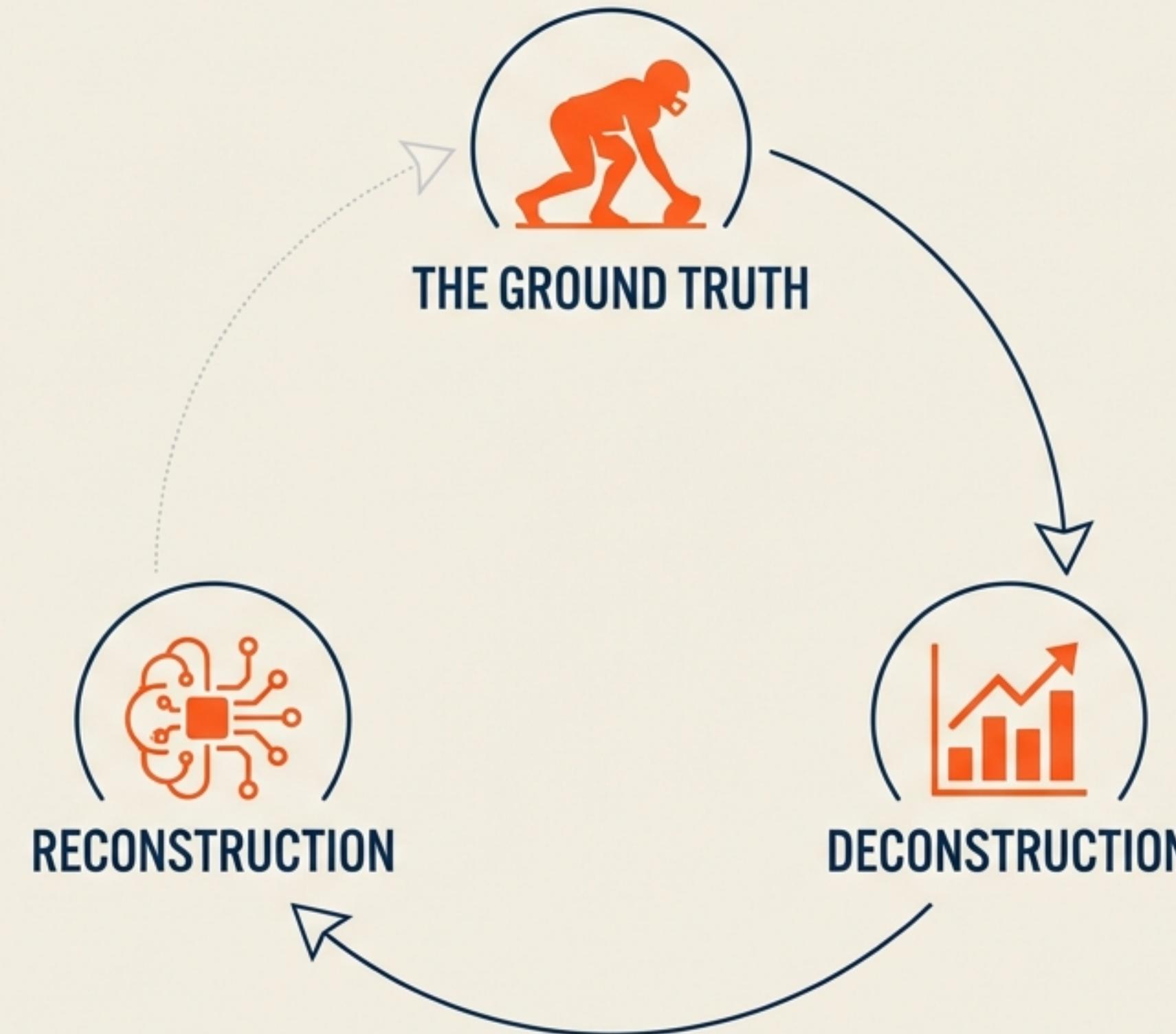


The Simulation Loop: Deconstructing & Reconstructing the NFL

An analysis of the ecosystem transforming how football is measured, understood, and experienced.



THE TARGET IS ALWAYS MOVING

The NFL is not a static system. The people, their physical forms, and their strategies are in constant flux, creating a complex reality that is difficult to model.



STRATEGIC VOLATILITY



DEFENSE OVERHAUL

The Atlanta Falcons hired Jeff Ulbrich to fix a defense that ranked 23rd in yards and points allowed, bringing in the coordinator from a Jets team that finished third in total defense in 2024.

➡ 23rd → 3rd (Proj.)



