

California Golden Bears Football

# Fourth Down Decision Maker

User Manual

Sports Analytics Group at Berkeley

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## Overview:

Sports Analytics Group at Berkeley is proud to present the Cal Football Fourth Down Decision maker. Our decision maker was developed using analysis of over 10 years of NCAA Division 1 Football data. Our model aims to assist in-game fourth down decisions by providing analytics that help coaches maximize their points per possession. Because football is highly situational, while our decision maker does provide suggested decisions for fourth down situations, it also provides useful additional analytics so that our coaches can make the most informed decision possible for any potential stage of the game.

## Navigating the Decision Maker:

The [Cal Football Fourth Down Decision Maker](#) is 20 pages in length including the cover page. The second page is a color-coded chart of suggested decisions for fourth down decisions at every yard line and “to go” distance. See the [Charts](#) section of this user manual for more information on this page.

After the first two pages, each page of the decision maker represents a fourth and “to go” distance, with each page titled with the appropriate distance at the top of the page. There are two pages for every “to go” distance.

For example, the first two pages of the decision maker represent all suggested decisions for “4<sup>th</sup> and 1” situations. The next two pages of the decision maker represent all suggested decisions for “4<sup>th</sup> and 2” situations, and so on, up to “4<sup>th</sup> and 9.”

For each “to go” distance, the first of the two pages covers all yard lines on the opponent’s end of the field, starting with the goal line (the endzone Cal scores in) up to the opponent’s 40 yard line. The second of the two pages covers all yard lines from the opponent’s 41 to Cal’s own 20 yard line. Midfield (50 yard line) is demarcated by double bold lines on the second page. Each yard line is labeled in the [Yard Line](#) column, and each yard line represents the current line of scrimmage for Cal’s offense. If the line of scrimmage is on Cal’s side of the field, it is prefixed by

“OWN.” If the line of scrimmage on the opponent’s side of the field, it is prefixed “OPP.”

Midfield is labeled “50” in the [Yard Line](#) column.

For example, the decision analytics for a “4<sup>th</sup> and 5” situation on the opponent’s 30 yard line would be found on the first page labeled “4<sup>th</sup> and 5,” in the row labeled “OPP 30” in the [Yard Line](#) column.

The columns of each row represent different analytics for each situation, details on each of which can be found in their appropriate sections in this manual. The eight columns of each page of the decision maker are: [Yard Line](#), [Suggestion](#), [Confidence Percentage](#), [Backfire](#), [Go EPV](#), [FG EPV](#), [Punt EPV](#), and [Notes](#) in this order.

## Charts:

The [Charts](#) page in the decision maker can be found on the first page after the cover sheet. This page simply serves as a visual representation of each decision indexed by yard line and “to go” distance, color-coded such that the suggestion to go for it is marked in green, the suggestion to attempt a field goal is marked in light orange, and the suggestion to punt is marked in red. For more information on these suggested decisions, please consult the [Suggested Decision](#) section of this manual which provides details on what each suggested decision indicates and where they can be found on the charts pages of the decision maker.

## Suggested Decision:

The [Suggestion](#) column in the decision maker provides the model’s suggested fourth down decision at that given yard line and that given “to go” distance during an even game situation. There are three possible decisions for every fourth down situation: “Go,” “FG” and “Punt.” “Go” means that the model suggests that the coaches opt to go for it on fourth down. “FG” means that the model suggests that the coaches opt to attempt a field goal on fourth down. “Punt” means that the model suggests that the coaches opt to punt on fourth down.

Our model returns one of those three options based on which option has the highest expected point outcome. In other words, the suggested decision is the decision that on average maximizes points for our team. This maximization simply checks which Expected Possession Value (EPV) is largest between [Go EPV](#), [FG EPV](#) and [Punt EPV](#) and returns this decision. For close calls, [Go EPV](#), [FG EPV](#) and [Punt EPV](#) provide the numerical values of each of these EPVs, so that coaches can determine how close to one another each EPV is.

For example, a smaller difference between [Go EPV](#) and [Punt EPV](#) suggests that the decision is a close call, and depending on the current game situation, at the coaching staff's discretion, an alternate decision is potentially advisable.

Our model provides these three values in order to give the coaching staff insight into which decisions are “slam dunks” and which are “close calls.” More information on these EPV values can be found under further sections in this manual.

Note that this suggested decision takes into account the matchup with the team we are playing, but does not account for the current score or time left in the game.

