Understanding Work-Life Balance: An Analysis of Quiet Quitting and Age Dynamics using Deep Learning

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Abstract - *In today's fast-paced society, achieving work-life balance is increasingly becoming a challenge for individuals across various age groups. To gain a comprehensive understanding of this phenomenon, we leverage the power of Deep Learning (DL) and Machine Learning (ML) techniques in this research study. We explore how ML can be instrumental in understanding the determinants of work-life balance, with a particular focus on the concept of "quiet quitting" and how different attributes possess varying degrees of importance in establishing work-life balance across different age groups. Our study is based on a comprehensive dataset of 15,977 survey responses encompassing 25 attributes related to work and personal life. To extract meaningful insights from the dataset, we have implemented Artificial Neural Network (ANN) algorithm. Our model's performance showcases promising results, with a test accuracy of 73.91%. This underscores the efficacy of the ANN implementation in capturing the complexity of work-life balance dynamics. Additionally, we discuss various potential solutions and recommendations derived from our findings, enabling organizations and individuals to proactively address work-life balance challenges and foster healthier, more sustainable work environments.*

***Key Words*: Deep Learning, Quiet Quitting, Work Life Balance, Artificial Neural Networks, Data Analysis.**

1.INTRODUCTION

In today's fast-paced and ever-evolving world, the influence of machine learning (ML) and deep learning (DL) algorithms is ubiquitous. These advanced computational techniques have significantly impacted various aspects of our lives, including the workplace. As industries undergo rapid transformations and individuals face increasing personal and work-related challenges, the concept of work-life balance has become crucial for maintaining well-being and productivity.

The changing landscape of industries has introduced novel demands and complexities, often leading to personal and work-related problems for individuals. The relentless pursuit of professional success and the pressures of modern-day work environments can take a toll on employees, affecting their physical and mental well-being [1]. Consequently, organisations have started recognizing the importance of work-life balance as a means to foster a healthier and more productive workforce.

One notable phenomenon that has emerged in recent years is Quiet Quitting. This term refers to employees who, do not openly resign but disengage from their work and become less committed to their organisations. Quiet Quitting can have detrimental effects on both the individual and the organisation, resulting in reduced job satisfaction, decreased productivity, and increased turnover rates [8]. Exploring the factors contributing to quiet quitting and understanding its implications is crucial for organisations to create an environment that promotes engagement and job satisfaction.

As individuals progress in age, their priorities, responsibilities, and overall life circumstances change. The factors influencing work-life balance can vary significantly based on age, as different life stages bring forth distinct priorities and responsibilities [12]. Understanding how various attributes hold different weightage in determining work-life balance for different age groups is crucial for organisations to tailor their strategies and support systems effectively. For instance, younger employees may place greater importance on career advancement, achievement, and social networking. These individuals may strive for recognition and engage extensively in professional networks to expand their opportunities. Consequently, work-life balance for this age group may be influenced by the interplay between their ambition, social connections, and the time dedicated to personal pursuits.

On the other hand, as individuals enter mid-career stages, their work-life balance considerations may shift. The ability to maintain financial stability, allocate time for personal interests and hobbies, and strike a healthy equilibrium between work and personal life becomes increasingly significant. Mid-career professionals often seek fulfilment beyond material success and strive for a more holistic approach to their well-being.

The Lifestyle and Wellbeing dataset from Kaggle consisting of survey responses from authentic-happiness website, includes factors such as fruits and vegetables consumption, stress levels, social network size, achievement orientation, physical health indicators like BMI range and daily steps, demographic variables like age and gender and various other parameters.

In this paper, we have used the Artificial Neural Network (ANN) algorithm which captures complex patterns and

correlations to derive valuable insights from the data. By assigning appropriate weights to different factors, we gained a deeper understanding of their relative importance in influencing work-life balance outcomes. By the end of our analysis, we aim to provide a comprehensive solution for the identified problems. The ANN-based approach enables us to generate predictions and recommendations that can assist organisations in promoting a healthier work-life balance. By understanding the factors contributing to quiet quitting, organisations can implement strategies to foster engagement and job satisfaction, ultimately reducing turnover rates. Furthermore, by understanding the varying significance of different factors in work-life balance across age groups empowers individuals to optimize their work-life equilibrium.