COMPLETE REBUILD

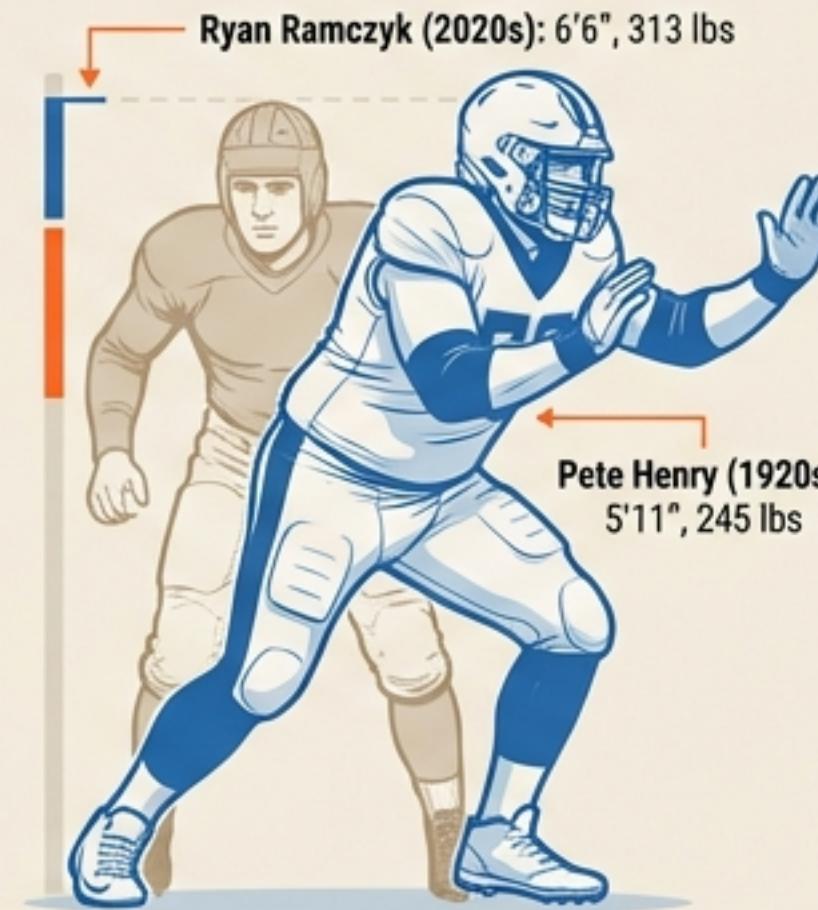
The Jacksonville Jaguars hired a new EVP (Tony Boselli), Head Coach (Liam Coen), GM (James Gladstone), DC (Anthony Campanile), and OC (Grant Udinski) in a single offseason, demonstrating total leadership turnover.

👤 EVP, 🏠 HC, 📂 GM, 🏈 DC, 🎤 OC



PLAYER EVOLUTION

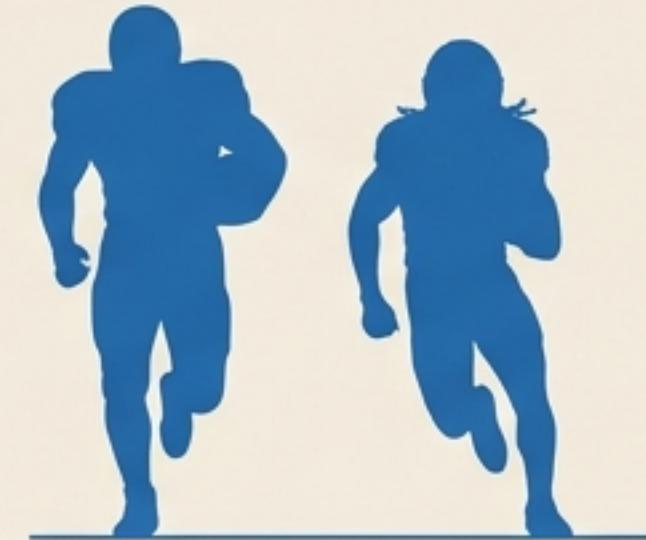
LINEMEN



Ryan Ramczyk (2020s): 6'6", 313 lbs

Pete Henry (1920s):
5'11", 245 lbs

POSITIONAL NUANCE



Bronko Nagurski (1930s): 6'2", 226 lbs
Alvin Kamara (2020s): 5'10", 215 lbs

While linemen have gotten larger, the ideal body type for other positions has evolved differently, with value shifting from raw size to specialized skills.

Takeaway: Modeling the NFL requires hitting a target that changes its size, shape, and strategic priorities every single season.

QUANTIFYING POTENTIAL: THE COMBINE AS A DATA FACTORY

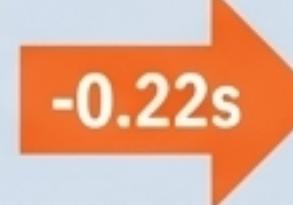
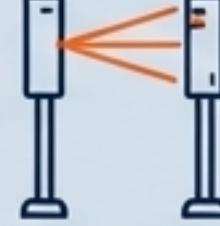
The Combine is the NFL's foundational attempt to standardize the measurement of athleticism, converting human potential into comparable data points.

 40-yard dash	 Bench press (225 lbs reps)	 Vertical jump
 Broad jump		
 Broad jump	 20-yard shuttle	 3-cone drill

 **UTILITY DEBATE**
Many argue for replacing the bench press with a more functional lift like the power clean, as it better measures explosive power relevant to football.


60-yard shuttle

 **THE PRECISION PROBLEM**
Research shows that hand-timing the 40-yard dash produces significantly faster results than modern electronic timing. A 2015 study of 81 college players found hand times were, on average, **0.22 seconds faster** than electronic times, rendering cross-era comparisons unreliable.

