

# Limits of predictability

By Group 4





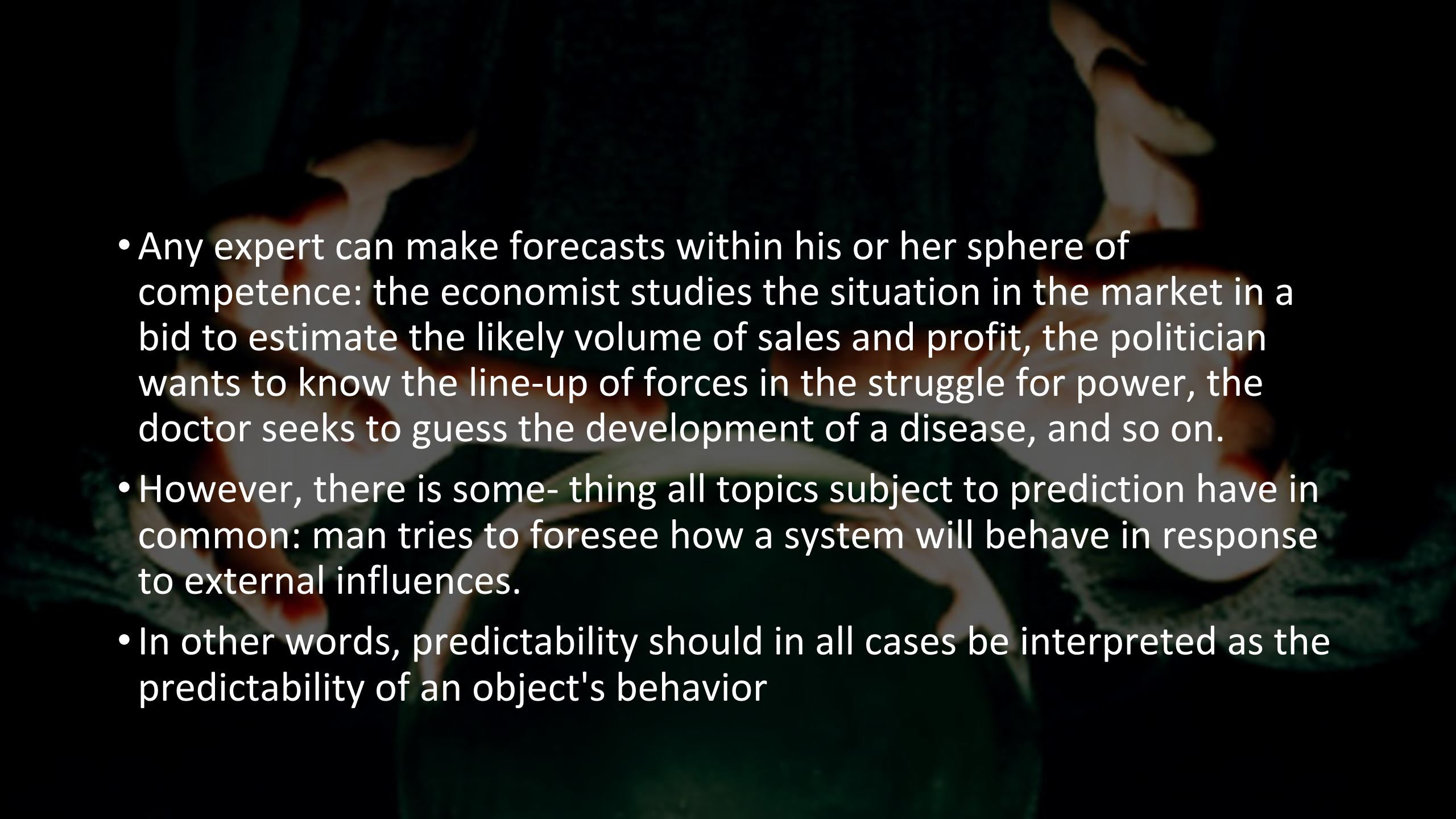
### What is Predictability ?

**Predictability** is the degree to which a correct prediction or forecast of a system's state can be made either qualitatively or quantitatively.

