**Methodology**

**Visualizing a Match’s Momentum**

* Goal, point margin, initial benefits – runs, example with Alcaraz v Djokovic
* Plot with server – problem, mistake momentum for serving

**Defining Momentum**

* We define momentum as the instantaneous derivative of the point margin at a given point. This captures the general trend of a match and extrapolates it from tennis’ complex scorning system.
  + Momentum entering a point vs momentum after a point. Momentum entering a point holds the state of the match the moment before a point occurs. Momentum after a point is the opposite, it reflects the trend of a match after a point.
* Problem- point margin has an interval of 1 unit and increases or decreases by 1 each point. This means that the instantaneous derivative is strictly 1 or -1 at each point. We need to smooth.

**Momentum Entering a Point**

Exponential Smoothing

* Explain exponential smoothing
* Different alphas

Seasonality

* Explain seasonality, server affects the conditions of point so much it can be understood as seasonality

Calculate derivative in two different methods

* First order backward gradient – simple, but point 5 does not impact point 4
* Spline – more advanced derivative method, but the derivative in point 4 can be impacted by the smoothed value of point 7
* Explain their function better

**Momentum After a point**

Same exponential smoothing and seasonality as before, except the smoothing is flipped. Forward exponential smoothing.

Calculate derivative in two different methods

* First order forward gradient – simple, but point 4 does not impact point 5 (good)
* Spline – more advanced derivative method, but the derivative in point 7 can be impacted by the smoothed value of point 4 (it should be forward looking)
* Explain their function better

Backward model

* First model used to determine if momentum exists. Does momentum entering a point impact the result of the next point?

Forward model

* Second model answers what causes momentum. Look at momentum after a point, what characteristics of a point correlate with this momentum