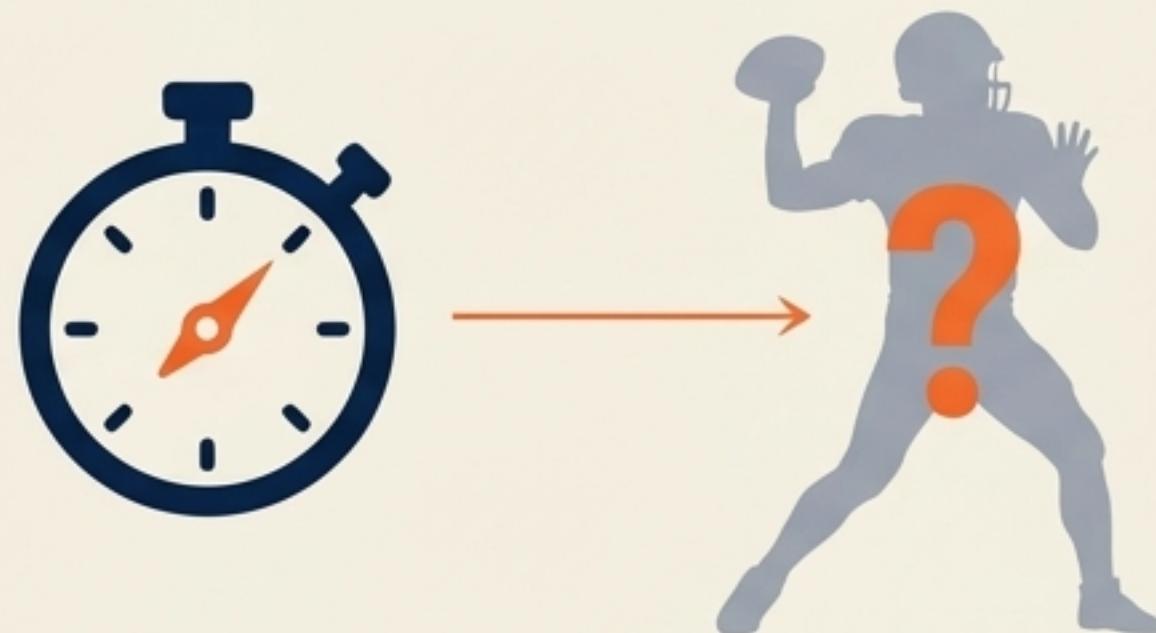
 4.40s  -0.22s  4.62s

FROM METRICS TO MEANING

The value of Combine data is complex, position-dependent, and emerges from analyzing combinations of traits, not single metrics. This insight is based on a 20-year discriminant function analysis study from Purdue.

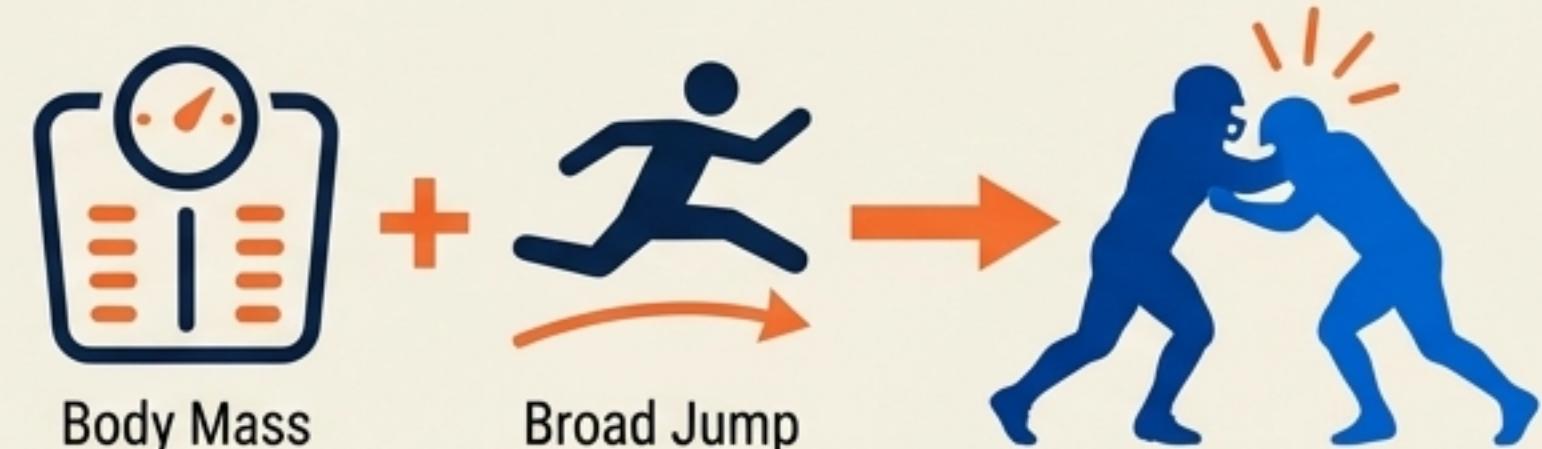
KEY FINDING: Single metrics have weak predictive power.
True indicators of success are found in specific *combinations* of physical traits.

LESS PREDICTIVE FOR OFFENSIVE SUCCESS



For most offensive positions (QB, WR, RB), the study found that Combine metrics are weak predictors of on-field success. Often, only a single measure like the 40-yard dash weakly correlates with becoming a starter or star.

MULTIVARIATE PREDICTORS FOR DEFENSIVE SUCCESS



For defensive players, specific combinations are highly predictive.

