



Designing A Neural Network Model in Grading Malaysian Rice

^{1*}Noraziah ChePa, ²Nooraini Yusoff, ³Norhayati Ahmad

^{1, 2} Human-Centered Computing Research Lab, Computational Intelligence Research Group, School of Computing, Universiti Utara Malaysia, Malaysia

³Jabatan Kejuruteraan Awam, Politeknik Tuanku Sultanah Bahiyah Kulim, Kedah

*Corresponding Author Email: aziah@uum.edu.my

Abstract

Un-consistency of rice evaluating rehearses in Malaysia came about numerous methodologies utilized by zones which effectively creating rice in Malaysia. Understanding the significance of rice reviewing process in guaranteeing rice quality can be controlled, it is critical to have a standard rice evaluating approach for the referenced reason. To accomplish this, there are two essential viewpoints that should be considered in structuring rice reviewing model; evaluating system and variables to be utilized for evaluating (generally alluded as rice characteristics). This article proposes a Neural Network (NN) demonstrate for evaluating Malaysian rice. To apply the model, twenty one rice highlights are proposed to be utilized. Mix of broad writing survey and arrangement of meeting were utilized in deciding the highlights. To assess the model, master survey was led including area specialists and skill of NN. The proposed model is accepted to be gainful for BERNAS as well as to different specialists in a similar space.. The NN model can be utilized as direction or reference for comparative reviewing works.

Keywords: Neural Network, rice grading, Malaysian rice

1. Introduction

Because of un-consistency of rice reviewing rehearses in Malaysia, zones which effectively delivering rice in Malaysia are utilizing their own particular manner of evaluating rice. Understanding the significance of rice reviewing process in guaranteeing rice quality can be controlled, it is essential to have a standard rice evaluating approach for the referenced reason. Rice or deductively known as *Oryza Sativa* is a staple nourishment for Asian populace including Malaysian. Rice has a place with the Poaceae or Gramineae family. *Oryza Sativa* is partitioned into three species to be specific, *Indica*, *Japonica* and *Javanica*. The fundamental sort of rice developed in the tropic and subtropics is the *Indica* species [1].

Rice quality is critical and vital in rice creation. The nature of rice isn't just found in highlights of assortments of rice yet should likewise be seen in numerous different angles, for example, the yield condition, gathering, handling, generation [2]. Rice superiority generally spoken to corporeal and compound attributes [3].

Many related works are found on rice reviewing, yet none of them is concentrating on rice evaluating in Malaysian setting. Thusly, the fundamental goal of this article is to structure a model that can be utilized to review Malaysian rice by utilizing Neural Network (NN) approach. Since evaluations and costs of rice in Malaysia are controlled by zones in Peninsular Malaysia, this article will just cover rice reviewing rehearses in the northern area of Kedah, Malaysia. Subsequently, exchange will be centered around the kinds of rice which are accessible in the referenced zone.

This investigation is concentrating reviewing rice principles by completing correlation of current rice evaluating replicas and the present routine with regards to rice evaluating in Northern Malaysia. These distinguished criteria at that point will be utilized to structure another rice evaluating model utilizing Neural Network (NN).

This article is sorted out as pursues; Section two talks about two essential angles in rice reviewing; system and highlights. Dialog likewise covers past procedures utilized by early specialists and the present routine with regards to rice reviewing in Northern Malaysia. Area three talked about how NN has effectively been connected in rice reviewing works. Strategy of developing the proposed model is canvassed in Section four. Segment five spreads closing comments of this article.

2. Literature review

There are two imperative angles that should be considered in deciding rice grades; reviewing system and components to be utilized for evaluating (generally alluded as rice properties). Rice evaluating is basic in deciding rice quality. Rice quality typically demonstrated by the evaluations which will decide the cost.

