

Data Mining Application In Ayurveda Therapy For Treatment Of Cancer

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Abstract

Data mining can be used in conjunction with a data warehouse to help with certain types of decisions. To be successful, data warehouse and data mining needs a skilled user who will supply the correct data and a specialist who can make objective conclusions out of the output that is created. If the user supplies incorrect or insufficient amounts of information, output will be affected and the result will not be credible. According to Ayurveda, there is no specific single disease termed as cancer. Cancer is a group of chronic disorders related to long term uncorrected disturbance affecting various dhatu and dosha. Cancer could manifest as a predominantly local disease in the form of an arbuda or granthi, the Sanskrit terms for tumour.

Main objectives of this paper are :

1. To find out relation between Habit & Cancer
2. To find out relation between Stages of Cancer & Status of the Patient
3. To find out Ayurvedic Treatment and Survival Rate of the Cancer Patient
4. To find role of Ayurved in Allopathic Treatment of Cancer

Keywords: Data warehouse, Data mining, Ayurvedic treatment, Cancer, Weka.

1 INTRODUCTION

This research identifies and documents the main obstacles for the Ayurvedic healthcare data integration and proposes a data mining algorithm suitable for integrating fragmented data in an Ayurvedic Cancer health care. This research is based on the use of proven technologies in respective fields and research published in reputable journals and conferences.

Data warehousing and data mining plays an important role in decision making of the healthcare organization as depicted in Fig-1. The general momentum behind this research is , there are increasingly high demands for DWs due to the reported successful improvement of information assets that support decision-making and the potential benefits of Data warehouse implementations are the enhancement of decision-making, improvement of the quality of care, integration of various types of health data, and enhancement of health practice and standards.

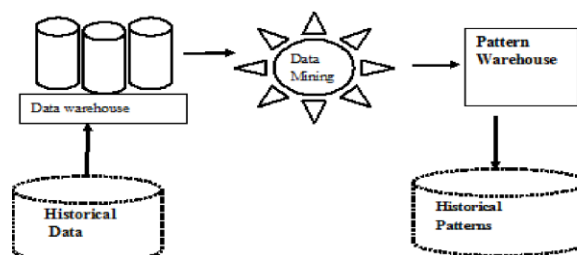


Fig-1: Working of Data Mining with Data warehouse

2. METHODOLOGY

The study adopted a survey method and questionnaire as a tool for collection of the data. Most of the questionnaire questions were designed as close-ended, so that it is easy to be completed within a limited time. The cases that had been studied are of the following types:

- Suffering from cancer
- Taking treatment to avoid reoccurrence of cancer
- Treatment discontinue
- Patient is not alive

The data analysed questionnaire wise and data collected from Ayurvedic practitioners. Interpretation was done by using number of consultations, stage of cancer, chief complaints after chemotherapy or radiotherapy with the help of WEKA software. Other information related to patients is also designed by pie charts, Line charts and column charts for more pictorial description and analysis. Tools used to find out the relations using WEKA are as follows:

- A. ZeroR method
- B. Naïve Bayes algorithm and
- C. Decision Tree

3. DATA ANALYSIS AND INTERPRETATION

The experiments were run on a database created with the help of questionnaires related to the Ayurvedic treatment of cancer. The data collected with the help of case papers obtained from Dr. Dilip Gadgil and Dr. Nanal's Ayurvedic Clinics in Pune consists of more than 40 attributes. The database consists of 100 cases with various types and different stages of cancer from various cities of Maharashtra selected by simple random technique.

➤ Raw Data Used in Analysis

The database of Ayurvedic treatment of cancer after pre-processing used for analysis to interpret the result is as follows. Table 1 gives the information about the attributes used in PATIENT_DETAILS along with its data type.

