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申请年度：	2025

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考试时间: 2009 年 6 月



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Article

The Effects of Drought Stress Intensity and Duration on the Dynamics of Nonstructural Carbohydrates in *Pinus yunnanensis* Seedlings

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Abstract: How drought impacts the allocation of nonstructural carbohydrates (NSCs) in *Pinus yunnanensis* remains unclear. In this study, *Pinus yunnanensis* seedlings were subjected to four levels of drought stresses treatment during a 60-day experiment period, including suitable moisture (CK), light drought (LD), moderate drought (MD), and severe drought (SD). NSCs in needles, stems, coarse roots, and fine roots were measured every two weeks. The distribution of NSC in *P. yunnanensis* seedlings varied with both drought stress intensity and duration, with different organ-specific patterns under increasing drought stress. Before the first 15 days, the intensity of drought stress had no significant effect on needle, stem and coarse root NSC contents, but decreased fine root NSC contents significantly. Between day 30 and 45, drought stress intensity showed no significant effect on NSC content in all organs. However, at 60 d, compared with CK, stem NSC concentrations under MD and SD increased by 47.92% and 48.23%, whereas fine root NSC concentrations decreased by 23.38% under SD conditions. With the extension of the drought duration, coarse root NSC increased while fine root NSC content decreased under SD conditions. Our results highlight the important role played by drought duration in controlling the NSC dynamics. Only fine root NSC decreased at the initial stage, and day 60 emerged as a turning point at which organ-level NSC changes became noticeable. These findings provide great insights into the understanding of organ-specific NSC dynamics under drought stress.

Keywords: drought stress intensity; drought duration; *Pinus yunnanensis* seedlings; non-structural carbohydrates

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1. Introduction

Rapid changes in the global climate have increased the frequency and intensity of drought events, creating worrying phenomena such as forest decline [1]. In particular, rainfall patterns are changing across the globe, drought-induced forest mortality is increasing,



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考试时间：2020年 9 月

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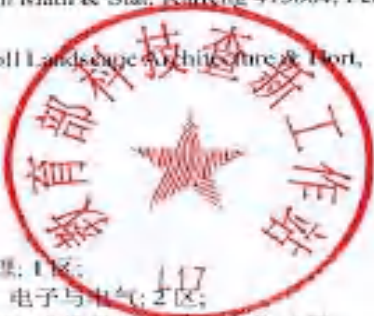
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专用章



1. MULTI-SEMANTIC MARKOV RANDOM FIELD MODEL FOR SEMANTIC SEGMENTATION OF HIGH-RESOLUTION REMOTE SENSING IMAGES

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Authors: Fu, Haoyu (1);Zheng, Chen (2);Xu, Weiheng (3);Zhao, Yili (3);Wang, Leiguang (4,5)

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Abstract: Remote sensing images have a large imaging field, covering a wide range of land surfaces and encompassing complex geographical scenes. More diverse land cover types and detailed structural information within geographical scenes can be observed with improved image spatial resolution. However, due to the high cost of annotating fine semantic scales, only a few semantic segmentation methods can fully utilize multi-level semantic information. This paper introduces a novel multi-semantic Markov Random Field (MRF-MS) model for semantic segmentation of high-resolution remote sensing images. This method extends the classical object-level Markov Random Field model by introducing a sub-label field to capture semantic hierarchical information in high-resolution images. Assuming the initial categories follow a mixture of Gaussian distribution, this method models the land cover types or structural details of geographical objects within the scene by decomposing the mixture of Gaussian distribution into sub-components. Furthermore, it establishes an interactive contextual structure between the sub-label and initial label fields to model the interaction across different semantic scales. Experimental results on multi-scene high-resolution remote sensing images demonstrate that this approach yields more accurate classification results compared to the latest MRF methods. ©2024 IEEE.

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Main heading: Gaussian distribution

Controlled terms: Image enhancement, Markov processes, Semantic Segmentation, Tropics

Uncontrolled terms: High-resolution remote sensing images, Imaging fields, Land-cover types, Markov Random Field model, Mixture of Gaussians, MRF, Multi-level semantic, Multilevels, Remote sensing images, Semantic segmentation

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OMRF-HS: Object Markov Random Field With Hierarchical Semantic Regularization for High-Resolution Image Semantic Segmentation

Haoyu Fu[✉], Ruiqi Yang[✉], Nan Chen[✉], Qinling Dai, Yili Zhao, Weiheng Xu, Guanglong Ou, Chen Zheng[✉], *Member, IEEE*, and Leiguang Wang[✉]

Abstract—As spatial resolution increases in remote-sensing imagery, the challenge of semantic segmentation intensifies due to the need to discern intricate changes in terrain. Terrain, a composite of diverse geographic elements arranged in specific spatial patterns, demands a higher level of abstraction in semantic categorization. Achieving accurate semantic segmentation in high-resolution remote-sensing images necessitates a profound understanding of the semantic structures within complex scenes. In response to this imperative, this article introduces the object Markov random field with hierarchical semantics (OMRF-HS) method. The primary contributions of this work are twofold: 1) effective representation of layered semantic information within images is achieved, enhancing the understanding of complex scenes and 2) unified under an object Markov random field (MRF) model, the method enables the joint modeling of structured semantics and spatial context information, facilitating more robust segmentation outcomes. Experimental evaluations conducted on multiscale high-resolution remote-sensing images from the aerial sensor, SPOT5, GeoEye, and Gaofen-2 satellites demonstrate that the proposed method outperforms state-of-the-art techniques, yielding superior segmentation accuracy. The availability of code and example data further facilitates the reproducibility and adoption of the OMRF-HS method, accessible at <https://github.com/FHY-146/OMRF-HS>.

Index Terms—High-resolution remote-sensing image, object Markov random field (MRF), semantic and spatial regularization.

I. INTRODUCTION

HIGH spatial resolution remote-sensing imagery can provide detailed surface information over a large area. Semantic segmentation of such imagery offers essential foundational support for applications such as detailed land cover mapping, intelligent cities, precision agriculture, and environmental monitoring [1], [2], [3]. Currently, a substantial amount of work is dedicated to the task of semantic segmentation of high-resolution remote-sensing images [4], [5], [6]. In high-resolution remote-sensing imagery, variations in spectral information do not precisely reflect the actual changes in ground objects or scenes. The alteration of semantic labels often exhibits a lagging characteristic. In such cases, inferring labels through spectral information is a challenging task. Therefore, most studies focus on how to incorporate more effective spatial information into the model [7], [8], [9].

Deep learning models possess strong capabilities in spatial context modeling, and with the increasing availability of remote-sensing data, various architectures of neural networks have achieved significant success in the semantic segmentation of high-resolution remote-sensing imagery [10], [11], [12]. The end-to-end training approach of deep learning allows for the gradual extraction of information from shallow spatial features to deep abstract semantic information in images [13], [14], [15], thereby better understanding different terrains and scenes. However, deep learning methods require extensive, finely annotated data. Consequently, many studies focus on model-driven approaches, including filtering [16], [17], re-learning [18], and random fields [19], [20]. These methods effectively leverage prior models to integrate domain knowledge, reducing reliance on large amounts of labeled data.

