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Физические принципы организации информационной безопасности предприятия

Резюме. В статье рассмотрены виды и методы угроз в исследовании физических принципов организации информационной безопасности предприятия, теоретические основы понятия информационной безопасности, видов угроз и методов их защиты, физические принципы защиты информации в локальной сети, изложены в политике информационной безопасности локальной сети предприятия. Кратко изложены финансовые, технологические и проектные документы, причины утери Логинов и паролей и методы ее предотвращения. Также были озвучены пути комплексной организации защиты информации. Было оговорено, что вся информация, связанная с деятельностью компании и не предназначенная для публикации, должна храниться в компании и быть защищена от угроз.

Ключевые слова. Информационная безопасность, защита информации, локальная сеть, методы защиты, политика безопасности.

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USING THE CONCEPT OF "GENERATION" IN BAYESIAN NETWORKS

Abstract. The article is devoted to the study of some aspects of the theory of oriented graphs when working with Bayesian networks. In some articles on the theory of Bayesian networks, the concept of “Generation” was introduced, which denotes a certain number of peaks that have parents belonging to earlier generations. The terminology for this concept has not yet fully developed. In graph theory, there are some concepts, in a sense, related to the concept of “Generation”: the dominant set of vertices, an independent set of vertices, the most independent set of vertices, connectivity, separating sets, etc. These concepts allow us to find simpler solutions to some problems as in general graph theory, and in the theory of directed graphs and Bayesian network theory. Some theorems and problems using these concepts will be considered in this article.

The concept of “Generation” in some cases makes it easier to prove some standard theorems in the theory of Bayesian networks, find simpler solutions to typical problems in Bayesian networks, and build simpler algorithms.

Keywords: Bayesian networks, directed graphs, HUGIN EXPERT.

1 Introduction

Artificial intelligence has firmly entered the life of problem researchers in various fields of science. The most popular use of artificial intelligence since the beginning of 2000 was the use of Bayesian networks in research.

There are many ways to provide motivation for using Bayesian networks. You can approach Bayesian networks from different points of view, such as machine learning, probability theory, knowledge management. Interest in Bayesian networks is directly related to the accumulation of a huge amount of information in various fields and the need for its analysis, taking into account the constant receipt of new data. Models based on Bayesian networks are capable of self-learning and self-improvement as new data accumulate. Such models are quite insensitive to possible erroneous or incomplete data. Another advantage of using Bayesian networks is the ability to integrate heterogeneous data. This is because Bayesian networks model the most common causal relationships between parameters of interest to the researcher. Bayesian learning algorithms allow parallelization of computations. Models using Bayesian networks easily bypass data redundancy.

For the correct use of Bayesian networks, an appropriate mathematical apparatus was developed. There are wide opportunities for studying problems in various fields of science. However, massive, complex calculations when using the Bayesian network apparatus urgently required the involvement of good computer technology and the availability of good software products that provide convenient work with Bayesian networks.

Many interesting packages for working with Bayesian networks have appeared on the software market. The most popular packages include: BayesiaLab, AgenaRisk, Bayes Server, Netica, Hugin Expert, BayesFusion. Despite the fact that some packages are already more than 15 years old, there is still grinding between mathematicians involved in the theoretical foundations of Bayesian networks, developers of algorithms and programmers, as well as researchers in applied fields of science.

2 Bayesian Networks in Applied Research

Bayesian network is a convenient tool to describe rather complex processes with uncertainties. Uncertainties can be very different:

• Experienced data almost always contains errors.

• The dependence between the various factors of the process under study in most cases is probabilistic.

• The opinions of experts in a given field are often far from the truth and often the assessments of one expert contradict the assessments of another expert.

• Etc.

Nevertheless, the problem under study must some how be solved. It is clear that the result of solving such problems should be some probabilistic estimates of the type:

• The probability of developing a cardiovascular disease in a patient under study is, for example, 40%.

• The probability of selling the investigated product on the market for given parameters (there may be thousands of such parameters) is 70%.

• The risk of non-repayment of the loan by this client is 80%.

• The risk of breakdown of complex equipment during the year is 5%.

• And so on.

However, inverse problems are often posed, for example:

• Determine the totality of the most important factors and the probabilistic estimates of these factors, which guarantee the likelihood of cardiovascular disease within 5%.

