

An application of dynamic programming in American football

Daniel Bestard, Hans-Peter Hoellworth, Akhil Lohia, Michael Cameron

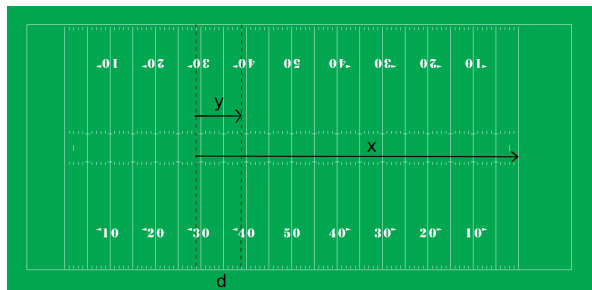
Barcelona Graduate School of Economics

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Table of Contents

1 The Football Model

The Football Model



- States: (x_i, y_i, d) , 15250 total states
- Actions: (P, R, U, K)
- Rewards: TD = 6.8, FG= 3, S= -2, Off Ex = $-\frac{6.8x}{100}$
- Aim: Find the optimal policy

DP Equation

$$\mu^k(i) = \arg \max_{u \in U} \left[\sum_{j \in S} p_{ij}(u)(g(i, u, j) + J^{\mu^{k-1}}(j)) \right]$$

Note: In reality J is difficult to compute, instead we use \tilde{J} .

Heuristic Algorithm

- We create a reasonable class of policies and implement it.
- Policies are compared by calculating the points from one drive.
- Simulations are run from the starting state of $(x_i, y_i, d) = (80, 10, 1)$.

API and OPI Policy Updates

- API: Many training sample points, few iterations
- OPI: Few training sample points, many iterations