Brainstorming Improvements to the Physical Activity Score Computation

Monday, May 19, 2025 11:35 PM

1. Workout Duration

Current Formula

```
if value <= low_daily:
    score = 0
elif value >= high_daily:
    score = 100
else:
    frac = (value - low_daily) / (high_daily - low_daily)
    score = frac * 100
```

Current Example (Works Well)

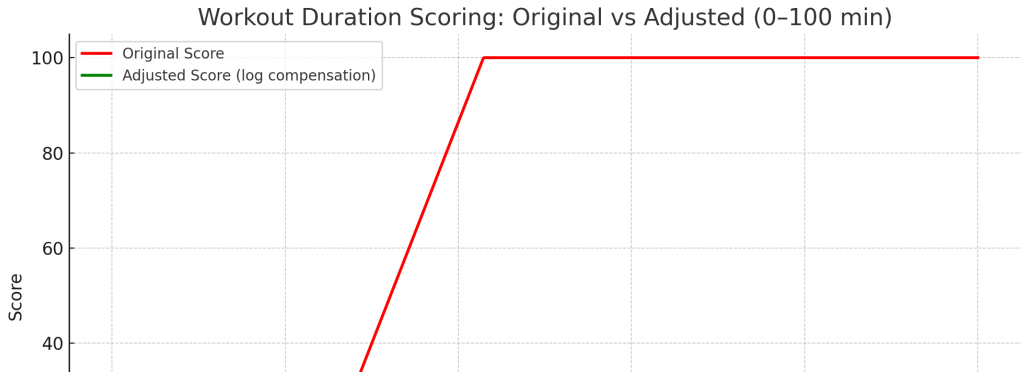
- Minimum daily duration = **21.4 min**
- Maximum (full credit) = **42.9 min**
- Anything < 20 gets **floored to 20**

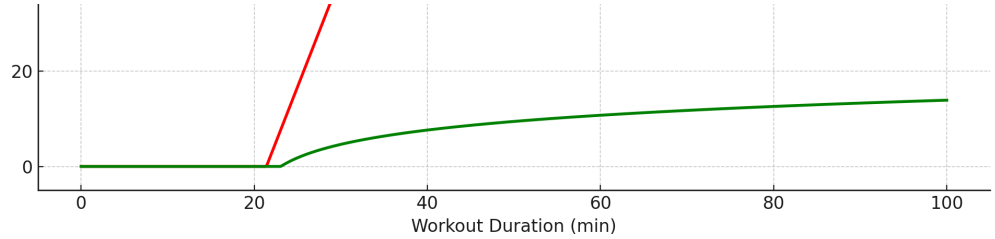
Input: 35 min workout
Score: (35 - 21.4) / (42.9 - 21.4) = ~0.632 → 63.2

Failure Case

- Minimum daily duration = **21.4 min**
- Maximum (full credit) = **42.9 min**
- Anything < 20 gets **floored to 20**

Input: 16-min **high-intensity HIIT**

- 16 < **21.4 min** → 0
- Despite
- 



- being a powerful, legitimate workout, user is **punished**.

Failed Improved Method

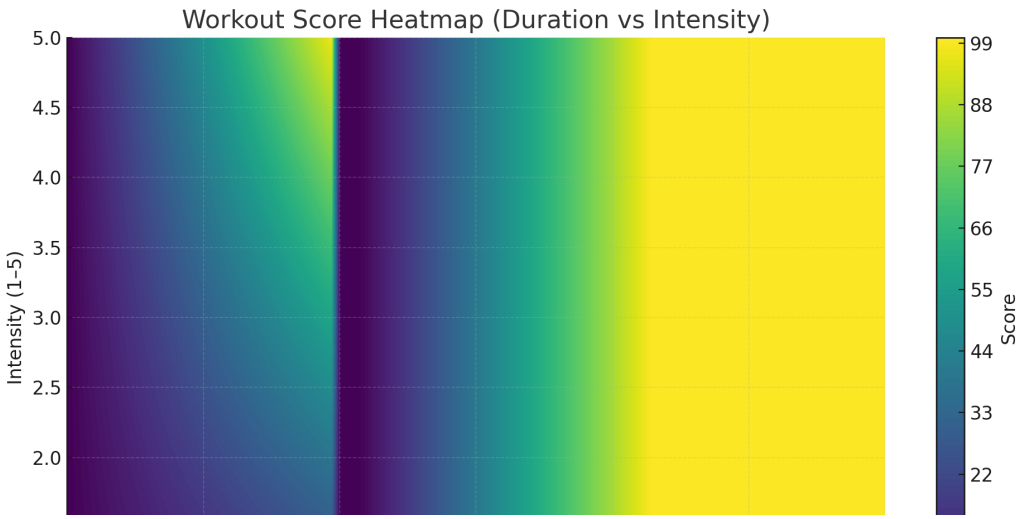
Introduce **logarithmic compensation** beyond 20 min (low_daily), ie create an **adjusted duration** (adj_duration), then apply the same cutoffs as before.

