Simple 1D KF

Kalman Filter : Bayes Filter w Linear dyn. and measurements w starting Gaussian $P(x_0)$ "prior"

$$\begin{cases} x_t = A x_{t-1} + n_q \\ z_t = H x_t + n_6 \end{cases}$$

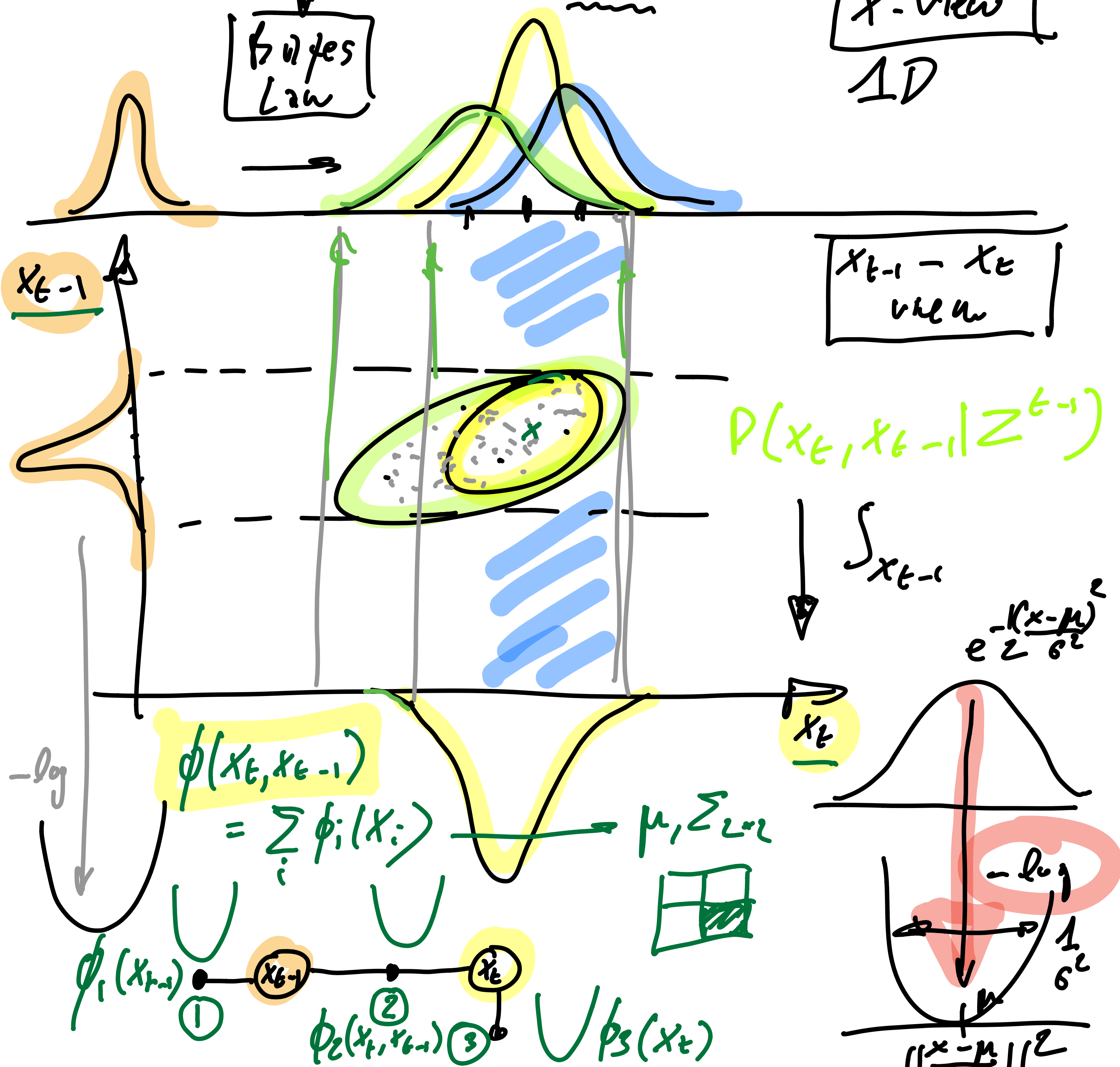
$A: n \times n$

$H: m \times n$

$$\underbrace{P(x_t \mid Z^t)}_{\text{"posterior"}} \propto P(z_t \mid x_t) \overbrace{P(x_t \mid Z^{t-1})}^{\text{predictive}}$$