## Confidence Percentage:

The [Confidence Percentage](#) column in the decision maker gives the expected success rate of fourth down conversions against Cal's opponent. This number provides how confident our model is that Cal will pick up the first down against Cal's opponent at down at that given yard line and that given “to go” distance. This number has been modified to express the difficulty of the opponent's defense. A confidence percentage well above “50%” indicates that fourth down conversion in that situation is very likely. A confidence percentage below “50%” indicates that a fourth down conversion is much less likely in that situation. Simply put, the easier the conversion will be for Cal's offense, the higher the confidence percentage will be.

## Turnover on Downs Backfire:

The **Backfire** column in the decision maker gives the expected points that Cal's opponent will be able to score with a drive starting at that given yard line. This provides the coaching staff with information as to how big the negative ramifications of a failing to convert on fourth down if the coaching staff opts to go for it at this yard line. This value can be positive or negative.

Negative values represent situations where our model suggests that, on average, an opponent drive starting at this yard line will yield positive points for the opposition. Positive values represent situations where our model suggests that, on average, an opponent drive starting at this yard line will yield negative points for the opposition, in other words, turning the ball over on downs at this yard line is not necessarily a disadvantage because it will ultimately result in points for Cal later on. This metric simply provides an easy indicator as to how bad it would be for Cal to attempt to convert a fourth down and fail. In summary, large negative values in the **Backfire** column indicate that failing to convert and turning the ball over will have a large negative impact for Cal.

## Go EPV:

The **Go EPV** column in the decision maker gives the Expected Possession Value (in terms of points) for making the decision to go for it on fourth down at that given yard line and that given "to go" distance during an even game situation. This value can be positive or negative. Positive values represent situations where our model suggests that, on average, choosing to go for it on fourth down in that situation will yield positive points for Cal. Negative values represent situations where choosing to go for it on fourth down in that situation will on average result in the opponent scoring points against Cal. The exact value of the **Go EPV** is the expected number of points scored for or against Cal if the coaches opt to attempt to convert the fourth down.

## FG EPV:

The **FG EPV** column in the decision maker gives the Expected Possession Value (in terms of points) for making the decision to attempt a field goal try at that given yard line and that given “to go” distance during an even game situation. This value can be positive or negative. Positive values represent situations where our model suggests that, on average, choosing attempt to kick a field goal on fourth down in that situation will yield positive points for Cal. Negative values represent situations where choosing to attempt to kick a field goal on fourth down in that situation will on average result in the opponent scoring points against Cal (for example in the event that Cal misses the field goal and turns the ball over). The exact value of the **FG EPV** is calculated as the expected number of points scored for or against Cal if the coaches opt to attempt a field goal on fourth down. “Chip shot” field goals that have a high “make” rate will have an **FG EPV** close to 3.0, and harder field goals will have progressively lower and lower **FG EPVs**.

## Punt EPV:

The **Punt EPV** column in the decision maker gives the Expected Possession Value (in terms of points) for making the decision to punt at that given yard line and that given “to go” distance during an even game situation. This value can be positive or negative. Positive values represent situations where our model suggests that, on average, choosing to punt on fourth down in that situation will yield positive points for Cal in future possessions (based on improved field position, or the potential of a muffed punt, etc.). Negative values represent situations where choosing to punt on fourth down in that situation will on average result in the opponent scoring points against Cal. The exact value of the **Punt EPV** is calculated as the expected number of points scored for or against Cal if the coaches opt to punt on fourth down. Many “to go” distances and yard lines have negative **Punt EPV** values simply because giving the possession over to the opposition may result in points scored against Cal on many drives. However, one thing to note is that punting is often preferable to attempting to go for it on fourth down in despite both being negative values because the cost and likelihood of turning it over on downs

in a bad field position far outweighs the potential of the opponent scoring against Cal after a punt.

## Notes:

The **Notes** column in the decision maker provides additional details that are potentially useful for certain situations, taking into account the range of Cal's kicker in close call situations. There will not be notes for every "close call" decision, but for particular situations, look for the **Notes** column to potentially provide extra insight into the most optimal decision. Some notes will simply read "Not Possible" for yard lines and "to go" distances that never occur, for example, "4<sup>th</sup> and 5 from the 1 yard line."

## Making a Decision:

When making a decision, the coaching staff should consider multiple values. Ultimately, for most even game situations, the recommended decision is the one that our model finds to be most optimal, but coaches should also consider the likelihood of success (**Confidence Percentage**) and the negative repercussions of failure (**Turnover on Downs Backfire**). Additionally, the coaching staff should examine where in the model the "close call" decisions are and consider that when interpreting how strongly our model suggests one decision over another.

But, finally, and most importantly ROLL ON BEARS!