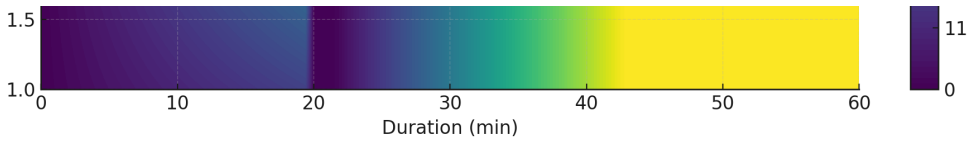
```
if duration < 20:
   adj_duration = 20  # still minimal floor
else:
   adj_duration = 20 + log(duration - 20 + 1)

if adj_duration <= low_daily:
   score = 0
elif adj_duration >= high_daily:
   score = 100
else:
   frac = (adj_duration - low_daily) / (high_daily - low_daily)
   score = frac * 100
```

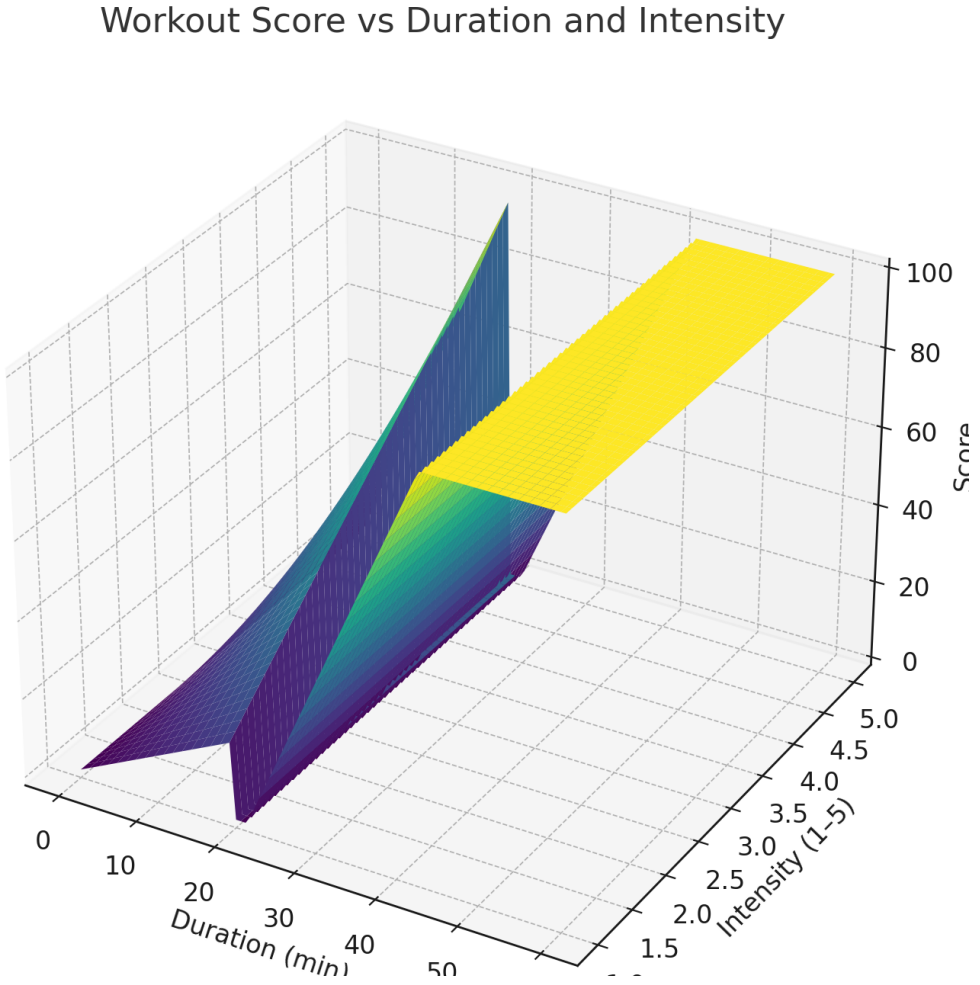
Create a scoring function that:

