



Classification of heart rate data using artificial neural network and fuzzy equivalence relation

U. Rajendra Acharya^a, P. Subbanna Bhat^b, S.S. Iyengar^{c,*}, Ashok Rao^d, Sumeet Dua^e

^a*Ngee Ann Polytechnic, 535 Clementi Road, Singapore, 599 409, Singapore*

^b*Karnataka Regional Engineering College, Sarabahal, Srirangapatna, India 574 157*

^c*Department of Computer Science, Louisiana State University, 298 Coates Hall, Baton Rouge, LA 70803, USA*

^d*CEDT, IISc, Bangalore, India*

Received 13 August 2001; accepted 25 February 2002

Abstract

The electrocardiogram is a representative signal containing information about the condition of the heart. The shape and size of the P-QRS-T wave, the time intervals between its various peaks, etc. may contain useful information about the nature of disease afflicting the heart. However, these subtle details cannot be directly monitored by the human observer. Besides, since bio-signals are highly subjective, the symptoms may appear at random in the time scale. Therefore, the signal parameters, extracted and analysed using computers, are highly useful in diagnostics. This paper deals with the classification of certain diseases using artificial neural network (ANN) and fuzzy equivalence relations. The heart rate variability is used as the base signal from which certain parameters are extracted and presented to the ANN for classification. The same data is also used for fuzzy equivalence classifier. The feedforward architecture ANN classifier is seen to be correct in about 85% of the test cases, and the fuzzy classifier yields correct classification in over 90% of the cases. © 2002 Pattern Recognition Society. Published by Elsevier Science Ltd. All rights reserved.

Keywords: Heart rate; Pattern recognition; ECG; Neural network; Fuzzy equivalence; Disease classification

1. Introduction

Electrocardiography deals with the electrical activity of the heart. Monitored by placing sensors at the limb extremities of the subject, electrocardiogram (ECG) is a record of the origin and propagation of the electric potential through cardiac muscles. It is considered a representative signal of cardiac physiology, useful in diagnosing cardiac disorders.

The state of cardiac health is generally reflected in the shape of ECG waveform and heart rate. It may contain important pointers to the nature of diseases afflicting the heart. However, bio-signals being non-stationary signals, this reflection may occur at random in the time scale. (That is,

the disease symptoms may not show up all the time, but would manifest at certain irregular intervals during the day.) Therefore, for effective diagnostics, the study of ECG pattern and heart rate variability signal (instantaneous heart rate against time axis) may have to be carried out over several hours. Thus, the volume of the data being enormous, the study is tedious and time consuming. Naturally, the possibility of the analyst missing (or misreading) vital information is high. Therefore, computer-based analysis and classification of diseases can be very helpful in diagnostics.

The present paper makes use of heart rate variability (HRV) as the base signal for analysis and classification of diseases. The heart rate is evaluated by measuring the time interval between the successive R-peaks (*R-R* interval) of the ECG waveform. It is known that almost all the useful frequency components in ECG signal falls below 40 Hz [1], and therefore sampled at the rate of 200 samples/s. The heart rate, plotted against the time scale provides the HRV signal,

* Corresponding author. Tel.: +1-225-578-1252; fax: +1-225-388-1465.

E-mail address: iyengar@bitnsc.lsu.edu (S.S. Iyengar).

Classification Of Heart Rate Data Using Artificial Neural

PT Brinkman



Classification Of Heart Rate Data Using Artificial Neural:

Embark on a breathtaking journey through nature and adventure with Crafted by is mesmerizing ebook, Witness the Wonders in **Classification Of Heart Rate Data Using Artificial Neural** . This immersive experience, available for download in a PDF format (PDF Size: *), transports you to the heart of natural marvels and thrilling escapades. Download now and let the adventure begin!

https://db1.greenfirefarms.com/public/book-search/Download_PDFS/what_is_ai_video_generator_ideas_for_beginners.pdf

Table of Contents Classification Of Heart Rate Data Using Artificial Neural

1. Understanding the eBook Classification Of Heart Rate Data Using Artificial Neural
 - The Rise of Digital Reading Classification Of Heart Rate Data Using Artificial Neural
 - Advantages of eBooks Over Traditional Books
2. Identifying Classification Of Heart Rate Data Using Artificial Neural
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Classification Of Heart Rate Data Using Artificial Neural
 - User-Friendly Interface
4. Exploring eBook Recommendations from Classification Of Heart Rate Data Using Artificial Neural
 - Personalized Recommendations
 - Classification Of Heart Rate Data Using Artificial Neural User Reviews and Ratings
 - Classification Of Heart Rate Data Using Artificial Neural and Bestseller Lists
5. Accessing Classification Of Heart Rate Data Using Artificial Neural Free and Paid eBooks
 - Classification Of Heart Rate Data Using Artificial Neural Public Domain eBooks
 - Classification Of Heart Rate Data Using Artificial Neural eBook Subscription Services
 - Classification Of Heart Rate Data Using Artificial Neural Budget-Friendly Options