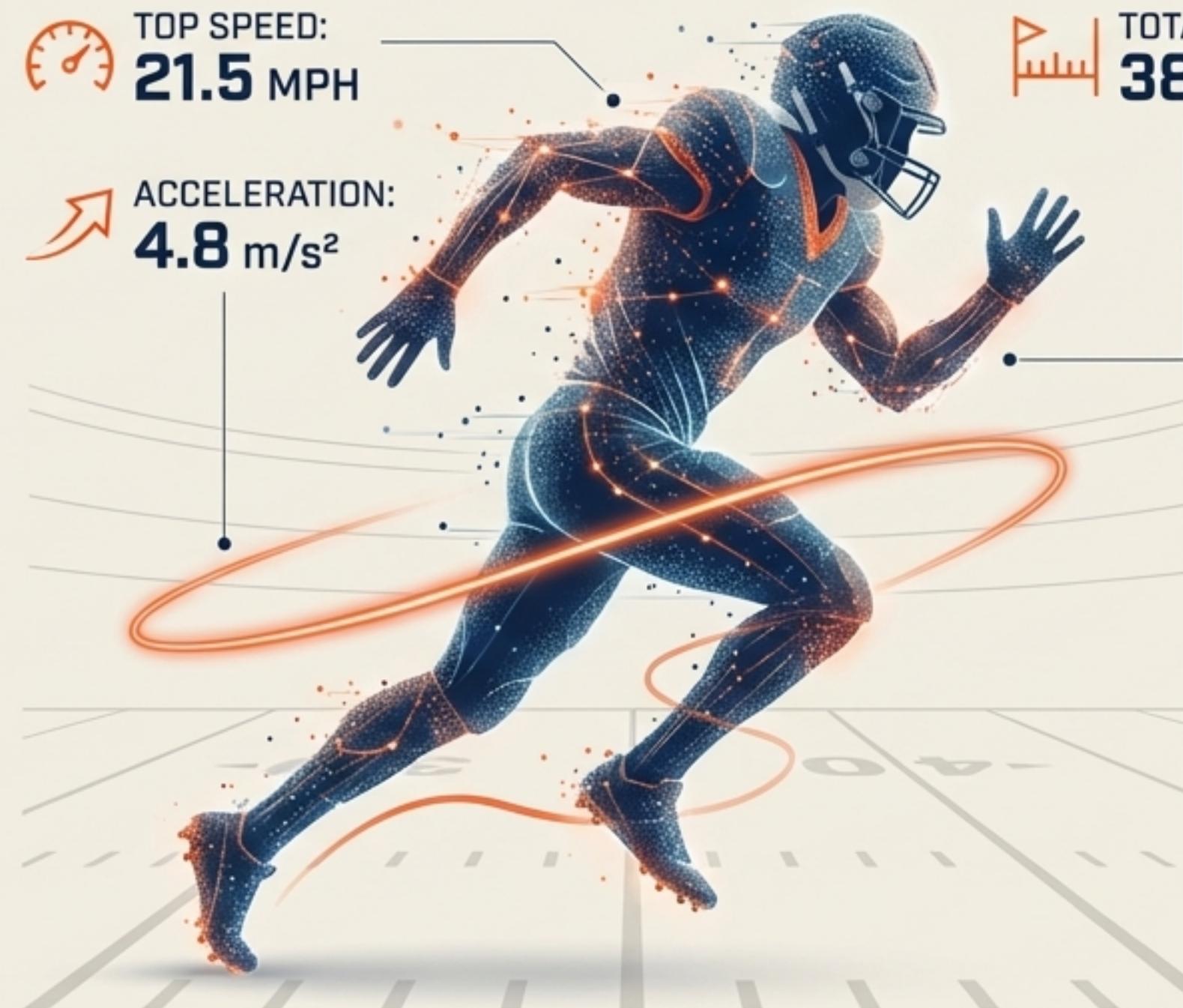
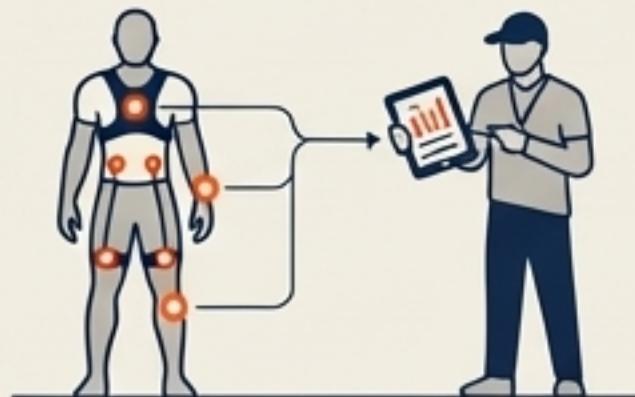
Example: "Edge rushers with the best combination of **body mass** and **horizontal jumping ability (broad jump)** were most likely to be regular starters." This reveals that size is only valuable when paired with elite explosiveness, a nuance missed by single-metric analysis.

THE PLAYER AS A DATA STREAM

Player measurement has evolved from a single, static event (the Combine) to a continuous, dynamic process using advanced wearable technology, from college to the pros.

