In the 2023 Wimbledon Gentlemen’s final, 20-year-old Spanish rising star Carlos Alcaraz defeated 36-year-old Novak Djokovic. The loss was Djokovic’s first at Wimbledon since 2013 and ended a remarkable run for one of the all-time great players in Grand Slams.

在2023年温网男子决赛中，20岁的西班牙新星卡洛斯·阿尔卡拉兹击败了36岁的诺瓦克·德约科维奇。这是德约科维奇自2013年以来首次在温布尔登网球公开赛上失利，结束了这位有史以来最伟大的大满贯选手之一的非凡表现。

The match itself was a remarkable battle.[1] Djokovic seemed destined to win easily as he dominated the first set 6 – 1 (winning 6 of 7 games). The second set, however, was tense and finally won by Alcarez in a tie-breaker 7 – 6. The third set was the reverse of the first, Alcaraz winning handily 6 – 1. The young Spaniard seemed in total control as the fourth set started, but somehow the match again changed course with Djokovic taking complete control to win the set 6 – 3. The fifth and final set started with Djokovic carrying the edge from the fourth set, but again a change of direction occurred and Alcaraz gained control and the victory 6 – 4. The data for this match is in the provided data set, “match\_id” of “2023-wimbledon-1701”. You can see all the points for the first set when Djokovic had the edge using the “set\_no” column equal to 1. The incredible swings, sometimes for many points or even games, that occurred in the player who seemed to have the advantage are often attributed to “momentum.”

这场比赛本身就是一场非凡的战斗。[1] 德约科维奇似乎注定要轻松获胜，因为他以6比1（赢得7场比赛中的6场）主宰了第一盘。然而，第二盘比赛很紧张，最终由阿尔卡雷斯以7-6的平局获胜。第三盘是第一盘的逆转，阿尔卡拉兹以6比1轻松获胜。第四盘开始时，这位年轻的西班牙人似乎完全控制了比赛，但不知何故，比赛再次改变了方向，德约科维奇完全控制了局面，以6-3赢得了这盘比赛。第五盘也是最后一盘比赛开始时，德约科维奇在第四盘占据优势，但方向再次发生变化，阿尔卡拉兹获得控制权，以6-4获胜。此匹配的数据在提供的数据集中，即“2023-imbled-1701”的“match\_id”。当德约科维奇使用等于1的“set\_no”列占据优势时，你可以看到第一盘的所有得分。看似占据优势的球员身上出现的令人难以置信的波动，有时甚至是多分甚至多场比赛，通常被归因于“动量”

One dictionary definition of momentum is “strength or force gained by motion or by a series of events.”[2] In sports, a team or player may feel they have the momentum, or “strength/force” during a match/game, but it is difficult to measure such a phenomenon. Further, it is not readily apparent how various events during the match act to create or change momentum if it exists.

动量的一个字典定义是“通过运动或一系列事件获得的力量或力量”。[2]在体育运动中，团队或球员可能会在比赛/比赛中感觉到自己有动量，或“力量/力量”，但很难衡量这种现象。此外，还不清楚比赛中的各种事件是如何产生或改变势头的。

Data is provided for every point from all Wimbledon 2023 men’s matches after the first 2 rounds. You may choose to include additional player information or other data at your discretion, but you must completely document the sources. Use the data to:

提供了2023年温布尔登网球公开赛前两轮之后所有男子比赛的每一分数据。您可以自行选择包含其他玩家信息或其他数据，但必须完整记录来源。使用数据可以：

Develop a model that captures the flow of play as points occur and apply it to one or more of the matches. Your model should identify which player is performing better at a given time in the match, as well as how much better they are performing. Provide a visualization based on your model to depict the match flow. Note: in tennis, the player serving has a much higher probability of winning the point/game. You may wish to factor this into your model in some way.

开发一个模型，捕捉得分时的比赛流程，并将其应用于一场或多场比赛。你的模型应该确定哪名球员在比赛的特定时间表现得更好，以及他们的表现有多好。根据您的模型提供可视化，以描述匹配流程。注：在网球比赛中，发球者赢得分数/局数的概率要高得多。您可能希望以某种方式将此因素纳入您的模型中。

A tennis coach is skeptical that “momentum” plays any role in the match. Instead, he postulates that swings in play and runs of success by one player are random. Use your model/metric to assess this claim.

一位网球教练对“动力”在比赛中的作用持怀疑态度。相反，他假设比赛中的波动和一名球员的成功是随机的。使用您的模型/指标来评估此断言。

Coaches would love to know if there are indicators that can help determine when the flow of play is about to change from favoring one player to the other.

教练们很想知道是否有指标可以帮助确定比赛流程何时会从偏袒一名球员转变为另一名球员。

Using the data provided for at least one match, develop a model that predicts these swings in the match. What factors seem most related (if any)?

使用至少一场比赛提供的数据，开发一个预测比赛中这些波动的模型。哪些因素似乎最相关（如果有的话）？

Given the differential in past match “momentum” swings how do you advise a player going into a new match against a different player?

考虑到过去比赛“动量”波动的差异，你如何建议一名球员与另一名球员进行新的比赛？

Test the model you developed on one or more of the other matches. How well do you predict the swings in the match? If the model performs poorly at times, can you identify any factors that might need to be included in future models? How generalizable is your model to other matches (such as Women’s matches), tournaments, court surfaces, and other sports such as table tennis.

在一个或多个其他匹配项上测试您开发的模型。你对比赛中的挥杆预测得有多好？如果模型有时表现不佳，您能确定未来模型中可能需要包含的任何因素吗？您的模型在其他比赛（如女子比赛）、锦标赛、场地和乒乓球等其他运动中的可推广性如何。

Produce a report of no more than 25 pages with your findings and include a one-to-two-page memo summarizing your results with advice for coaches on the role of “momentum”, and how to prepare players to respond to events that impact the flow of play during a tennis match.

制作一份不超过25页的报告，其中包含你的调查结果，并包括一到两页的备忘录，总结你的结果，并就“动力”的作用以及如何让球员做好应对网球比赛中影响比赛节奏的事件的准备向教练提出建议。