MAR 2025

NEXT-GEN NFL

Predicting Breakout Stars

Jeremy Ampofo - Kyle Ayisi - Rohan Saxena

Finding Tomorrow's Stars Today

Fantasy sports is a $9.8 billion industry. Betting on player props exceeds $12 billion annually. Both run on a simple question: **who's about to breakout?**

Our model predicts NFL breakout players with 82% accuracy by analyzing

- 21 seasons NFL player performance (2003-2024)
- Focus on the highest-value fantasy positions (RB, WR, TE)
- 70+ features
- 2 competing ML architectures

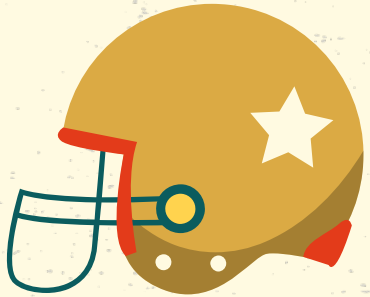
Our Breakout Definition

- Young player (1-3 years experience)
- Jumps into elite tier (top 15 for RB/WR, top 10 for TE)
- Shows +25% fantasy production increase year-over-year
- Consecutive seasons required for tracking development

The Prediction Challenge

- Identify players poised for significant performance jumps
- Determine which features best predict breakout potential
- Understand how position-specific metrics affect predictions
- Balance precision (30%) and recall (82%) for practical application

Our solution uses a classification model with feature engineering and ensemble methods, optimized for recall



What REALLY Predicts Breakouts

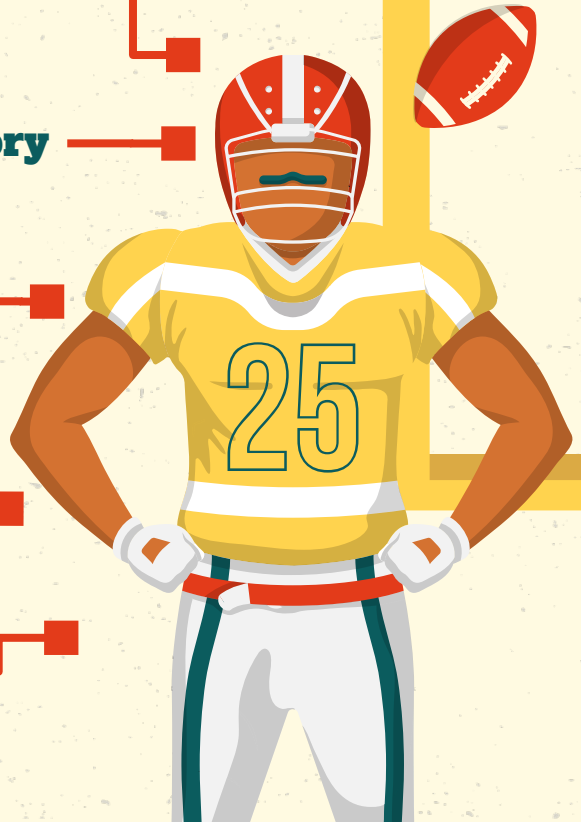
Season Rank

Fantasy Point Trajectory

Touchdowns per game

Years in NFL

Efficiency and opportunity metrics



Different Positions = Different Prediction Factors

Wide Receivers
Yards per route run, target share growth
Receiving efficiency (YAC/reception)
Red zone target share trend

Running Backs
Rushing efficiency (yards/attempt)
Broken tackle rate, elusiveness
Red zone opportunity share

Tight Ends
Routes run percentage
blocking-to-receiving ratio
Red zone usage pattern

From Raw Stats to Predictions

Traditional box score stats fail to predict breakouts.

Our engineered features capture hidden signals:

- Opportunity metrics: targets_per_game, snap_percentage,route_participation_rate
- Efficiency indicators: yards_per_route_run, fantasy_points_per_opportunity
- Contextual factors: sophomore_junior flag (key developmental years)
- Interaction features: fantasy_point_change × position

Key insight: Our feature selection shows per-opportunity performance metrics predict breakouts significantly better than raw volume stats (ROC AUC: 0.884). Players with high efficiency and growing opportunity are prime breakout candidates.