Numerous methodologies and strategies have been utilized in the assurance of the highlights of rice for reviewing reason. These are the picture handling together with NN, Wavelet Packet and Support Vector Machine, Contacting Angle Analysis strategy (isolating reaching rice grain), Multi-edge technique dependent on most extreme entropy (pallor), Minimum square shape (MER)(length and

width), picture preparing and the Adaptive Network Based Fuzzy Inference System (ANFIS), picture preparing, picture preparing and NN with help from PC vision frameworks and machine vision frameworks. The greater part of the specialists, for example, [8], [9], [10], [11], [12] have utilized picture preparing and NN strategy.

Different mechanisms, for example, by [13], utilizes the picture preparing technique in their works since they simply needed to think about reviewing. [14] utilized the Wavelet [15] utilized a few strategies in their investigations that are reaching edge examination technique to isolate reaching rice grain, Multi-limit strategy dependent on most extreme entropy for whiteness highlights Table 1 indicates criteria utilized for evaluating rice by past analysts.

Researcher	Year	Criteria
Pabamalie , L.A.I. &Premaratne, H.L	2010	Texture
Seyed Jalaleddin Mousavi Rad, Fardin Akhlaghian Tab,and Kaveh Mollazade	2011	
Pabamalie ,L.A.I. &Premaratne, H.L	2010	Color
Seyed Jalaleddin Mousavi Rad,	2011	
Fardin Akhlaghian Tab, and Kaveh Mollazade Deden. M.F. Shiddiq, Yul Y.Nazaruddin, Farida I. Muchtadi and Sapta Raharja	2011	
Weifeng Zhong, Chengji Liu, Yanli Zhang and Ligu Wu	2011	Dead
Weifeng Zhong, Chengji Liu, Yanli Zhang and Ligu Wu	2011	Chalky
Qing Yao, Jianhua Chen, Zexin Guan, Chengxiao Sun and Zhiwei Zhu	2009	
Mingyin Yao, Muhua Liu, Huadong Zheng	2011	
Liu Guangrong	2010	
Bhunpinder Verma	2010	
Weifeng Zhong, Chengji Liu, Yanli Zhang and Ligu Wu	2011	Cracked
Mingyin Yao, Muhua Liu, Huadong Zheng	2010	
Bhunpinder Verma	2010	
Weifeng Zhong, Chengji Liu, Yanli Zhang and Ligu Wu	2011	Immature
Qing Yao, Jianhua Chen, Zexin Guan, Chengxiao Sun and Zhiwei Zhu	2009	Shape (length & width)
Jose D Guzman & Engelbert K.Peralta	2008	
Mingyin Yao, Muhua Liu, Huadong Zheng	2010	Head rice
Oliver C. Agustin, Byung-Joo Oh	2008	
Oliver C. Agustin, Byung-Joo Oh	2008	Broken kernel
Bhunpinder Verma	2010	
Chong Yaw Wee, P. Raveendran, Fumiaki Takeda	2007	Brewers
Oliver C. Agustin, Byung-Joo Oh	2008	
Jose D Guzman & Engelbert K.Peralta	2008	
Jose D Guzman & Engelbert K.Peralta	2008	Varietal types

In Malaysia, requirement in rice evaluating and assurance of rice reviewing are done as administered in Padi and Rice Control Act 1994. The criteria utilized for reviewing and deciding the nature of rice grain depends on its length and whiteness. The substance of head rice, length of grain, substance of broken rice, and processing degree are the fundamental criteria for evaluating of rice (BERNAS, 2011) [6,7,23].

3. Neural network for rice grading

Actually, NN is arranged for an explicit application, for example, bunching, reviewing or design acknowledgment, expectation framework and capacity estimation through a learning procedure.

