

Enhancing Undergraduate Engagement and Motivation Towards Internship Using Machine Learning and Gamification Techniques

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I. INTRODUCTION

Internship selection process is a critical milestone for undergraduates in their academic journey. Traditional selection processes for internships often face challenges in selecting the full potential of candidates. Those methods are manual, time-consuming, and lack the ability to engage and motivate students effectively. They are focused on a limited range of methods, such as interviews, resumes, biodata, and assessment centers. This not only creates barriers for deserving students but also leaves organizations struggling to identify suitable candidates. To address this, we propose a gamification based solution which integrates machine learning, designed to engage and evaluate undergraduates in more accurate manner. Gamification elements such as points, badges, leaderboards and feedback has proven effective in improving motivation and engagement in various domains [2]. By implementing these gamification mechanisms, we aim to transform the internship selection process into an interactive and rewarding experience. The proposed solution evaluates undergraduates based on their academic performance, extracurricular activities, and sports participation. This approach aims to save time for recruiters by automating evaluations from academic performance to extracurricular engagement. Ultimately undergraduates feel valued, employers find better matches, and internships that nurture potential rather than suppress it.

II. AIM AND OBJECTIVES

A. Problem

The main issue addressed by our research is the disconnect between undergraduates' capabilities and their ability to secure a suitable internship. This current concern motivated us to conduct a research and find a solution that will help undergraduates to secure a suitable opportunity in industry.

B. Literature Review

Previous research has shown that gamification techniques, such as point systems, feedback loops, and leaderboards, can boost engagement, improve academic performance, and career readiness [2]. By utilizing the above techniques, the proposed research focuses on IT internship selection for Sri Lankan IT undergraduates. These methods have also been effective in reducing human bias [3]. From one of the research, Platonova and Berzisa found that the use of gamification in software development projects increased employee motivation, enhanced productivity, and made it easier to track progress [4]. Therefore, we make sure to use gamification techniques and implement machine learning algorithms to identify negative behaviors and provide personalized feedback. This makes our research distinct from previous work. This study focuses on the specific area of IT internship selection. This aims to provide an interactive experience that highlights academic performances, extracurricular activities, and personal development. The proposed approach not only fosters engagement but also motivates undergraduates to actively improve their skills.

C. Aim and Objectives

Our aim is to address the need for a suitable platform to select Sri Lankan university IT undergraduates for suitable IT internship programs. To implement the above aim, proposed platform will use gamification techniques like points, leaderboards, badges, feedback, and levels. And the platform will identify the undergraduate with lowest marks and motivate them through feedback. The declared objectives are as follows:

1. To develop an environment for undergraduate students based on selected gamification strategies to engage with career improvements.
2. To develop an algorithm to assess the performance levels of the students based on their player modes.

3. To develop an algorithm to detect the negative behaviors of the students based on their player modes and provide the supportive feedback.

III. METHODOLOGY

A. Skills Mapping and Classification

Skill mapping is the basic conversion method that we follow to convert all performances into their respective skills. We considered knowledge, leadership, communication, problem solving, decision making, creativity and team working as our mapping skills. We allocate marks for each skill according to the performance influence on each skill. These marks of each skill act as input for our neural network classifier.

B. Data Collection and Preprocessing

We have collected 824 data from the graduates who are working in the IT industry, including their GPA and activities like sports, self-learning courses they did, clubs they were engaged with, events they attended during the university academics and how they got their internships (difficulties they faced when they try to get an internship). Before analyzing the data, several pre-processing steps were performed. First, we handled the missing data, removed unusual entries. Then collected activities were mapped to related skills. Then points will be given to each skill according to the current employees' performance and the difficulty level they felt when getting an internship will be converted to the numerical value. Easy: 0, Better: 1, Hard: 2. The preprocessed data split into training and testing. For testing 20% of data is used randomly from the dataset.

C. Model Classifier

We developed a model which classifies undergraduates into 3 classes whether the specific undergraduate will get their internship easily or moderate or hard. After tuning the hyperparameters to get the optimal values, we constructed neural network architecture comprising four layers: three hidden layers with 128 nodes each, utilizing ReLU activation functions, and a final output layer with three nodes employing a SoftMax activation function. This configuration enables the model to generate one of three possible classifications. As we collected 824 data we used K-Fold validation method. To optimize the model's learning process, we employed the Adam optimizer, known for its effectiveness in adapting learning rates during training.