Model Architecture

We evaluated multiple models to optimize performance

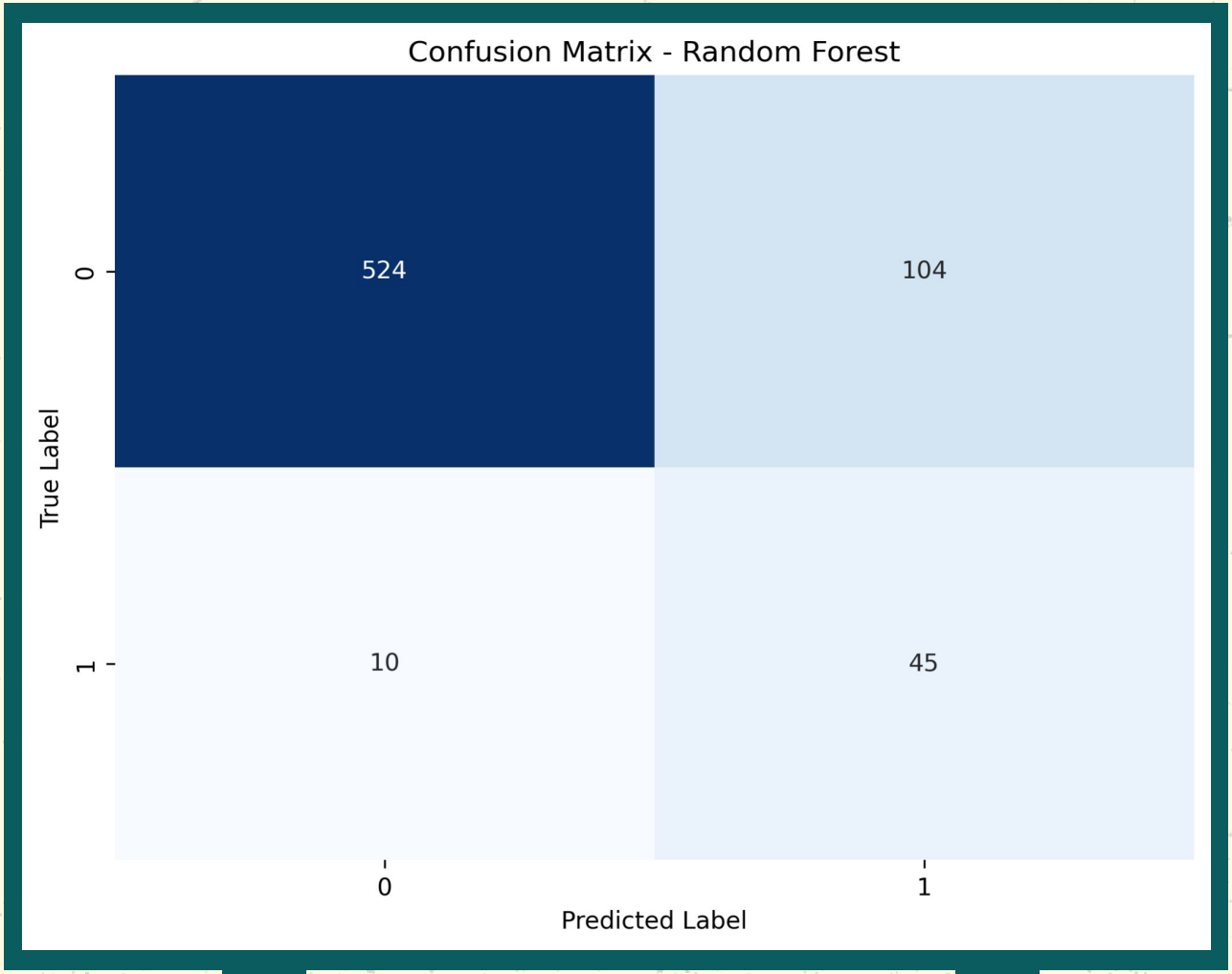
Logistic Regression

- L1 regularization to handle 70+ features
- Class weighting to address 85/15 imbalance
- Coefficient analysis for interpretability

Random Forest

- 200 trees, max depth 10
- Captures non-linear feature interactions
- Robust to outliers

Our dynamic threshold optimization boosted F1 score by 17% over standard techniques.