The use of Neural Network in horticultural items isn't new. Sidnal and his group from India [26] has effectively connected NN in evaluating and quality testing of nourishment grains. Their NN figured out how to deliver high exactness of grain reviewing (above 80%) and figured out how to recognize 100% of the grains. Another effective work of NN was led by Effendi and his group [27] in reviewing Grading *Jatropha curcas* Fruits so as to decide the organic product development. Their backpropagation NN performed well by creating 95% precision. Table 2 indicates exactness of NN together with different techniques in reviewing rice [28]

Table 2: NN accuracy

Method	Accuracy
Image Processing & Neural Networks	94% - Premium 93% - Grade 1 71% - Grade 2 68% - Grade 3
	Grading accuracy 96.67% 90% - mahli 92.34% - Neda 100% - Gerda 100% - Fajr 100% - Hashemi
	90%-95% (sound, cracked, chalky, broken & damaged)
	100% - short 97.27 % - medium 99.13% - long 98.30 % - very long [size] 97.73% long and slender 94.27% intermediate 100% round [shape]
Wavelet packet (preprocessed) Support Vector Machine	95.75% - dead 91.6% - chalky 99.8% - cracked 96.8% - immature 100% - sound 98.6% - overall
Computer Vision (for image)	96.41% - crackle rate 94.79% - chalky 96.20% - head rice rate
Image Processing	23.3% - Chalky degree 57.1% - Chalky grain rate

Past deals with rice reviewing detailed that NN is the most well known strategy utilized [18],[11],[9]. They utilized a similar technique to characterize rice with the blend of other methodology for catching the rice picture. The distinction between the analysts is the structure that they utilized for grouping rice and the highlights or attributes for rice reviewing.

NN has turned out to be a promising worldview for smart frameworks. It has been prepared to perform complex capacities in different fields of use including design acknowledgment, recognizable proof and characterization (Johnson and Picton, 1995). Consequently, NN is proposed in this article dependent on its quality.

4. Designing the proposed model

Four main phases involved in designing the NN model;

4.1. Theoretical study

This stage is tied in with distinguishing and characterizing the hole of the talked about subject and the significance of directing the examination. Eleven noteworthy models of rice evaluating including the utilization of NN in rice reviewing have been recognized and altogether assessed [29].

4.2. Requirement gathering

This stage included blend of deliberate writing survey, content investigation and arrangement of meeting with area specialists from BERNAS. Fundamental hypotheses and existing rice evaluating techniques [30] and highlights utilized from writing were altogether surveyed to distinguish classifier utilized already. There are fourteen characteristics of rice have been extricated from writing audit

As per individual correspondence with BERNAS especially with staff from Quality Management Division, current usage of deciding rice quality and rice reviewing depend on Act 54, Rice (Grade and Price Control) 1992 Amendment 2008 [31]. In view of the Act, there are seventeen characteristics utilized right now. Highlights and credits to be utilized in the proposed model are acquired from mix of qualities utilized in the current models and technique utilized by BERNAS. Correlation and examination have been made between properties from these two assets. These traits were looked at. Redundancies were evacuated to get the last twenty one credits to be utilized in the proposed model. Table 3 and Table 4 delineated the properties recognized for info and yield layer individually [32].

Table 3: List of attributes for input layer

No	Input unit	Attributes	Formal representation
1	X ₁	Kernel	<i>Kn</i>
2	X ₂	Head rice	<i>Hr</i>
3	X ₃	Big broken	<i>Bb</i>
4	X ₄	Small broken	<i>Sb</i>
5	X ₅	Brewer	<i>Bw</i>
6	X ₆	Whiteness	<i>Wh</i>
7	X ₇	Translucency	<i>Tr</i>
8	X ₈	Milling degree	<i>Md</i>
9	X ₉	Chalky	<i>Ch</i>
10	X ₁₀	Immature	<i>Im</i>
11	X ₁₁	Damage	<i>Da</i>
12	X ₁₂	Red streak kernel	<i>RSK</i>
13	X ₁₃	Colour	<i>Co</i>
14	X ₁₄	Foreign matter	<i>Fm</i>
15	X ₁₅	Average length	<i>Avgl</i>
16	X ₁₆	Paddy grain	<i>Pg</i>
17	X ₁₇	Moisture content	<i>Mc</i>
18	X ₁₈	Size	<i>Sz</i>
19	X ₁₉	Shape	<i>Sh</i>
20	X ₂₀	Width	<i>Wi</i>
21	X ₂₁	Texture	<i>Tx</i>