Random fields are probabilistic graphical models with comprehensive theoretical support, enhancing the understanding of the contextual information in images by establishing spatial correlations between nodes. Representative random field models include Markov random fields (MRFs) [21], [22], [23] and conditional random fields (CRFs) [24], [25], [26]. CRFs can be regarded as a particular type of MRFs that directly model the posterior probability. In the semantic segmentation

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12	承诺书	33

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	获硕士学位单位	(10676) 云南农业大学		
	硕士学位专业	(082800) 农业工程		
获硕士学位年月	20250601000000	硕士学位证书编号	暂无	

联系信息	通讯地址	云南省昆明市盘龙区沣源路 452 号		
	邮政编码	650201		
	固定电话	0	移动电话	13577464532
	电子信箱	2205520365@qq.com		
报考信息	报考单位	(10677) 西南林业大学		
	报考院系所	(001) 林学院		
	报考专业	(090704) 森林经理学		
	报考研究方向	(05) 林业大数据		
	报考博导姓名	代飞		
	报考类别	(11) 非定向就业		
	定向就业单位所在地			
	定向就业单位			
外语和学术能力	外语能力	CET-4		
	学术能力	第一作者发表论文《Construction and analysis of students' physical health portrait based on principal component analysis improved Canopy-K-means algorithm》(SCI 中科院 3 区, IF=2.5)		
	备用信息 1			
	备用信息 2			
其他	报名时间	2025-04-24 16:56:59	最后修改时间	2025-04-24 17:36:01
	考生登录用户名	20210072	报名信息简表生成时间	2025-05-06 15:42:41

4、 外语能力证书

全国大学英语四级考试 成绩报告单



姓 名: 季荣彪
学 校: 云南农业大学
院 系: 大数据学院
身份证号:

笔 试

准考证号: 530030191117101

考试时间: 2019年6月

总分	听力 (35%)	阅读 (35%)	写作和翻译 (30%)
427	156	137	134

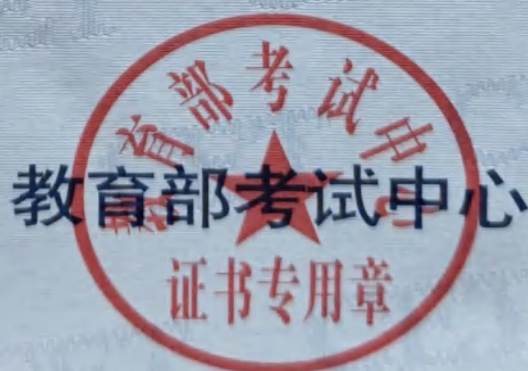
口 试

准考证号: --

考试时间: --

等级	--
----	----

成绩报告单编号: 191153003000153



5、 学术能力证明材料

报告编号: (2024)YNAU00420

论文和期刊收录/引用检索报告

项目名称: 季荣彪论文被数据库收录情况

委托人: 云南农业大学 季荣彪

委托时间: 2024年9月9日

检索机构: 云南农业大学图书馆

完成时间: 2024年9月9日



一、项目的技术要求

季荣彪发表论文被 SCI 数据库收录、影响因子、中科院分区等情况。

二、检索数据库

1.数据库

(1) Science Citation Index Expanded (SCI-E)

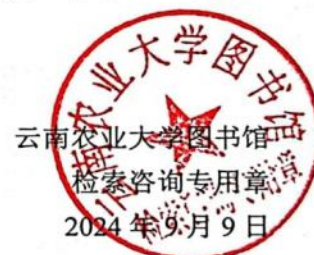
(2) 中国科学院文献情报中心期刊分区表

2.检索策略：题名 作者 单位 期刊名称

三、检索结论

依照用户委托，通过以上数据库检索，季荣彪发表的 5 篇论文：5 篇被 SCI 数据库收录，详细情况见附表（SCI 数据库收录情况）。

查新员(签字):  查新员职称: 高工



附表 SCI 数据库收录情况

序号	论文题录信息	作者排名	作者单位	文献类型	SCI 影响因子(年份)	中科院分区(大类/年份)	Top 期刊
1	Ji Rongbiao, Yang Jianke, Wu Yehui, Li Yadong, Li Rujia, Chen Jiaojiao, Yang Jianping*. Construction and analysis of students' physical health portrait based on principal component analysis improved Canopy-K-means algorithm[J]. JOURNAL OF SUPERCOMPUTING, 2024, 80(11): 15940-15973.	第一作者	云南农业大学	Article	2.5 (2023)	计算机科学 3 区 (2023)	否
2	Yehui Wu#, Canyu Wang#, Rongbiao Ji, Yadong Li, Junkui Yang, Yixuan Wang, Rujia Li, Mengyao Wu, Jiaojiao Chen, Jianping Yang*. Metricizing policy texts: Comprehensive dataset on China's Agri-policy intensity spanning 1982-2023[J]. Scientific Data, 2024, 11(1): 528.	第三作者	云南农业大学	Article	5.8 (2023)	综合性期刊 2 区 (2023)	否
3	Li Yadong, Rujia Li, Rongbiao Ji, Yehui Wu, Jiaojiao Chen, Mengyao Wu, Jianping Yang*. Research on Factors Affecting Global Grain Legume Yield Based on Explainable Artificial Intelligence[J]. AGRICULTURE-BASEL, 2024, 14(3): 438.	第三作者	云南农业大学	Article	3.3 (2023)	农林科学 2 区 (2023)	否
4	Rujia Li, Weibo Qin, Yiting He, Yadong Li, Rongbiao Ji, Yehui Wu, Jiaojiao Chen, Jianping Yang*. Method for the classification of tea diseases via weighted sampling and hierarchical classification learning[J]. International Journal of Agricultural and Biological Engineering, 2024, 17(3): 211-221.	第五作者	云南农业大学	Article	2.2 (2023)	农林科学 2 区 (2023)	否
5	Rujia Li#, Yiting He#, Yadong Li, Weibo Qin, Arzlan Abbas, Rongbiao Ji, LiShuang, WuYehui, SunXiaohai, Jianping Yang*. Identification of cotton pest and disease based on CFNet-VoV-GCSP-LSKNet-YOLOv8s: a new era of precision agriculture[J]. Frontiers in Plant Science, 2024, 15: 1348402.	第六作者	云南农业大学	Article	4.1 (2023)	生物学 2 区 (2023)	是

注: *代表通讯作者, #代表共同第一作者。

预期成果	公开发表论文 1 篇
实际成果 目录	在 The Journal of Supercomputing 期刊公开发表题为《Construction and analysis of students' physical health portrait based on principal component analysis improved Canopy-K-means algorithm》(IF=3.3) 的论文
验收方式	☒ 书面验收 ☐ 会议验收
学校意见	情况属实，同意通过验收，并报省教育厅备案。 经办人：美永开 2024年5月10日 
省教育厅意见	同意备案。 经办人：  

云南省教育厅科学研究基金项目验收证书

项目名称	基于农业类院校大学生体质健康测试数据的学生画像模型的构建研究		
项目负责人	季荣彪	批准号	2023Y1039
验收号	验字〔2024〕0539号		
项目组成员	季荣彪，吴叶辉，李亚东，陈娇娇，李汝嘉，陈健，林冲		
研究时间	2023年3月1日—2024年2月1日		
研究内容	1、调研目前国内外关于学生画像的研究现状，以及现有的画像系统，明确基于大学生体质健康测试数据构建学生画像的意义。 2、针对大学生体质健康测试数据的特点以及学生画像的实际应用设计学生画像标签体系。 3、研究画像构建的关键技术，针对不同的数据类型设计合理准确的标签提取算法。 4、针对大学生体质健康测试数据的统计结果以及学生标签对学生在身体健康、体能、生活以及心理方面出现的异常进行预警。 5、利用统计图表或词云图，对学生的画像信息与该学生存在的预警信息进行可视化展示。		



Construction and analysis of students' physical health portrait based on principal component analysis improved Canopy-K-means algorithm

Rongbiao Ji¹ · Jianke Yang^{2,3} · Yehui Wu¹ · Yadong Li¹ · Rujia Li¹ · Jiaojiao Chen¹ · Jianping Yang¹

Accepted: 18 March 2024

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Abstract

With the advancement of society and the improvement of living standards, the significance of students' physical health has become increasingly prominent. However, currently, the assessment and analysis of students' physical health heavily depend on conventional statistical methods. Even with the application of data mining-related methodologies for analysis and evaluation, the exploitation and utilization of physical health big data remain relatively restricted. In this paper, an improved Canopy-K-means algorithm based on principal component analysis (PCA) is used to construct and analyze a portrait of students' physical fitness and health. The method combines data dimensionality reduction techniques and cluster analysis techniques, and its combined performance is the best compared to other algorithms in the ablation experiments for both male and female student data groups. In this paper, the algorithm was used to process the grouping of physical fitness test data of male and female students, realize the construction and analysis of students' physical fitness and health portrait, and give the exercise prescription for different categories of students. In this paper, the physical health test data of students of Yunnan Agricultural University in 2020–2022 were collected to carry out experiments, and the results found that there are differences in physical health status among students of different genders, grades, and majors in this university, and the physical health status of the students of Classes 2018 and 2019 is generally deficient; on different majors, the students of the Faculty of Agricultural Sciences are slightly superior to the Faculty of Science and Technology, and the students of the Faculty of Science and Technology are slightly superior to the students of the Faculty of Humanities and Social Sciences. Our study offers novel methods and ideas for the assessment and analysis of students' physical health, holding significant implications for schools and related

Jianping Yang, Yehui Wu, Yadong Li, Rujia Li, Jiaojiao Chen and Jianping Yang have contributed equally to this work.