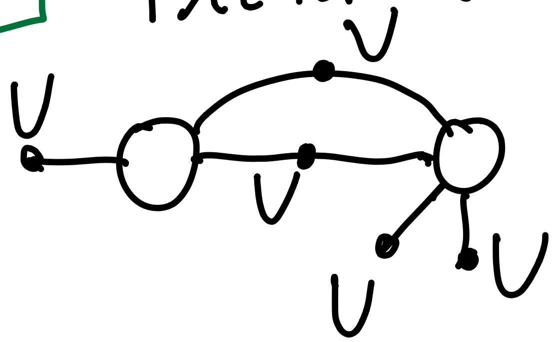
$$\propto \underbrace{L(x_t; z_t)}_{\text{likelihood}} ③ \int_{x_{t-1}} P(x_t \mid x_{t-1}) ② \; P(x_{t-1} \mid Z^{t-1}) ①$$

filtering density



$\boxed{\text{LLS}}$ FACTOR GRAPH

$$\psi(x_t, x_{t-1}) = \prod_i \psi(X_i)$$



$$\phi(x_t, x_{t-1}) = \sum_i \phi(x_i)$$

Iterated Extended Kalman Filter

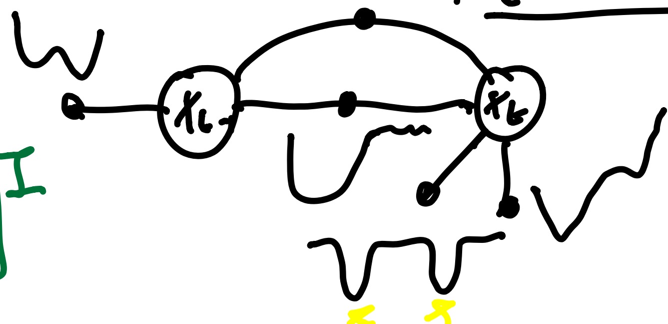
