# Appendices

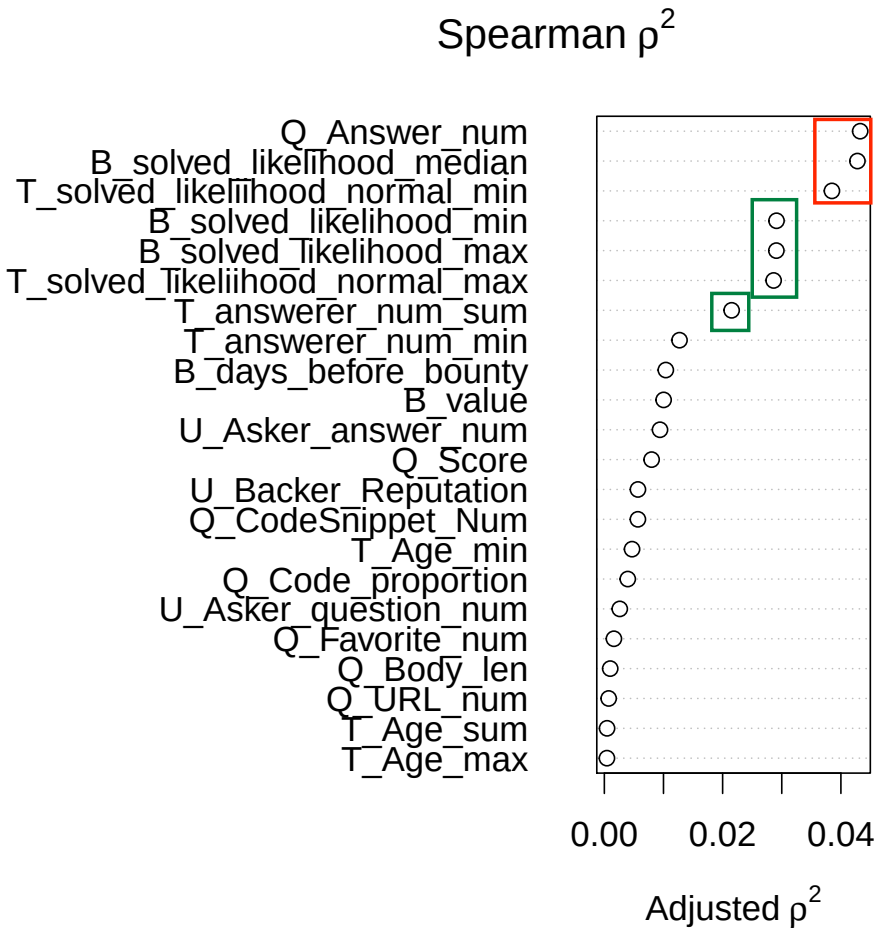


Fig. 1: Dotplot of the Spearman multiple $\rho^2$ of each factor in the bounty question solving-likelihood model. The larger the $\rho^2$ value, the more likely the factor has a non-linear relationship with the response variable. By observing the rough clustering of the factors according to their $\rho^2$, we clustered the factors into four groups according to the Spearman multiple $\rho^2$ values. We assigned the first, second, and third groups of factors (categorized by the $\rho^2$ value) which are highlighted by red rectangle, black rectangle and green rectangle, 5, 4, and 3 degrees of freedom, respectively.

This appendix will be available online Zhou (2019). We included it as supplementary material for the convenience of the anonymous reviewers.