### What is limits of Predictability ?

One of the driving forces behind much of modern science and technology is the desire to foresee and thereby control the future. In recent years, however, it has become clear that, even in a deterministic world, there is a limit to the accuracy with which we can predict the future is known as limits of predictability.



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- Any expert can make forecasts within his or her sphere of competence: the economist studies the situation in the market in a bid to estimate the likely volume of sales and profit, the politician wants to know the line-up of forces in the struggle for power, the doctor seeks to guess the development of a disease, and so on.
  - However, there is something all topics subject to prediction have in common: man tries to foresee how a system will behave in response to external influences.
  - In other words, predictability should in all cases be interpreted as the predictability of an object's behavior

# Limits of Predictability in human mobility?

- Processes that rely on human mobility patterns, like the prediction of new epidemics, traffic engineering, or city planning, could benefit from highly accurate predictive models.
- To investigate the predictability of human dynamics, Song et al. used the recorded trajectories of millions of mobile phone users, collected by mobile phone companies and anonymized for research purposes.

# Limits of predictability in human dynamics ?

Here we explore the limits of predictability in human dynamics by studying the mobility patterns of anonymized mobile phone users.

By measuring the entropy of each individual's trajectory, we find a 93% potential predictability in user mobility across the whole user base.

Despite the significant differences in the travel patterns, we find a remarkable lack of variability in predictability.

# Why is limits of predictability in human mobility is important ?

- Human mobility is important for understanding the evolution of size and structure of urban areas, the spatial distribution of facilities, and the provision of transportation services
- Until recently, exploring human mobility in detail was challenging because data collection methods consisted of cumbersome manual travel surveys, space-time diaries, or interviews.
- The development of location-aware sensors has significantly altered the possibilities for acquiring detailed data on human movements

