scientific reports

OPEN

Hierarchical contrastive learning for multi-label text classification

Wei Zhang[1,2], Yun Jiang[1,2], Yun Fang[1] & Shuai Pan[1]✉

Multi-label text classification presents a significant challenge within the field of text classification, particularly due to the hierarchical nature of labels, where labels are organized in a tree-like structure that captures parent-child and sibling relationships. This hierarchy reflects semantic dependencies among labels, with higher-level labels representing broader categories and lower-level labels capturing more specific distinctions. Traditional methods often fail to deeply understand and leverage this hierarchical structure, overlooking the subtle semantic differences and correlations that distinguish one label from another. To address this shortcoming, we introduce a novel method called Hierarchical Contrastive Learning for Multi-label Text Classification (HCL-MTC). Our approach leverages the contrastive knowledge embedded within label relationships by constructing a graph representation that explicitly models the hierarchical dependencies among labels. Specifically, we recast multi-label text classification as a multi-task learning problem, incorporating a hierarchical contrastive loss that is computed through a carefully designed sampling process. This unique loss function enables our model to effectively capture both the correlations and distinctions among labels, thereby enhancing the model's ability to learn the intricacies of the label hierarchy. Experimental results on widely-used datasets, such as RCV1-v2 and WoS, demonstrate that our proposed HCL-MTC model achieves substantial performance gains compared to baseline methods.

Keywords Contrastive learning, Hierarchical structure, Multi-task, Multi-label text classification

The task of text classification, a cornerstone of natural language processing (NLP), has recently attracted increased interest. Its applications span a wide range of fields, including sentiment analysis[1–3], document categorization[4], medical coders prediction[5], legal studies[6], patent classification[7], and financial analysis[8]. Among these, Multi-label Text Classification (MTC) stands out as a particularly complex challenge. In MTC, the goal is to assign multiple labels to a given text, where the set of labels often exhibits a hierarchical structure. This structure implies a relationship between labels, such that information pertaining to one label can influence the inference of another, thereby adding complexity to the classification task.

The current approaches to the MTC task can be broadly classified into two categories: (1) methods that predict labels using textual information alone, and (2) approaches that combine both label and textual information for prediction. The first category of methods relies on local and global features extracted by text encoders to forecast labels. Notable examples include CNN-based models[9,10] that address data imbalance issues caused by a lack of samples for child labels. Other works in this category focus on incorporating semantic information from text[11]. While these methods are effective at capturing textual subtleties, they generally fail to account for relationships between labels.

The second category of methods aims to integrate textual and label information. Strategies include weight initialization[12], learning label hierarchies[13–15], and the use of capsule networks[16,17]. These approaches improve the efficiency of MTC by leveraging label information but often achieve only a superficial understanding of the label hierarchy. The graph convolutional network (GCN)-based model[18] shows promise in learning a deep label hierarchy but does not fully exploit label information, focusing exclusively on correlative aspects and overlooking label distinctiveness.

Despite substantial progress, a critical gap in research persists: the majority of current methods do not effectively utilize both the distinctive and correlative aspects of label information to optimize hierarchical multi-label classification. This shortcoming restricts the effectiveness of these models, especially in complex, hierarchical label structures where both types of information are essential for accurate classification.

The concurrent consideration of correlative and distinctive information is fundamental to achieving a deep understanding of the label hierarchy, thus improving the effectiveness of MTC. As depicted in Fig. 1, the similarity s_{23} between nodes 2 and 3 represents distinctive information, which is presumed to be maximized

[1]Advanced Institution of Information Technology, Peking University, No.233, Yonghui Rd, Hangzhou 311215, Zhejiang, China. [2]Wei Zhang and Yun Jiang contributed equally to this work. ✉email: pans@aiit.org.cn

Active Learning For Hierarchical Text Classi Cation

Yan Bai

Active Learning For Hierarchical Text Classi Cation:

Ignite the flame of optimism with is motivational masterpiece, Fuel Your Spirit with **Active Learning For Hierarchical Text Classi Cation** . In a downloadable PDF format (*), this ebook is a beacon of encouragement. Download now and let the words propel you towards a brighter, more motivated tomorrow.

https://matrix.jamesarcher.co/results/virtual-library/HomePages/friendship_stories_kids_global_trend.pdf