6. Navigating Classification Of Heart Rate Data Using Artificial Neural eBook Formats
 - ePub, PDF, MOBI, and More
 - Classification Of Heart Rate Data Using Artificial Neural Compatibility with Devices
 - Classification Of Heart Rate Data Using Artificial Neural Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Classification Of Heart Rate Data Using Artificial Neural
 - Highlighting and Note-Taking Classification Of Heart Rate Data Using Artificial Neural
 - Interactive Elements Classification Of Heart Rate Data Using Artificial Neural
8. Staying Engaged with Classification Of Heart Rate Data Using Artificial Neural
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Classification Of Heart Rate Data Using Artificial Neural
9. Balancing eBooks and Physical Books Classification Of Heart Rate Data Using Artificial Neural
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Classification Of Heart Rate Data Using Artificial Neural
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Classification Of Heart Rate Data Using Artificial Neural
 - Setting Reading Goals Classification Of Heart Rate Data Using Artificial Neural
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Classification Of Heart Rate Data Using Artificial Neural
 - Fact-Checking eBook Content of Classification Of Heart Rate Data Using Artificial Neural
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

Classification Of Heart Rate Data Using Artificial Neural Introduction

In this digital age, the convenience of accessing information at our fingertips has become a necessity. Whether its research papers, eBooks, or user manuals, PDF files have become the preferred format for sharing and reading documents. However, the cost associated with purchasing PDF files can sometimes be a barrier for many individuals and organizations. Thankfully, there are numerous websites and platforms that allow users to download free PDF files legally. In this article, we will explore some of the best platforms to download free PDFs. One of the most popular platforms to download free PDF files is Project Gutenberg. This online library offers over 60,000 free eBooks that are in the public domain. From classic literature to historical documents, Project Gutenberg provides a wide range of PDF files that can be downloaded and enjoyed on various devices. The website is user-friendly and allows users to search for specific titles or browse through different categories. Another reliable platform for downloading Classification Of Heart Rate Data Using Artificial Neural free PDF files is Open Library. With its vast collection of over 1 million eBooks, Open Library has something for every reader. The website offers a seamless experience by providing options to borrow or download PDF files. Users simply need to create a free account to access this treasure trove of knowledge. Open Library also allows users to contribute by uploading and sharing their own PDF files, making it a collaborative platform for book enthusiasts. For those interested in academic resources, there are websites dedicated to providing free PDFs of research papers and scientific articles. One such website is Academia.edu, which allows researchers and scholars to share their work with a global audience. Users can download PDF files of research papers, theses, and dissertations covering a wide range of subjects. Academia.edu also provides a platform for discussions and networking within the academic community. When it comes to downloading Classification Of Heart Rate Data Using Artificial Neural free PDF files of magazines, brochures, and catalogs, Issuu is a popular choice. This digital publishing platform hosts a vast collection of publications from around the world. Users can search for specific titles or explore various categories and genres. Issuu offers a seamless reading experience with its user-friendly interface and allows users to download PDF files for offline reading. Apart from dedicated platforms, search engines also play a crucial role in finding free PDF files. Google, for instance, has an advanced search feature that allows users to filter results by file type. By specifying the file type as "PDF," users can find websites that offer free PDF downloads on a specific topic. While downloading Classification Of Heart Rate Data Using Artificial Neural free PDF files is convenient, its important to note that copyright laws must be respected. Always ensure that the PDF files you download are legally available for free. Many authors and publishers voluntarily provide free PDF versions of their work, but its essential to be cautious and verify the authenticity of the source before downloading Classification Of Heart Rate Data Using Artificial Neural. In conclusion, the internet offers numerous

platforms and websites that allow users to download free PDF files legally. Whether its classic literature, research papers, or magazines, there is something for everyone. The platforms mentioned in this article, such as Project Gutenberg, Open Library, Academia.edu, and Issuu, provide access to a vast collection of PDF files. However, users should always be cautious and verify the legality of the source before downloading Classification Of Heart Rate Data Using Artificial Neural any PDF files. With these platforms, the world of PDF downloads is just a click away.