2. LITERATURE SURVEY

Work-life balance has become a crucial aspect of employees' well-being and overall quality of life. Researchers, such as Pawlicka et al [1] have explored the potential of artificial intelligence and machine learning to improve work-life balance. In their study, they utilized a machine learning tool to analyse a substantial dataset comprising 800 employees. By employing an artificial neural network, they identified significant factors affecting work-life balance, including the relation between the feeling of balance and actual working hours, availability of free time, weekend work, self-employment, and subjective financial status. Similarly, Radha and Rohith [2] conducted an analysis using machine learning classifiers on a dataset of 12,756 individuals. Their findings revealed correlations between various factors and work-life balance, providing insights into improving employee well-being.

In addition to understanding the factors influencing work-life balance, it is essential to address the issue of "Quiet Quitting," which refers to employees limiting their commitment to their jobs. Mahand and Caldwell [8] discuss how the decline in employee commitment stems from the failure of managers and supervisors to fulfil their leadership responsibilities effectively. They emphasize the significance of engaging, empowering, and inspiring employees to increase commitment. Additionally, considering the impact of age on work-life balance, Richert-Kaźmierska and Stankiewicz [12] examined the relationship between age and the assessment of work-life balance. Their study found that older workers were more likely to prioritize work-life balance and indicated a need for equal opportunities for flexible solutions. The results provide valuable insights for employers in managing personnel and creating workplace conditions that support work-life balance, particularly for senior workers.

Broadening the scope of prior findings, this study analyses a comprehensive dataset and provides age-specific recommendations for enhancing work-life balance, thus offering practical solutions for individuals experiencing

work-life imbalance and addressing the underexplored aspect of "quiet quitting."

3. METHODOLGY

The dataset used in this research paper was collected from Kaggle consisting of survey responses from authentic-happiness website. This dataset was chosen due to its comprehensive coverage of attributes related to work-life balance, providing a holistic view of individuals' experiences. The study includes attributes such as fruits and veggies consumption, daily stress levels, places visited, core circle of friends and family, social network usage, achievement orientation, donation habits, BMI range, completed tasks, experience of flow, daily steps, vision for their lives, sleep duration, unused vacation days, instances of daily shouting, perceived income sufficiency, personal awards received, time allocated to passions, weekly meditation practice, age, gender, and work-life balance score. For research purposes, the target attribute – "lifestatus" was introduced, which consists of 3 categories - poor, good, and excellent work life balance. Fig -1 illustrates the model building process used to extract meaningful insights.
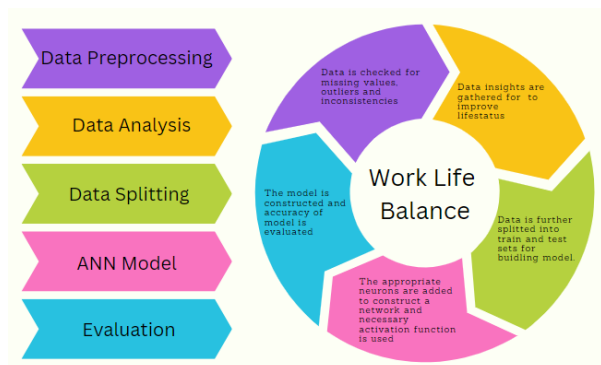

Fig -1: Model Building Process

First, the dataset was checked for missing values, outliers, and inconsistencies. Missing values were either imputed using appropriate techniques or, if the percentage of missing values for a particular attribute was significant, the corresponding instances were removed. Outliers were identified using statistical methods and treated accordingly. Min-Max normalization was used to bring all the attributes on the same scale, between 0 and 1.

The utilization of feature engineering techniques allowed for the extraction of supplementary valuable insights from the available attributes. For instance, the age was transformed into a categorical variable indicating whether an individual falls under the categories of <20, 21 to 35, 36 to 50, or >50. Similarly, the attribute "lifestatus" was categorized into levels such as poor, good, and excellent work-life balance. These transformations aimed to enhance the interpretability and predictive power of the data.

Further, the ANN algorithm was chosen for its ability to effectively capture complex patterns and relationships within the data, making it well-suited to understand the intricate dynamics of work-life balance. The ANN architecture consisted of multiple layers, including an input layer, four hidden layers, and an output layer. The input layer utilized the rectified linear activation function, which helps to preserve the positive values and improve the convergence of the network. The rectified linear activation function is known for its ability to handle non-linear relationships effectively. The four hidden layers provided depth to the network, allowing for the extraction of abstract features from the dataset. The specific number of nodes in each hidden layer was determined through experimentation and hyperparameter tuning, aiming to strike a balance between model complexity and overfitting. The output layer employs the soft-max activation function, which is commonly used in multi-class classification problems. This activation function assigns probabilities to each class, enabling the prediction of the most likely "lifestatus" category for a given set of input features. During the model training process, various hyperparameters and parameters were tuned to optimize the performance of the ANN. These included parameters such as batch size, regularization techniques (e.g., dropout), and the number of epochs.