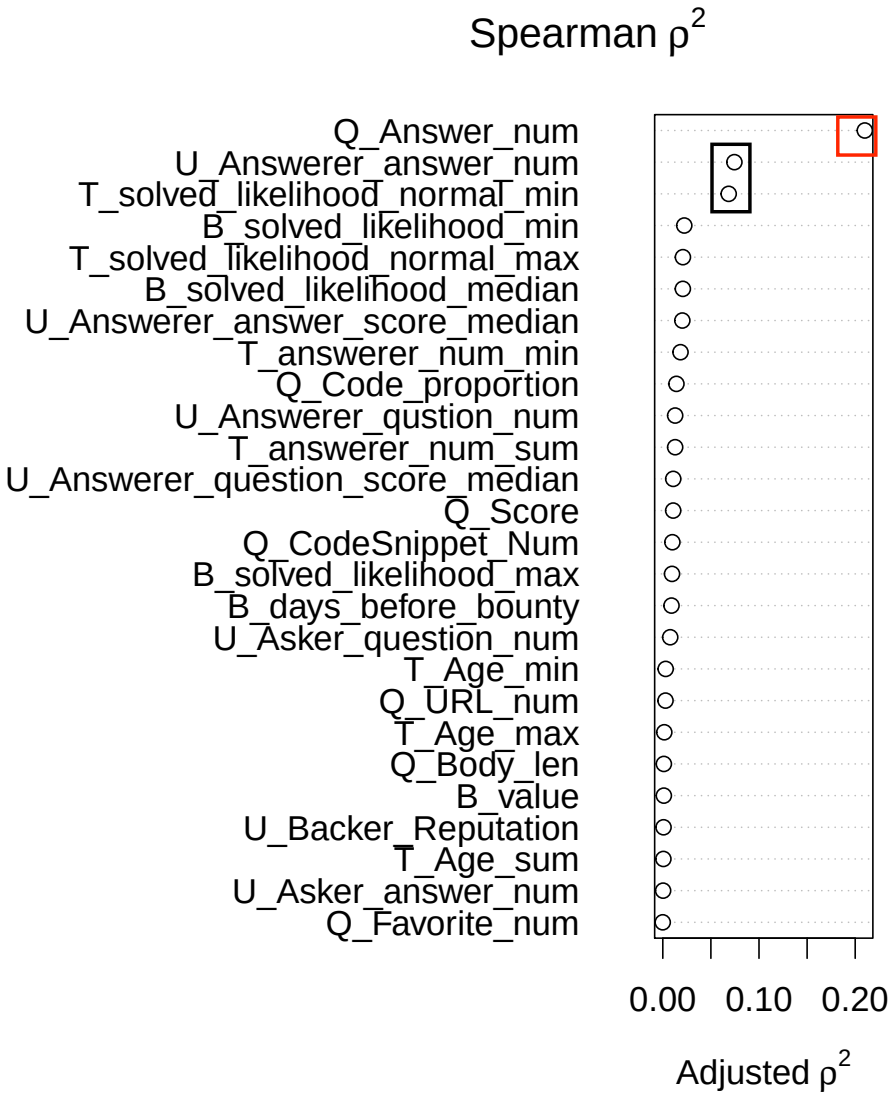


Fig. 2: Dotplot of the Spearman multiple $\rho^2$ of each factor in the bounty question solving-time model. The larger the $\rho^2$ value, the more likely the factor has a non-linear relationship with the response variable. By observing the rough clustering of the factors according to their $\rho^2$, we clustered the factors into four groups according to the Spearman multiple $\rho^2$ values. We assign the first and second groups of factors (categorized by the $\rho^2$ value) which are highlighted by red rectangle and black rectangle, 5 and 4 degrees of freedom, respectively.

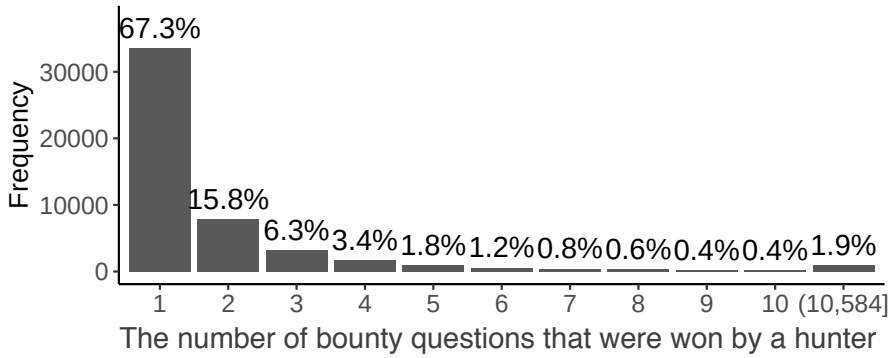


Fig. 3: The frequency of the number of bounty questions that were won by a hunter.