Extended author information available on the last page of the article

Published online: 08 April 2024

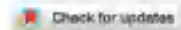
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西南林业大学博士研究生招生 “申请-审核制”审核材料

申请人姓名：	李初蕤
申请导师：	强振平
申请专业：	(090704) 森林经理学
申请学院：	(001) 林学院
考生类别：	往届毕业生
申请年度：	2025

scientific reports



OPEN Distribution patterns and potential suitable habitat prediction of *Ceracris kiangsu* (Orthoptera: Arcypteridae) under climate change- a case study of China and Southeast Asia

Churui Li^{1,4}, Guangfei Luo^{2,4}, Cairong Yue^{1,3}, Lanzhong Zhang¹, Yunfang Duan¹, Yu Liu², Song Yang², Zemin Wang² & Peng Chen³

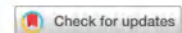
Ceracris kiangsu (Orthoptera: Arcypteridae), is greatly affected by climatic factors and exhibits strong adaptability, posing a serious threat to the ecological environment. Therefore, predicting its potential suitable habitat distribution provides a proactive theoretical basis for pest control. This study using the Biomod2 package of R simulated and predicted the current and future potential distribution, area changes, changes in the center points of suitable habitats, and niche shifts of *C. kiangsu* under two different greenhouse gas emission scenarios, SSP1-26 and SSP5-85. The results show that: (1) Currently, the high suitability areas for *C. kiangsu* are mainly distributed in Yunnan, Jiangxi, Hunan provinces in southern China and phongsaly province in northern Laos. In the future, the center of the suitable habitat distribution pattern of *C. kiangsu* will remain unchanged, primarily expanding outward from medium and high suitability areas. Additionally, significant suitable habitats for *C. kiangsu* were discovered in Southeast Asian countries without previous pest records. (2) Compared to the present, the overall suitable habitat area for *C. kiangsu* is expected to expand, particularly under the SSP5-85 climate change scenario. (3) In the SSP1-26 and SSP5-85 climate scenarios, the geometric center of the suitable habitat generally shows a trend of gradually shifting northeast. (4) Under different climate scenarios, the suitable habitat of *C. kiangsu* has highly overlapping, indicating that the suitable habitat of *C. kiangsu* in the invaded areas is broader than in its native regions. In conclusion, the research findings represent a breakthrough in identifying the potential distribution areas of *C. kiangsu*, which is of great practical significance for the monitoring and control of *C. kiangsu* pest infestation in China and Southeast Asian countries.

Keywords Biomod2, *Ceracris kiangsu*, Climate change, Forest pest

Global climate change represents one of the foremost challenges facing modern society¹. As ectothermic organisms, insects rely entirely on external temperatures for their growth, development, and various physiological activities². A Warming climate accelerates the developmental rate of insects throughout all life stages in all periods. It has been observed that the developmental period of each life stage of *Acanthoscelides obtectus* (Coleoptera: Bruchidae) shortens with increasing temperatures, and a positive correlation between developmental rate and temperature has been established³. A study investigating the impact of climatic conditions in China on the flight behaviour of *S. gregaria* (Orthoptera: Acrididae) found that extreme weather events, such as tropical cyclones, have created favorable conditions for the migration of *S. gregaria* towards the southern Tibetan border of China, thereby posing significant risks to agricultural and ecological systems⁴. Luo et al.⁵ sought to examine changes in the suitable habitats of *Calliptamus italicus* (Orthoptera: Oedipodidae) and *Gomphocerus*

¹College of Forestry, Southwest Forestry University, Kunming 650224, China. ²Jiangcheng County Forestry and Grassland Bureau, Pu'er 665900, China. ³Yunnan Academy of Forestry and Grassland, Yunnan Province, Kunming 650201, China. ⁴These authors contributed equally: Churui Li and Guangfei Luo. ⁵email: cryue@163.com

scientific reports



OPEN Distribution patterns and potential suitable habitat prediction of *Ceracris kiangsu* (Orthoptera: Arcypteridae) under climate change- a case study of China and Southeast Asia

Churui Li^{1,4}, Guangfei Luo^{1,4}, Cairong Yue^{1✉}, Lanzhong Zhang¹, Yunfang Duan¹, Yu Liu², Song Yang², Zemin Wang² & Peng Chen³

Ceracris kiangsu (Orthoptera: Arcypteridae), is greatly affected by climatic factors and exhibits strong adaptability, posing a serious threat to the ecological environment. Therefore, predicting its potential suitable habitat distribution provides a proactive theoretical basis for pest control. This study using the Biomod2 package of R simulated and predicted the current and future potential distribution, area changes, changes in the center points of suitable habitats, and niche shifts of *C. kiangsu* under two different greenhouse gas emission scenarios, SSP1-26 and SSP5-85. The results show that: (1) Currently, the high suitability areas for *C. kiangsu* are mainly distributed in Yunnan, Jiangxi, Hunan provinces in southern China and phongsaly province in northern Laos. In the future, the center of the suitable habitat distribution pattern of *C. kiangsu* will remain unchanged, primarily expanding outward from medium and high suitability areas. Additionally, significant suitable habitats for *C. kiangsu* were discovered in Southeast Asian countries without previous pest records. (2) Compared to the present, the overall suitable habitat area for *C. kiangsu* is expected to expand, particularly under the SSP5-85 climate change scenario. (3) In the SSP1-26 and SSP5-85 climate scenarios, the geometric center of the suitable habitat generally shows a trend of gradually shifting northeast. (4) Under different climate scenarios, the suitable habitat of *C. kiangsu* has highly overlapping, indicating that the suitable habitat of *C. kiangsu* in the invaded areas is broader than in its native regions. In conclusion, the research findings represent a breakthrough in identifying the potential distribution areas of *C. kiangsu*, which is of great practical significance for the monitoring and control of *C. kiangsu* pest infestation in China and Southeast Asian countries.

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Global climate change represents one of the foremost challenges facing modern society¹. As ectothermic organisms, insects rely entirely on external temperatures for their growth, development, and various physiological activities². A Warming climate accelerates the developmental rate of insects throughout all life stages in all periods. It has been observed that the developmental period of each life stage of *Acanthoscelides obtectus* (Coleoptera: Bruchidae) shortens with increasing temperatures, and a positive correlation between developmental rate and temperature has been established³. A study investigating the impact of climatic conditions in China on the flight behaviour of *S. gregaria* (Orthoptera: Acrididae) found that extreme weather events, such as tropical cyclones, have created favorable conditions for the migration of *S. gregaria* towards the southern Tibetan border of China, thereby posing significant risks to agricultural and ecological systems⁴. Luo et al.⁵ sought to examine changes in the suitable habitats of *Calliptamus italicus* (Orthoptera: Oedipodidae) and *Gomphocerus*

¹College of Forestry, Southwest Forestry University, Kunming 650224, China. ²Jiangcheng County Forestry and Grassland Bureau, Pu'er 665900, China. ³Yunnan Academy of Forestry and Grassland, Yunnan Province, Kunming 650201, China. [✉]These authors contributed equally: Churui Li and Guangfei Luo. [✉]email: cryue@163.com

Habitat Suitability Evaluation and Ecological Corridor Construction of Asianelephants: The Case of Jiangcheng, a New Range for Elephants in Southwestern China

Lanzhong Zhang ^{1,a}, Churui Li ^{1,a}, Cairong Yue ^{1,*}, Hongbin Luo ¹, Xin Li ¹, Qiongfeng Yu ¹, Jia Li ¹, Jian Shen ¹, Song Yang ³ and Fei Chen ²

¹ College of Forestry, Southwest Forestry University, Kunming 650224, China

² Asian elephants Research Center, State Forestry and Grassland Administration, Kunming 650224, China

³ Jiangcheng County Forestry and Grassland Bureau 665900, China

* Correspondence: Cairong Yue, College of Forestry, Southwest Forestry University, E-mail: cryue@swfu.edu.cn

^a These authors contributed equally to this work.

