

NAPLES

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**STINT SPRING HACKATHON**

# INTRODUCTION

- Creation of an algorithm based on a mathematical model
- Achieve best possible experience for both the business and the student
- Calculate a number of different variables, to then unite them in a single parameter called **desirability**
- Data analysis on MATLAB to determine the parameters shaping the normalisation curves

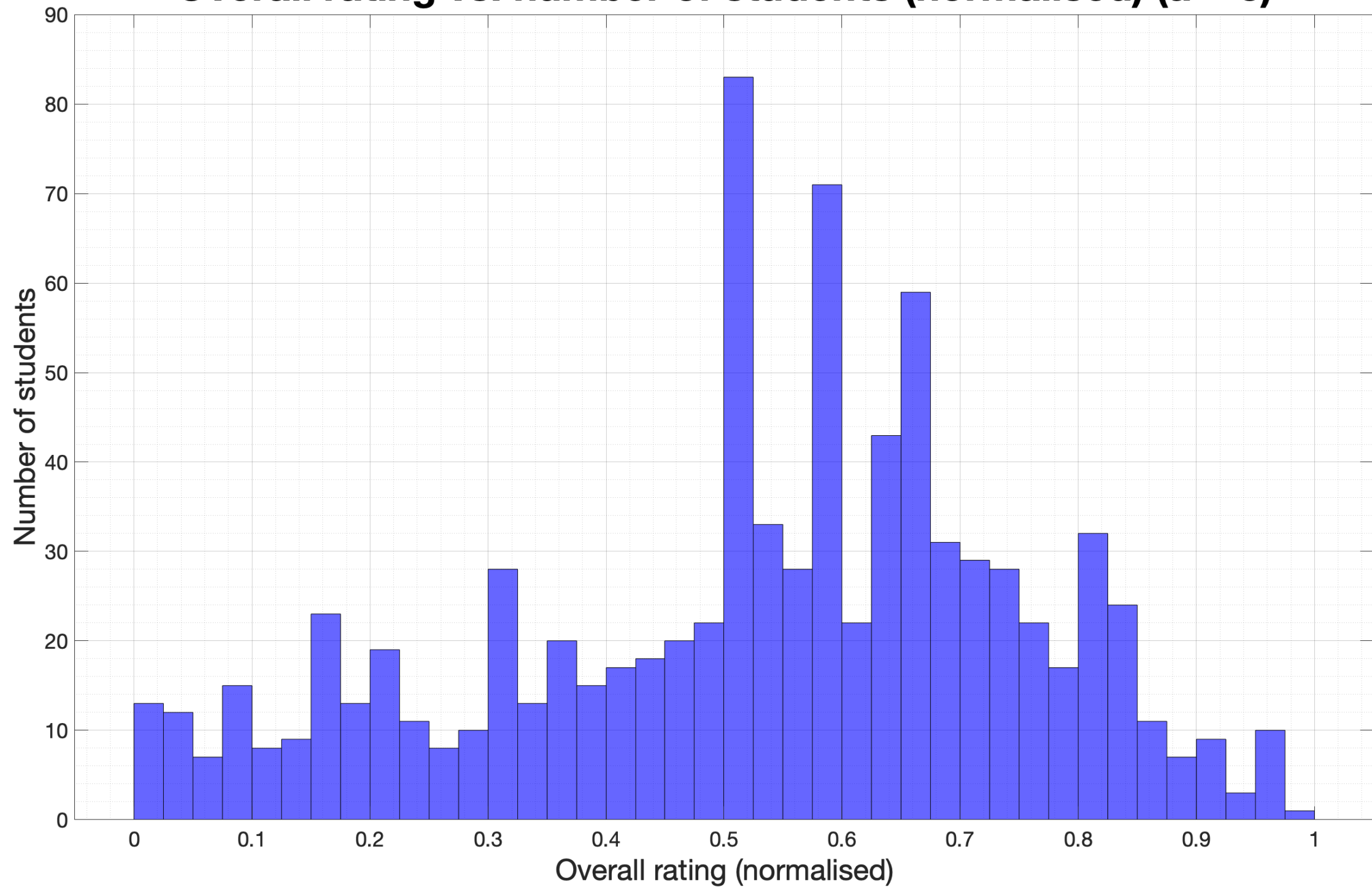
## OVERALL RATING

$$R = \sum_{i=1}^N \frac{(R_i - \bar{R})}{N}$$

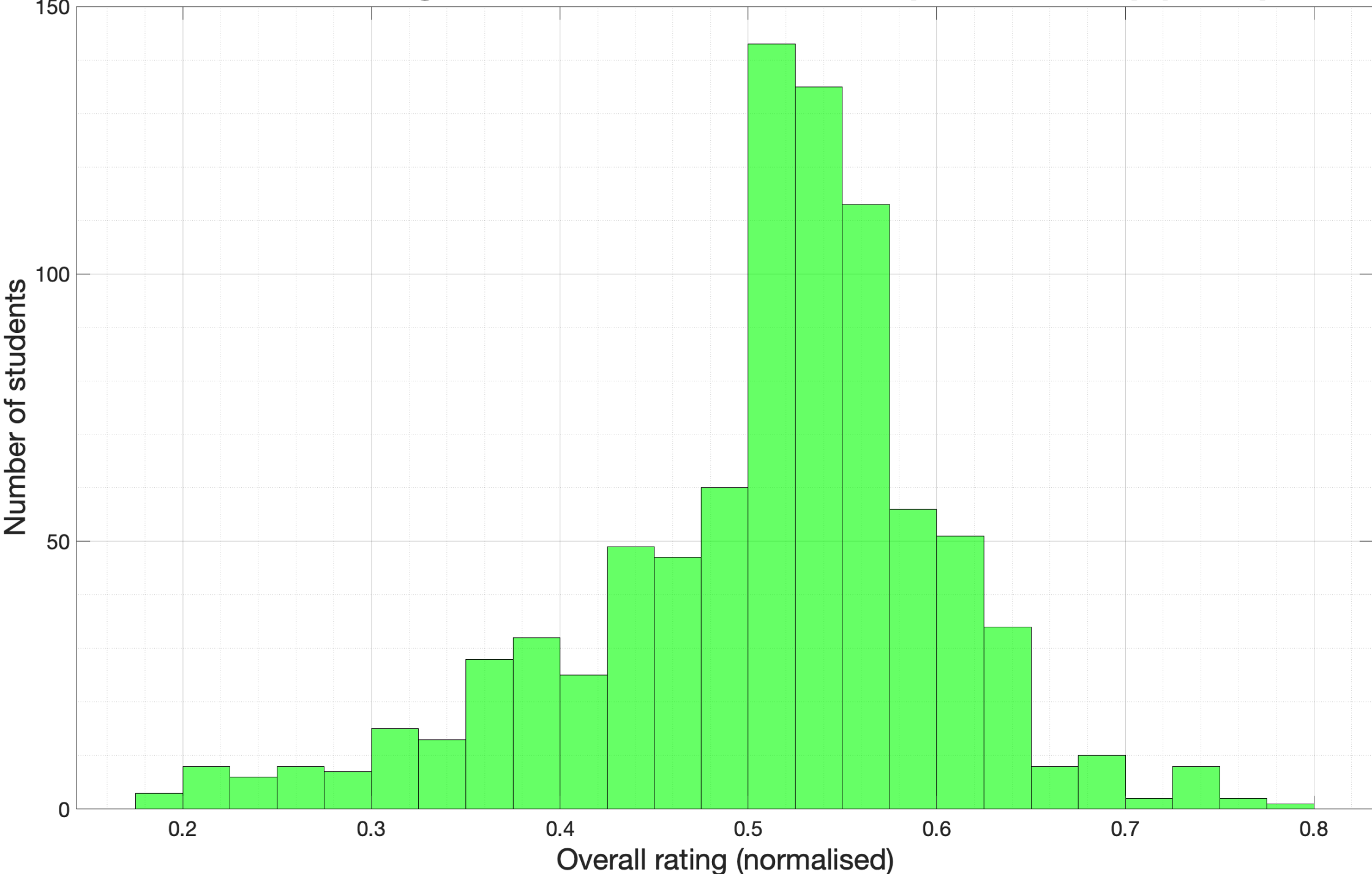
$$R(\text{Normalised}) = \frac{e^{3R}}{e^{3R} + 1}$$