	ATTRIBUTE	DATA TYPE
1	@ PID	NUMBER
2	@ GENDER	STRING
3	@AGE	NUMBER
4	@ HABIT	STRING
5	@ STAGE	NUMBER
6	@ DOD	DATE
7	@No. of CHEMOTHERAPY	NUMBER
8	@ No. of RADIOTHERAPY	NUMBER
9	@ OPERATED	STRING
10	@ COMPLAINTS	STRING
11	@ TYPE OF CANCER	STRING

Table-1: RELATION PATIENT_DETAILS

Following table shows the sample data used in PATIENT_DETAILS

P id	Gender	Age	Habit	Stage	Date	Chemo	Radio	Operated	Complaint	Type of Cancer
1	Female	23	No	1	24/07/2012	8	18	No	Hair Fall	Lymphoma
2	Male	56	Yes	3	04/03/2015	0	0	No	Vomiting	Tumour
3	Female	67	No	1	01/12/2014	6	0	Yes	weakness	Carcinoma
4	Male	27	Yes	2	26/02/2015	0	0	Yes	Nausea	Carcinoma
5	Female	42	No	1	16/09/2015	8	21	Yes	Body Heat	Breast cancer

➤ **Gender ratio of the patients**

To find out the gender ratio of the patients only gender attribute is used from the relation PATIENT_DETAILS as shown in Table-1

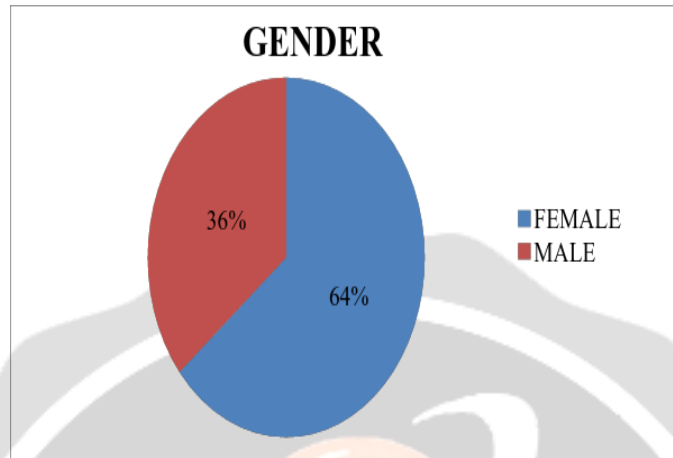


Fig-2: Pie Chart That Shows Gender Ratio of the Cancer Patient

Fig-2 shows that out of 100 records of the study 36 patients were male and 64 patients were female. The ratio of male and female cancer patients was 36:64.

3.1. To find relation between Habit & Cancer

Purpose of this relation is to find out the relation of habit and type of cancer. In Fig-3 the bar graphs represent the distributions of the different attributes which are considered for data mining.

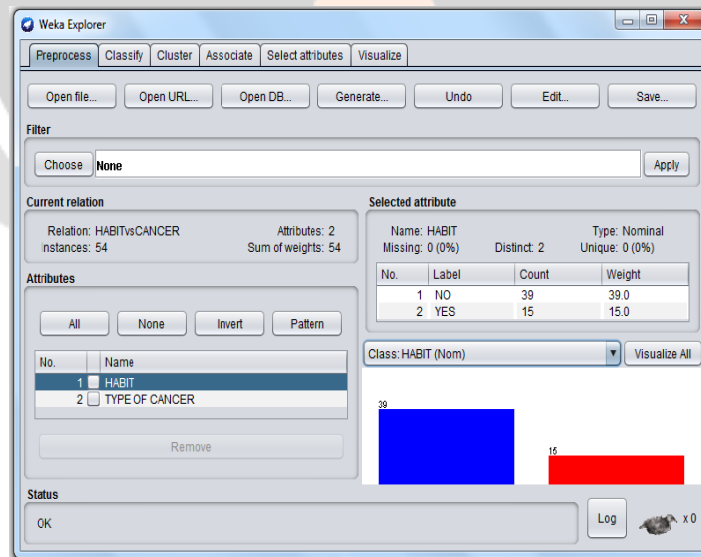


Fig-3: Relation Habit and Type of Cancer

To find out the relation between eating habits of the patients and type of cancer two attributes are used from the relation HABITvsCANCER as follows which is also used in relation PATIENT_DETAILS as shown in table 2.