• Determine the totality of the most important factors and probabilistic estimates of these factors (price, advertising, product quality, etc.) that guarantee the probability of the sale of the investigated product is not lower than 90%.

• Determine the most important characteristics of the client so that the risk of loan default does not exceed 10%.

• And so on.

We list the various areas in applied research in which the Bayesian network apparatus is currently effectively used:

• Aeronautics
• Architecture
• Biotechnology
• Decision Analysis
• Ecology
• Economics
• Econometrics
• Energy
• Epidemiology
• Intelligence Analysis
• Marketing Sciences
• Machine learning
• Medical research
• National security
• Policy Analysis
• Management of risks
• Social Sciences
• Strategic planning
• Supply chain
• Aeronautics
• Architecture
• Biotechnology
• Decision Analysis
• Ecology
• Economics
• Econometrics
• Energy

• Epidemiology
• Intelligence Analysis
• Marketing Sciences
• Machine learning
• Medical research
• National security
• Policy Analysis
• Management of risks
• Social Sciences
• Strategic planning
• Supply chain

3 Use of the concept of "Generation"

Intuitively, the concept of generation is fairly obvious. For a generation of descendants, this is a multitude of peaks having parents only from earlier generations (or having no parents at all), and having children only in later generations (or having no children at all).

For a generation of ancestors, this concept is similar - it is a lot of peaks having children only in later generations (or having no children at all) and having parents only from earlier generations (or having no parents at all).

The only difference is that the construction of generations of descendants begins with nodes that do not have parents, and the construction of generations of ancestors begins with nodes that do not have descendants.

Two types of generations can be identified - generation of descendants and generation of ancestors. Generations of descendants are built, starting with peaks that do not have parents.

Definition. Generations of descendants are defined as follows:
• No parent nodes belong to the 0 generation of descendants.
• Nodes with parents of only 0 generations belong to the 1st generation of descendants.
• Nodes with parents of only 0 and 1 generation belong to the 2nd generation of volumes.
• ******
• Nodes that have parents with only 0, 1, 2, ... K generations belong to the K + 1 generation of descendants.

The algorithm for splitting the vertices of a Bayesian network into generations is quite simple.

4

5 Breeding into generations of descendants

First, we search and select peaks that do not have parents. We assign such vertices to the zero generation, mark the selected vertices. Next, we look at the remaining unmarked vertices, determine the parents of these vertices, and select only those vertices for which the parents belong only to the zero generation. We get the first generation of descendants, we also note the newly selected vertices of the first generation. Again, we look at the remaining unmarked peaks and select only those peaks whose parents belong only to either the zero or the first generation. We get the second generation of descendants, we also mark the selected peaks. So continue until all the vertices are marked.

An example of generationalization is shown in Figure 1.

Generations of descendants for a given Bayesian network:
• Peaks Age and Visit_to_Asia will be assigned to the zero generation.
• The first generation includes the summits of Smoker and Tuberculosis.
• Cancer and Bronchitis peaks belong to the second generation.
• Only one vertex of TbOrCa belongs to the third generation.
• The fourth generation includes the peaks of XRay and Dyspnea.

Generations of ancestors are built starting from the peaks that do not have children. The construction algorithm is similar to the algorithm for splitting into generations of descendants.

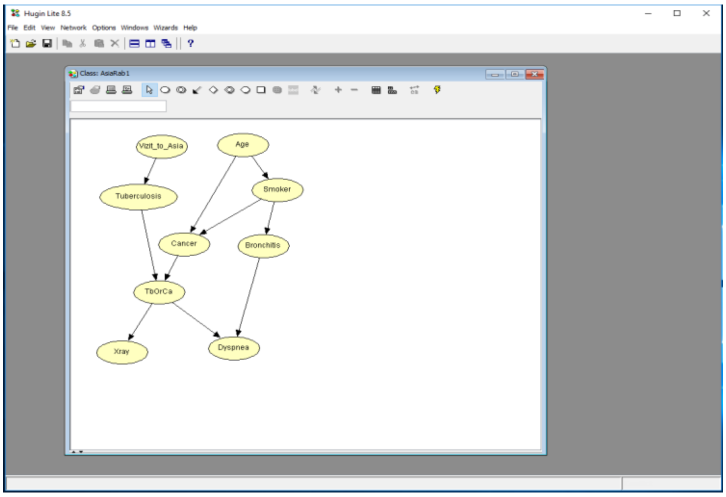

Fig. 1. An example of generationalization

In most cases, the partition of the many peaks of the Bayesian network into generation of descendants and generation of ancestors is significantly different. However, it is not difficult to come up with a graph (Bayesian network) in which the division into generations of descendants and generations of ancestors is completely identical.