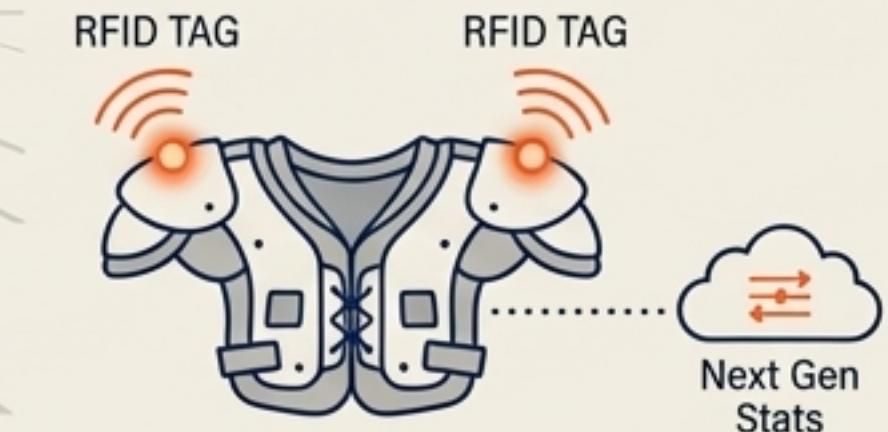
COLLEGIATE FOUNDATION

Elite NCAA programs use technologies like GPS trackers, Inertial Measurement Units (IMUs), and force plates for "individualized student-athlete management." A coach can adjust practice reps based on real-time data, saying, "Hey, this guy is a 50% guy today" ... that coach would script him into 15 reps instead of 30.



NFL APPLICATION

The Zebra MotionWorks system places two active RFID tags in every player's shoulder pads, transmitting location data 12 times per second. Linemen have a third tag on their back. This constant stream of (X, Y) coordinate and speed data powers the advanced Next Gen Stats metrics.

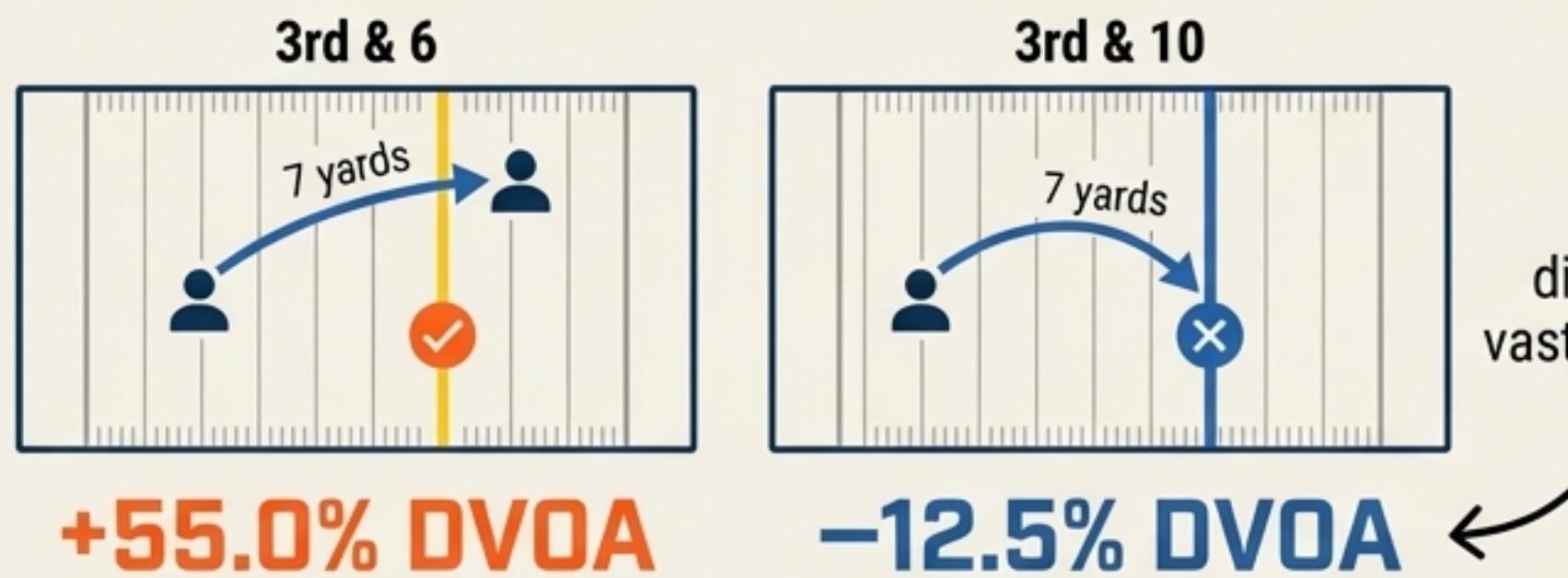


THE RISE OF THE ADVANCED METRIC

Advanced models like DVOA provide a more insightful understanding of performance than traditional box scores by adding context to every play.

CASE STUDY: DVOA

Defense-adjusted Value Over Average evaluates every single play based on its situational context (down, distance, opponent strength). It moves beyond raw yardage to measure a team's true efficiency.



The team with the best DVOA rating has gone on to win the Super Bowl in **3 of the last 10 seasons**.

THE ANALYST'S TOOLKIT

Building these models requires specialized tools for data acquisition and statistical analysis.



STATISTICAL MODELING

Using books like *Introduction to NFL Analytics with R* to build linear regression models.

DATA SCRAPING

Employing libraries like `nfl_data_py` to acquire and clean the necessary play-by-play data.

METHODOLOGY & TUTORIALS

Channels like "Kerry Sports Analyst" provide public tutorials on the end-to-end process.

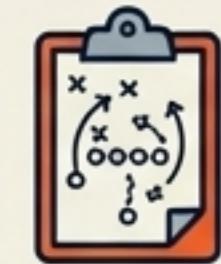
Takeaway: Deconstruction culminates in analytical models that redefine how we measure value and success in the NFL.

THE BENCHMARK FOR A ‘LIVING LEAGUE’

Released in 2004 for just \$19.99, ESPN NFL 2K5 is still revered by simulation enthusiasts for its unparalleled depth, presentation, and creation of a dynamic, believable league.