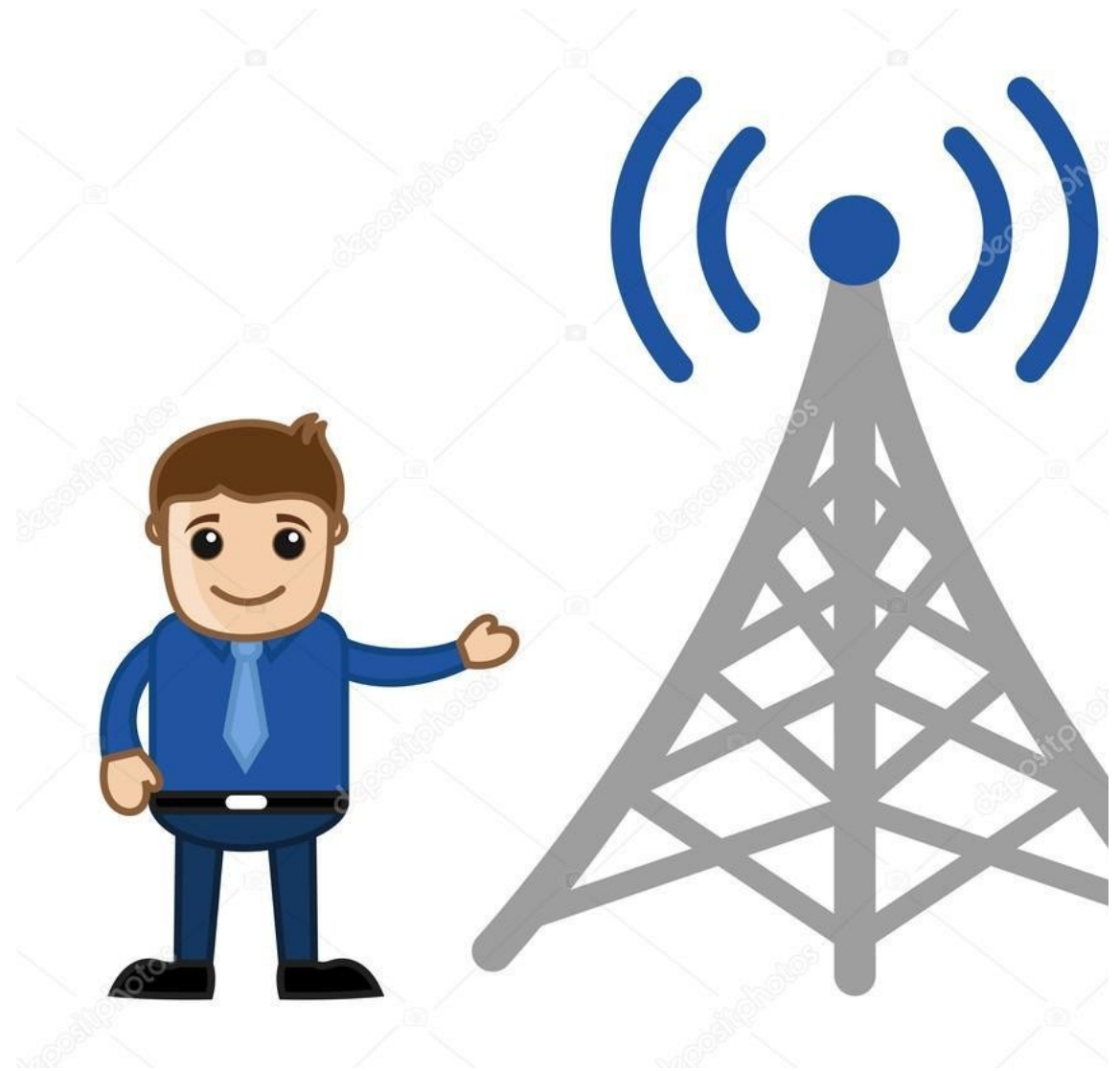
# Data Collection

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- Mobile carriers record the closest mobile tower each time the user uses his or her phone.

50,000 individuals chosen from ~10 million anonymous

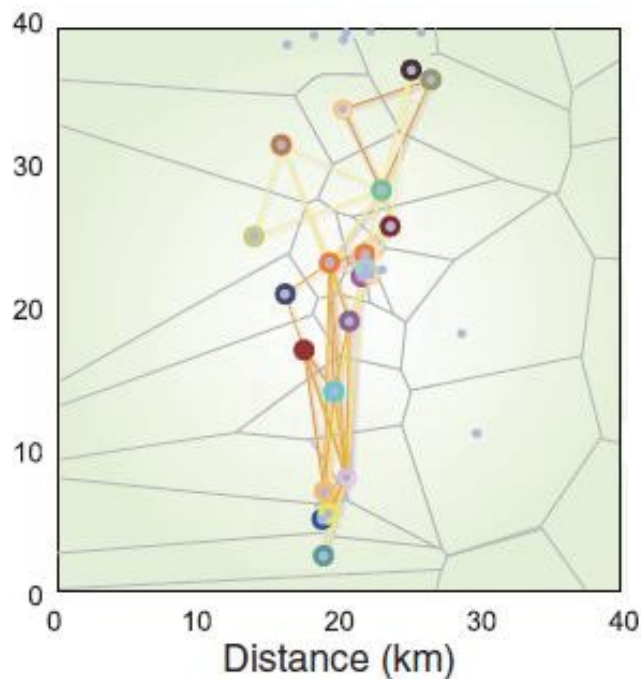
- 3-month-long record
- Visit more than 2 locations (tower vicinity)
- Average call frequency  $f$  is  $\geq 0.5/\text{hour}$