#	Attribute	Data Type
1	@HABIT	STRING
2	@TYPEOF CANCER	STRING

Table-2: Relation HABIT vs CANCER

Examples of a few cases in the relation HABITvsCANCER are as follows:

HABIT	TYPE OF CANCER
NO	LYMPHOMA
YES	TUMOR
NO	CARCINOMA
YES	CARCINOMA
NO	BREAST CANCER

A. ZeroR method

In fig-4 ZeroR method which is one of the classification tools is implemented.

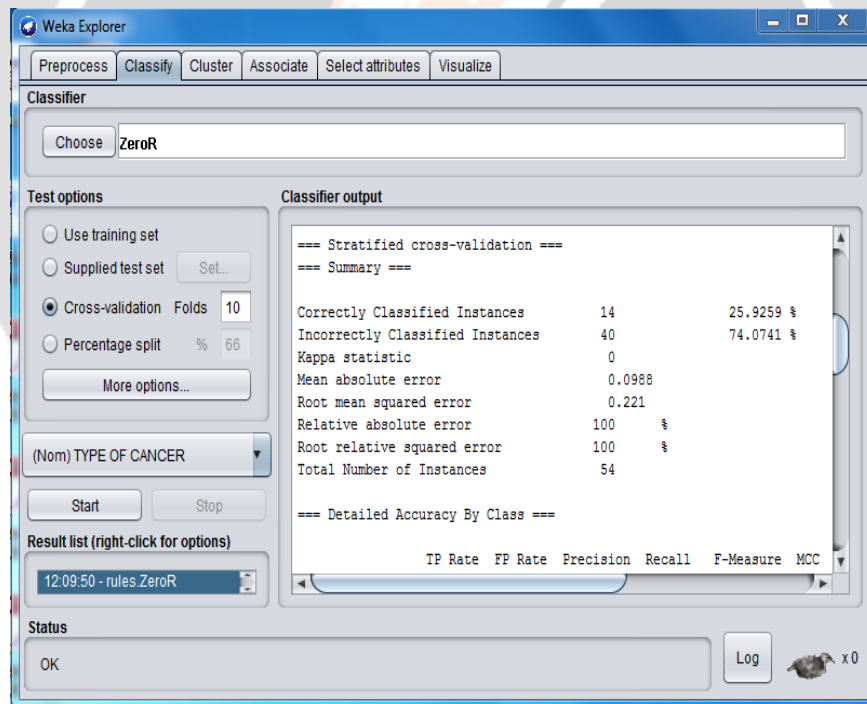


Fig-4: Output using ZeroR method

B. Naïve Bayes method

Naïve Bayes algorithm is a kind of concept learning method. It uses the Bayes theorem to find the probability of all the classification in the database. Fig-5 shows the classification output that was generated from the WEKA software.

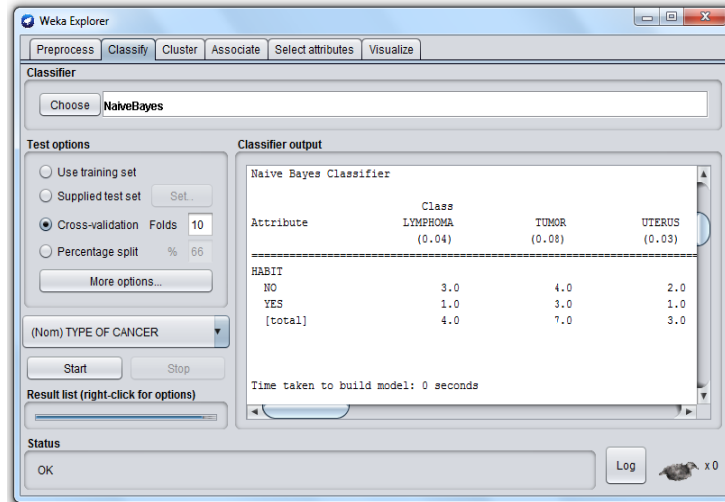


Fig-5: Output using Naïve Bayes method.

C. Decision Tree

For the decision tree to be created, rules are required to be extracted from the training data. Once the rules are extracted, the decision tree is created based on the rules and the association between the attributes. The decision tree with respect to habit and type of cancer based on the relation HABITvsCANCER as shown in Fig-6. Classification on the Ayurvedic treatment data is done based on the decision tree that is created.