ESPN Presentation: Full integration of the ESPN broadcast package, including a complete *SportsCenter* show. Crucially, the halftime and weekly wrap-up shows featured **highlights from simulated CPU-vs-CPU games** around the league, making the user feel part of a larger, active world.



Detailed Weekly Prep: GMs could analyze opponent stats and design specific practice schedules, including full-team drills, position drills, and weightlifting sessions to boost attributes for that week's game.



Deep Franchise Logic: Realistic contract negotiations, detailed scouting notes beyond simple letter grades, and believable player progression and regression logic that sustained multi-decade franchises.

“The halftime report showed highlights from simulated CPU-vs-CPU games... giving the franchise mode a sense of a living, dynamic NFL world.”

REBUILDING DEPTH: THE MODERN APPROACH

Modern simulation engines like Madden NFL 26 are focusing on dynamic systems—like coaching strategy, player fatigue, and injury uncertainty—to add new layers of strategic management.



COACH ABILITIES & PLAYSHEETS

Coaches have **unique abilities** (e.g., Andy Reid's "Dr. Dots" ability boosts QB accuracy) and **custom playsheets** that mimic real-world schematic advantages, making coordinator hires strategically vital.



RE-ENGINEERED PLAYER AI

AI QB behavior is being rebuilt with **player-specific traits** to feel more distinct and **authentic**, moving away from generic CPU logic.



WEAR AND TEAR SYSTEM

Simulates the **cumulative physical toll** of an NFL season. Overusing a star player increases their **fatigue and injury risk**, forcing GMs to strategically manage player workloads and develop their bench.



NON-DETERMINANT INJURIES

Reflecting real-world uncertainty, injured players are now given a **range of weeks for recovery** (e.g., 4-6 weeks) instead of a fixed duration, adding suspense and forcing more thoughtful roster decisions.

Takeaway: The frontier of reconstruction is in modeling the league's complex, interconnected systems, not just individual player actions.

How the Virtual Players Think

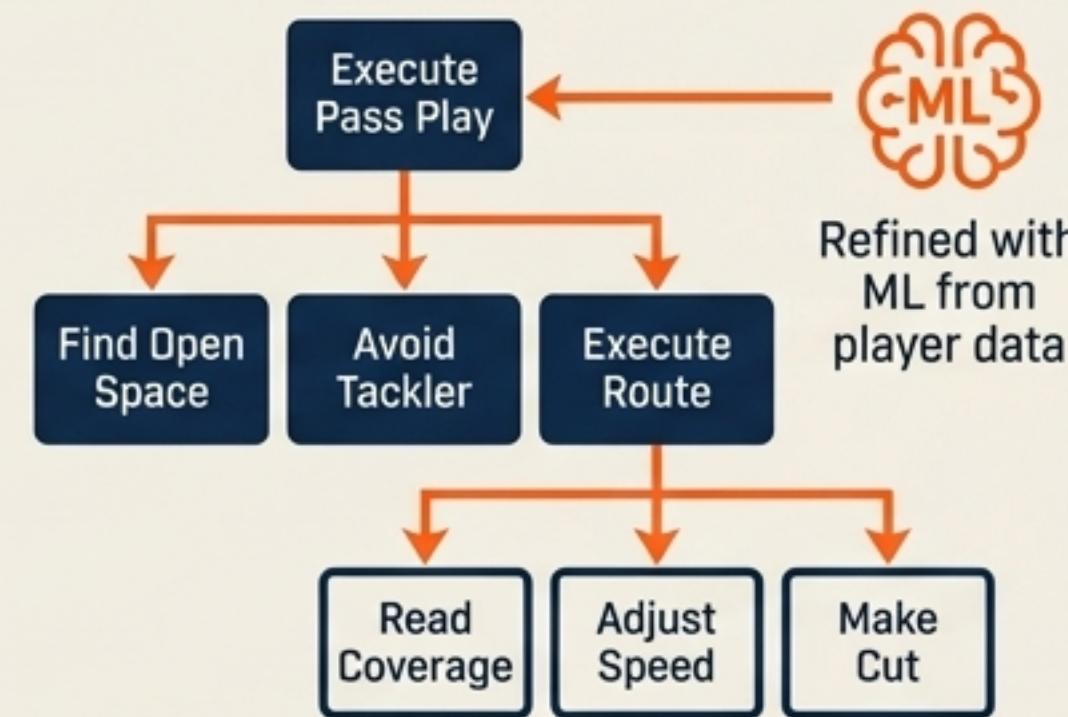
Game AI is evolving from simple, exploitable ‘if/then’ logic to complex, modular systems that can learn and better mimic the nuanced, aggregate behavior of real athletes.