In the model fitting output, achieving a loss value of zero and an accuracy of approximately 74.08% on the training data may suggest that the model has learnt the patterns present in the training set quite well. The model evaluation output reveals a test loss of zero and a test accuracy of approximately 73.91%. These metrics indicate that the trained model performs well on unseen data, achieving a high accuracy in predicting the target variable. This implies that the model has successfully generalized from the training data to make accurate predictions on new, unseen instances.

3.1 Quiet Quitting

The problem of "Quiet Quitting" refers to a phenomenon where individuals silently disengage from their work or career due to issues related to work-life balance. It signifies a situation where employees may not explicitly resign from their positions but become increasingly disengaged, leading to reduced productivity and satisfaction.

Quiet quitting is more prevalent among individuals aged 21-35. This period of life often involves significant transitions and challenges, such as starting a career, building relationships, and managing personal responsibilities. This age group may be more prone to silently quitting as they may feel pressured to prove themselves, face high workloads, experience difficulty in setting boundaries between work and personal life, and have a greater desire for work-life balance and fulfilment.
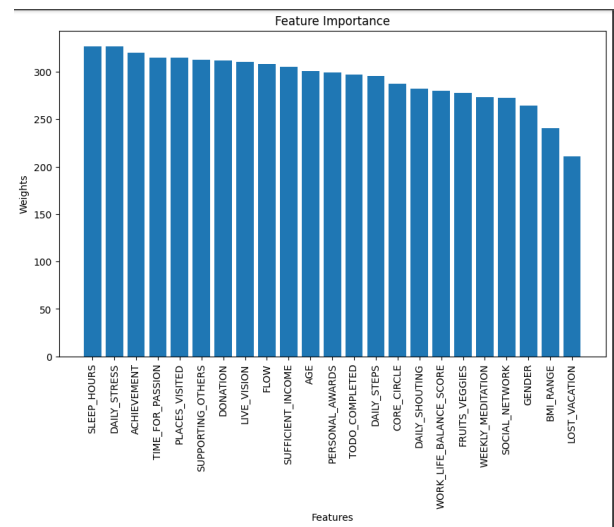

Fig - 2: Important features of ANN model

From Fig -2, it can be inferred that the most important features which can help individuals and organizations prevent quiet quitting are as follows:

Sleep Hours - Sufficient sleep is crucial for physical and mental well-being. Inadequate sleep can lead to fatigue, reduced cognitive functioning, and decreased productivity, making individuals more susceptible to disengagement and the inclination to quietly quit.

Daily Stress Levels - High daily stress levels can contribute to increased burnout, reduced job satisfaction, and a higher likelihood of disengagement from work. When individuals experience excessive stress on a daily basis, it can negatively impact their well-being and motivation to continue in their current role.

Achievement - When individuals feel their efforts and accomplishments are acknowledged and valued, it enhances their motivation and commitment to their work. Conversely, a lack of recognition and opportunities for achievement can lead to feelings of stagnation and disengagement, making individuals more susceptible to Quiet Quitting.

3.2 Dynamics of Age and Work-Life Balance

3.2.1　Age Category: <20 years

Among the total people present in the age group below 20, with a poor work life balance ("lifestatus" = 0), the attribute "TODO_Completed" was analyzed. Approximately 63.84% (Fig -3) of individuals in this age group, who reported having a less than satisfactory work-life balance, scored 0 or 1 indicating the challenges they face in accomplishing their tasks. This suggests that a substantial portion of this age group, who struggle with maintaining a good work-life balance, encounter difficulties in managing and completing their daily activities. This can be attributed to factors such as

time constraints, lack of prioritization skills, or overwhelming workloads.
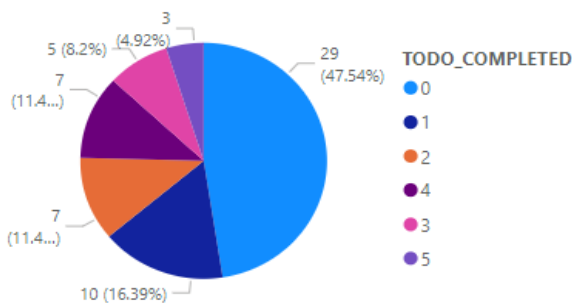

Fig - 3: Distribution scores of attribute "TODO_COMPLETED"

Several strategies can be adopted to enhance completion of daily activities and overall productivity. Prioritize tasks by identifying the most important ones and organizing them into a to-do list or using task management tools. Effective time management techniques, such as the Pomodoro Technique or time blocking, can be employed to break tasks into manageable chunks and allocate dedicated time slots for focused work. Setting realistic and achievable goals for each day, breaking down large tasks into smaller steps, and eliminating distractions is also crucial.