- $N$ : total number of STINTs completed by the student in any job category
- $R_i - \bar{R}$  : the difference between the single rating received by the student from the employer for a single job and the average rating the employer gives to employees

**Overall rating vs. number of students (normalised) ( $\alpha = 3$ )**



**Overall rating vs. number of students (normalised) (a = 1)**

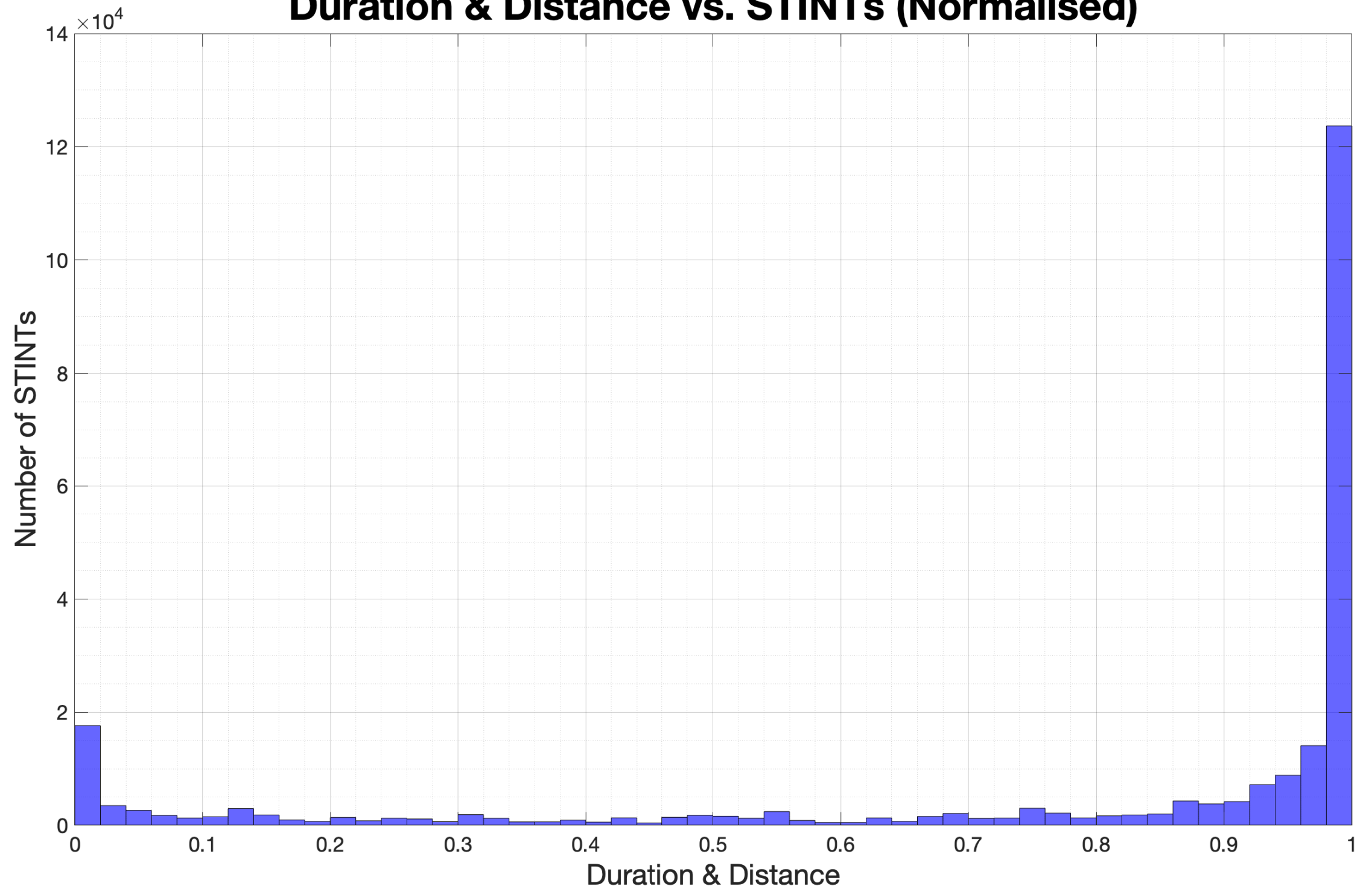


## DISTANCE AND DURATION

$$D_T = \frac{e^{-(D-1.9T)}}{e^{-(D-1.9T)} + 1}$$

- **D** : the distance between the business and the student (in km)