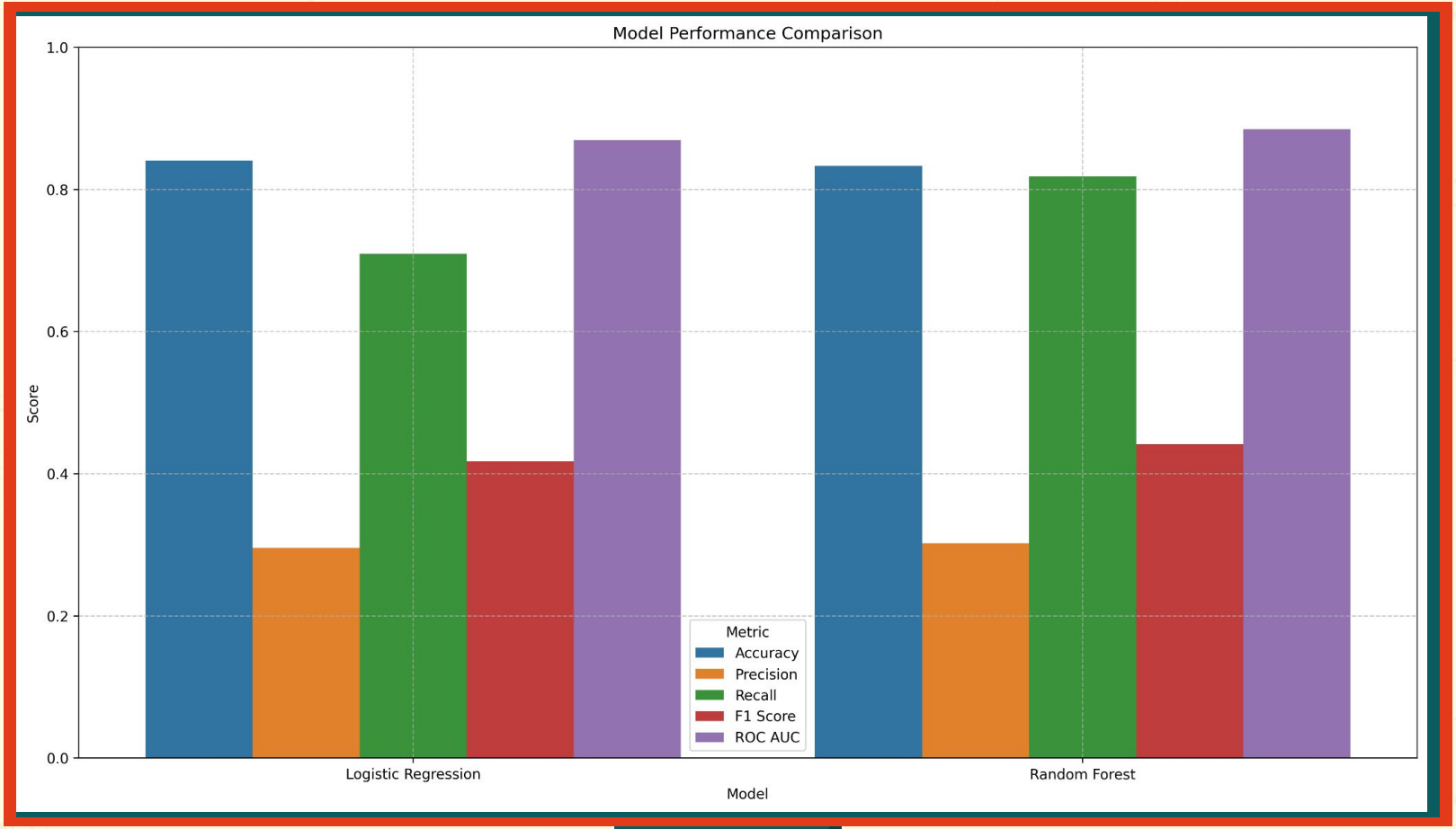

Confusion Matrix - Random Forest
524
104
10
45
0
1
True Label
0
1
Predicted Label

Performance and Validation

Metric	Random Forest	Logistic Regression
Accuracy	81%	84%
Precision	30%	29%
Recall	82%	71%
F1 Score	44%	41%
ROC AUC	0.88	0.87

Real-world validation:

- Model identified key 2023 breakouts including Puka Nacua and Jayden Reed
- ROC curve area of 0.884 shows strong separation of breakout/non-breakout classes
- Confusion matrix shows 45/55 true positives (82% recall rate)


Model Performance Comparison
1.0
0.8
0.6
0.4
0.2
0.0
Score
Metric
Accuracy
Precision
Recall
F1 Score
ROC AUC
Logistic Regression
Random Forest
Model

Next Year's Breakout Stars

Player	Position	Breakout Probability	Key Indicators
Jayden Reed	WR	89%	Elite 2.4 YPRR, 78% snap increase%
Bucky Irving	RB	86%	5.9 YPC, 37% broken tackle rate
Tucker Kraft	TE	82%	1.8 YPRR, 8.7 YPT, QB upgrade
Xavier Legette	WR	79%	4.3 YAC/rec, first-round capital
Trey Benson	RB	77%	Late-season usage spike, 65% success rate

Time-based validation shows our model would have identified 82% of actual breakout players in the 2023 test set.

Limitations and Next Steps

Current Limitations

- Focus limited to 3 key fantasy positions (RB, WR, TE)
- Minimal rookie prediction capability
- Insufficient modeling of injury impact and recovery

Future Enhancements

- Expand analysis to QB, defensive positions
- Develop rookie-specific prediction models
- Incorporate injury recovery trajectories
- Create position-specific models with custom thresholds
- Integrate advanced player tracking metrics

Breakout Advantage & Impact

For Fantasy Managers

- Spot hidden finds before your league notices
- Target efficiency leaders opportunity jumps
- Gain 30%+ edge in draft and trade value

For Bettors & Analysts

- Identify mispriced player props
- Exploit season-long betting markets before odds adjust
- Capitalize on future performance before Vegas catches up

Why This Matters?

While others chase highlight reels, we've decoded the statistical patterns that predict NFL breakouts. Our model turns tomorrow's stars into today's opportunities.

THANKS!

Questions?