THE OLD WAY: STATE MACHINES



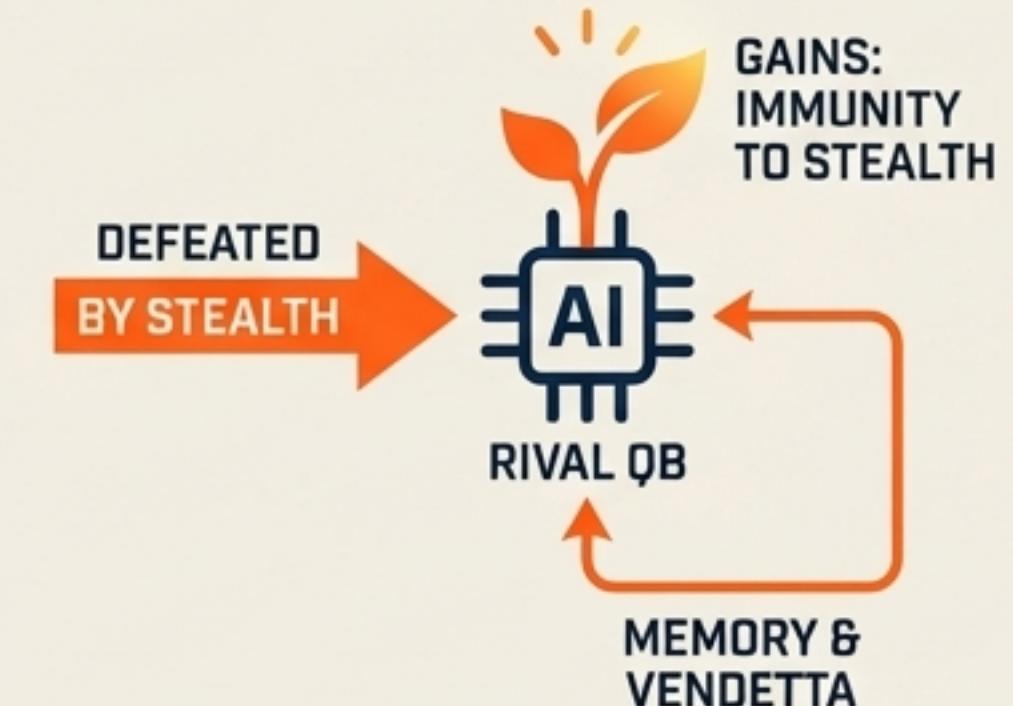
Basic AI operates like a simple flowchart. This logic is predictable and easily exploited by experienced human players.

THE ADVANCED WAY: BEHAVIOR TREES



Modern AI uses a hierarchical structure of modular logic. These “Behavior Trees” are more flexible and can be refined with machine learning to create agents with more human-like, aggregate behavior.

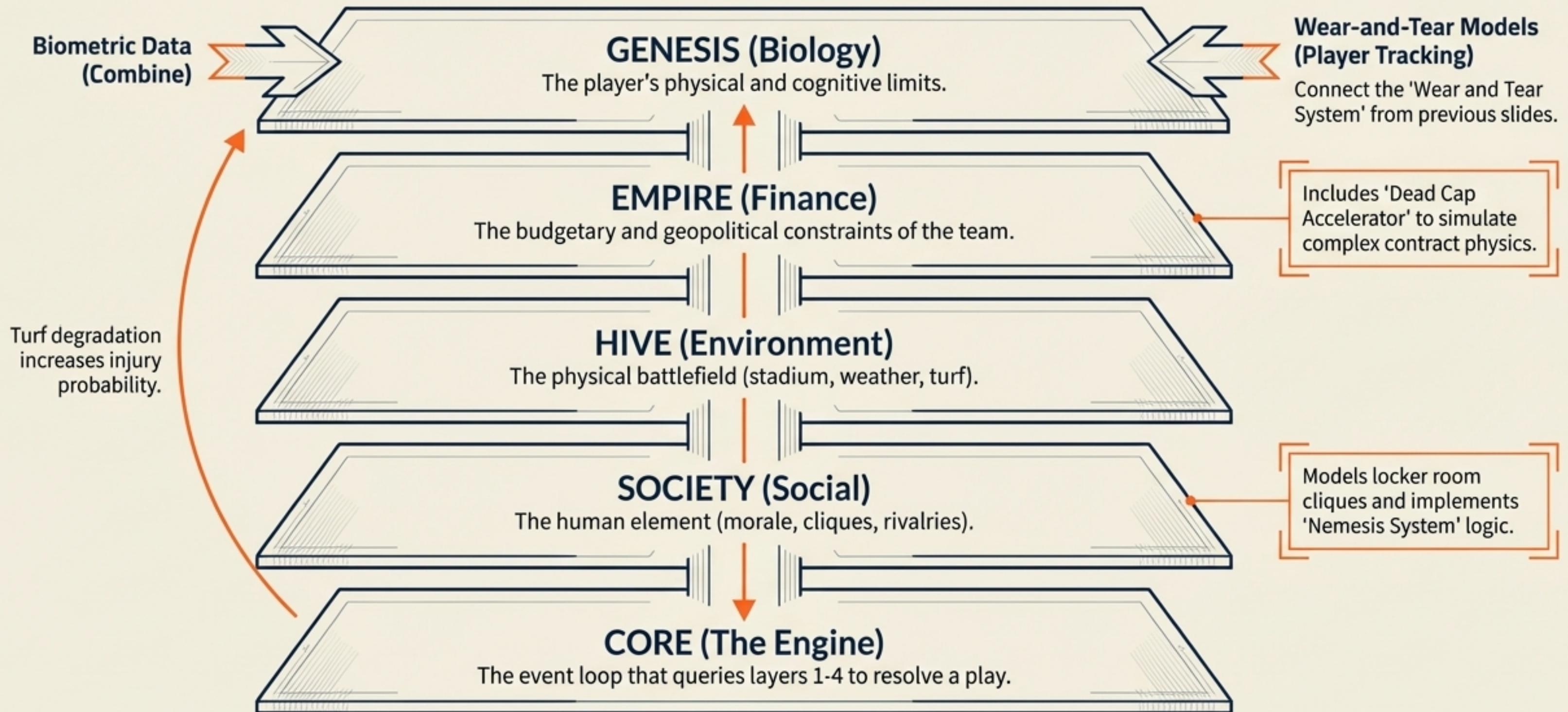
THE ASPIRATIONAL AI: NEMESIS SYSTEM



Aspirational systems remember interactions, form rivalries, and dynamically evolve traits based on game events, creating a persistent, narrative-driven opponent.

