Dear coach，

为了协助球员在面对各种比赛势头时能够更加出色地应对，我在此向您介绍我们的研究成果，并据此提出一些建议。

我们首先通过建立一个球员获得杠杆率的指数加权移动平均模型，具体描绘了比赛中球员的势头变化。此模型能够准确反映球员的短期势头，并对即将到来的局势变化做出合理预测。经过一系列的验证，我们证实了势头对比赛得分的显著影响。

为了预测整场比赛的局势波动，我们建立了关于累计相减势头的温思特加性模型，该模型具有拟合优度高、预测结果合理等优点。同时我们也发现了一些与局势波动最相关的指标是serve 、Unf\_err、Break\_pt，他们对局势的影响分别是serve对局势变好有很强的正相关性即发球优势，Unf\_err 非迫性失误出现通常意味着局势的恶化，而Break\_pt 破球点通常意味着局势变好。

在现实比赛中通过观测这些指标的变化有助于我们预测出局势的波动，进而调整相应的战术。比如，处于发球时，要打的更加积极，因为无论是利用发球扩大优势还是利用发球扭转战局都是很好的选择；当对手出现非迫性失误时，要抓住机会积累势头；当自己出现非迫性失误时，要放缓比赛节奏及时调整状态；当自己打出破球点时，要积极比赛以求扩大优势或逆转劣势；对方打出破球点时要更加小心应对避免进入不利的势头。

接着我们对模型进行检验，发现总体来说模型较好。结果显示，模型在一场比赛重给定足够多的比赛数据的情况下，对短中期的比赛流程变化有很好的预测能力和灵敏度；但在一场比赛中比赛数据有限的情况下，预测长期的比赛数据会有偏差，但是对长期比赛的趋势的预测有很好的表现；总而言之，模型对波动的变化预测能力和适用范围还是较好的有较高的参考价值。

最后，基于本文的研究我提出以下几点建议，主要关注如何抓住势头的优势扩大比分或者应对势头的劣势伺机扭转局势。

1.当势头不利于自己时，建议放慢速度，调整状态减缓对手的进攻节奏避免比分尽一步拉大，在规则允许的情况下尽量把握好每一次休息时间来调整自己的状态努力找到机会逆转势头。

2.在势头所在的点转折时，建议增加能量并且打的更加激进来扭转比赛势头或者避免自己陷入颓势。

3.当势头为中性的时候，双方玩家不仅要争夺积分，还要争夺抓住势头的控制权。选择发挥自己的作用发球和接发球的主要模式。

4.当势头对球员有利时，重要的是利用势头使优势更大化，且不能陷入了误区因为暂时的优势产生安全感或自信过度。

Sincerely，

Team #2410809

Dear Coach,

To enhance our players' performance against varying game dynamics, I present to you the findings of our research along with some recommendations.

We began by developing an Exponential Weighted Moving Average model for players' momentum, accurately depicting changes during the match. This model precisely reflects short-term momentum shifts and predicts upcoming changes in the game situation. Our validations confirmed the significant impact of momentum on scoring.

For predicting overall game momentum fluctuations, we established a Winsted additive model based on cumulative subtractive momentum, characterized by high fit and reasonable predictive outcomes. We identified serve, Unf\_err, and Break\_pt as the most relevant indicators to momentum fluctuations. Their impacts are as follows: serve has a strong positive correlation with improving situations, indicating the advantage of serving; Unf\_err, or unforced errors, typically signify worsening situations; while Break\_pt usually indicates a shift towards a better situation.

Observing these indicators helps us predict momentum shifts, thereby adjusting tactics accordingly. For instance, during service, playing more aggressively is beneficial, whether to expand an advantage or to reverse the game's tide. When the opponent makes unforced errors, seizing the opportunity to build momentum is crucial; conversely, slowing the game's pace to adjust one's state is advisable upon making unforced errors oneself. Aggressively capitalizing on break points can either widen the lead or overturn a disadvantage; caution is advised when facing break points to avoid unfavorable momentum.

Upon testing our model, we found it generally performs well. The results indicate that with sufficient match data, the model accurately predicts short to medium-term game flow changes. However, with limited data within a match, long-term predictions may deviate, though it still performs well in predicting long-term trends. Overall, the model's predictive capability and applicability are commendable and valuable for reference.

Based on our research, I propose the following suggestions, focusing on leveraging momentum to expand the score or counteracting disadvantages to reverse situations:

1.In adverse situations, decelerate the pace, recalibrate your state,。

2.At pivotal momentum shifts, intensify the offense to aim for a turnaround.

3.Under neutral momentum, compete for control, optimizing serving and receiving strategies.

4.When advantageous, amplify the lead while avoiding overconfidence or a false sense of security.

Sincerely,

Team #2410809