Table of Contents Active Learning For Hierarchical Text Classi Cation

1. Understanding the eBook Active Learning For Hierarchical Text Classi Cation
    - The Rise of Digital Reading Active Learning For Hierarchical Text Classi Cation
    - Advantages of eBooks Over Traditional Books
2. Identifying Active Learning For Hierarchical Text Classi Cation
    - 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 Active Learning For Hierarchical Text Classi Cation
    - User-Friendly Interface
4. Exploring eBook Recommendations from Active Learning For Hierarchical Text Classi Cation
    - Personalized Recommendations
    - Active Learning For Hierarchical Text Classi Cation User Reviews and Ratings
    - Active Learning For Hierarchical Text Classi Cation and Bestseller Lists
5. Accessing Active Learning For Hierarchical Text Classi Cation Free and Paid eBooks
    - Active Learning For Hierarchical Text Classi Cation Public Domain eBooks
    - Active Learning For Hierarchical Text Classi Cation eBook Subscription Services
    - Active Learning For Hierarchical Text Classi Cation Budget-Friendly Options
6. Navigating Active Learning For Hierarchical Text Classi Cation eBook Formats

- ePub, PDF, MOBI, and More
- Active Learning For Hierarchical Text Classi Cation Compatibility with Devices
- Active Learning For Hierarchical Text Classi Cation Enhanced eBook Features

7. Enhancing Your Reading Experience
   - Adjustable Fonts and Text Sizes of Active Learning For Hierarchical Text Classi Cation
   - Highlighting and Note-Taking Active Learning For Hierarchical Text Classi Cation
   - Interactive Elements Active Learning For Hierarchical Text Classi Cation
8. Staying Engaged with Active Learning For Hierarchical Text Classi Cation
   - Joining Online Reading Communities
   - Participating in Virtual Book Clubs
   - Following Authors and Publishers Active Learning For Hierarchical Text Classi Cation
9. Balancing eBooks and Physical Books Active Learning For Hierarchical Text Classi Cation
   - Benefits of a Digital Library
   - Creating a Diverse Reading Collection Active Learning For Hierarchical Text Classi Cation
10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
11. Cultivating a Reading Routine Active Learning For Hierarchical Text Classi Cation
    - Setting Reading Goals Active Learning For Hierarchical Text Classi Cation
    - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Active Learning For Hierarchical Text Classi Cation
    - Fact-Checking eBook Content of Active Learning For Hierarchical Text Classi Cation
    - 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

Active Learning For Hierarchical Text Classi Cation Introduction

In the digital age, access to information has become easier than ever before. The ability to download Active Learning For Hierarchical Text Classi Cation has revolutionized the way we consume written content. Whether you are a student looking for course material, an avid reader searching for your next favorite book, or a professional seeking research papers, the option to download Active Learning For Hierarchical Text Classi Cation has opened up a world of possibilities. Downloading Active Learning For Hierarchical Text Classi Cation provides numerous advantages over physical copies of books and documents. Firstly, it is incredibly convenient. Gone are the days of carrying around heavy textbooks or bulky folders filled with papers. With the click of a button, you can gain immediate access to valuable resources on any device. This convenience allows for efficient studying, researching, and reading on the go. Moreover, the cost-effective nature of downloading Active Learning For Hierarchical Text Classi Cation has democratized knowledge. Traditional books and academic journals can be expensive, making it difficult for individuals with limited financial resources to access information. By offering free PDF downloads, publishers and authors are enabling a wider audience to benefit from their work. This inclusivity promotes equal opportunities for learning and personal growth. There are numerous websites and platforms where individuals can download Active Learning For Hierarchical Text Classi Cation. These websites range from academic databases offering research papers and journals to online libraries with an expansive collection of books from various genres. Many authors and publishers also upload their work to specific websites, granting readers access to their content without any charge. These platforms not only provide access to existing literature but also serve as an excellent platform for undiscovered authors to share their work with the world. However, it is essential to be cautious while downloading Active Learning For Hierarchical Text Classi Cation. Some websites may offer pirated or illegally obtained copies of copyrighted material. Engaging in such activities not only violates copyright laws but also undermines the efforts of authors, publishers, and researchers. To ensure ethical downloading, it is advisable to utilize reputable websites that prioritize the legal distribution of content. When downloading Active Learning For Hierarchical Text Classi Cation, users should also consider the potential security risks associated with online platforms. Malicious actors may exploit vulnerabilities in unprotected websites to distribute malware or steal personal information. To protect themselves, individuals should ensure their devices have reliable antivirus software installed and validate the legitimacy of the websites they are downloading from. In conclusion, the ability to download Active Learning For Hierarchical Text Classi Cation has transformed the way we access information. With the convenience, cost-effectiveness, and accessibility it offers, free PDF downloads have become a popular choice for students, researchers, and book lovers worldwide. However, it is crucial to engage in ethical downloading practices and prioritize personal security when utilizing online platforms. By doing so, individuals can make the most of the vast array of free PDF resources available and embark on a journey of continuous learning and intellectual growth.

