

Call to the Pen: MLB Pitchers Due for a Role Change in 2024

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As MLB pitching staffs become increasingly amorphous, our group recognized that several big-league pitchers may be better suited for different roles on their teams. What if a relief pitcher's struggles out of the bullpen are an indication that they should start games? Could a starter who falls apart the second time through the order actually become an elite reliever? Which pitchers are the best candidates for a role change? We realize that MLB clubs have already explored these questions to great depths but felt as though we could provide additional context and insight through modeling.

To answer these questions, we decided to identify pitchers' roles, create and run models to evaluate a pitcher's current effectiveness and potential effectiveness in a different role, and ultimately pinpoint which pitchers would thrive in a different role.

To assign roles, we used the pitch-by-pitch leverage data and the innings per appearance formula to determine which category a pitcher fit in: starter, high-leverage long reliever, high-leverage short reliever, low-leverage long reliever, and low-leverage short reliever. Our threshold for leverage was a GMLI of 0.85, and our threshold for outing length was 1.0 innings. Both of these values were approximate medians.

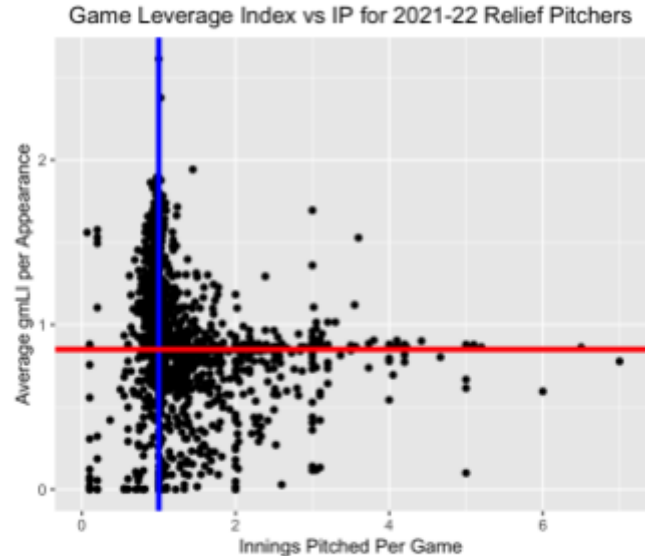


Figure 1: Pitchers in 2021 and 2022 based on innings per appearance and GMLI thresholds, utilized in training data.

We believed that adding leverage- and length-based bullpen roles allowed us to be more specific in our player analysis process. At the same time, roles like “closer,” “set-up man,” or “opener” are becoming increasingly subjective and can sometimes depend more on a team's strategic approach than an individual player's skill set, to some degree, so they were not specified as categories.

We believe our assigned roles better reflect the breakdown of a bullpen. For example, the long, low-leverage category will include most openers because they often pitch multiple innings and enter the game with the bases empty. Short, high-leverage pitchers will

typically be closers, set-up men, or other types of specialists, though our model also took into account that some players in these roles may be lower-leverage options based on factors out of their control (strength of their own team, strength of opponent, manager's tendencies, etc.).

After classifying pitchers, we created numerical representations of qualities that may differ between roles, especially between starters and relievers. We ultimately created quantitative methods for measuring command (Location+), efficiency (pitches per batters faced), pitch effectiveness (Stuff+), pitch variety (greater than 10% dependence on an individual pitch), stamina (gradient of decrease in fastball velocity over an appearance), handedness matchups (wOBA splits), and bases empty vs. runners on scenarios (wOBA splits).

Next, we needed to find one individual stat that could model overall effectiveness. We ultimately chose FIP- because it is weighted against the league average (comparing across years is not a major issue) and ignores factors that a pitcher cannot control, such as defense.

Then, we created five linear regression models using 2021 and 2022 data to predict FIP- based on our previously selected quantitative measurements (one for each role).

We used the coefficients from these five models to predict how every pitcher will perform (FIP-) in 2024. Our two best models were the random forest classification model and the Gaussian Naive Bayes model.

The random forest model used a series of decision trees to classify a data point and ultimately predict the value of a player in each role. It had a testing accuracy of 77.6%. The Bayes model used Bayes theorem to find the conditional probability of a datapoint being in a class given its attributes. It had a testing accuracy of 75.7%.

We decided the Bayes model was better specifically because it had a significantly higher accuracy on starters when compared to the Random Forest, or any other model (ADA Boost, KNN Classifier, and a Logistic Regression) we attempted to create.

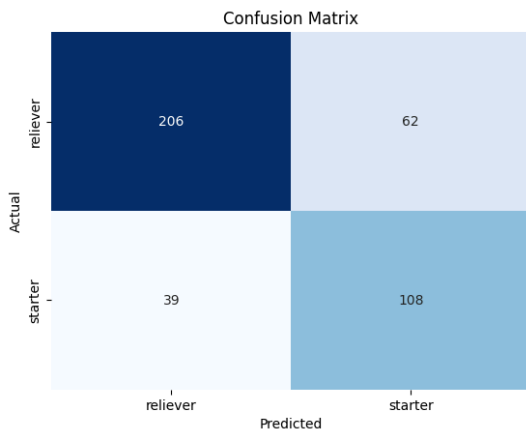


Figure 2: Confusion matrix showing predicted and actual starters and relievers from the Bayes model (75.7% accuracy).

