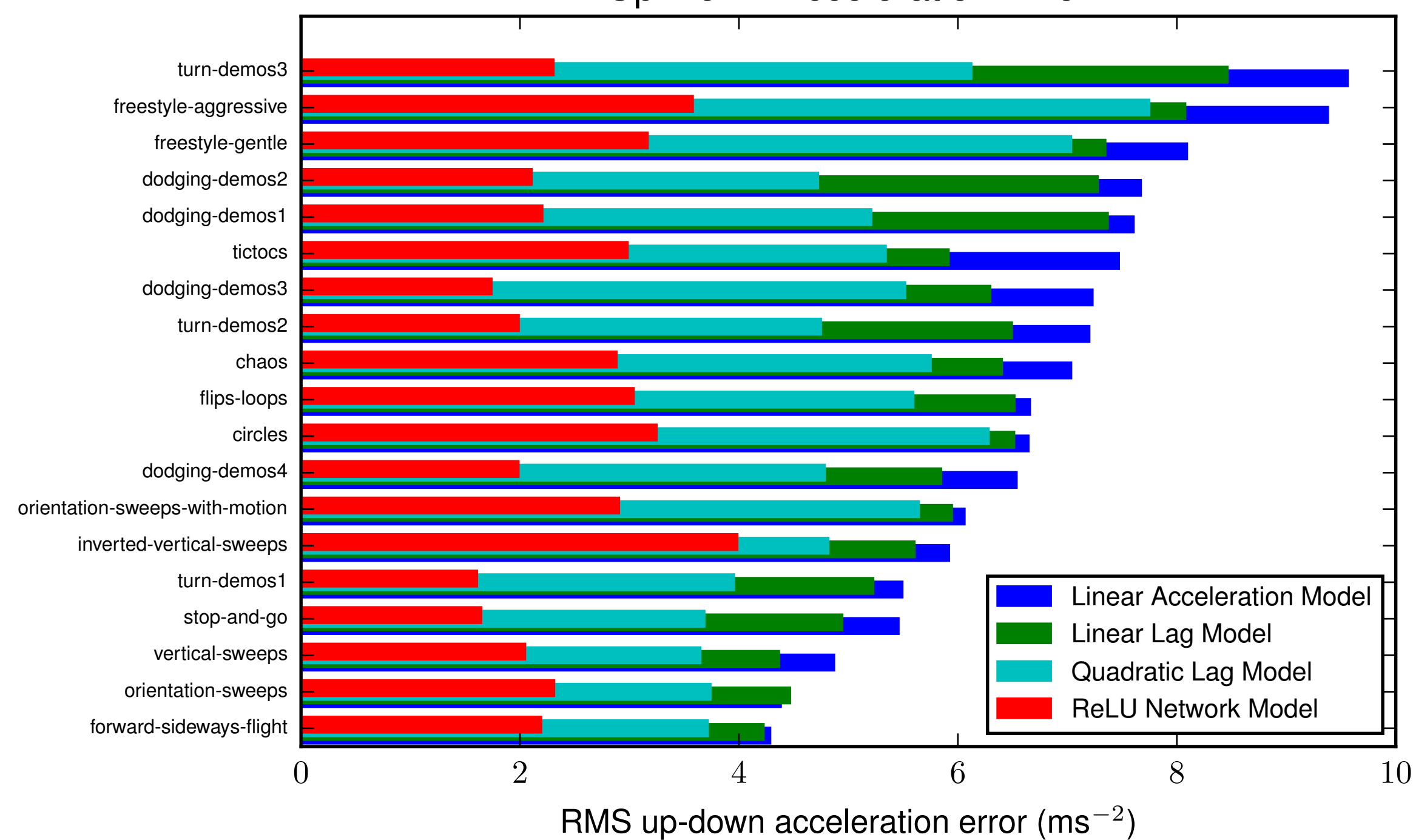
## Kinematics:

$$\dot{s} = \begin{bmatrix} \dot{r} \\ \dot{q} \\ \dot{v} \\ \dot{\omega} \end{bmatrix} = F(s, u, \theta) = \begin{bmatrix} C_{12}v \\ \frac{1}{2}\hat{\omega}q \\ C_{12}^T g - \omega \times v + f_v(s, u, \theta) \\ f_\omega(s, u, \theta) \end{bmatrix}$$

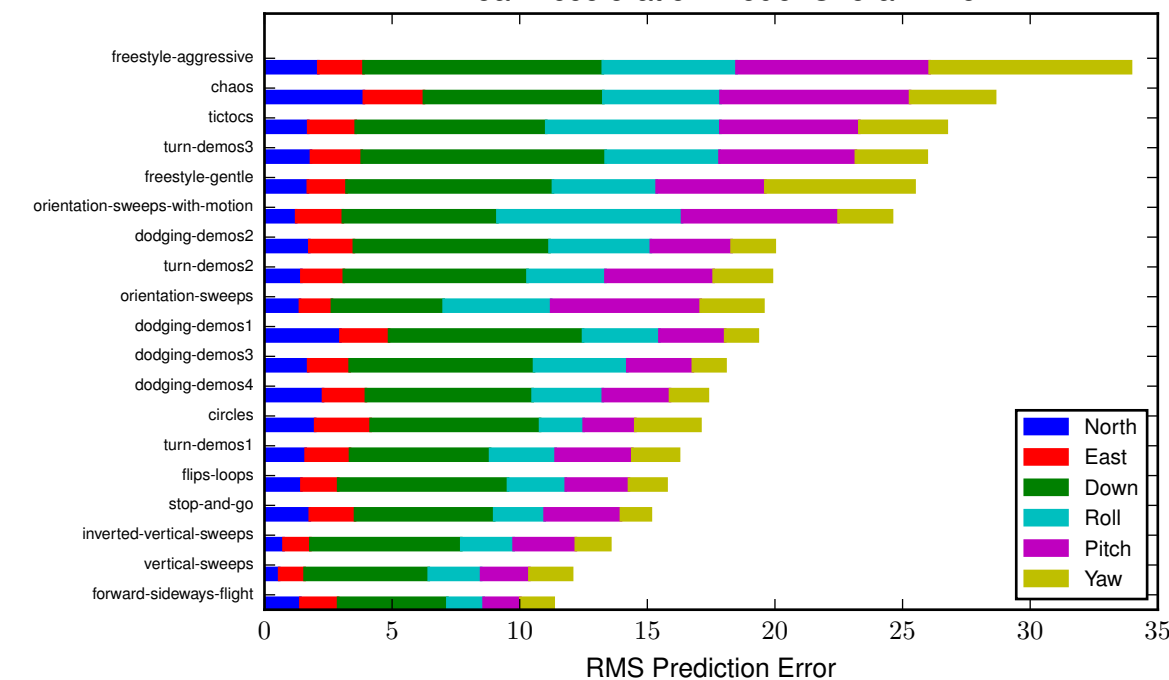
## ReLU Network Model



Up-Down Acceleration Error



Linear Acceleration Model Overall Error



ReLU Network Model Overall Error

