A PREDICTIVE PSYCHOLOGICAL HEALTH MODEL FOR WOMEN PERFORMANCE AT WORK

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Introduction

The world's population as provided by the United Nation Population Fund (UNPF) in 2022 is estimated at about 7.8 billion with China and India being the two most populous countries in the world possessing about 1.42 and 1.39 billion people respectively. A similar data provided by the World's review (an online database) on the percentage of female is also estimated at 3.97 billion representing 49.59% of the world's population. Most countries of the world have a higher percentage of male to female excluding China and India; else, the female's population could have been higher than their male counterpart.

Available records revealed that 38.3% of the American women completed a four-year college degree in 2020 and 55.65 million women are employed (frin et al., 2022) on full time basis consequently having a positive impact on their national economy.

In Nigeria, there had been a continuous decline in the percentage of women in her labour force over the last ten years due to several factors limiting effective performance and hindering national development. Despite the wide claim that psychological health is a great determinant to work performance, very few attempts have been made to measure the rate (benchmark) of psychological health needed to achieve optimum work performance. This study explores the capabilities of Artificial Intelligence (AI) to predict the psychological health rating of women highlighting factors to be eliminated or minimized for effective work performance.

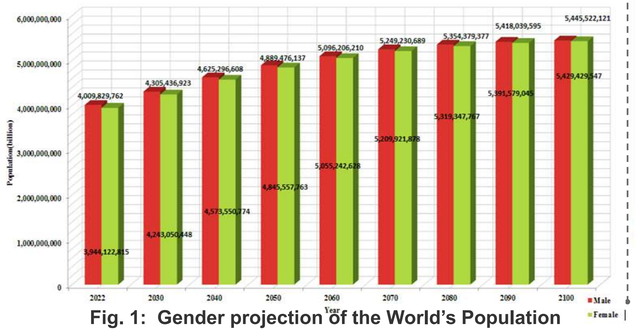

Fig. 1: Gender projection of the World's Population

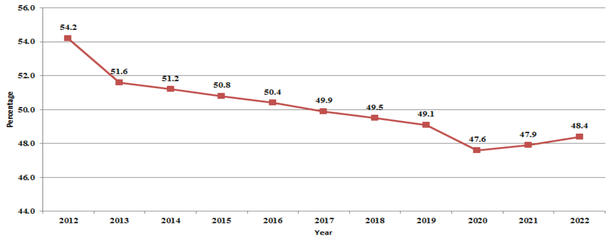

Fig. 2: Percentage Decline of female labour force in Nigeria

Methodology

The proposed AI model deploys an Adaptive Neuro-Fuzzy (ANFIS) technique consisting of fuzzy inference engine with a rule based layer holding 972 rules automatically generated from the trained dataset. The overall process is sub-divided into five different stages namely:

1. Data Collection
2. Data Pre-processing and Modelling
3. Model Development
4. Model Training and Testing
5. Evaluation and Result Comparison

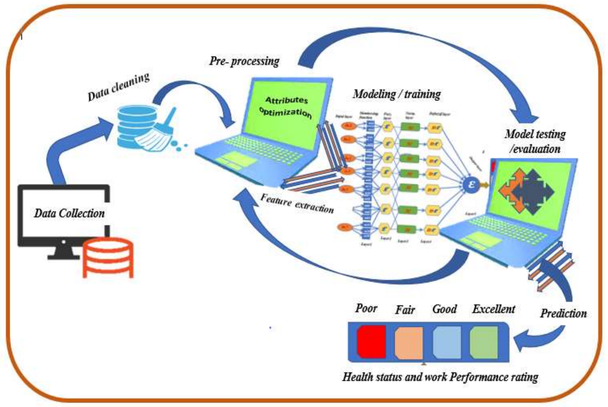

Fig. 3: Proposed Architectural Framework

INPUT VARIABLES	OUTPUT VARIABLE	
Marital Status Dependants Sleep disorder Average Work Hours Mental Drain Job Pressure Total Life Events	Health status and work performance	
	Poor	*0 - 25%*
	Fair	*26 -49%*
	Good	*50 - 75%*
	Excellent	*76 - 100%*

Results

All algorithms are implemented on Intel Core™ i5-5020U CPU @ 2.20GHZ workstation, embedded with 8gb RAM, 1TB of hard disk drive and installed softwares (WEKA and MATLAB).

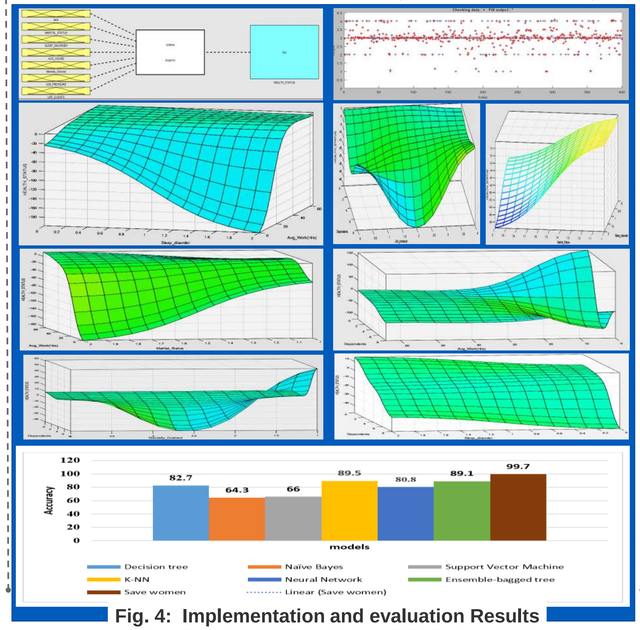

Fig. 4: Implementation and evaluation Results

S/n	Model	Accuracy	F-Measure	Area under Curve (AuC)	Root mean Square Error (RMSE)	Root-Square Error (RSE)	Mean square Error (MSE)	Mean Average error (MAE)
1.	Decision tree	82.7	0.819	0.96	1.21	-0.91	1.48	0.99
2.	Naïve Bayes	64.3	0.638	0.71	1.07	-0.48	1.14	0.86
3.	Support Vector Mechanism	66	0.652	0.78	1.06	-0.45	1.12	0.84
4.	K-NN	89.5	0.875	0.88	1.06	-0.47	1.14	0.86
5.	Neural Network	80.8	0.801	0.82	1.12	-0.62	1.26	0.90
6.	Ensemble-Bagged tree	89.1	0.885	1.00	1.72	-0.50	1.16	0.89

Fig. 5: Comparison of Evaluation Metrics

Conclusion

The work performance assessment model generated accuracy, precision and recall results of 99.7%, 96.5% and 97.4% respectively in comparison with other models as shown in Fig.4. Critical factors affecting the optimal work performance are highlighted. Evidently, from these results, rest is an important factor to women health status and work performance.

The absence of rest and increased worked hours have negative effect on women's work performance. The effect of job pressure and unavoidable life events on women health(performance) is inversely varied. However, if job pressure is moderate and unpredictable life experience is minimized, the health status and work performance rate are greatly improved.

In addition, to ensure that women overall work performance is improved, the number of dependants should be decreased and psychological health improved with the rightly proportioned work hours. Conclusively, this model may be deployed as an assessment checker for women to determine their fitness for various categories of tasks at work environments..

References

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