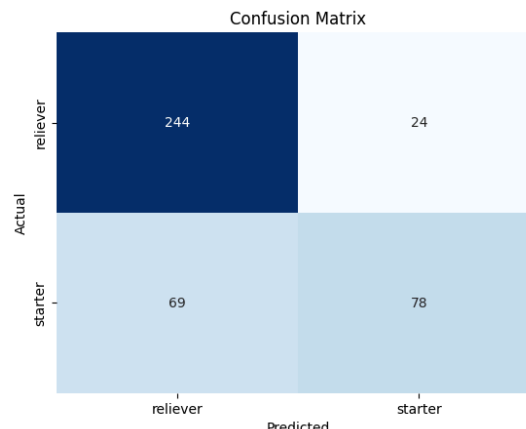


Figure 3: Confusion matrix showing predicted and actual starters and relievers from the random forest model (77.6% accuracy).

We also created a linear regression model with the aforementioned quantitative methods as x-values and assigned weights that best predicted FIP- (y-value) for each of the five pitcher roles that we created. We used this model because we were confident in its accuracy when differentiating between individual bullpen roles (based on leverage and outing lengths). We primarily used it to forecast role changes for current starters (63.4% accuracy) and short-length relievers (61.3% accuracy).

Ultimately, our models identified several candidates who should change roles. With that said, we did manually eliminate several options, including high-level starters who would thrive as closers but offer the most value as starters (i.e., Spencer Strider), pitchers with limited MLB experience in recent years (i.e., Ryan Weber), and pitchers who are retired or free agents and may not open the season on an MLB roster (i.e., Brent Honeywell).

After thorough consideration and testing, we identified two pitchers who should change roles: Tigers LHP Tyler Holton and Reds LHP Nick Lodolo.

Holton is a 27-year-old left-handed reliever whom our model classified as a long, high-leverage arm. We suggest the Tigers would benefit most from shifting him to the starting rotation. He appeared in 85.1 innings over 59 games last year, contributing 7.8 K/9, 1.9 BB/9, and an 84 FIP-.

	NameASCII	Assigned_Role	Predicted_Bayes
590	Tyler Holton	reliever	starter

Figure 4: The Bayes model returned Tyler Holton as a candidate to switch from reliever to starter.

In addition to our model suggesting Holton become a starter, various other factors indicate that he would thrive in the rotation. As is typical in starters (and less common in relievers), Holton has an extensive pitch repertoire. According to Baseball Savant, he throws a four-seam fastball, changeup, cutter, slider, sinker, and curveball, utilizing every pitch but the curveball more than 10% of the time in 2023. He also doesn't have the excessive velocity that many high-leverage relievers possess, but he does possess stamina and rotation experience. (Holton was a starter in college at Florida State and also in the Diamondbacks' farm system through most of 2021.)

Moving Holton to the rotation was suggested by the Bayes model. We are confident in this result given the Bayes model has a 75.7% accuracy rate.

Lodolo is a former first-round pick who battled a calf injury in 2023, posting a 5.79 FIP, 12.32 K/9, and 2.62 BB/9. While we believe that his pitching makeup could allow him to be a very successful starter in the future (as the Reds intended when they drafted him seventh overall), we also believe that moving him to the bullpen for the time being would be beneficial for both his own development and the Reds' performance in 2024.

This move was supported by both our linear regression model and our Bayes model. The Bayes model is our most accurate and strongly believes that Lodolo offers the most value in a relief role. Our linear regression model gets more specific by suggesting him as a long, high-leverage option out of the bullpen. Currently, Lodolo's four-seam fastball and curveball are his best pitches. Specifically, the breaking ball can allow him to succeed in a bullpen role given its 45.0% whiff rate and 28.1% putaway rate in 2023, according to Baseball Savant. Having two strong offerings will also allow Lodolo to further develop his changeup and sinker to round out the rest of his repertoire.

Name	Change in Short/Low FIP-	Change in Short/High FIP-	Change in Long/Low FIP-	Change in Long/High FIP-	Change in Starter FIP-
Nick Lodolo	+6.9	-5.2	-6.8	-9.3	0.0

Figure 5: The linear regression model shows the potential gain or loss in FIP- for Nick Lodolo if he were to shift roles in 2024. It should be noted that a FIP- below 100 is considered above average, so a greater decrease (negative change) in FIP- is good.

Ultimately, between our two models, we are confident in our findings and believe that the Tigers and Reds would benefit most from implementing role changes for Tyler Holton (to starting pitcher) and Nick Lodolo (to long, high-leverage relief pitcher), respectively.