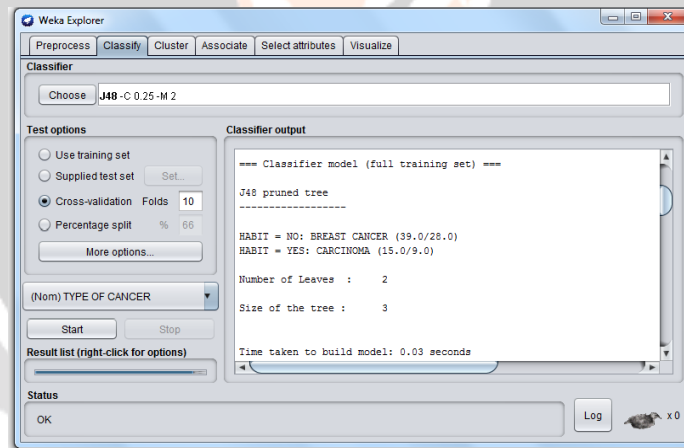


Fig-6: output based on decision trees.

From the decision tree shown in Fig-6 , it can be stated that Breast Cancer is not directly related to eating habits. On the other hand, another type of Cancer (Carcinoma) is directly or indirectly related to the eating habits of the patients.

3.2 To find relation between Stages of Cancer & Status of the Patient

Purpose of this is to find out the relation of stage of the cancer (ex. stage I, stage II, stage III, and stage IV) and current status of the patient. Fig-7 is based on the relation STAGE_STATUS as follows

#	Attribute	Data Type
1	@STAGE	NUMBER
2	@STATUS	STRING

Table- 3: Relation STAGE_STATUS

In the Table-3 attribute STAGE describes the Stage of the cancer according to oncologists when patients first time approached Ayurveda practitioners. And the attributes STATUS describes the current status of the patient after 2nd or 3rd Ayurveda consultations. Sample cases in the relation STAGE_STATUS are as follows:

STAGE	STATUS
1	WELL AND TAKING TREATMENT
3	DEAD
1	WELL AND TAKING TREATMENT
4	TREATMENT DISCONTINUE
2	WELL N TAKING TREATMENT

Examples of few cases in relation STAGE_STATUS

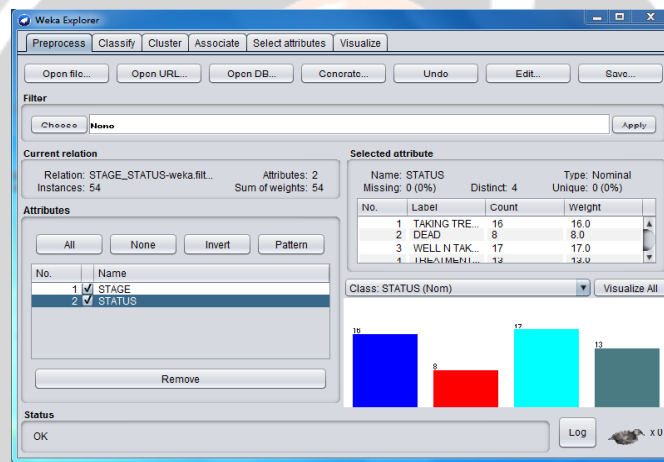


Fig-7: Relation Stage VS Status

A. ZeroR method

The bottom right section of the Fig- 8 marked with X displays the classifier output.

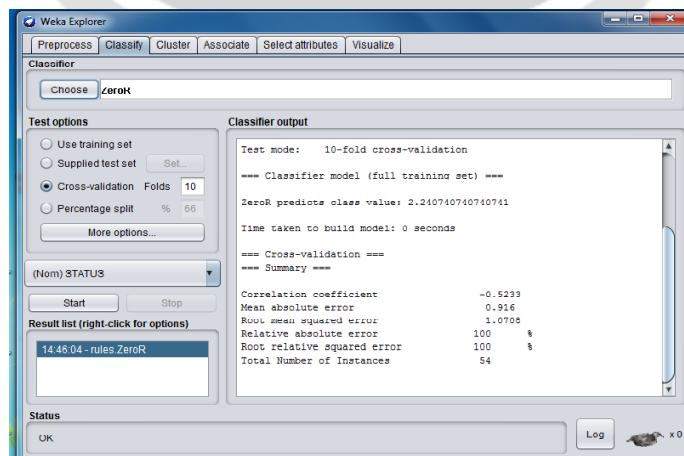


Fig-8: Output using ZeroR method

B. Naïve Bayes method

Fig-9 shows the classification output that was generated using WEKA software.