D. Results and Discussion

The results showed that the model performed well in correctly classifying students into the "Better" and "Hard" categories, with accuracy scores ranging from 0.62 to 0.84. This indicates that the model is particularly effective at identifying students who are likely to secure internships with relative ease or those who may face significant challenges.

TABLE I. Confusion Matrix of Result

	Better	Easy	Hard
Better	0.758065	0.177778	0.122807
Easy	0.225806	0.688889	0.040000
Hard	0.129032	0.066667	0.842105

21/21	0s 3ms/step	- acc: 0.9447	- loss: 0.2526
Train accuracy: 0.8993902206420898			

6/6	0s 7ms/step	- acc: 0.7799	- loss: 1.1316
Test accuracy: 0.7682926654815674			

Fig. 1. Testing and training accuracy

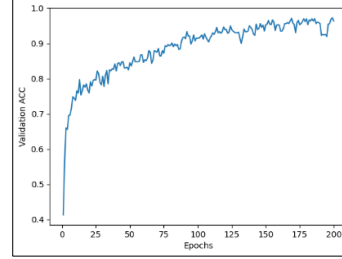


Fig. 2. Accuracy Graph

Class: better
Precision: 0.68
Recall: 0.76
F1-Score: 0.72

Class: easy
Precision: 0.78
Recall: 0.69
F1-Score: 0.73

Class: hard
Precision: 0.87
Recall: 0.84
F1-Score: 0.86

Fig. 3. Results

E. Conclusion

The proposed approach facilitated the development of an engaged platform and received positive outcomes in its implementation. The developed web application utilizes machine learning techniques to identify the negative behaviors of users and provide positive feedback. The proposed solution will display their current points and if they have the highest marks, they will receive badges and if they have the lowest marks, it will provide them with supportive feedback. The study highlights the effectiveness of combining machine learning and gamification techniques to enhance task efficiency and user engagement. As future work we are going to provide an exact point according to the performances using a fuzzy logic approach and this could improve the accuracy of the output of the system. Increasing the amount of data will help to avoid bias in the results.

REFERENCES

- [1] Philip S. Rose, "RECRUITING AND SELECTING GRADUATE EMPLOYEES VIA INTERNSHIPS," *ResearchGate*.
- [2] M. A. Sharma, "Implementing a gamified learning system for enhancing student engagement and motivation using Reward-Based mechanisms and machine learning," *International Journal of Scientific Research and Engineering Trends*, vol. 11, no. 1, pp. 298-303, Jan. 2025, doi: 10.61137/ijset.vol.11.issue1.125.
- [3] Muñoz, A. P. Pérez Negrón, J. Mejía, G. P. Gasca-Hurtado, M. C. Gómez-Alvarez, and M. L. Hernández, "Applying gamification elements to build teams for software development," *IET Software*, https://doi.org/10.1049/iet-sen.2018.5088 vol. 13, no. 2, pp. 99-105, 2019/04/01 2019.
- [4] Platonova and S. Bērziša, "Gamification in Software Development Projects," *Information Technology and Management Science*, vol. 20, 12/20 2017.
- [5] C. J. Hellín, F. Calles-Esteban, A. Valledor, J. Gómez, S. Otón-Tortosa, and A. Tayebi, "Enhancing Student Motivation and Engagement through a Gamified Learning Environment," *Sustainability*, vol. 15, no. 19, p. 14119, Sep. 2023, doi: 10.3390/su151914119.
- [6] S. Hussain, S. Qazi, R. R. Ahmed, D. Streimikiene, and J. Vveinhardt, "Employees Management: Evidence from Gamification Techniques,"
- [7] C. J. Hellín, F. Calles-Esteban, A. Valledor, J. Gómez, S. Otón-Tortosa, and A. Tayebi, "Enhancing Student Motivation and Engagement through a Gamified Learning Environment," *Sustainability*, vol. 15, no. 19, p. 14119, Sep. 2023, doi: 10.3390/su151914119.
- [8] Learning Performance Prediction-Based Personalized Feedback in Online Learning via Machine Learning by Xizhe Wang 2022