The feasibility of dividing the vertices of a Bayesian network into one or another type of generation is determined by a specific task. To solve some problems, it turns out to be expedient to make two partitions at once: into generations of descendants and generations of ancestors.

Here are some properties of generations.

• Generations are disjoint sets.

• Two neighboring generations with numbers K and K + 1 (descendants or ancestors) are adjacent areas. Indeed, these sets of vertices of generations are disjoint. For generations of descendants, each vertex of generation K + 1 has a parent from generation K, and each vertex of generation K has a child from generation K + 1. For ancestral generations, each vertex of generation K has a parent from generation K + 1, and each vertex of generation K + 1 has a child from generation K.

• If the skeleton of a Bayesian network is a complete graph Kn, the number of generations of a Bayesian network is n and each generation contains exactly one node.

• The many peaks of each generation of a Bayesian network are independent.

• The skeleton of a Bayesian network with K generations can be considered K-partite.

When building a Bayesian network, it is important to have a mechanism that makes it easy to determine the presence of cycles. Such a mechanism can be constructed using the following theorem. To prove this theorem, you can use any generationalization: generational descendants or generational ancestors.

Conclusion

This article shows some possibilities of using the concept of “Generation” in the proof of some standard theorems in the theory of Bayesian networks. Bayesian networks make it possible to investigate the influence of many concomitant factors on the process under study, for example, the influence of various factors on the risk of cardiovascular diseases. Or, the influence of various economic, political, social and other factors in the study of the behavior of various social groups and sectors of society. There may be hundreds or thousands of such factors. Most factors will depend on some of the other factors considered. Since the Bayesian network is an oriented acyclic graph, it is necessary to constantly check the acclivity of the graph. Even for small networks, visually determining the acyclicity of a graph is quite difficult. For large networks, a module that determines the acyclicity of a graph is absolutely necessary. This module needs to work as fast as possible. The concept of "Generation" allows you to develop such a module.

Studying the various versions of the models of the process under study, we need to understand that the corresponding Bayesian networks are significantly different, i.e. are not isomorphic. Checking for isomorphism of Bayesian networks is a rather complicated task. The concept of “Generation” allows to simplify this task.

Only a small part of the possibilities of using the concept of "Generation" is given.

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«Ұрпақ» ұғымын Байес желілерінде қолдану

Түйіндеме. Мақалада «ұрпақ» ұғымын Байес желілерінде қолдану сипатталған. «Ұрпақ» ұғымы Байес желілері теориясында кейбір стандартты теоремаларды дәлелдеуді, Байес желілеріндегі типтік мәселелердің қарапайым шешімдерін табуды және қарапайым алгоритмдерді құруды жеңілдетеді.

Кілттік сөздер: Байестік желілер, бағытталған граф, HUGIN EXPERT

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Использование понятия «поколение» в байесовских сетях

Резюме. В статье описывается использование понятия «поколение» в байесовских сетях. Рассматривались байесовские сети в прикладных исследованиях Понятие «Поколение» позволяет более легко доказывать некоторые стандартные теоремы в теории байесовских сетей, находить более простые решения типичных задач в байесовских сетях, строить более простые алгоритмы.

Ключевые слова: Байесовские сети, ориентированный граф, HUGIN EXPERT

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DEVELOPMENT OF THE INTELLIGENT CONTROL ALGORITHM FOR CENTRIFUGAL CONCENTRATOR FALCON C1000

Abstract. Currently, in the field of beneficiation of fine and small classes ores in a centrifugal field, Falcon centrifugal concentrators equipped with automated control systems have worked well. Automation systems of concentrators, of course, facilitates control, but do not allow to achieve maximum technological beneficiation indices. The paper considers development of an intelligent control algorithm for centrifugal concentrator Falcon C1000 using fuzzy logic. The algorithm is based on the knowledge of competent expert technologists and allows to researchers to simulate the various modes of operation of the concentrator. The obtained algorithm is capable of integration with the existing control system, which will improve the quality of control and, as a result, beneficiation indices.

Keywords: centrifugal concentrator, concentrate, waste-rocks, intelligent control algorithm, fuzzy logic.