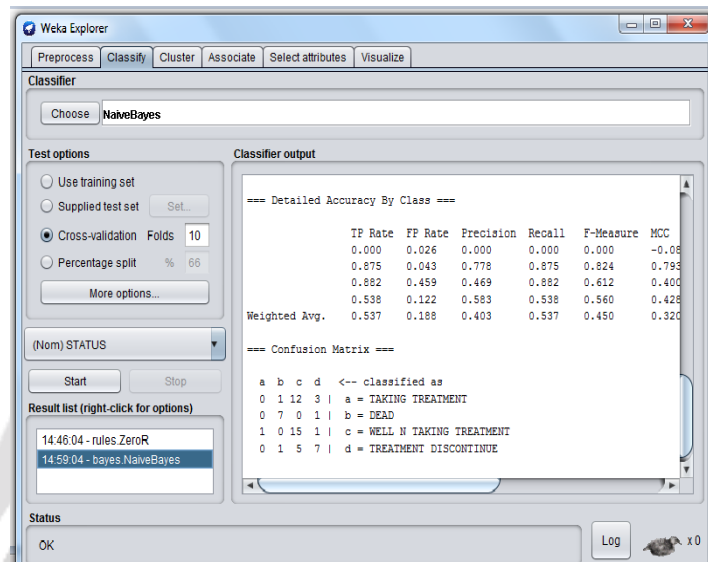


Fig-9: Classifier output of the Naïve Bayes method

C. Decision Tree Method

The decision tree to find out the stage of a cancer and what is the status of the patient as described in Table-3 is shown in Fig-10. Classification on the Ayurvedic treatment data is done based on the decision tree that is created.

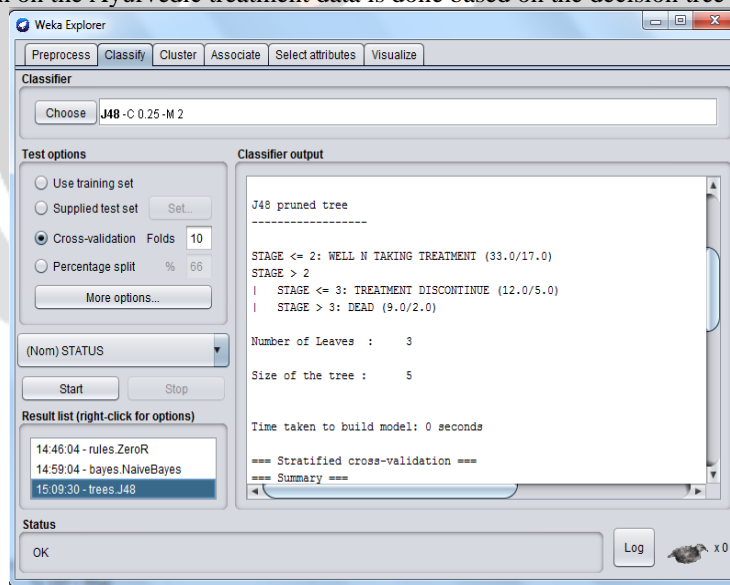


Fig-10: Classifier output based on decision trees.

The fig-10 shows the Decision tree created using WEKA. It highlights the state of treatment given at certain stages of cancer. Cancer is known to have four stages, the intensity of treatment differing for each stage. When the stage is less than or equal to two the patient is observed to be well and is taking regular treatment. The overall health of the patient is said to be fine and the chances of recovery are quite high. But if the stage advances to less than or equal to three, some patients tend to discontinue the supplementary Ayurvedic treatment and also chances of survival drop. The advancement of cancer further stage three proves to be fatal for most of the patients.