$\mu_2 \Sigma_{2\times 2}$

$W \; K(\pi(\ldots\ldots))$

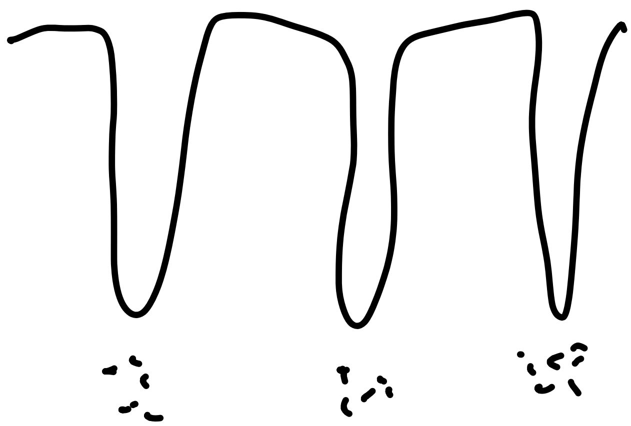
$\boxed{\text{NLS}}$

1) linearize $\rightarrow \Delta x$
2) LLS Δx
3) update lin point

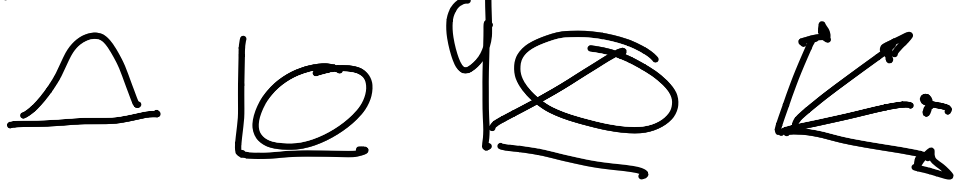
I

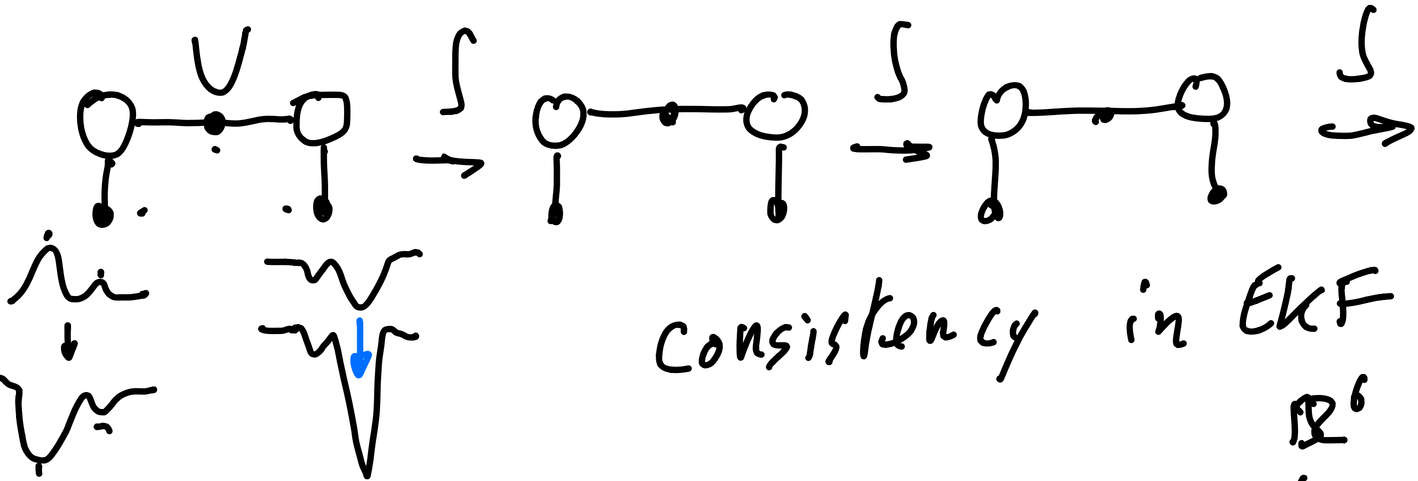


$p(x_t | z^t)$



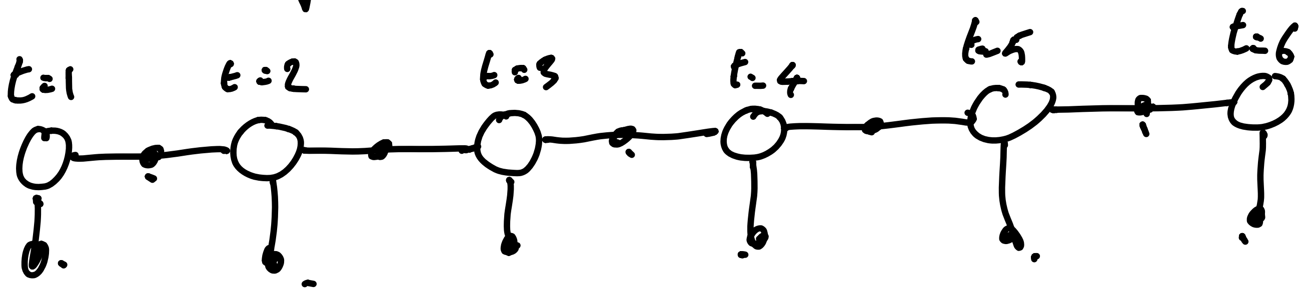
Kalman Smoothing ⟷ Filtering.