In this appendix, we present the dotplots of the Spearman multiple $\rho^2$ of each factor for the bounty question solving-likelihood model (Figure 2) and the bounty question solving-time model (Figure 2).

We also show the Wald $\chi^2$ value and the statistical significance (p-value) of all factors in the model for solving-likelihood of bounty questions 1 and the model for solving-time of bounty questions 2 .

We also present the results of the analysis on hunters. Figure 3 shows the frequency of a hunter winning bounty question. We found that 67.3% of the hunters only solved 1 bounty question and 1.9% of the hunters solved more than 10 bounty questions. This finding indicates that most hunters in Stack Overflow are one-shot hunters. Figure 4 shows the total bounty amount that was won by a hunter. We found that the total earning of 48.3% of the hunters was no more than 50 reputation points and only 6.2% of the hunters earned more than 500 reputation points.

## References

Zhou, J. (2019). Supplementary material for our paper. https://github.com/SAILResearch/wip-18-jiayuan-SO-bounty-SupportMaterials/blob/master/appendix.pdf.

Table 1: The result of our logistic regression model that is for understanding the relationship between the studied factors and the bounty question solving-likelihood. Factors are ordered by their variable importance (i.e., their Wald's $\chi^2$ value).

| **Factors** | | **Overall** | **NL** |
|---|---|---|---|
| Q_answer_num | D.F. | 1 | |
| | $\chi^2$ | 1348.604 *** | |
| B_value | D.F. | 9 | |
| | $\chi^2$ | 597.668 *** | |
| T_solving_likelihood_normal_min | D.F. | 4 | 3 |
| | $\chi^2$ | 473.843 *** | 7.921 *** |
| B_days_before_bounty | D.F. | 1 | |
| | $\chi^2$ | 382.611 *** | |
| T_answerer_num_sum | D.F. | 2 | 3 |
| | $\chi^2$ | 359.326 *** | 108.199 *** |
| T_solving_likelihood_normal_max | D.F. | 3 | 2 |
| | $\chi^2$ | 349.808 *** | 54.763 *** |
| B_solved_likelihood_median | D.F. | 4 | 3 |
| | $\chi^2$ | 164.312 *** | 128.110 *** |
| B_solved_likelihood_min | D.F. | 3 | 2 |
| | $\chi^2$ | 106.017 *** | 104.622 *** |
| T_age_min | D.F. | 1 | |
| | $\chi^2$ | 64.624 *** | |
| Q_codesnippet_num | D.F. | 1 | |
| | $\chi^2$ | 50.250 *** | |
| B_solved_likelihood_max | D.F. | 3 | 2 |
| | $\chi^2$ | 44.900 *** | 41.039 *** |
| Q_body_len | D.F. | 1 | |
| | $\chi^2$ | 29.932 *** | |
| T_age_max | D.F. | 1 | |
| | $\chi^2$ | 21.996 *** | |
| Q_url_num | D.F. | 1 | |
| | $\chi^2$ | 17.373 *** | |
| U_asker_answer_num | D.F. | 1 | |
| | $\chi^2$ | 12.798 *** | |
| U_asker_question_num | D.F. | 1 | |
| | $\chi^2$ | 8.061 ** | |
| U_backer_reputation | D.F. | 1 | |
| | $\chi^2$ | 7.130 ** | |
| T_answerer_num_min | D.F. | 1 | |
| | $\chi^2$ | 6.216 * | |
| Q_favorite_num | D.F. | 1 | |
| | $\chi^2$ | 5.167 * | |
| Q_score | D.F. | 1 | |
| | $\chi^2$ | 2.645 | |
| T_age_sum | D.F. | 1 | |
| | $\chi^2$ | 1.514 | |
| Q_code_proportion | D.F. | 1 | |
| | $\chi^2$ | 1.508 | |

P-value of the $\chi^2$ test: '***' $< 0.001$; '**' $< 0.01$; '*' $< 0.05$

Table 2: The result of our logistic regression model that is for understanding relationship between the studied factors and solving-time. Factors are ordered by their variable importance (i.e., Wald's $\chi^2$ value).