3.3 Ayurvedic Treatment and Survival Rate of the Cancer Patient

The fig-11 demonstrates the help of Ayurvedic treatment in the survival rate of cancer patients. When a cancer affected patient opts for Ayurveda as a supplementary remedy for curing the disease, it plays a major role in the recovery of the patient. As the chart shown in fig-11 clearly depicts, the stage of cancer and the survival rate of a patient are inversely proportional to each other. The chances of survival of a first staged cancer patient taking simultaneous Ayurvedic treatment is thirty-five per cent, while that of a patient having second stage cancer is twenty-five per cent. The rate of survival decreases from twenty-two per cent to sixteen per cent as the cancer intensifies from third to fourth stage respectively.

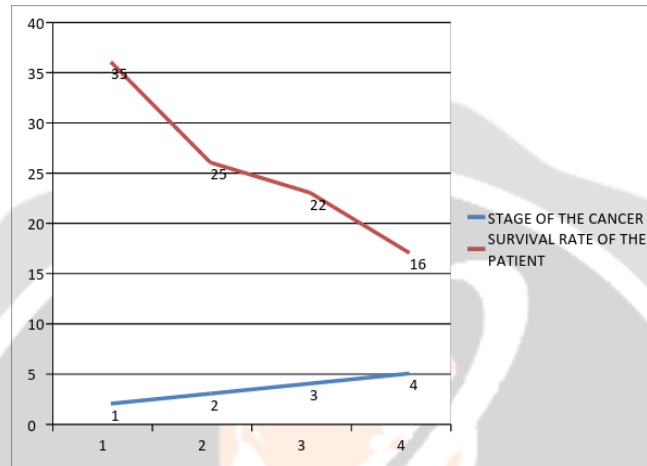


Fig-11: Survival rate of cancer patient

3.4 Role of Ayurved in Allopathic Treatment of Cancer

The chart shown in fig-12 illustrates how Ayurveda helps to reduce side effects and complaints of chemo and radiotherapy. It has been proven time and again that the ancient Indian and natural remedies that Ayurveda offers can not only cure deadly diseases but also reduce the side effects inflicted by the constant chemo and radiotherapy treatment.

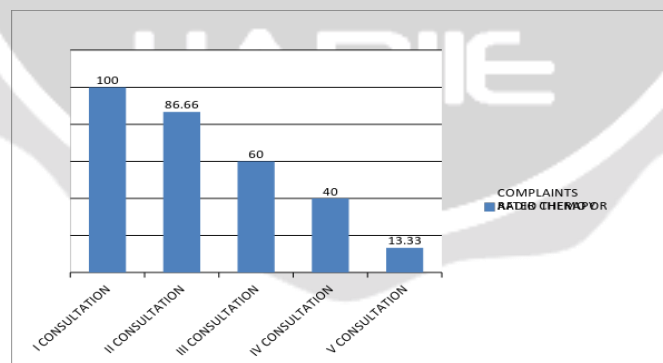


Fig-12: Complaints after each consultation

During the first consultation, the complaint rate which is one hundred percent is seen to be reduced to 88.66 per cent during the second consultation. In the beginning, the difference observed is not much as Ayurvedic treatment is known to have slow influence and does not make immediate effect. The complaint rate is observed to drop to sixty per cent during the third consultation and then to forty per cent during the fourth consultation. It finally reduces to 13.33 per cent in the course of fifth consultation as Ayurvedic treatment becomes more effective.

4. CONCLUSIONS

In this paper a comparative study was conducted, for data of Ayurvedic treatment of cancer. Results have shown that most of decision tree based methods implemented have outperformed the base case we used i.e. WEKA's ZeroR method. An added advantage of decision tree based methods is that it is easier to produce interpretability for the medical practitioners and may help in both the validation of the method and in developing further knowledge of the problem.

Ayurveda has a long successful historical background. Today we find that 'Ayurved', the ancient Indian Medicinal therapy and its wisdom is getting famous worldwide.

This research work is an attempt to explore the possibility of implementation of the Ayurvedic Data Warehouse and the concept of data mining to the domain of Ayurvedic treatment for Cancer.

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