Abstract: In recent years, the northward migration of elephant herds in China's Yunnan Province has attracted unprecedented public attention to the conservation of Asian elephants, with habitat fragmentation and human disturbance thought to be key factors. In this study, we took Jiangcheng, a new distribution site for Asian elephants in southwest China, as an example, combined the available remote sensing and monitoring data with the MaxEnt model to analyze the factors affecting the activities of Asian elephants under the conditions of human disturbance and habitat degradation, the Least Cumulative Resistance model was utilized to construct the potential ecological dispersal corridors, the key corridors were identified through the gravity model, so as to explore the ecological security pattern of the Asian Elephant Habitat in Jiangcheng County. The results show that the habitat of Asian elephants in Jiangcheng County is fragmented, showing a north-south strip distribution, never moving to the northeast, the existing suitable habitat is located in the low elevation area (<1500 m), which is close to water sources and roads, there is no nature reserve in this area. The land use type is mainly scrub or grassland near mountain forests and its cultivated land, human-elephant conflicts occur frequently. There are 14 ecological source areas, which are mainly distributed in the two regions of Zhengdong and Kangping, and there are 92 ecological corridors, of which, 3 are important corridors and 89 are general corridors. This study comprehensively analyzes the current status and connectivity of Asian elephant habitat in Jiangcheng County at the regional scale, which helps to optimize the pattern of suitable habitat, promotes the dispersal of Asian elephants and habitat connectivity, provides realistic guidance and basic information for the conservation planning of isolated populations of this species and their habitats.

Keywords: elephants; ecological corridor; habitat; habitat suitability; MaxEnt; Yunnan north-migrating elephant herd

1. Introduction

The Asian elephant, *Elephas maximus*, is the most representative umbrella species in tropical forest ecosystems and is listed as an endangered (EN) species by the International Union for Conservation of Nature (IUCN) and is protected by law [1]. At the same time, elephant conservation, management and research are specific responses to the 15th United Nations Convention on Biological Diversity, known as the Kunming Declaration. Its habitat range is substantially influenced by topography and vegetation type [2,3]. The most suitable habitat for Asian elephants is low-altitude river valleys, and areas rich in tropical plants are their preferred habitat [4]. Currently, the main threats to the survival of wild



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申请人姓名：	刘国玺
申请导师：	代飞
申请专业：	(090704) 森林经理学
申请学院：	(001) 林学院
考生类别：	应届毕业生
申请年度：	2025

4、 外语能力证书

报告编号: J20255001266803359



报告验真

检索报告

检索主题: 刘国玺发表论文收录情况

委 托 人: 西南林业大学

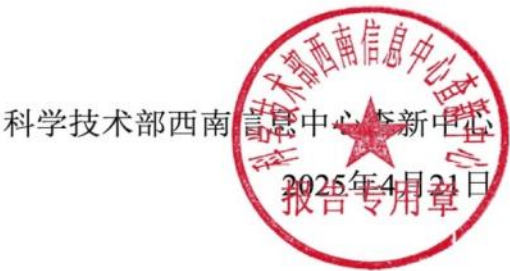
数 据 库: SCI、EI

检索时间: 2025年4月21日

检索结果:

根据委托人本次委托要求, 在上述数据库范围内, 刘国玺发表论文收录情况如下表:

委托要求		检索结果
数据库	委托篇数	收录篇数
SCI	3	0
EI	3	2



一、检索结果附表

序号	论文信息	收录情况	期刊指标
1	Liu Guoxi, Liu Guozhi, Chai Xinzhuo, Li Lecheng, Dai Fei, Huang Bi. Crack-DETR: Complex Pavement Crack Detection by Multi-frequency Feature Extraction and Fusion. IEEE Sensors Journal, 2025.	EI	JCR影响因子(2023):4.3 中科院分区(2023升级版): 大类:综合性期刊2区
2	Guoxi Liu, Xiaojing wu, Fei Dai, Guozhi Liu, Lecheng Li, Bi Huang. Crack-MsCGA: A Deep Learning Network with Multi-Scale Attention for Pavement Crack Detection. Sensors.2025. 25 (8), 2446.	-	JCR影响因子(2023):3.4 中科院分区(2023升级版): 大类:综合性期刊3区
3	Liu Guoxi, Huang Bi, Liu Ning, Wu Xiaojing, Yang Li, Dai Fei. Pavement Crack Detection Based on Channel Attention Mechanism. Proceedings - 2024 IEEE Cyber Science and Technology Congress, CyberSciTech 2024, 2024: p 280-287.	EI	-

西南信息中心
奇缝

检索员（签章）王敏

科学技术部西南信息中心李新中心



Crack-DETR: Complex Pavement Crack Detection by Multi-frequency Feature Extraction and Fusion

Publisher: IEEE

Cite This



Guoxi Liu ; Guozhi Liu; Xinzhuo Chai; Lecheng Li; Fei Dai ; Bi Huang All Authors

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Abstract

Abstract:

Automated detection of pavement cracks plays a crucial role in road maintenance and traffic safety. However, pavement crack detection under noisy conditions is challenging due to the complex expression forms of pavement cracks and the presence of multi-type background noise. In this paper, we propose Crack-DETR, an efficient pavement crack detection deep learning network, that can detect complex pavement cracks from complex background noise. In this network, we first propose a Multi-frequency Feature Extraction and Fusion (MFEF) block to enhance pavement crack features and suppress background noise from both high-frequency and low-frequency perspectives in two stages: multi-frequency feature extraction and multi-frequency feature fusion. In the multi-frequency feature extraction stage, we design a high-frequency attention mechanism to extract high-frequency features from high-level features. Then, we propose a low-frequency attention mechanism to capture low-frequency features of high-level features. In the multi-frequency feature fusion stage, we fuse the high- and low-frequency features through intra-frequency feature fusion and cross-frequency feature fusion. Secondly, we propose an evaluating metric, Diagonal Intersection over Union (DIOU), to enhance the loss function of Crack-DETR, improving the learning effectiveness of the model. Finally, we conduct

Authors

Keywords

Metrics

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5、 学术能力证明材料

报告编号: J20255001266803359



报告验真

检 索 报 告

检索主题: 刘国玺发表论文收录情况

委 托 人: 西南林业大学

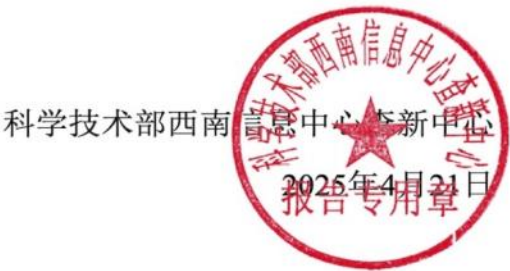
数 据 库: SCI、EI

检索时间: 2025年4月21日

检索结果:

根据委托人本次委托要求, 在上述数据库范围内, 刘国玺发表论文收录情况如下表:

委托要求		检索结果
数据库	委托篇数	收录篇数
SCI	3	0
EI	3	2



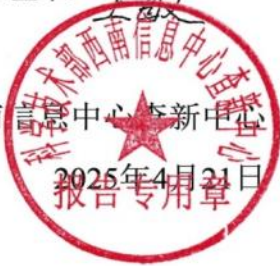
一、检索结果附表

序号	论文信息	收录情况	期刊指标
1	Liu Guoxi, Liu Guozhi, Chai Xinzhuo, Li Lecheng, Dai Fei, Huang Bi. Crack-DETR: Complex Pavement Crack Detection by Multi-frequency Feature Extraction and Fusion. IEEE Sensors Journal, 2025.	EI	JCR影响因子(2023):4.3 中科院分区(2023升级版): 大类:综合性期刊2区
2	Guoxi Liu, Xiaojing wu, Fei Dai, Guozhi Liu, Lecheng Li, Bi Huang. Crack-MsCGA: A Deep Learning Network with Multi-Scale Attention for Pavement Crack Detection. Sensors.2025. 25 (8), 2446.	-	JCR影响因子(2023):3.4 中科院分区(2023升级版): 大类:综合性期刊3区
3	Liu Guoxi, Huang Bi, Liu Ning, Wu Xiaojing, Yang Li, Dai Fei. Pavement Crack Detection Based on Channel Attention Mechanism. Proceedings - 2024 IEEE Cyber Science and Technology Congress, CyberSciTech 2024, 2024: p 280-287.	EI	-



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Crack-DETR: Complex Pavement Crack Detection by Multi-frequency Feature Extraction and Fusion