Blueprint for the Ultimate Simulation

The 'Cortex' blueprint illustrates a five-layer architecture where every element of the deconstructed NFL is rebuilt and interconnected within a single, dynamic simulation engine.



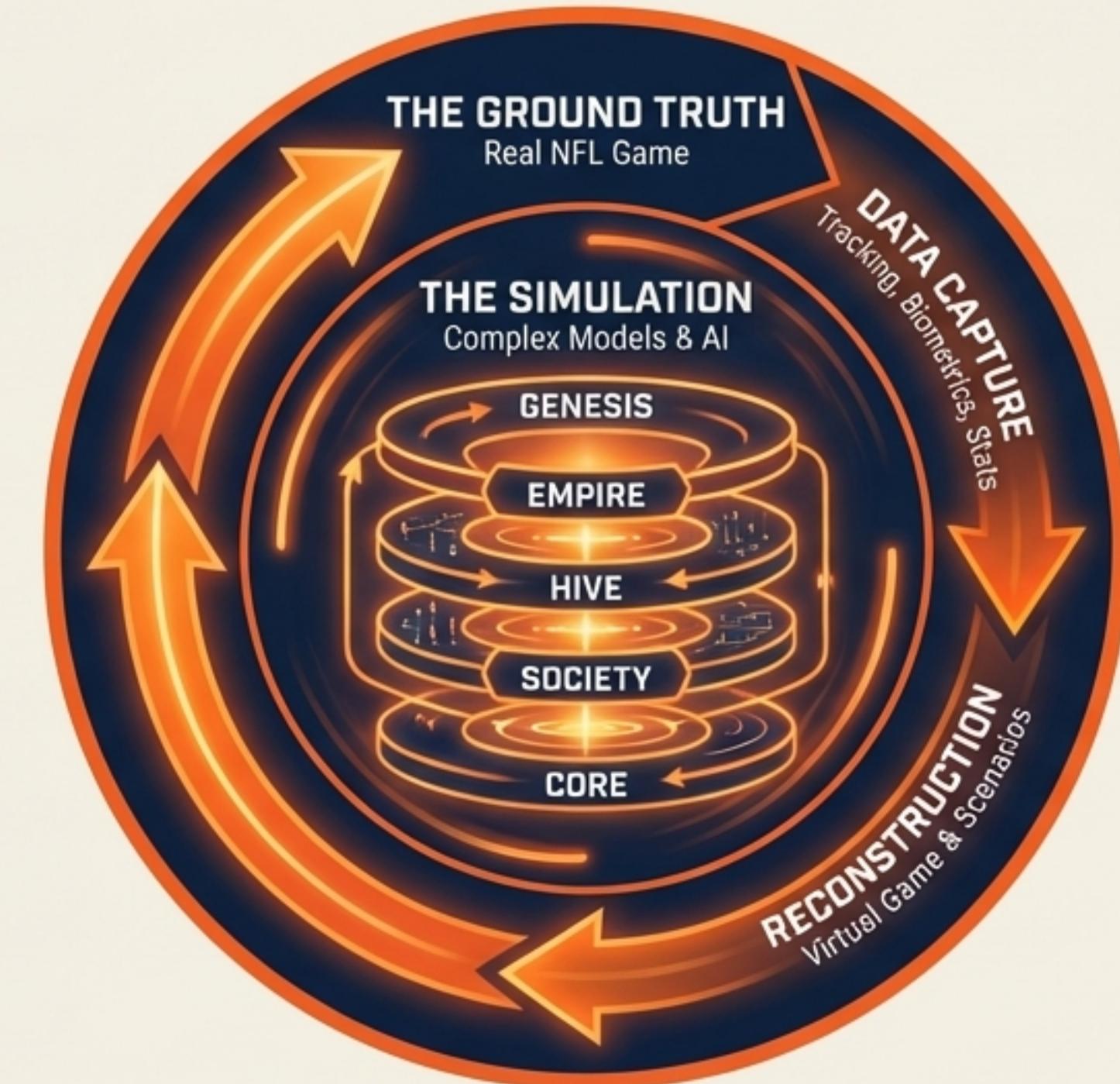
The Flywheel in Motion: When the Simulation Shapes the Game

The virtual reconstruction of the NFL has become so sophisticated that it now actively influences the strategy, training, and perception of the real-world game, completing the simulation loop.



PUBLIC & MEDIA PERCEPTION

Video game player ratings and simulation outcomes have become a central part of fan and media discourse, influencing the public's perception of real players' skills and value.



COACHING & STRATEGY

Coaches now regularly use **win probability models**—a form of simulation—to make aggressive, data-driven decisions on fourth down, a trend that has dramatically increased over the past decade.

Source: NFL Football Operations



PLAYER PREPARATION

Players use tablets loaded with opponent film, creating a personalized, interactive simulation of game situations. Wide receiver Alshon Jeffery states, "I could be soaking in the tub with my tablet watching film," illustrating how accessible this form of personal simulation has become.

Source: "Inside The Game" article