3.2.2   Age Category: 21-35 years

Similarly, the attribute "DAILY_STRESS" was examined among the age group 21-35, with a poor work life balance ("lifestatus" = 0). 70.5% of individuals scored 4 or 5 (Fig -4) for this attribute, indicating high stress levels on a daily basis. This reveals a notable correlation between work-life balance and daily stress levels among individuals who fall in this category. Heavy workloads, long working hours, and difficulties in managing personal and professional commitments are some of the main causes of high stress levels.
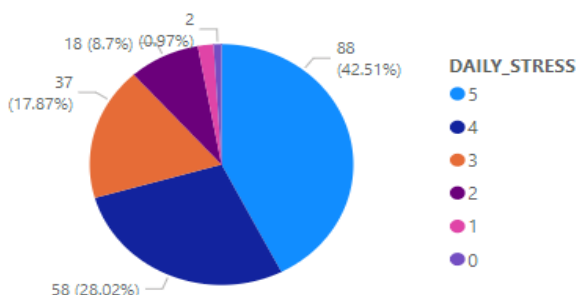

Fig - 4: Distribution scores of attribute "DAILY_STRESS"

To address this issue and mitigate the impact of high daily stress levels, several solutions can be proposed. Offering flexibility and autonomy in work can empower individuals and enable better work-life integration and reduce stress associated with rigid work structures. Equipping individuals with effective strategies for handling conflicts and fostering positive relationships can also reduce workplace stress. Participating in activities that foster relaxation and stress reduction, such as exercising, meditating, pursuing hobbies, or enjoying with loved ones, enhances your ability to effectively handle personal and professional responsibilities.

3.2.3   Age Category: 36-50 years

Among individuals aged 36 to 50 with a poor work life balance ("lifestatus" = 0), a total of 74% of individuals in this age group scored 0 or 1 (Fig -5) for the attribute "FLOW". This indicates that individuals, who reported having an unsatisfactory work-life balance, barely experience any state of flow during their daily activities. Flow refers to a state of complete absorption and enjoyment in the work one is engaged in.
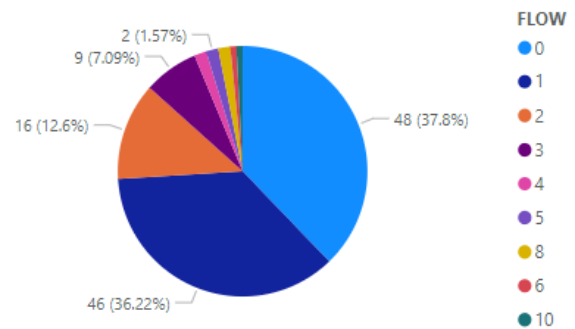

Fig - 5: Distribution scores of attribute "FLOW"

This can be attributed to various factors, such as job dissatisfaction due to mismatch between skills and responsibilities. It is essential to promote job satisfaction by aligning job responsibilities with individuals' skills, interests, and values. Helping individuals identify and leverage their unique skills and strengths in their work and promoting the importance of regular breaks throughout the workday to help individuals recharge and regain focus can increase the ability to experience flow.

3.2.4   Age Category: >50 years

A total of 69.7% of this age group with a poor work-life balance who scored 0,1 or 2 (Fig -6) for the attribute "CORE_CIRCLE". This suggests that individuals in this category have a small core circle. These findings highlight potential challenges related to loneliness, a stubborn nature, and face difficulty in adapting to a changing environment among individuals in this age group. The lack of a significant support network or close relationships can contribute to

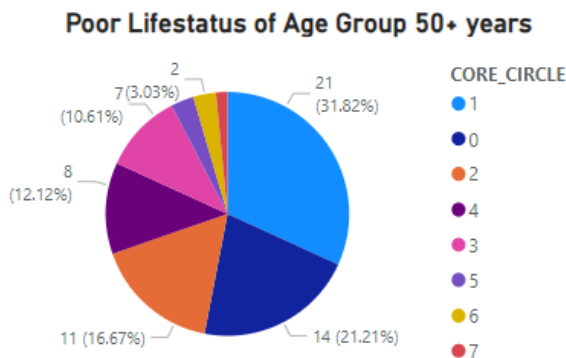feelings of isolation and can impact overall well-being and mental health.