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Abstract

Abstract:

Automated detection of pavement cracks plays a crucial role in road maintenance and traffic safety. However, pavement crack detection under noisy conditions is challenging due to the complex expression forms of pavement cracks and the presence of multi-type background noise. In this paper, we propose Crack-DETR, an efficient pavement crack detection deep learning network, that can detect complex pavement cracks from complex background noise. In this network, we first propose a Multi-frequency Feature Extraction and Fusion (MFEF) block to enhance pavement crack features and suppress background noise from both high-frequency and low-frequency perspectives in two stages: multi-frequency feature extraction and multi-frequency feature fusion. In the multi-frequency feature extraction stage, we design a high-frequency attention mechanism to extract high-frequency features from high-level features. Then, we propose a low-frequency attention mechanism to capture low-frequency features of high-level features. In the multi-frequency feature fusion stage, we fuse the high- and low-frequency features through intra-frequency feature fusion and cross-frequency feature fusion. Secondly, we propose an evaluating metric, Diagonal Intersection over Union (DIOU), to enhance the loss function of Crack-DETR, improving the learning effectiveness of the model. Finally, we conduct

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Keywords

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Crack-MsCGA: A Deep Learning Network with Multi-Scale Attention for Pavement Crack Detection

by Guoxi Liu ^{1,†}, Xiaojing Wu ^{1,†}, Fei Dai ¹, Guozhi Liu ², Lecheng Li ¹ and Bi Huang ^{1,*}¹ College of Big Data and Intelligent Engineering, Southwest Forestry University, Kunming 650224, China² School of Computer Science and Engineering, South China University of Technology, Guangzhou 510641, China

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Abstract

Pavement crack detection is crucial for ensuring road safety and reducing maintenance costs. Existing methods typically use convolutional neural networks (CNNs) to extract multi-level features from pavement images and employ attention mechanisms to enhance global features. However, the fusion of low-level features introduces substantial interference, leading to low detection accuracy for small-scale cracks with subtle local structures and varying global morphologies. In this paper, we propose a computationally efficient deep learning network with CNNs and multi-scale attention for multi-scale crack detection, named Crack-MsCGA. In this network, we avoid fusing low-level features to reduce noise interference. Then, we propose a multi-scale attention mechanism (MsCGA) to learn local detail features and global features from high-level features, compensating for the reduced detailed information. Specifically, first, MsCGA employs local window attention to learn short-range dependencies, aggregating local features within each window. Second, it applies a cascaded group attention mechanism to learn long-range dependencies, extracting global features across the entire image. Finally, it uses a multi-scale attention fusion strategy based on Mixed Local Channel Attention (MLCA) selectively to fuse local features and global features of pavement cracks.



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项目名称：西南林业大学马晨灏发表论文被 SCI 收录、期刊影响因子及中科院 JCR 分区情况

委 托 人：马晨灏

委托日期：2025 年 03 月 25 日

完成日期：2025 年 03 月 25 日

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西南林业大学马晨灏发表论文被 SCI 收录、期刊影响因子及中科院 JCR 分区情况。

1. 标题: **FasterMLP efficient vision networks combining attention mechanisms and wavelet downsampling**

作者: Ma, CH(Ma, Chenhao)[1];Liu, XY(Liu, Xueyuan)[4];Cao, Y(Cao, Yong)[1,3];Rong, J(Rong, Jian)[1,2,3];

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1. 标题: **FasterMLP efficient vision networks combining attention mechanisms and wavelet downsampling**

作者: Ma, CH(Ma, Chenhao)[1];Liu, XY(Liu, Xueyuan)[4];Cao, Y(Cao, Yong)[1,3];Rong, J(Rong, Jian)[1,2,3];

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ISSN: 2045-2322

(二) 期刊影响因子 (IF)

期刊名称	影响因子	
	2023 年	五年影响因子
SCIENTIFIC REPORTS	3.8	4.3

(三) 中国科学院 JCR 期刊分区(2023 年)

期刊全称	ISSN	所属大类	大类分区	Top 期刊
SCIENTIFIC REPORTS	2045-2322	综合性期刊	2	不是

四、检索结论

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(一) **SCI** 收录: 西南林业大学马晨灏以第一作者发表的 1 篇论文被 **SCI-E** 收录。

(二) 期刊影响因子见上表;

(三) 中国科学院 **JCR** 期刊分区见上表。

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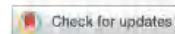
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2025 年 03 月 25 日



OPEN FasterMLP efficient vision networks combining attention mechanisms and wavelet downsampling

Chenhao Ma¹, Xueyuan Liu⁴, Yong Cao^{1,3} & Jian Rong^{1,2,3}✉

The integration of Multi-layer Perceptrons (MLPs), Convolutional Neural Networks (CNNs), and attention mechanisms has been demonstrated to significantly enhance model performance across various computer vision tasks. In this paper, a novel lightweight neural network architecture, FasterMLP, is proposed to achieve high computational efficiency and accuracy, particularly in resource-constrained and real-time applications. FasterMLP is designed to combine the local connectivity and weight-sharing properties of CNNs with the global feature representation capabilities of MLPs, while feature extraction is enhanced through the Convolutional Block Attention Module and spatial dimensions are effectively reduced using Haar wavelet downsampling without sacrificing critical feature information. The architecture, structured into four stages, has been rigorously evaluated on multiple benchmarks. On the ImageNet-1K dataset, a top-1 accuracy 3.9% higher than that of MobileViT-XXS is achieved by FasterMLP-S, while being 2× and 2.7× faster on GPU and CPU, respectively. On the COCO dataset, the performance of FasterMLP-L is shown to be comparable to FasterNet-L with significantly fewer parameters, and on the Cityscapes dataset, a mean Intersection-over-Union of 81.7% is achieved, surpassing existing methods such as CCNet and DANet. These results demonstrate that FasterMLP can effectively balance computational efficiency and accuracy, making it particularly suitable for visual perception tasks in resource-constrained and real-time environments such as autonomous driving. Code is available at <https://github.com/windisl/FasterMLP>.

Keywords Multi-layer perceptrons, Haar wavelet downsampling, Channel attention, Spatial attention

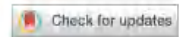
In the field of computer vision, Vision Transformers (ViTs) have gained significant attention in recent years due to their exceptional modeling capabilities and impressive performance^{1–3}. However, as model sizes and parameter counts grow rapidly, ViTs such as Swin Transformer V2 and V-MoE, while achieving higher accuracy, also impose substantial computational costs and resource demands^{4,5}. In scenarios requiring real-time responsiveness, such as autonomous driving, this heavy computational load renders these models impractical^{6–8}. Although recent studies focus on reducing model parameters or computational overhead (e.g., FLOPs), they often overlook critical metrics like inference speed, which is crucial for real-time applications.

Traditional Multi-layer Perceptron (MLP) networks, although optimized for feature representation, suffer from inefficiencies due to dense connectivity, especially when processing large-scale data. Moreover, MLPs lack the ability to handle spatial hierarchies, an essential characteristic for processing visual information effectively. In terms of lightweight and efficient network design, existing methods still face considerable challenges.

To address these limitations, this paper proposes a novel network architecture, FasterMLP, which combines the local connectivity and weight-sharing properties of Convolutional Neural Networks (CNN) with the robust feature representation capabilities of MLPs. This hybrid design is specifically tailored for high-efficiency applications, particularly in autonomous driving. By integrating the strengths of CNNs and MLPs, FasterMLP achieves a significant reduction in computational costs, as evidenced by its lower FLOPs, while also delivering superior inference speed, demonstrated by reduced latency in experimental evaluations. These improvements make FasterMLP well-suited for scenarios demanding real-time responsiveness without compromising accuracy.

