- STATE VECTOR ($\hat{x}$) : corrected prediction

$$\hat{x} = \begin{bmatrix} x \\ y \\ \dot{x} \\ \dot{y} \end{bmatrix}$$

where x, y = position (2D)
$\dot{x}, \dot{y}$ = velocity

PREDICTION

- PREDICTED STATE VECTOR ($\hat{x}^-$) : raw prediction soloty based on the previous step.

$$\hat{x}^- = F \cdot \hat{x}$$

where F is the STATE TRANSITION MATRIX which describes how the system evolves overtime.

$$F = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

} ensure velocity remains constant

- PREDICTED COVARIANCE (P^-) : tells how UNCERTAIN about the predicted state.

$$P^- = F \cdot P \cdot F^T + Q$$

where P is the PREVIOUS ERROR COVARIANCE MATRIX which tells us HOW MUCH UNCERTAINTY we have in our ESTIMATE.

Q is the process noise covariance