Predicting post-snap MOFO/MOFC from Tracking data

FOR $t \in \{1, 2, \ldots, T\}$ seconds before the snap (say, $T = 7$)

FOR each Relevant player $i \in$ {Safeties, linebackers}

↳ see NE_NYJ_116_Q2 when the linebacker pops back to create cover 3 and cover MOFC

take the starting location $l_{it} = (x_{it}, y_{it})$,

velocity vector $v_{it} = (v_{it}^x, v_{it}^y)$,

and acceleration vector $a_{it} = (a_{it}^x, a_{it}^y)$

and predict the location $l'_{it} = (x'_{it}, y'_{it})$ 2.5 seconds after the snap

Specifically, given covariates $\vec{X}_{it} = \{(l_{it}, v_{it}, a_{it})\}$

fit the post-snap location density $\mathbb{P}(l'_{it} \mid \vec{X}_{it})$

we expect a narrower density as time t is closer to 0!

— fit separate density for each $t \in \{1, 2, \ldots, T\}$

— separate density for each player? Joint density theoretically better, but difficult. Start simple.

— consider RFCDE to fit the density

and use kinematics projections $\hat{x}' = x + v_x(t+2.5) + \frac{1}{2} a_x (t+2.5)^2$

$\hat{y}'$ similarly

Given post-snap location predictions $\{\widehat{\ell}'_{it}\}_i$, predict post-snap MOFC, denoted MOFC', probability

- logistic Regression $\mathbb{P}(\text{MOFC}' \mid \{\widehat{\ell}'_{it}\}_i)$
- Consider a function of min y distance to the center

Finally, the continuous time MOFC' probability prediction at time t is

$$P_t := \mathbb{P}_t(\text{MOFC}') = \int \mathbb{P}(\text{MOFC}' \mid \{\ell'_{it}\}_i) \cdot d\,\mathbb{P}(\ell'_{it} \mid \vec{X}_{it})$$

Dataset Needed

for all Relevant players i

play id j	frame id	time t before Snap	def team name	position of player i	x_{ijt}	y_{ijt}	v^x_{ijt}	v^y_{ijt}	a^x_{ijt}	a^y_{ijt}	x'_{ijt}	y'_{ijt}	MOFC'_j

num relevant players