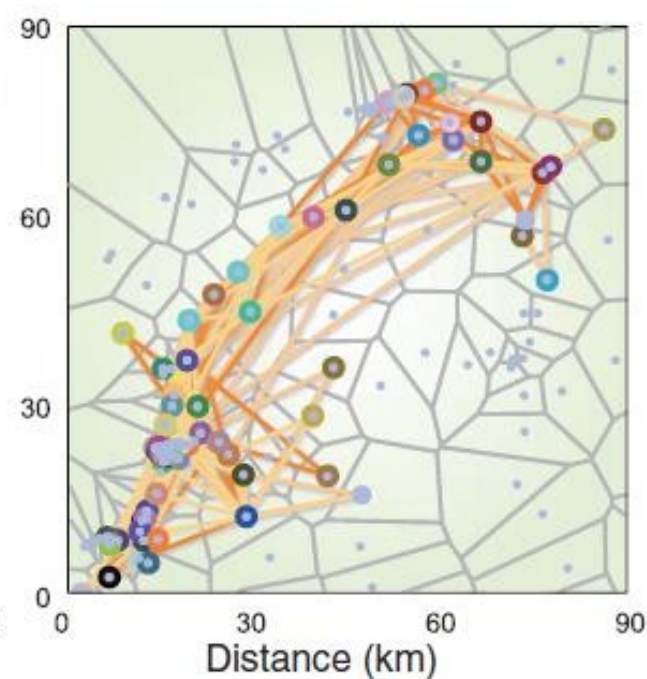
A

22 vicinities

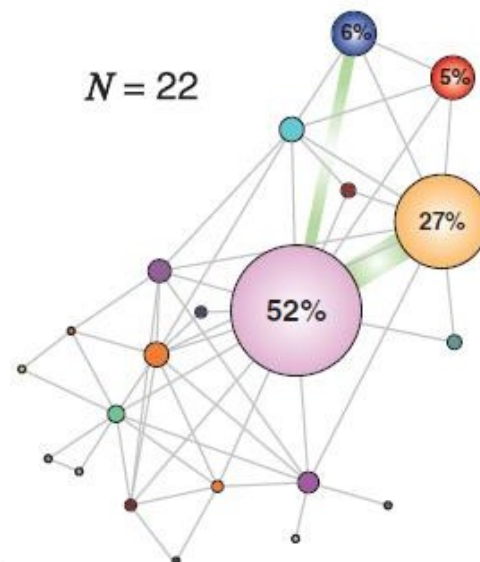
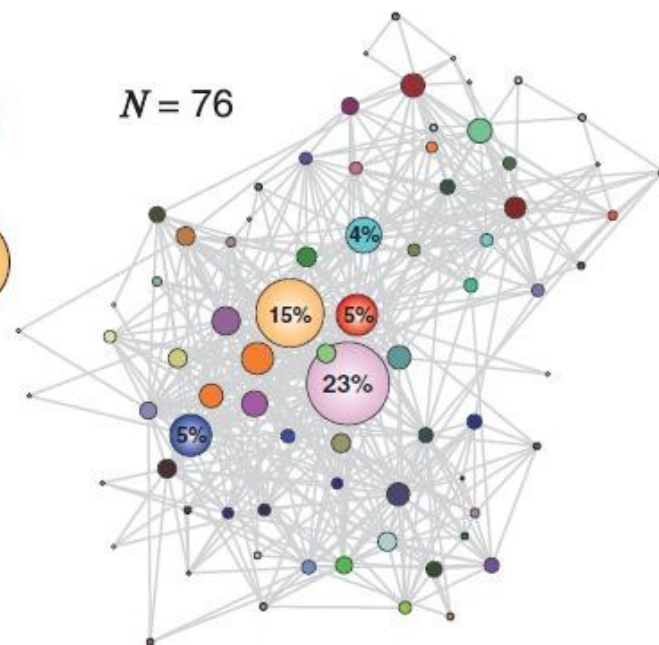