1. Grows from **21.4 min (WHO min)** to **42.9 min (WHO max)** like before
2. But if a workout is **shorter than 20 min**, allow **partial credit** based on **intensity**
3. Still caps score at 100
4. Prevents “gaming” by doing a 3-min sprint just to get point



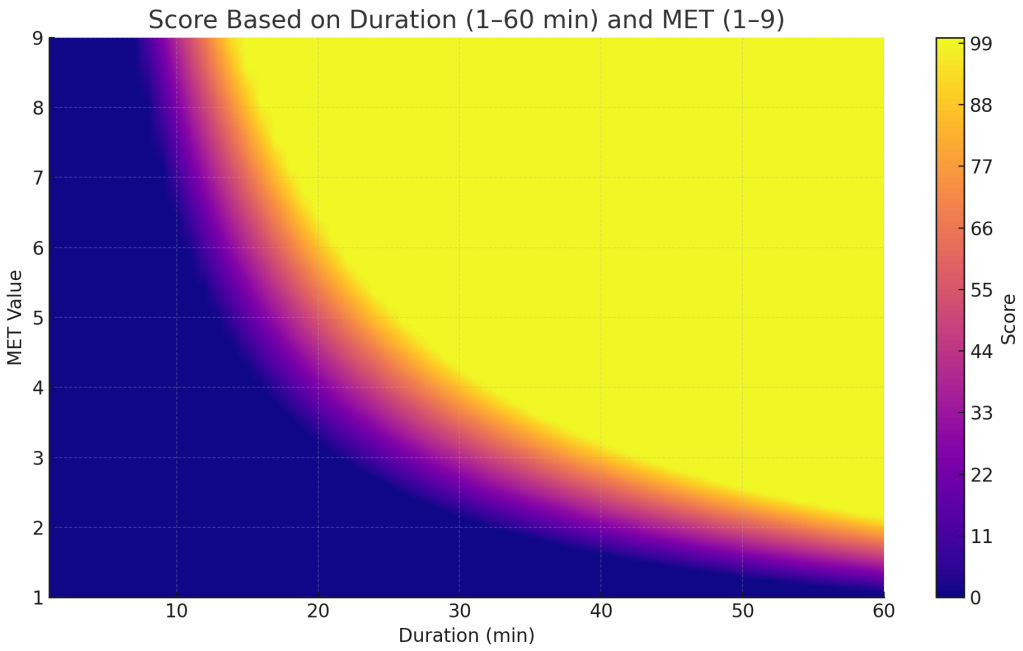


$$\text{score}(d, i) = \begin{cases} \min\left(100,\ 100 \cdot \frac{i}{5} \cdot \frac{d}{20}\right) & \text{if } d < 20 \\ [6pt]0 & \text{if } d \leq 21.4 \\ [6pt]100 & \text{if } d \geq 42.9 \\ [6pt]\left(\frac{d-21.4}{42.9-21.4}\right) \cdot 100 & \text{otherwise} \end{cases}$$



60 1.0

Issue: Duration Score is still agnostic of Effort



$$\text{MET} = \frac{\text{Calories per minute}}{0.0175 \times \text{Weight (kg)}}$$

$$\text{normalized\_duration} = \frac{\text{Duration} \times \text{MET}}{3}$$

```
if norm_dur <= 21.4:
    score = 0
elif norm_dur >= 42.9:
    score = 100
else:
    score = (duration - 21.4) / (42.9 - 21.4) * 100
```