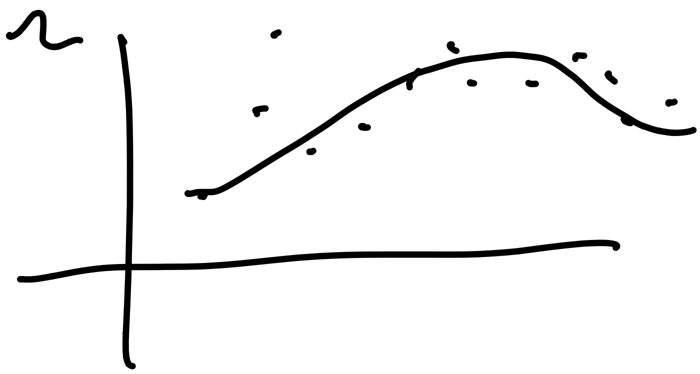




Consistency in EKF

$\mathbb{R}^6$

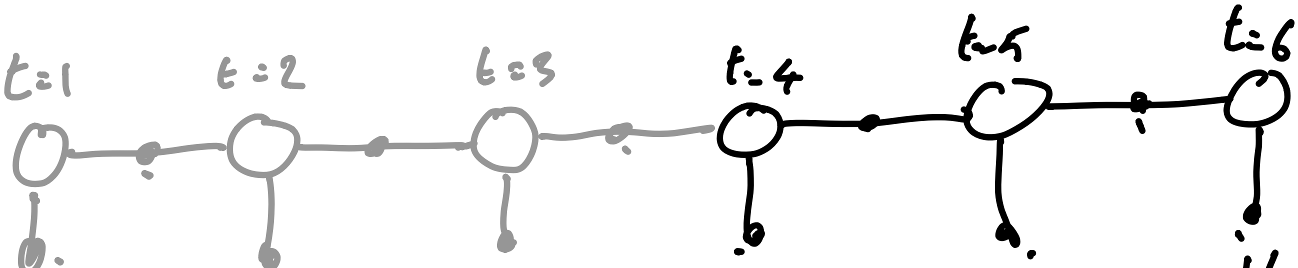




K smoothing

IEKS $\equiv$ NLS

$\mathbb{R}^3$

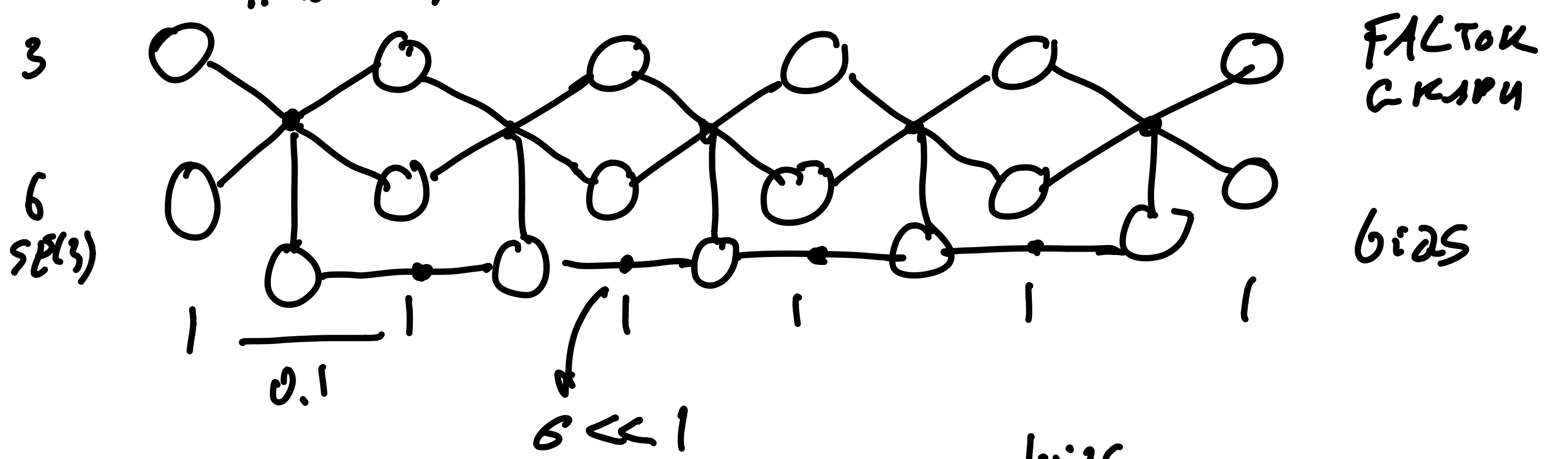


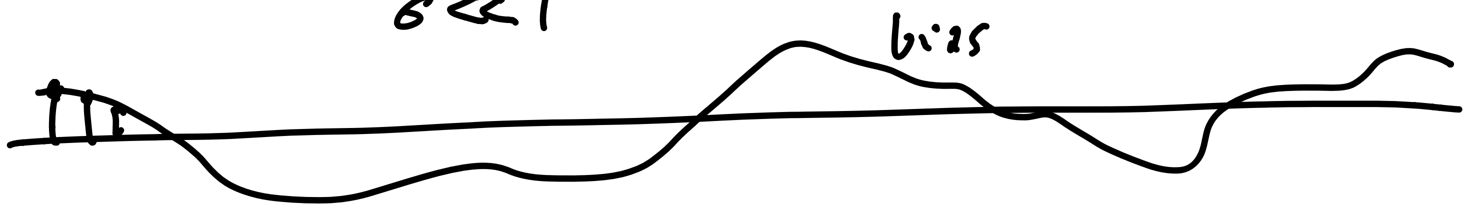
Fixed-lag smoother.

lag = 3

$3 \times 6 = 18$

200Hz $\}_{20}$





$$a = \cancel{\ddot{x} + n}$$

$$a = \ddot{x} + \underline{b} + n$$

$$x = \iint a$$

$$\boxed{e = \frac{1}{2} b_a^2}$$

$$\underline{\dot{b} = e^{-b/\sigma} + n}$$

$$\underline{g = \omega + b + n}$$

$$\theta = \int \omega$$

$$\boxed{e = b_g T}$$