B

76 vicinities



**The trajectories of two users with  
sidely different mobility patterns.**

 $N = 22$  $N = 76$ 

**Mobility networks associated with the  
two users**



# Limits of Predictability

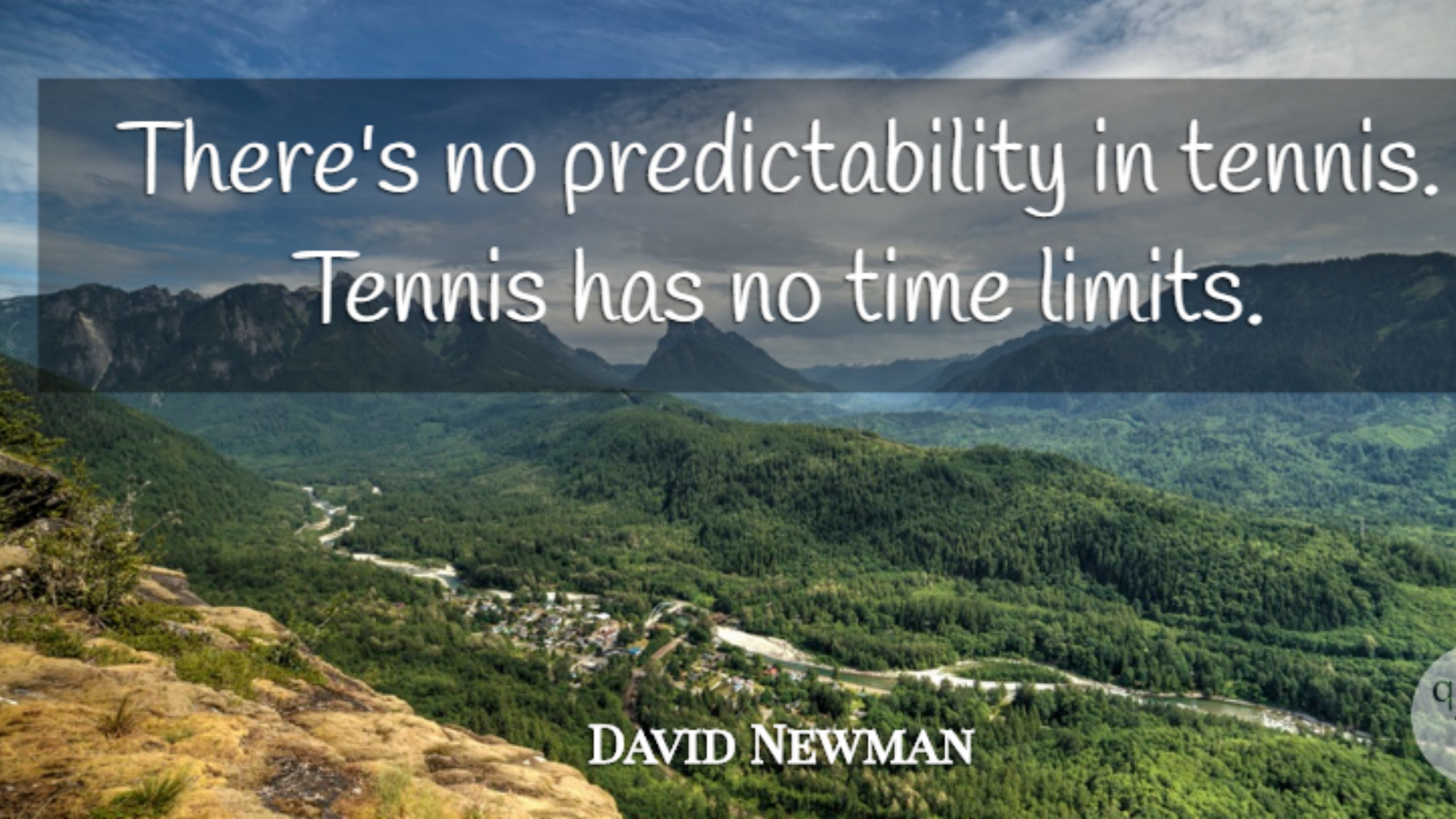
- **What determines the limits of predictability for the atmosphere?**
- **Limits dependent on many factors such as:**
  - Flow regime**
  - Geographic location**
  - Spatial scale of disturbance**
  - Weather element**

# Difference Between the prediction and probability?

- Understanding the difference between a prediction and the probability of a particular outcome occurring is an important distinction for successful investors.
- Anyone, regardless of their specific knowledge or expertise, can toss around market predictions.
- Probabilities are based on historical data sets and mathematics.
- Probabilities run a spectrum, from highly unlikely to extremely likely while Predictions are absolute, right or wrong.
- Relying on probabilities does not guarantee success either, but it can stack the deck in your favor and help you mentally prepare for unexpected outcomes.







There's no predictability in tennis.  
Tennis has no time limits.

DAVID NEWMAN