- **T** : time duration of the STINT (in hours)

# Duration & Distance vs. STINTs (Normalised)



## STINTS COMPLETED BY THE STUDENT IN A SPECIFIC ROLE

$$N_S(\text{Normalised}) = \frac{e^{0.8(N_S-4)}}{e^{0.8(N_S-4)} + 1}$$

- $N_S$ : takes into account the number of STINTs completed by the student in a specific job category
- The biggest change in  $N_S$  occurs around the value of 4. The 0.8 factor which multiplies the exponents reduces the rate of change of this parameter, so that there is a smaller difference between students who completed just one or two STINTs more or less



## RATING FOR A SPECIFIC JOB ROLE

$$R_S = \sum_{i=1}^{N_S} \frac{(R_i - \bar{R})}{N_S} \quad R_S(\text{Normalised}) = \frac{e^{3R_S}}{e^{3R_S} + 1}$$

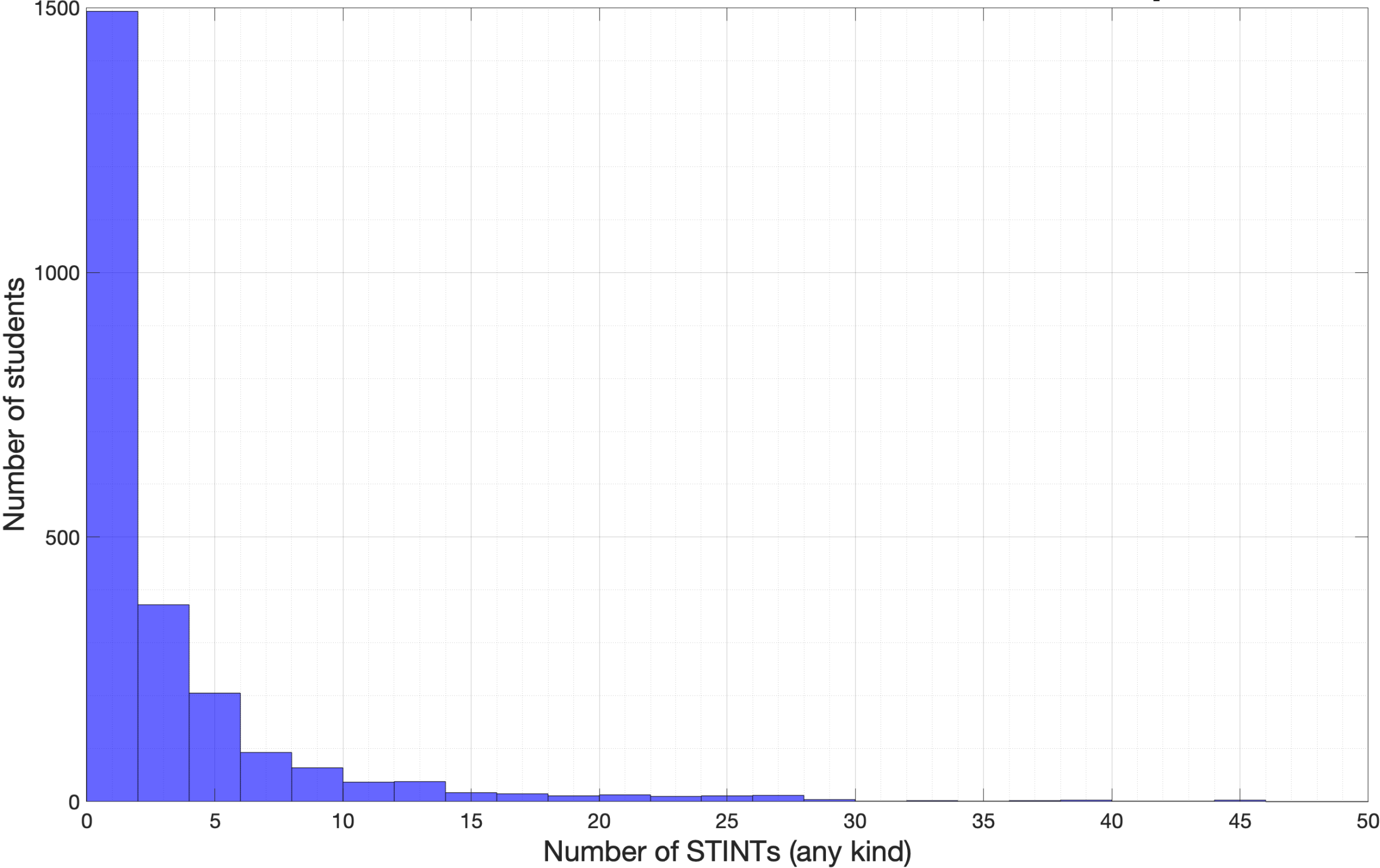
- $N_S$ : total number of STINTs completed by the student in the specific job category
- $R_i - \bar{R}$ : the difference between the single rating received by the student from the employer for a single specific job and the average rating the employer gives to employees for that specific job role

