Using Affinity Set on the Key Attributes of Delayed Diagnosis Problem

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ABSTRACT

According to “ Institute of Medicine investigation report ”, there are at least 44,000 people die in hospitals each year as a result of medical errors, and these deaths due to medical errors is becoming the 8th-leading cause of death in the United States. These results point out a serious problem of medical errors, and consumers should realize that there is no absolutely safe in the health care system. In this research, medical errors are defined as delayed diagnosis, which means patients ’ injuries are ignored at Emergency Room (ER), but are identified by doctors in Intensive Care Unit (ICU). This study is using Affinity Set by topology concept as the tool of data mining to classify and analyze the relations within medical data, and to discuss which key attributes would cause delayed diagnosis. Furthermore, to help medical providers to reduce the probability of delayed diagnosis and to improve the quality of health care. Studying results indicate when the patient ’ s triage is resuscitative, and the blood pressure and the pulse are abnormal, which lead to high probability (59%) to cause delayed diagnosis, it may because doctors at ER don ’ t have time to appropriately diagnose the patients, and doctors usually diagnose a patient ’ s symptoms by his first impression; therefore, they really ignore when the patient is consciously and breathes normally. In addition, when doctors are overworked, it is likely cause to delayed diagnosis, but doctors ’ age and specialists don ’ t influence the probability of delayed diagnosis. The rules of Affinity with the highest hit rate is 72.6%; however, the first rule of ROSETTA only gets 40% hit rate, and the database is disorderly and can ’ t describe the observation ’ s behavior clearly.

Keywords : delayed diagnosis ; affinity set ; data mining ; topology

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REFERENCES

[1]Bellman, R. E. and Zadeh, L. A., “ Decision making in a fuzzy environment, ” Management Science 17B, 141-164, 1970.

[2]Dubois, D. and Prade, H., Fuzzy Sets and Systems, Theory and Applications, Academic Press, New York, 1980.

[3]Ham, J. W. and Kamber, M., Data mining: concept and techniques, QA76.9.D343 H36, 2001.

[4]Klir, G. J. and Yuan, B., Fuzzy Sets and Fuzzy Logic: Theory and Applications, 3rd, Taiwan, 2003.

[5]Kohn, L. T., Corrigan, J. M. and Donaldson, M. S. Editors, To Err is Human: Building a Safer Health System, Washington D. C., 1999.

[6]Leape, L. L., Brennan, T. A., Laird, N., Lawthers, A. G., Localio, A. R., Barnes, B. A., Hebert, L., Newhouse, J. P., Weiler, P. C. and Hiatt, H., “Incidence of adverse events and negligence in hospitalized patients. Results of the Harvard Medical Practice Study I,” THE NEW ENGLAND JOURNAL of MEDICINE, vol. 324, 370-376, 1991.
[7]Moussa, L. and Chen, Y. W., A fuzzy Set Based Framework for the Concept of Affinity.
[8]Moussa, L. and Chen, Y. W., Developing the Affinity Set (or Guanxi Set) Theory and Its Applications.
[9]Pawlak, Z., “Rough Set,” International Journal of Computer and Information Science, Vol. 11, pp. 341-356, 1982.
[10]Pawlak, Z., Rough Sets. Theoretical Aspects of Reasoning about Data, Kluwer Academic Publishers, 1991.
[11]Viveros, M. S., Nearhos, J. P. and Rothman, M. J., “Applying Data Mining Techniques to a Health Insurance Information System,” Very Large Data Bases Conference, 22nd, 1996.
[12]Wilson, R. McL., Runciman, W. B., Gibberd, R. W., Harrison, B. T., Newby, L. and Hamilton, J. D., “The Quality in Australian Health Care Study,” THE MEDICAL JOURNAL OF AUSTRALIA, vol. 163, 458-471, 1995.
[13]Zadeh, L. A., Fuzzy sets, Information and Control, 8, 338-353, 1965.
[14]Department of Health, Executive Yuan, R.O.C.(Taiwan): http://www.doh.gov.tw/CHT2006/index_populace.aspx.
[15]IBM: http://www.ibm.com/us/ [16]Medicare Australia: http://www.hic.gov.au/ [17]Patient Safety Net: http://www.patientsafety.tw/big5/default.asp.
[18]ROSETTA software: http://www.idi.ntnu.no/~aleks/thesis/ [19]World Health Organization: http://www.who.int/patientsafety/en/.
[20]古裕彥，統計資料採礦，東海大學統計學系研究所碩士論文，2002。
[21]周建河，急診醫師人力調整前後之醫療品質相關性探討-以南部三家醫院為例，國立中山大學人力資源管理研究所碩士論文，2003。
[22]郭萃華，醫療錯誤相關因素探討-以外科醫療為例，國立台灣大學醫療機構管理研究所碩士論文，2005。
[23]陳麗琴，中文版五級急診檢傷分類電腦化系統之建構與臨床應用評估，台北醫學大學護理學研究所碩士論文，2005。
[24]楊哲彥，楊秀儀，台灣地區中醫與西醫醫療糾紛的差異，長庚大學醫務管理學系及研究所碩士論文，J Chin Med, 15(1), 1-15, 2004。
[25]雷賀君，前十字韌帶傷害快速診斷系統-以粗略集合、基因演算法與倒傳遞網路為工具，大葉大學工業工程學系研究所碩士論文，2004。
[26]趙文敏，拓樸學導論，九章出版社，台北，1992。
[27]蘇步青，拓樸學初步，亞東書局，台北，1992。