- Duration = 10AM to 12AM
- Total Winners per Day = 100
- Reward = interest component of the disbursed user
- Daily budget = ₹2,00,000/-

Based on historical data of disbursals per hour in a day of the given campaign period a 2x2 matrix can be designed to finalise the number of winners that need to be selected in a particular hour.

Winners														
interest bucket	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
01. 0 - 1k	3	4	4	4	4	4	4	4	4	3	3	2	2	1
02. 1.1k - 2k	2	2	2	2	2	2	2	2	2	2	2	1	1	1
03. 2.1k - 3k	1	1	1	1	1	1	1	1	1	1	1	0	0	0
04. 3.1k - 5k	1	1	1	1	1	1	1	1	1	1	1	0	0	0
05. 5.1k - 10k	1	1	1	1	1	1	1	1	1	1	1	0	0	0
Total	**8**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**8**	**8**	**3**	**3**	**2**

From the above constraints the average reward(interest component) we can give for a user is ₹2,000/-

The Logic can be as follows -

$$Base\ Probability\ = \frac{Remaining\ Winners}{Total\ Winners}$$

$$Proximity\ Bias\ = 1\ - \frac{Distance\ from\ MEDIAN}{Max\ distance\ in\ bucket}$$

$$Time\ Scaling\ = 1\ - \left(0.25\ \times \left(1\ - \left(\frac{Time\ Passed}{Current\ Batch\ Duration}\right)\right)\right)$$

$$Scaled\ Probability\ =\ Base\ Probability\ \times Time\ Scaling$$

$$Final\ Probability\ =\ (1\ -\ bias)\ \times\ scaled\ probability\ \times 0.5\ +\ bias\ \times\ proximity\ bias\ \times 0.5$$

$$bias\ =\ 0.45$$

$$Random\ float\ generator(0\ to\ 1)\ \leq\ Final\ Probability\ \Rightarrow\ WINNER$$

For every eligible user the above logic will be run based on the hour coming into the system.

Base probability →

To determine the probability based on the winners that had been selected till time.

- Total Winners = Winners that need to be selected in the given hour
- Remaining winners = winners that yet need to be selected

Purpose: To determine the base level probability of the user

Proximity Bias →

To determine the probability based on the user's interest component distance from the median of the interest buckets.

- Distance of median = |median - interest|
- Max distance = |Upper limit - Lower limit|

Purpose: To make sure we spend our budget near our margin and won't under or over spend.

Time Scaling →

Since, in the beginning the chance of the winner getting selected is very high the logic would be served as "first come first serve". To avoid this we will be reducing the probability for the users who are coming first and will increase as the hour progresses.

- Time Passed = Time passed in the hour
- Current batch duration = total duration of the current winner batch (60 min)

Purpose: To make sure we maintain fairness & select the winners throughout the hour.

Final Probability →

We merge all the probability factors calculated till now to get a final probability. We add a bias parameter to give weights to the "probability based on fairness & leftover winners" vs "budget control"

- Bias = 0.45 (based on multiple iterations performed)

Note:

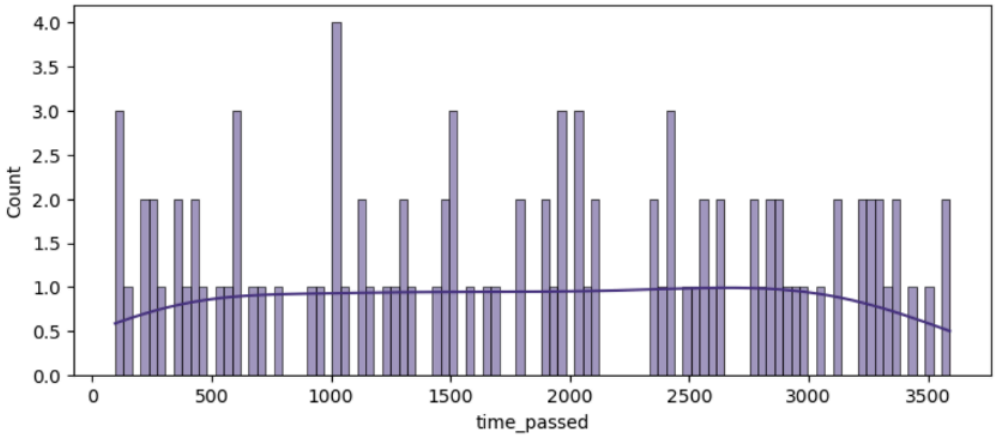
Both the terms of the final probability was multiplied by 0.5 because -

- To smoothen out the variations which were encountered during the testing.
- To normalise the terms on both sides.

Results:

Accuracy = 98.5%

Winner distribution in a particular hour →



Future Developments:

- Instead of hard coding the number of users per hour based on historical data, we can develop a ML model which can predict the user types and their range for an entire day and decide the probability of the current user based on that.
- The logic can be simplified.