Fig - 6: Distribution scores of attribute "CORE_CIRCLE"

To promote a more fulfilling and socially connected life, individuals can actively seek opportunities for social engagement and connection by joining community groups, clubs, or organizations that align with their interests, participating in social events, or volunteering for causes they care about. Encouraging a growth mindset and providing support during transitions can enhance their ability to adapt and thrive in changing environments. Encouraging connections between older individuals and younger generations can foster mutual learning, understanding, and a sense of purpose.
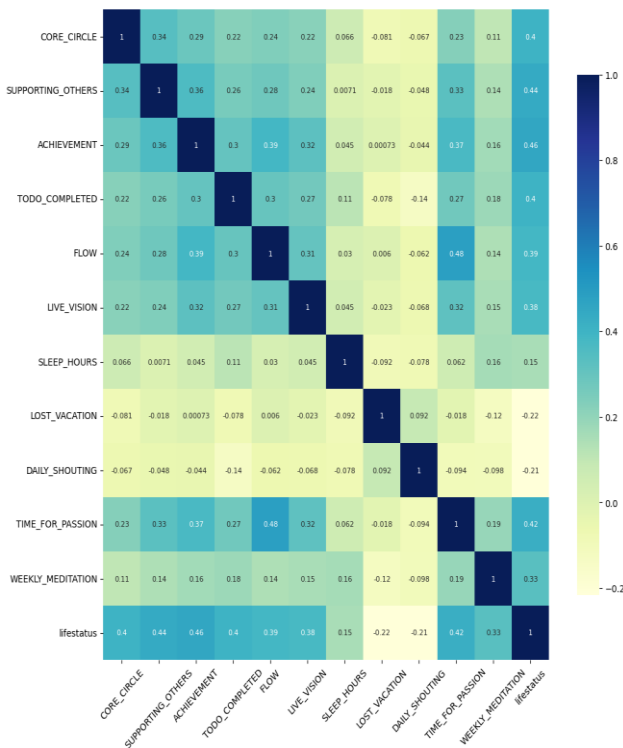
4. RESULTS

Fig - 7: Correlation Analysis

The results of the research paper indicate that the ANN test model achieved an accuracy of 73.91%, demonstrating its effectiveness in predicting work-life balance based on the dataset attributes. Additionally, the analysis revealed a correlation between certain variables (Fig -7), namely "FLOW" and "TIME_FOR_PASSION", "CORE_CIRCLE" and "SUPPORTING_OTHERS", as well as "LIFE_VISION" and "ACHIEVEMENT". These findings highlight the interconnectedness of these factors in influencing individuals' work-life balance and suggest the importance of considering them collectively when designing interventions or strategies to enhance overall well-being.

From our analysis, the following are the strategies that can be implemented by individuals to improve their overall work life balance.

1. Prioritizing self-care by setting boundaries, allocating time for relaxation, hobbies, and activities that bring joy.

2. Practicing effective time management techniques such as prioritizing tasks, delegating when possible, and avoiding multitasking.

3. Establishing clear communication with supervisors and colleagues regarding workload and expectations.

4. Leveraging technology and automation tools to streamline and optimize tasks.

5. Maintaining a support network of friends, family, or mentors who can provide guidance and emotional support.

The proposed solutions can contribute to creating a more balanced and fulfilling work-life harmony for individuals.

5. CONCLUSION

The significance of work-life balance cannot be emphasized enough, as it has a direct influence on our holistic well-being and the quality of our lives. It enables individuals to uphold their physical and mental health, diminish stress levels, and safeguard against burnout. A healthy work-life balance fosters better productivity, engagement, and job satisfaction, leading to improved performance and career success. Moreover, it enables individuals to allocate time and energy to personal relationships, hobbies, and self-care, promoting a fulfilling and meaningful life beyond work.

The utilization of Artificial Neural Networks (ANN) proved instrumental in our research for addressing the issue of quiet quitting and understanding how different attributes hold varying weightage in determining work-life balance for distinct age groups, providing insights into age-specific challenges. ANN's ability to capture complex patterns and relationships within the dataset enabled us to identify significant factors contributing to Quiet Quitting, such as

inadequate sleep, high daily stress levels, and lack of recognition. This helped develop personalized strategies to tackle quiet quitting and enhance work-life balance by considering the unique needs and dynamics of each age group.

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