FAQs About Classification Of Heart Rate Data Using Artificial Neural Books

What is a Classification Of Heart Rate Data Using Artificial Neural PDF? A PDF (Portable Document Format) is a file format developed by Adobe that preserves the layout and formatting of a document, regardless of the software, hardware, or operating system used to view or print it. **How do I create a Classification Of Heart Rate Data Using Artificial Neural PDF?** There are several ways to create a PDF: Use software like Adobe Acrobat, Microsoft Word, or Google Docs, which often have built-in PDF creation tools. Print to PDF: Many applications and operating systems have a "Print to PDF" option that allows you to save a document as a PDF file instead of printing it on paper. Online converters: There are various online tools that can convert different file types to PDF. **How do I edit a Classification Of Heart Rate Data Using Artificial Neural PDF?** Editing a PDF can be done with software like Adobe Acrobat, which allows direct editing of text, images, and other elements within the PDF. Some free tools, like PDFescape or Smallpdf, also offer basic editing capabilities. **How do I convert a Classification Of Heart Rate Data Using Artificial Neural PDF to another file format?** There are multiple ways to convert a PDF to another format: Use online converters like Smallpdf, Zamzar, or Adobe Acrobats export feature to convert PDFs to formats like Word, Excel, JPEG, etc. Software like Adobe Acrobat, Microsoft Word, or other PDF editors may have options to export or save PDFs in different formats. **How do I password-protect a Classification Of Heart Rate Data Using Artificial Neural PDF?** Most PDF editing software allows you to add password protection. In Adobe Acrobat, for instance, you can go to "File" -> "Properties" -> "Security" to set a password to restrict access or editing capabilities. Are there any free alternatives to Adobe Acrobat for working with PDFs? Yes, there are many free alternatives for working with PDFs, such as: LibreOffice: Offers PDF editing features. PDFsam: Allows splitting, merging, and editing PDFs. Foxit Reader: Provides basic PDF viewing and editing capabilities. How do I compress a PDF file? You can use online tools like Smallpdf, ILovePDF, or desktop software like Adobe Acrobat to compress PDF files without significant quality loss. Compression reduces the file size, making it easier to share and download. Can I fill out forms in a PDF file? Yes, most PDF viewers/editors like Adobe Acrobat, Preview (on Mac), or various online tools allow you to fill out forms in PDF files by selecting text fields and entering information. Are there any restrictions when working with PDFs? Some PDFs might have restrictions set by

their creator, such as password protection, editing restrictions, or print restrictions. Breaking these restrictions might require specific software or tools, which may or may not be legal depending on the circumstances and local laws.

Find Classification Of Heart Rate Data Using Artificial Neural :

what is ai video generator ideas for beginners

best way to minimalist lifestyle guide for experts

best ai video generator step plan for experts

trending cheap flights usa for moms for creators

how to start index fund investing ideas for experts

how to keyword research for moms for experts

trending ai writing assistant for creators for creators

top method for ai image generator for students for students

pro cheap flights usa step plan for creators

trending digital nomad visa for creators for students

top anti-inflammatory diet full tutorial for beginners

how to start sleep hygiene tips for small business

advanced ai tools for small business for students

top method for matcha health benefits step plan for beginners

top method for ai tools ideas for experts

Classification Of Heart Rate Data Using Artificial Neural :

NAVFAC DM7-02 Foundations and Earth Structures soil mechanics in the design of foundations and earth structures for naval shore facilities. It is intended for use by experienced engineers. The contents ... Foundations and Earth Structures: NAVFAC DM 7.02 This manual covers the application of basic engineering principles of soil mechanics in the design of foundations and earth structures for naval shore. NAVFAC DM7-02 Foundations and Earth Structures soil mechanics in the design of foundations and earth structures for naval shore facilities. It is intended for use by experienced engineers. The contents ... Foundations and Earth Structures. Design Manual 7.2 1982 · Cited by 7 — Design guidance is presented for use by experienced engineers. The contents include excavations compaction, earthwork, and hydraulic fills analysis of walls ... Foundations and Earth Structures: NAVFAC DM 7.02 It covers a wide variety of topics, including excavations; compaction,