The core innovation of this work lies in the integration of convolutional modules, the Convolutional Block Attention Module (CBAM), and Haar wavelet downsampling into a unified lightweight architecture. This combination enables efficient feature extraction and expression in real-time scenarios, outperforming

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OPEN FasterMLP efficient vision networks combining attention mechanisms and wavelet downsampling

Chenhao Ma¹, Xueyuan Liu⁴, Yong Cao^{1,3} & Jian Rong^{1,2,3}✉

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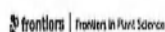
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DOI: 10.1002/for



Estimation of *Dendrocalamus giganteus* leaf area index by combining multi-source remote sensing data and machine learning optimization model

Zhen Qin¹, Huanfen Yang², Qinglai Shu^{1*}, Jingye Yu¹,
Zhengdao Yang³, Xu Ma³ and Qandan Duan⁴

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The Leaf Area Index (LAI) is an essential parameter that affects the exchange of energy and materials between the vegetation canopy and the surrounding environment. Estimating LAI using machine learning models with remote sensing data has become a prevalent method for large-scale LAI estimation. However, existing machine learning models have exhibited various biases. Inheriting the accurate estimation of LAI, thus, a new method for large-scale estimation of *Dioscorea alata* LAI was proposed, which by integrating ICE3D-STATSLA and Sentinel-2/3 data, and refines machine learning models through the application of Bayesian Optimization (BO). Particle Swarm Optimization (PSO), Genetic Algorithm (GA) and Simulated Annealing (SA). First, spatial interpolation was performed using the Multi-Stage Geostatistical Conditional Spatial GSGS method. Then, hierarchical remote sensing data were leveraged to optimize feature variables through the Pearson correlation coefficient approach. Subsequently, optimization algorithms were applied to Random Forest Regression (RFR), Gradient Boosting Regression Tree (GBRT), and Support Vector Machine Regression (SVR) models, yielding an efficient large-scale LAI estimation. The results showed that the BO-GBRT model achieved high accuracy in LAI estimation, with a coefficient of determination (R^2) of 0.932, a root mean square error (RMSE) of 0.263, a mean absolute error (MAE) of 0.137, and an overall estimation accuracy (OAI) of 92.38%. Compared to existing machine learning methods, the proposed approach demonstrated superior performance. This method holds significant potential for large-scale forest LAI estimation and can facilitate further research on other forest structural parameters.

KEYWORDS: learned data, remote sensing data, sequential queries, conditional distribution, acquisition algorithm, L2L machine learning models

Logistics & Risk Value

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Article

Zhen Qin ¹✉, Huanfen Yang ¹, Qinglai Shu ^{1,4}✉, Jingye Yu ²✉, Li Xu ¹✉, Mingxiao Wang ¹, Cuifen Xia
and Dandan Duan ³

[illegible]² School of Ecology and Applied Microbiology, Nanjing University of Information Science & Technology² Information Technology Research Center, Beijing Academy of Agriculture and Forestry Sciences.

* ទំព័រទាំងស្រុងនៅលើទំព័រ ២៤, ទំព័រ ២៥

Abstract: The Local Area Index (LAI) plays a crucial role in assessing the health of forest ecosystems. This study utilized ICESat-2/LAIs as the primary information source, integrating 18 measured variables such as canopy height, canopy density, and canopy cover, along with 60 derived variables, and employed the Sequential Gaussian Conditional Simulation (SGCS) method to determine surface ground elevation for the study area. The backscattering coefficient and texture feature index from Sentinel-2, as well as the spatial trend and vegetation index from Sentinel-2, were integrated. The random forest (RF), gradient boosted regression tree (GBRT) model, and XGBoost neighbor (XGB) method were employed to estimate the LAI estimation model. The optimal model RF was selected to conduct accuracy analysis of various remote sensing data combinations. The spatial distribution map of *Fimbristylis spicata* in Yangping County was then generated using the optimal combination model. The findings reveal the following: (1) Few key parameters—optimal fitted regression linear slope, normalized linear surface height, distance near canopy height, and solar elevation angle—were explicitly involved; (2) The RF model demonstrated superior performance compared to GBRT and XGB models; (3) Sentinel-2 and Sentinel-2 data achieved optimal accuracy, with a coefficient of determination (R^2) of 79% and root mean square error (RMSE) value absolute error (MAE) of 0.19, while relative evaluation values of 0.895, and relative root mean square error (RRMSE) of 0.045; (4) The accuracy of LAI estimation using a combination of ICESat-2/LAIs, Sentinel-2 and Sentinel-2 remote sensing data showed slight improvement compared to using either ICESat-2/LAIs data combined with Sentinel-2 or Sentinel-2 data alone, with a significant enhancement in LAI estimation accuracy compared to using ICESat-2/LAIs data alone; (5) LAI values in the study area ranged widely from 1.29 to 2.87, averaging 2.1. Research indicates that employing ICESat-2/LAIs captured LAI data for regional-scale LAI estimation provides data complementarity incorporating SAR data and optical imagery and obtaining diverse data types for complementary information significantly improves the accuracy of LAI estimation, demonstrating the feasibility of LAI inversion with multi-source remote sensing data. This approach offers an innovative framework for enhancing multi-source remote sensing data for regional-scale LAI inversion, demonstrating a methodology for integrating various remote sensing data, and serves as a reference for low-cost, high-precision regional-scale LAI estimation.

Keywords: ICTS-2/ATLAS; multi-source remote sensing data; Sequential Gaussian Conditional Selection; Leaf Area Index; biomass

1. Introduction

The Leaf Area Index (LAI) represents the total sum of single-sided leaf area per unit of ground surface area, thus characterizing the size of the leaf area per unit area within an



Article

Estimation of Leaf Area Index for *Dendrocalamus giganteus* Based on Multi-Source Remote Sensing Data

Zhen Qin ¹✉, Huanfen Yang ¹, Qingtai Shu ^{1,*}✉, Jingye Yu ²✉, Li Xu ¹✉, Mingxing Wang ¹, Cuifen Xia ¹ and Dandan Duan ³

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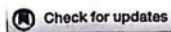
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Abstract: The Leaf Area Index (LAI) plays a crucial role in assessing the health of forest ecosystems. This study utilized ICESat-2/ATLAS as the primary information source, integrating 51 measured sample datasets, and employed the Sequential Gaussian Conditional Simulation (SGCS) method to derive surface grid information for the study area. The backscattering coefficient and texture feature factor from Sentinel-1, as well as the spectral band and vegetation index factors from Sentinel-2, were integrated. The random forest (RF), gradient-boosted regression tree (GBRT) model, and K-nearest neighbor (KNN) method were employed to construct the LAI estimation model. The optimal model, RF, was selected to conduct accuracy analysis of various remote sensing data combinations. The spatial distribution map of *Dendrocalamus giganteus* in Xiping County was then generated using the optimal combination model. The findings reveal the following: (1) Four key parameters—optimal fitted segmented terrain height, interpolated terrain surface height, absolute mean canopy height, and solar elevation angle—are significantly correlated. (2) The RF model constructed using a combination of ICESat-2/ATLAS, Sentinel-1, and Sentinel-2 data achieved optimal accuracy, with a coefficient of determination (R^2) of 0.904, root mean square error (RMSE) of 0.384, mean absolute error (MAE) of 0.319, overall estimation accuracy (P_1) of 88.96%, and relative root mean square error (RRMSE) of 11.04%. (3) The accuracy of LAI estimation using a combination of ICESat-2/ATLAS, Sentinel-1, and Sentinel-2 remote sensing data showed slight improvement compared to using either ICESat-2/ATLAS data combined with Sentinel-1 or Sentinel-2 data alone, with a significant enhancement in LAI estimation accuracy compared to using ICESat-2/ATLAS data alone. (4) LAI values in the study area ranged mainly from 2.29 to 2.51, averaging 2.4. Research indicates that employing ICESat-2/ATLAS spaceborne LiDAR data for regional-scale LAI estimation presents clear advantages. Incorporating SAR data and optical imagery and utilizing diverse data types for complementary information significantly enhances the accuracy of LAI estimation, demonstrating the feasibility of LAI inversion with multi-source remote sensing data. This approach offers an innovative framework for utilizing multi-source remote sensing data for regional-scale LAI inversion, demonstrates a methodology for integrating various remote sensing data, and serves as a reference for low-cost high-precision regional-scale LAI estimation.