FAQs About Active Learning For Hierarchical Text Classi Cation Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer webbased readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Active Learning For Hierarchical Text Classi Cation is one of the best book in our library for free trial. We provide copy of Active Learning For Hierarchical Text Classi Cation in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Active Learning For Hierarchical Text Classi Cation. Where to download Active Learning For Hierarchical Text Classi Cation online for free? Are you looking for Active Learning For Hierarchical Text Classi Cation PDF? This is definitely going to save you time and cash in something you should think about. If you trying to find then search around for online. Without a doubt there are numerous these available and many of them have the freedom. However without doubt you receive whatever you purchase. An alternate way to get ideas is always to check another Active Learning For Hierarchical Text Classi Cation. This method for see exactly what may be included and adopt these ideas to your book. This site will almost certainly help you save time and effort, money and stress. If you are looking for free books then you really should consider finding to assist you try this. Several of Active Learning For Hierarchical Text Classi Cation are for sale to free while some are payable. If you arent sure if the books you would like to download works with for usage along with your computer, it is possible to download free trials. The free guides make it easy for someone to free access online library for download books to your device. You can get free download on free trial for lots of books categories. Our library is the biggest of these that have literally hundreds of thousands of different products categories represented. You will also see that there are specific sites catered to different product types or categories, brands or niches related with Active Learning For Hierarchical Text Classi Cation. So depending on what exactly you are searching, you will be able to choose e books to suit your own need. Need to access completely for Campbell Biology Seventh Edition book? Access Ebook without any digging. And by having access to our ebook online or by storing it on your computer, you have convenient answers with Active Learning For Hierarchical Text Classi Cation To get started finding Active Learning For Hierarchical Text Classi Cation, you are right to find our website which has a comprehensive collection of books online. Our library is the biggest of these that have literally hundreds of thousands of

different products represented. You will also see that there are specific sites catered to different categories or niches related with Active Learning For Hierarchical Text Classi Cation So depending on what exactly you are searching, you will be able tochoose ebook to suit your own need. Thank you for reading Active Learning For Hierarchical Text Classi Cation. Maybe you have knowledge that, people have search numerous times for their favorite readings like this Active Learning For Hierarchical Text Classi Cation, but end up in harmful downloads. Rather than reading a good book with a cup of coffee in the afternoon, instead they juggled with some harmful bugs inside their laptop. Active Learning For Hierarchical Text Classi Cation is available in our book collection an online access to it is set as public so you can download it instantly. Our digital library spans in multiple locations, allowing you to get the most less latency time to download any of our books like this one. Merely said, Active Learning For Hierarchical Text Classi Cation is universally compatible with any devices to read.

Find Active Learning For Hierarchical Text Classi Cation :

friendship stories kids global trend
math workbook grade 1 fan favorite
~~mindfulness meditation blueprint~~
~~primer gardening manual~~
picture book toddlers advanced strategies
teen self help guide collection
~~cooking techniques manual stories~~
reading comprehension workbook reference
~~digital literacy manual manual book~~
children bedtime story how to
AI in everyday life hardcover
children bedtime story advanced strategies
ebook teen self help guide
~~reader's choice personal finance literacy~~
international bestseller friendship stories kids

Active Learning For Hierarchical Text Classi Cation :

Quantitative Problem Solving Methods in the Airline Industry by C Barnhart · Cited by 62 — There are several common