earthwork and hydraulic fills; analysis of walls and retaining structures; shallow ... NAVFAC DM7.01 Soil Mechanics Sep 1, 1986 — Soil Mechanics. 7.02. Foundations and Earth Structures. 7.03. Soil Dynamics, Peep Stabilization and Special Geotechnical. Construction. Change 1 ... The “Before and After” of NAVFAC DM 7 - vulcanhammer.net Sep 28, 2022 — “DM-7” refers to the design manual for geotechnical engineering, entitled Soil Mechanics, Foundations and Earth Structures. The “original” DM-7 ... Foundations and Earth Structures: NAVFAC DM 7.02 Jul 25, 2009 — It covers a wide variety of topics, including excavations; compaction, earthwork and hydraulic fills; analysis of walls and retaining structures ... Foundations and Earth Structures: Navfac DM 7.02 It covers a wide variety of topics, including excavations; compaction, earthwork and hydraulic fills; analysis of walls and retaining structures; shallow ... Design Manual 7.2 - Foundations and Earth Structures S. NAVFAC Design Manual'DM-7.2. Design Criteria. Final. Foundations and Earth Structures ... portions of Soil Mechanics, Foundations, and Earth Structures, NAVFAC ... What Got You Here Won't Get You... by Goldsmith, Marshall What Got You Here Won't Get You There: How Successful People Become Even More Successful [Goldsmith, Marshall, Reiter, Mark] on Amazon.com. What Got You Here Won't Get You There: How Successful ... What Got You Here Won't Get You There: How Successful People Become Even More Successful - Kindle edition by Goldsmith, Marshall, Mark Reiter. What got you here wont get you there “If you are looking for some good, practical advice on how to be more successful, this is a good place to start. Marshall Goldsmith, author of What Got You Here ... What Got You Here Won't Get You There Quotes 86 quotes from What Got You Here Won't Get You There: 'Successful people become great leaders when they learn to shift the focus from themselves to others.' What Got You Here Won't Get You There: How Successful ... What Got You Here Won't Get You There: How Successful People Become Even More Successful · Hardcover(Revised ed.) · \$25.99 \$29.00 Save 10% Current price is \$25.99 ... What Got You Here Won't Get You There What Got You Here Won't Get You There: How Successful People Become Even More Successful by Marshall Goldsmith is a fantastic collection of 256 pages and is a ... Book Summary: What Got You Here Won't Get You There Incredible results can come from practicing basic behaviors like saying thank you, listening well, thinking before you speak, and apologizing for your mistakes. What Got You Here Won't Get You There by Marshall Goldsmith Marshall Goldsmith is an expert at helping global leaders overcome their sometimes unconscious annoying habits and attain a higher level of success. His one-on- ... What Got You Here Won't Get You There Summary Mar 24, 2020 — But with What Got You Here Won't Get You There: How Successful People Become Even More Successful, his knowledge and expertise are available ... Terpsichore in Sneakers: Post-Modern Dance (Wesleyan ... A dance critic's essays on post-modern dance. Drawing on the postmodern perspective and concerns that informed her groundbreaking Terpsichore in Sneakers, ... Terpsichore in Sneakers A dance critic's essays on post-modern dance.Drawing on the postmodern perspective and concerns that informed her groundbreaking Terpsichore in Sneakers, ... Terpsichore in Sneakers: Post-Modern Dance - Project MUSE by S Banes · 2011 · Cited by 1305 — In this Book ... Drawing on the postmodern perspective and concerns that informed her

groundbreaking Terpsichore in Sneakers, Sally Bane's Writing ... Terpsichore in Sneakers: Post-Modern Dance by Sally Banes Terpsichore in Sneakers offers the first critical review of the history of post-modern dance—an avant-garde style that emerged in the USA in the 1960s. Terpsichore in Sneakers: Post-Modern Dance by Sally Banes A dance critic's essays on post-modern dance. Drawing on the postmodern perspective and concerns that informed her groundbreaking Terpsichore in Sneakers, ... Terpsichore in sneakers, post-modern dance title: Terpsichore in Sneakers : Post-modern Dance Wesleyan Paperback author: Banes, Sally. publisher: Wesleyan University Press isbn10 | asin: 0819561606 ... Terpsichore in Sneakers: Post-modern Dance - Sally Banes Terpsichore in Sneakers: Post-modern Dance · From inside the book · Contents · Other editions - View all · Common terms and phrases · About the author (1980). Terpsichore in Sneakers: Post-Modern Dance by Sally Banes A dance critic's essays on post-modern dance. Drawing on the postmodern perspective and concerns that informed her groundbreaking. Terpsichore in sneakers: Post-modern dance: Banes, Sally Drawing on the postmodern perspective and concerns that informed her groundbreaking Terpsichore in Sneakers, Sally Bane's Writing Dancing documents the ... Terpsichore Sneakers Post Modern Dance by Sally Banes Terpsichore in Sneakers: Post-Modern Dance (Wesleyan Paperback). Banes, Sally. ISBN 13: 9780819561602. Seller: ...