Keywords: ICESat-2/ATLAS; multi-source remote sensing data; Sequential Gaussian Conditional Simulation; Leaf Area Index; inversion

1. Introduction

The Leaf Area Index (LAI) represents the total sum of single-sided leaf area per unit of ground surface area, thus characterizing the size of the leaf area per unit area within an



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Estimation of *Dendrocalamus giganteus* leaf area index by combining multi-source remote sensing data and machine learning optimization model

Zhen Qin¹, Huanfen Yang¹, Qingtai Shu^{2*}, Jingye Yu²,
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The Leaf Area Index (LAI) is an essential parameter that affects the exchange of energy and materials between the vegetative canopy and the surrounding environment. Estimating LAI using machine learning models with remote sensing data has become a prevalent method for large-scale LAI estimation. However, existing machine learning models have exhibited various flaws, hindering the accurate estimation of LAI. Thus, a new method for large-scale estimation of *Dendrocalamus giganteus* LAI was proposed, which integrates ICESat-2/ATLAS and Sentinel-1/2 data, and refines machine learning models through the application of Bayesian Optimization (BO), Particle Swarm Optimization (PSO), Genetic Algorithms (GA), and Simulated Annealing (SA). First, spatial interpolation was performed using the Sequential Gaussian Conditional Simulation (SGCS) method. Then, multi-source remote sensing data were leveraged to optimize feature variables through the Pearson correlation coefficient approach. Subsequently, optimization algorithms were applied to Random Forest Regression (RFR), Gradient Boosting Regression Tree (GBRT), and Support Vector Machine Regression (SVR) models, leading to efficient large-scale LAI estimation. The results showed that the BO-GBRT model achieved high accuracy in LAI estimation, with a coefficient of determination (R^2) of 0.922, a root mean square error (RMSE) of 0.263, a mean absolute error (MAE) of 0.187, and an overall estimation accuracy (P_2) of 92.38%. Compared to existing machine learning methods, the proposed approach demonstrated superior performance. This method holds significant potential for large-scale forest LAI inversion and can facilitate further research on other forest structure parameters.

KEYWORDS

ICESat-2/ATLAS, sentinel data, remote sensing data, sequential gaussian conditional simulation, optimization algorithm, LAI, machine learning models

一、检索结果附表

序号	论文信息	收录情况	SCI引用	期刊指标
1	Qin Zhen, Yang Huanfen, Shu Qingtai, Yu Jingge, Xu Li, Wang Mingxing, Xia Cuifen, Duan Dandan. Estimation of Leaf Area Index for Dendrocalamus giganteus Based on Multi-Source Remote Sensing Data. FORESTS, 2024, 15(7).	SCI	0次	JCR影响因子(2023):2.4 JCR分区(2023):Q1区 中科院分区(2023升级版): 大类:农林科学2区
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一、检索结果附表

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2	秦臻, 舒清态, 杨焕芬, 罗绍龙, 杨正道, 段丹丹. 基于序贯高斯条件模拟的龙竹叶面积指数估测. 森林与环境学报, 2024, 44(05): 539-550.	CNKI CSCD	北大核心 科技核心

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考生类别：	往届毕业生
申请年度：	2025

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一、项目的技术要求

西南林业大学强振平委托查询的论文被 SCI 收录引用情况、期刊影响因子。论文列表如下：

1、论文题目： Face Image Completion Method Based on Parsing Features Maps.; 作者： Shiqi Su, Xiaofeng Shao, Libo He, Hong Lin, Yuxuan Zuo and Zhenping Qiang; 第一作者单位： Southwest Forestry University, Kunming 650224, China; 论文出版源： IEEE Journal of Selected Topics in Signal Processing;

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作者 Su, SQ (Su, Shiqi) [1] ; Shao, XF (Shao, Xiaofeng) [2] ; He, LB (He, Libo) [3] ; Lin, H (Lin, Hong) [1] ; Zuo, YX (Zuo, Yuxuan) [1] ; Qiang, ZP (Qiang, Zhenping) [1] (由 Clarivate 提供)

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摘要

In this article, we focus on the facial completion task based on the parsing feature map. In recent years, methods based on deep learning have achieved remarkable results in face image completion. However, many methods do not consider the semantic structure information of face images, these methods may lead to unreasonable or discontinuous cases in the return results. To solve this problem, we propose a face image completion network based on face parsing features. The network includes two sub-network: face parsing map prediction network and face image completion network. The face parsing map prediction network predicts the parsing features of the missing regions, and the face image completion network uses these features to guide the face image completion network to fill the missing areas. On the open dataset, CelebA-HQ and Flickr Faces High Quality (FFHQ), the validity of this method is verified by qualitative and quantitative analysis.

关键词

作者关键词

Face image completionparsing feature mapdeep learning

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四、检索结论

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2023 年 10 月 13 日

Face Image Completion Method Based on Parsing Features Maps

Shiqi Su¹, Xiaofeng Shao¹, Libo He, Hong Lin, Yuxuan Zuo, Zhenping Qiang*

Abstract—In this paper, we focus on the facial completion task based on the parsing feature map. In recent years, the methods based on deep learning have achieved remarkable results in face image completion. However, since many methods do not consider the semantic structure information of face images, these methods may lead to unreasonable or discontinuous cases in the return results. To solve this problem, we propose a facial image completion network based on face parsing features. The network includes two sub-network: face parsing map prediction network and facial image completion network. The face parsing map prediction network predicts the parsing features of the missing regions, and the facial image completion network uses these features to guide the facial image completion network to fill the missing areas. On the open dataset CelebA-HQ and Flickr-Faces-High-Quality (FFHQ), the validity of this method is verified by qualitative and quantitative analysis.

Index Terms—Face image completion, face parsing, deep learning.

I. INTRODUCTION

FACIAL image completion is a specific field of image completion. It can be applied to many practical applications related to face, and its research is of great value. Facial image completion is to generate the broken or occluded incomplete facial image, mainly through the semantic information of the whole face image to generate the image. In the previous completion work, although there are many algorithms that can produce reasonable results, using the known facial information to guide the completion work (for example, edge information), the methods will produce results that do not conform to the facial structure or the completion image will have discontinuous results. Therefore, the work of this paper is proposed to solve this problem.

Due to the specificity of facial semantic structure, the traditional methods based on diffusion and patch [1] cannot capture the high-level semantics and generate facial images based on semantics. With the development of technology, the emergence of deep learning techniques, such as generative adversarial networks (GAN) [2] and convolutional neural networks (CNN) [3], has accelerated the development of facial completion technology. These completion methods based on deep learning learned a wealth of information through massive datasets. Many researchers have used these techniques extensively in

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Fig. 1. Facial image completion process: for the input incomplete image (left), a complete parsing image (middle) is generated based on the incomplete parsing map, and a complete image (right) is generated based on the two pictures on the left.

various image processing tasks. Pathak et al. [4] proposed a context-encoder(CE) that can generate arbitrary image regions based on the surrounding environment, but it cannot maintain global and local consistency, generates ambiguous results, and is not very effective in semantic inpainting. Alec et al. [5] proposed a deep convolution generative adversarial network (DCGAN), which has been widely used for image completion. It combines a GAN with a convolution neural network. Although it can perform image completion for different missing regions, it relies on the generation model and training process. Therefore, if we use GAN for image completion, we need to "spoof" the discriminator after training on a large amount of data. Liu et al. [6] proposed partial convolution instead of vanilla convolution, where partial convolution is conditioned only on valid pixels to reduce the artifacts caused by the difference in the distribution of masked and unmasked regions. The mask of this convolution decreases as the depth of the network increases, and finally, the value of the mask will all be 1. Therefore, the features at this point still contain information extracted from the missing regions, but this method produces unreasonable facial images when the missing regions become contiguous and large; when performing image complementation, the vanilla convolution treats all pixels as valid pixels.

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Shiqi Su¹, Xiaofeng Shao¹, Libo He, Hong Lin, Yuxuan Zuo, Zhenping Qiang*

Abstract—In this paper, we focus on the facial completion task based on the parsing feature map. In recent years, the methods based on deep learning have achieved remarkable results in face image completion. However, since many methods do not consider the semantic structure information of face images, these methods may lead to unreasonable or discontinuous cases in the return results. To solve this problem, we propose a facial image completion network based on face parsing features. The network includes two sub-network: face parsing map prediction network and facial image completion network. The face parsing map prediction network predicts the parsing features of the missing regions, and the facial image completion network uses these features to guide the facial image completion network to fill the missing areas. On the open dataset CelebA-HQ and Flickr-Faces-High-Quality (FFHQ), the validity of this method is verified by qualitative and quantitative analysis.