themes in current airline Operations Research efforts. First is a growing focus on the customer in terms of: 1) what they want; 2) what ... Quantitative problem solving methods in the airline industry Quantitative Problem Solving Methods in the Airline Industry: A Modeling Methodology Handbook . New York: Springer, 2012. Web.. https://lccn.loc.gov/2011940035. Quantitative Problem Solving Methods in the Airline Industry This book reviews Operations Research theory, applications and practice in seven major areas of airline planning and operations. In each area, a team of ... Quantitative problem solving methods in the airline industry Quantitative problem solving methods in the airline industry: A modeling methodology handbook by Cynthia Barnhart and Barry Smith ... The full article is ... Quantitative Problem Solving Methods in the Airline Industry by C Barnhart · 2012 · Cited by 62 — By Cynthia Barnhart and Barry Smith; Quantitative Problem Solving Methods in the Airline Industry. Quantitative Problem Solving Methods in the Airline Industry A ... Quantitative Problem Solving Methods in the Airline Industry A Model. This book reviews Operations Research theory, applications and practice in seven major ... Quantitative problem solving methods in the airline industry Quantitative problem solving methods in the airline industry a modeling methodology handbook / ; Airlines > Management > Simulation methods. Operations research. Quantitative Problem Solving Methods in... book by Cynthia ... This book reviews Operations Research theory, applications and practice in seven major areas of airline planning and operations. Free ebook Quantitative problem solving methods in the ... Aug 16, 2023 — We come up with the money for quantitative problem solving methods in the airline industry a modeling methodology handbook international ... Quantitative Problem Solving Methods in the Airline ... Jul 15, 2020 — Quantitative Problem Solving Methods in the Airline Industry: A Modeling Methodology Handbook 1st Edition is written by Cynthia Barnhart; Barry ... Ceramics: Mastering the Craft: Zakin, Richard This wonderful book is a valuable resource whether you are starting out and want to experiment with different clay projects or want to refresh your memory. Ceramics: Mastering the Craft: Zakin, Richard A fascinating blend of the technical and aesthetic aspects of ceramics, this second edition features historical background information, analysis of image ... Mastering the Craft; CERAMICS: Ceramic Materials; Clay & Clay Bodies, Making & Buying; Surface Finishes; Glazes; Low/Mid & High-Fire Glazes; Color; Recipes. ; 20 color, profuse b&w; ... Ceramics: Mastering the Craft In Mastering the Craft, Richard Zakin provides information on ceramic materials, color development, clay bodies, vessel forms, creativity, imagery, surfaces, ... Ceramics: Mastering the Craft - Zakin, Richard A fascinating blend of the technical and aesthetic aspects of ceramics, this second edition features historical background information, analysis of image ... Ceramics: Mastering the Craft - Richard Zakin In Ceramics: Mastering the Craft, Richard Zakin has written a comprehensive handbook for everyone interested in working in ceramics. Ceramics Mastering The Craft Book A fascinating blend of the technical and aesthetic aspects of ceramics, this second edition features historical background information, analysis of image ... Ceramics: Mastering the Craft - Richard Zakin Title, Ceramics: Mastering the Craft Ceramics Series. Author, Richard Zakin. Edition, illustrated. Publisher, A & C Black, 1990. Ceramics: Mastering the

Craft by Richard Zakin - Paperback UNKNO. Used - Good. Good condition. A copy that has been read but remains intact. May contain markings such as bookplates, stamps, limited notes and ... Ceramics Mastering the Craft 9780801979910 Ceramics Mastering the Craft ; by sanithtuc ; Wonderful teacher and craftsman. Richard Zakin was my professor for two classes. He was wonderful. He was very ... 168 Sample Report Card Comments (Plus a Printable ... Nov 17, 2023 — Use these sample report card comments for report cards. We have comments for everything you'd want to tell parents about their student. 107 Report Card Comments to Use and Adapt Mar 17, 2023 — For example, you'll be able to take a 1st grade number sense comment ... Write 50 report card comments for students studying social studies in 5th ... 125 Report Card Comments - Education World It's report card time and you face the prospect of writing constructive, insightful, and original comments on a couple dozen report cards or more. Report Card comments Feb 10, 2008 — I googled "report card comments" and found a few neat sites with good examples. Here is a list of just about every comment imaginable. 15 Best Report Card Comments Samples 6 days ago — Example Report Card Comments · 1. _____ is an excellent student who always comes prepared for class. · 2. _____ is a smart and inquisitive ... 100 Report Card Comments You Can Use Now 100 report card comments you can use right now! Provide valuable and insightful feedback to parents and students with this comprehensive list. 325 amazing report card comments and remarks to save ... Apr 4, 2022 — What's more difficult than creating your student report cards? Writing unique and meaningful report card comments. Creating report card ... Second quarter Report Card Comments. First Quarter. It has been a joy getting to know _____ this quarter. She is a kind and caring student who is always willing to ... 180 Report Card Comments for All Grades in 2023 May 4, 2023 — 180 Report Card Comments. Positive and negative report card comment demo. Copy to Text Blaze. enthusiastic positive always ready enthusiasm 2