## STINTS COMPLETED BY THE STUDENT

$$N(\text{Normalised}) = \frac{e^{2.8(N-1.8)}}{e^{2.8(N-1.8)} + 1}$$

- $N$ : takes into account the number of all STINTs completed by the student (regardless of job category)
- The biggest change in  $N$  occurs around the value of 1.8. The 2.8 factor which multiplies the exponents increases the rate of change of this parameter, so that there is a bigger difference between students who completed just one or two STINTs more or less

**Distribution of students vs. number of STINTs completed**

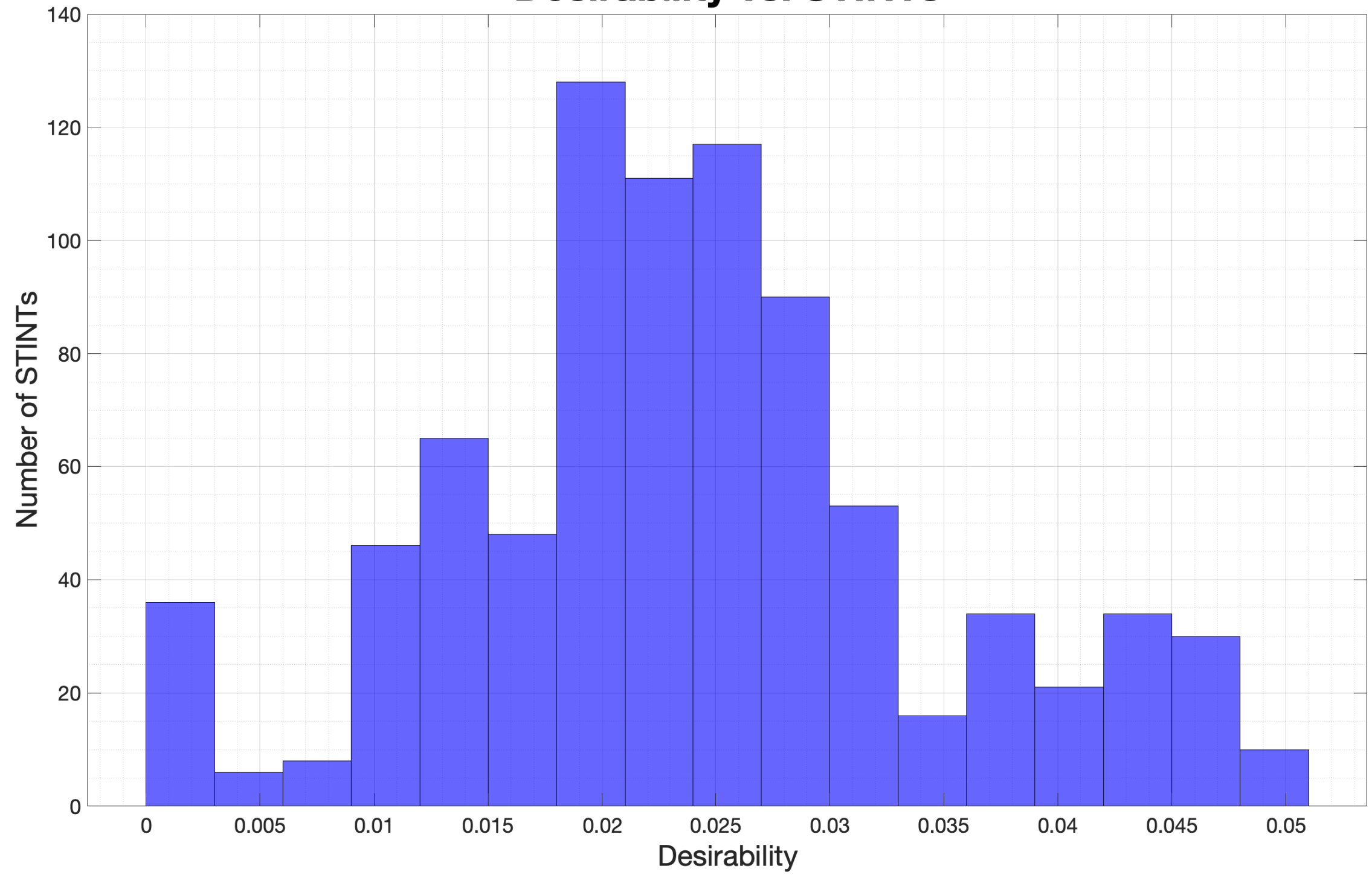


## DESIRABILITY

$$\Xi = N \frac{(\alpha \cdot \mathbf{R}_S + \beta \cdot \mathbf{N}_S + \gamma \cdot \mathbf{R} + \delta \cdot \mathbf{D}_T)}{\alpha + \beta + \gamma + \delta}$$

$\mathbf{R}_S$  is the rating achieved by the student in the specific job type being taken into consideration,  $\mathbf{N}_S$  is the number of STINTs completed by the student in the specific job type being taken into consideration,  $\mathbf{R}$  is the overall rating achieved by the student (see above),  $\mathbf{D}_T$  is the “distance and duration” variable described in the corresponding paragraph above, and, lastly,  $\mathbf{N}$  is the total number of STINTs completed by the student in any job category