| **Factors** | | **Overall** | **NL** |
|---|---|---|---|
| Q_answer_num | D.F. | 1 | |
| | $\chi^2$ | 2032.150 *** | |
| U_answerer_answer_num | D.F. | 3 | 2 |
| | $\chi^2$ | 581.880 *** | 361.452 *** |
| T_solving_likelihood_normal_min | D.F. | 3 | 2 |
| | $\chi^2$ | 391.171 *** | 76.639 *** |
| T_age_max | D.F. | 1 | |
| | $\chi^2$ | 317.732 *** | |
| T_solving_likelihood_normal_max | D.F. | 1 | |
| | $\chi^2$ | 243.640 *** | |
| B_days_before_bounty | D.F. | 1 | |
| | $\chi^2$ | 173.308 *** | |
| Q_code_proportion | D.F. | 1 | |
| | $\chi^2$ | 144.062 *** | |
| Q_favorite_num | D.F. | 1 | |
| | $\chi^2$ | 74.265 *** | |
| Q_body_len | D.F. | 2 | |
| | $\chi^2$ | 58.913 *** | |
| T_age_sum | D.F. | 1 | |
| | $\chi^2$ | 45.573 *** | |
| T_answerer_num_sum | D.F. | 1 | |
| | $\chi^2$ | 42.458 *** | |
| Q_codeSnippet_num | D.F. | 1 | |
| | $\chi^2$ | 15.294 *** | |
| B_solved_likelihood_max | D.F. | 1 | |
| | $\chi^2$ | 14.696 *** | |
| B_value | D.F. | 1 | |
| | $\chi^2$ | 11.257 ** | |
| T_age_min | D.F. | 1 | |
| | $\chi^2$ | 10.580 ** | |
| Q_url_num | D.F. | 1 | |
| | $\chi^2$ | 10.191 ** | |
| U_asker_answer_num | D.F. | 1 | |
| | $\chi^2$ | 5.888 * | |
| T_answerer_num_min | D.F. | 1 | |
| | $\chi^2$ | 5.446 * | |
| U_answerer_question_score_median | D.F. | 1 | |
| | $\chi^2$ | 2.564 | |
| B_solved_likelihood_median | D.F. | 1 | |
| | $\chi^2$ | 2.358 | |
| U_asker_question_num | D.F. | 1 | |
| | $\chi^2$ | 1.203 | |
| U_backer_reputation | D.F. | 1 | |
| | $\chi^2$ | 0.640 | |
| B_solved_likelihood_min | D.F. | 1 | |
| | $\chi^2$ | 0.603 | |
| U_answerer_question_num | D.F. | 1 | |
| | $\chi^2$ | 0.11 | |
| U_answerer_answer_score_median | D.F. | 1 | |
| | $\chi^2$ | 0.011 | |
| Q_score | D.F. | 1 | |
| | $\chi^2$ | 0.011 | |

P-value of the $\chi^2$ test: '***' $< 0.001$; '**' $< 0.01$; '*' $< 0.05$

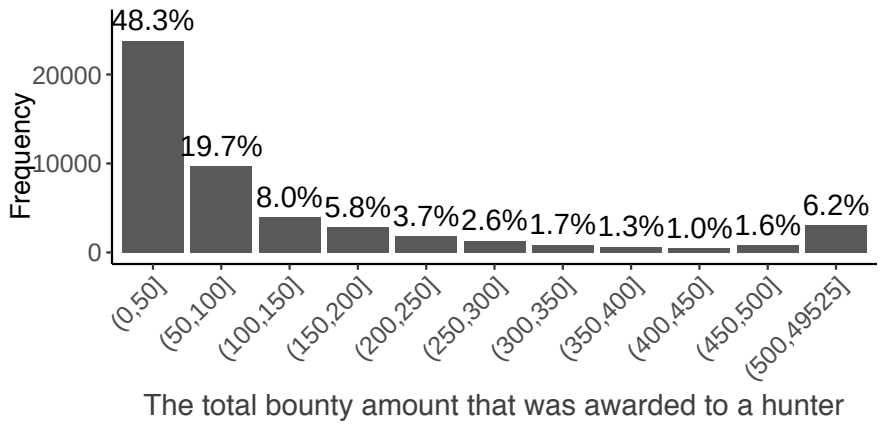


Fig. 4: The frequency of total bounty amount that was awarded to a hunter.