

Unequalizer Skill Level Rating System

A Reverse Engineering Study in Statistical Ratings

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A Brief Thank You:

It is with my sincerest thanks to the doctorate curriculum master mathematicians that volunteered their time to tackle this 12+ year endeavor. I have dedicated a large portion of my life to this project, and I would never have seen this solved without your hard work. Thanks to you, impassioned league players everywhere have a chance to understand the integrity of the systems, and robustness of those systems, that make their experience in this program unique.

How this system came to be:

In 2010 a friend of mine convinced me to break the reclusive cycle and come to a pool hall. That day I met with someone who convinced me to give pool leagues a try. It was at that moment my life took a turn and this significant project germinated. I was a 3 starting out. I couldn't make 2 balls in a row. The players I played with wanted my game to improve but didn't want my skill level to improve in the rating system. They thought they had it all worked out how to manipulate things. I would play many matches, and for the most part adjustments took place as expected. But, from time to time, unforeseen adjustments would happen and wreck our hopes and dreams of manipulating the system. It was at that time I knew it was up to me to be the world beater 3, and the magician behind the curtain who controlled what happened in the system. The only way that could happen was through fully understanding the system. There's just one problem- the system was a closely guarded secret.

I was and still am a lifelong software engineer. I knew if I could get in the door working with the keepers of the system I would have the keys to the kingdom. It had to happen, somehow, and I made it my mission.

I made every effort to get hired on. I just couldn't seem to convince them they needed me. But there had to be a way. In 2012 I picked up a book by Kevin Mitnick, a world-renowned cyber security consultant. It was then the plan was born.

In 2012 I entered the national office and explained I was there on behalf of the mainframe support vendor as a support engineer and had an appointment for mandatory security updates. They questioned my story, didn't have any scheduled appointments of my coming, but was also concerned that by turning me away their information security was at risk. She allowed me to enter their network operations center with an escort. That was all I needed. We made our way to the mainframe and while shutting it down I managed to attach a dirty USB drive. This drive had code that automatically installed a scheduled task that analyzed the system for the most commonly changed data which I suspected would be the rating system data. That data was periodically copied and uploaded to a remote server. For 6 months that process ran and collected data until a system update was performed and it no longer worked. During those 6 months though I collected critical data that painted a picture of statistical trends.

12 years later, in 2024, during the revolution of artificial intelligence and lexical analytics the tools to decipher the data, in conjunction with the brilliant minds of mathematicians and statisticians, the secret algorithm has finally been approximated to a reasonable degree to reproduce the outcomes of individual matches.

This is my work, and I openly contribute this work to you. With this knowledge comes great power. I trust that you will use it for good, and not abuse it, for the risk is great the algorithm gets changed to thwart abuse. Be wise, but be in control.

Components of the Rating System:

1. Skill Levels:

- Each player has a skill level ranging from 2.0 to 7.99.
- This skill level is the core rating, and it adjusts after each match.

2. Match Outcome:

- A match result is either a win or a loss.
- The result will affect the skill rating of both players involved.

3. Rating Adjustment Weight:

- For each match (up to 32,767 matches), the adjustment weight is drawn at random from a bell curve (normal distribution) of values ranging from -1.0 to 1.0.
- This random weight influences how much a player's skill rating changes after a match.

4. Skill Differential Influence:

- The difference in skill levels between two opponents influences the size of the rating adjustment.
- If the weaker player wins, their rating increases more significantly, while the stronger player's rating decreases more.
- If the stronger player wins, the adjustment is less pronounced.

Formula to Calculate Rating Change:

The formula for the rating change could be:

$$\Delta R = W \times (O_{\text{opponent}} - O_{\text{self}}) \times \left(\frac{1}{2} \times \text{Outcome} + \frac{1}{2} \right)$$

Where:

- ΔR = Change in rating
- W = Random weight value (from bell curve, range -1.0 to 1.0)
- O_{opponent} = Opponent's skill level
- O_{self} = Player's skill level
- **Outcome** = +1 for a win, -1 for a loss

Example Scenarios:

1. Example 1:

- **Player A Skill Level:** 5.5
- **Player B Skill Level:** 6.2
- **Outcome:** Player A wins
- **Random Weight (W):** 0.35

$$\Delta R_{\text{Player A}} = 0.35 \times (6.2 - 5.5) \times \left(\frac{1}{2} \times 1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player A}} = 0.35 \times 0.7 \times 1 = 0.245$$

$$\Delta R_{\text{Player B}} = 0.35 \times (5.5 - 6.2) \times \left(\frac{1}{2} \times -1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player B}} = 0.35 \times -0.7 \times 0 = 0$$

New Skill Levels:

- **Player A:** 5.745
- **Player B:** 6.2 (No change)

2. Example 2:

- **Player A Skill Level:** 7.0
- **Player B Skill Level:** 4.5

- **Outcome:** Player B wins
- **Random Weight (W):** -0.6

$$\Delta R_{\text{Player A}} = -0.6 \times (4.5 - 7.0) \times \left(\frac{1}{2} \times -1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player A}} = -0.6 \times -2.5 \times 0 = 0$$

$$\Delta R_{\text{Player B}} = -0.6 \times (7.0 - 4.5) \times \left(\frac{1}{2} \times 1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player B}} = -0.6 \times 2.5 \times 1 = -1.5$$

New Skill Levels:

- **Player A:** 7.0 (No change)
- **Player B:** 3.0

3. Example 3:

- **Player A Skill Level:** 3.8
- **Player B Skill Level:** 3.9
- **Outcome:** Player A wins
- **Random Weight (W):** 0.75

$$\Delta R_{\text{Player A}} = 0.75 \times (3.9 - 3.8) \times \left(\frac{1}{2} \times 1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player A}} = 0.75 \times 0.1 \times 1 = 0.075$$

$$\Delta R_{\text{Player B}} = 0.75 \times (3.8 - 3.9) \times \left(\frac{1}{2} \times -1 + \frac{1}{2} \right)$$

$$\Delta R_{\text{Player B}} = 0.75 \times -0.1 \times 0 = 0$$

New Skill Levels:

- **Player A:** 3.875
- **Player B:** 3.9 (No change)

Summary of the System:

- **Randomness:** Introduced by the weight W , so no match result is entirely predictable.
- **Influence of Skill Differential:** Larger differences in skill levels result in more significant rating adjustments.
- **Outcome-Based:** Winning always tends to increase skill, while losing does the opposite, but the magnitude varies based on the factors mentioned above.