## Desirability vs. STINTs



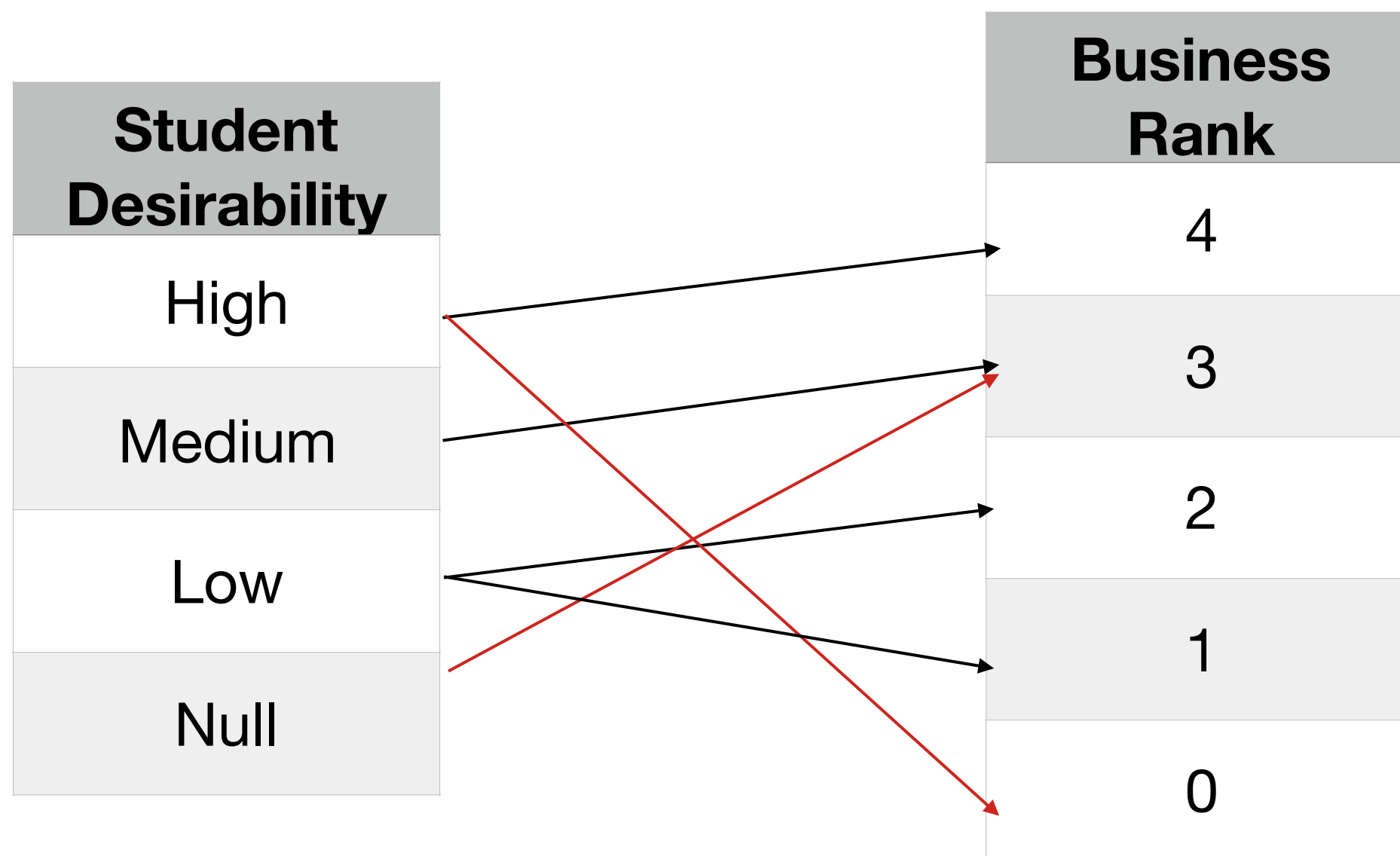
# EXCEPTIONS

- Desirability parameter will not apply to all student-business matchings
- This is done in order not to penalise students who have yet to complete a reasonable number of STINTs
- These special clauses will apply to students who have only completed between 0 and 2 STINTs, and businesses who have only hosted between 0 and 4

- New students are assigned to average-ranking businesses (level 3) (cf. Business ratings), so that they'll have enjoyable and productive first experiences, making them more willing to work for STINT again in the future. The reason why they are assigned to average businesses is that, this way, they will still like working at that business (as opposed to working at a low-ranking one), whilst not risking STINT's reputation with high-ranking businesses, which are statistically more demanding

- New businesses, whose business rank will be null, will be assigned **only very good students** for the first 4 STINTs they post, so that they will have a good first impression of the students, resulting in a higher likelihood of their continuing to use the app

A rough summary of the matching between students and businesses is shown below. The features highlighted above are shown as red arrows:





# FAST TRACKING

- At the very beginning of the algorithm, before ordering workers based on their respective desirability, a student will be “fast-tracked” to a certain business (i.e. he will be matched with a business regardless of other parameters) if both the following conditions are met:
- The student has already worked before with the specific business
- The average of the ratings the student has received from that specific business is higher than the average rating that business gives to all its STINTs