Table 4: List of attributes for output layer

No	Input unit	Attributes	Formal representation
1	Y ₁	Super Special Tempatan 5%	<i>SST5</i>
2	Y ₁	Super Special	<i>SST10</i>

		Tempatan 10%	
3	Y ₁	Super (local)	<i>Sp</i>
4	Y ₁	Premium	<i>Pm</i>
5	Y ₁	Standard	<i>St</i>
6	Y ₁	Rebus	<i>Re</i>
7	Y ₁	Pulut	<i>Pu</i>
8	Y ₁	Hancur	<i>Ha</i>

Ascribes to be utilized in the information layer are highlights of rice that will be considered for evaluating reason. While ascribes to be utilized in the yield layer are rice class utilized by BERNAS.

4.3. Model design

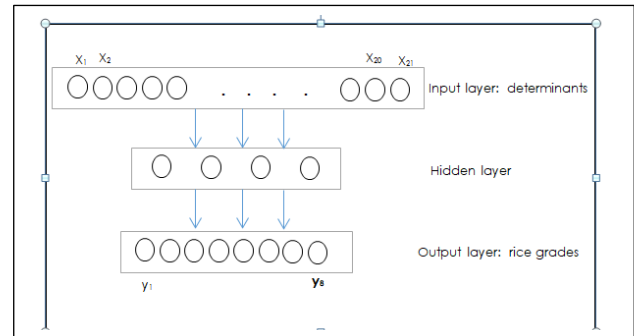


Figure 1: The proposed NN model

NN demonstrate is structured dependent on the recognized properties. Multilayer Perceptron (MLP) is been utilized in this investigation because of its quality and the capacity to do arrangement undertaking. There are 21 highlights which speaking to factors utilized for rice evaluating are utilized in structuring the info layer of the proposed NN demonstrate. While for yield layer, there are eight highlights utilized which speaking to rice classes in Malaysia. Engineering for shrouded layer will be resolved through analysis. Figure 1 demonstrates the structure of NN display.

In light of the proposed model, eight units in the yield layer speak to evaluations of rice. In this examination there are eight evaluations accessible, consequently the eight hubs are utilized to speak to the referenced evaluations [5].

4.4. Model evaluation

Master audit used to assess the planned model. The reason for model assessment is to get the assent from master with respect to the planned model. Three primary perspectives utilized in assessment are; reasonableness of the highlights for evaluating, appropriateness of the evaluations, and the engineering of the proposed model.

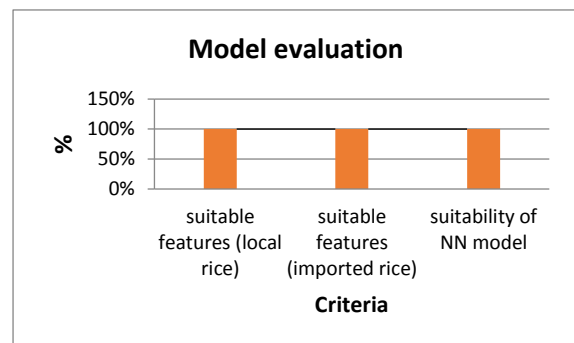


Figure 2: Results of model evaluation

Specialists included were area specialists from BERNAS and specialists from figuring, especially the specialists of NN. Assessment results [33] demonstrate that the respondents concurred that the highlights are appropriate to be utilized in the proposed rice evaluating model.

5. Conclusion

Rice reviewing is vital as it relates altogether with the rice quality. Superb rice will be appointed to high evaluations while low quality rice will be allotted to low evaluations. Rice quality influences the cost and interest for rice in market. Consequently rice evaluating is required to control rice quality.

This examination distinguished twenty one highlights that can be utilized to review Malaysian rice. These highlights were recognized through mix of broad writing survey, content investigation and arrangement of meeting with the space specialists from BERNAS. With the distinguished highlights, a NN demonstrate has been proposed for evaluating Malaysian rice.

The model can be utilized as direction or reference for comparative reviewing works. Despite the fact that the proposed model is in fact acknowledged by the specialists, there are a few spaces for development as talked about in Section four.

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