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学科代码: 071100

项目编号: 2022Y560

是否专项: 是

专项名称：三个定位

任务合同书

项目名称: 基于深度学习的人脸图像

修复方法研究

项目单位: _____西南林业大学

负责人：_____苏世琪

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签订日期: 2022 年 3 月 1 日

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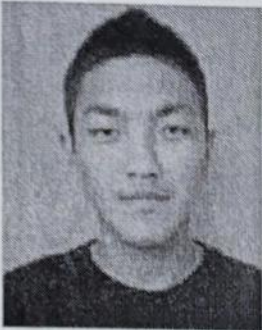
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4、 外语能力证书

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考试时间： 2018年12月

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基于贝叶斯法估计龙竹人工林叶面积指数模型

孙 杨 舒清态 黄金君 席 磊 刘玥伶 罗 浩

(西南林业大学林学院, 云南 昆明 650233)

摘要: 以云南广泛栽培龙竹的沧源和新平2个县为研究区, 以异速生长方程为 LAI 基础模型, 结合 73 块样地数据, 采用非线性最小二乘、有先验信息贝叶斯法和分层贝叶斯3种方法对模型参数进行拟合, 运用决定系数(R^2)、均方根误差(RMSE)和估测精度(E)指标对拟合效果进行评价。结果表明: 当未引入随机效应变量时, 传统的最小二乘法和有先验信息贝叶斯法的 R^2 、RMSE 和 E 分别为 0.4875、0.0071、75.31% 和 0.4874、0.0070、75.31%; 引入随机效应变量后, 分层贝叶斯方法 R^2 、RMSE 和 E 分别为 0.6733、0.0057、80.27%, 估测效果较最小二乘方法和有先验信息的贝叶斯方法有较为明显的提高, R^2 提高了 0.1858, RMSE 降低了 0.0014, E 提高了 4.96%。对于有明显地域差异的样本, 分层贝叶斯方法能明显提升模型参数估测精度, 适合中大尺度上采样数据的模型参数估测。

关键词: 贝叶斯法; 分层贝叶斯法; 最小二乘法; 叶面积指数; 龙竹

中图分类号: S771.8

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Estimation of Leaf Area Index Model of *Dendrocalamus giganteus* Plantation Based on Bayesian Method

Sun Yang, Shu Qingtai, Huang Jinjun, Xi Lei, Liu Yueling, Luo Hao

(College of Forestry, Southwest Forestry University, Kunming Yunnan 650233, China)

Abstract: The research takes Cangyuan County and Xinping County where *Dendrocalamus giganteus* is widely cultivated in Yunnan as the study area. Taking the allometric growth equation as the LAI basic model, combined with the data of 73 sample plots on the ground, the model parameters were fitted by nonlinear least squares, Bayesian method with prior information and hierarchical Bayesian method. The fitting effect was evaluated by using the determination coefficient(R^2), root mean square error(RMSE) and estimation accuracy(E). The results show that the R^2 , RMSE and E of the traditional least square method and Bayesian method with prior information are 0.4875, 0.0071, 75.31% and 0.4874, 0.0070, 75.31% respectively without adding random effect variables. After introducing the random effect variable, the R^2 , RMSE and E of the hierarchical Bayesian method are 0.6733, 0.0057 and 80.27%, respectively. The estimation effect is significantly improved compared with the least square method and the Bayesian method with prior information. R^2 increases by 0.1858, RMSE decreases by 0.0014, and E increases by 4.96%. Therefore, for the samples with obvious regional differences, hierarchical Bayesian method can significantly improve the accuracy of model parameter estimation, which is suitable for the

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申请年度：	2025

4、 外语能力证书



TEST TAKER SCORE REPORT

Note: This report is not valid for transmission of scores to an institution.

PEICHUN SUO

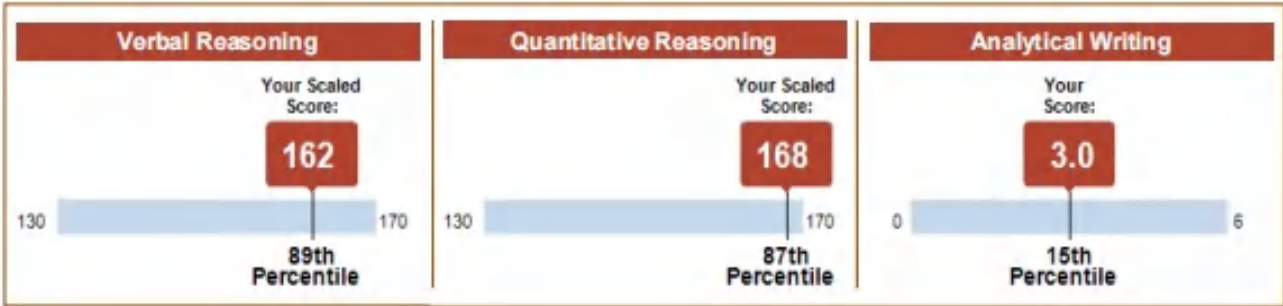
Most Recent Test Date: February 3, 2024

Address: BEIJING, KUNMING, KUNMING, 650106 China

Registration Number: 2689114
Print Date: February 12, 2024

Email: 85556840@qq.com
Phone: 86-15808803193
Date of Birth: March 17, 1987
Gender: Male
Intended Graduate Major: Education, General (3911)

Your Scores for the General Test Taken on February 3, 2024



Your Test Score History

General Test Scores

Test Date	Verbal Reasoning		Quantitative Reasoning		Analytical Writing	
	Scaled Score	Percentile	Scaled Score	Percentile	Score	Percentile
February 3, 2024	162	89	168	87	3.0	15

Subject Test Scores

You do not have reportable test scores at this time.

Your Score Recipient(s)

Undergraduate Institution

Report Date	Institution (Code)	Department (Code)	Test Title	Test Date
Pending	Anhui Medical University (4766)	EDUCATION-OTHER (3999)	General Test	February 3, 2024

Designated Score Recipient(s)

Report Date	Score Recipient (Code)	Department (Code)	Test Title	Test Date
Pending	China University of Petroleum, Beijing (4996)	EDUCATION-OTHER (3999)	General Test	February 3, 2024

• Pending - Scores are being processed or are not yet reportable.



TEST TAKER SCORE REPORT

Note: This report is not valid for transmission of scores to an institution.

PEICHUN SUO

Most Recent Test Date: February 3, 2024

Date of Birth: March 17, 1987

Registration Number: 2689114
Print Date: February 12, 2024

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Scores for a test administration must be reported in their entirety. Institutions will receive score reports that show only the scores that you selected to send to them. There will be no special indication if you have taken additional GRE tests. See the *GRE® Information Bulletin* for details. The policies and procedures explained in the Bulletin for the current testing year supersede previous policies and procedures in previous bulletins.

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A percentile rank for a test score indicates the percentage of test takers who took that test and received a lower score. Regardless of when the reported scores were earned, the percentile ranks for General Test and Subject Test scores are based on the scores of all test takers who tested within the most recent three-year period.

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5、学术能力证明材料

WeNet-RF: An Automatic Classification Model for Financial Reimbursement Budget Items

Peichun Suo¹, Xiuyan Wang^{2*}, Weili Kou^{3*}, Wen Suo¹, Yujing Zhang⁴, Jinfen Duan⁵, Tingting Zeng¹, Meicai Zhu¹, Fubing Wang¹

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Abstract

Accurate classification of budget items is a critical component of financial reimbursement, as it determines the legitimacy and regulatory compliance of financial expenditures. Currently, manual classification of reimbursement budget items faces two challenges of inefficiency and inaccuracy. This is primarily due to the labor-intensive nature of the task, which increases the likelihood of selecting incorrect categories. To address these challenges, this study proposed a WeNet-Random Forest (WeNet-RF) model, which leverages speech recognition technology (WeNet) and Random Forest (RF) to improve efficiency and classification accuracy. WeNet-RF includes four steps: speech identification, features extraction, items classification, and evaluated model. This study compared WeNet-RF with Convolutional Neural Networks (CNN), Logistic Regression (LR) and K-Nearest Neighbors (KNN). WeNet-RF was verified by 50 real financial reimbursement records, and the results show that accuracy rate, precision rate, recall rate, and F1 score of WeNet-RF all are 90.77%. The findings provide a robust solution for improving financial management processes, and a reference model to financial management system.

Keywords: budget items; WeNet; speech recognition; machine learning; automatic classification

1. Introduction

Automated categorization of financial reimbursement expenses is essential for improving operational efficiency and accuracy in corporate finance management. Automatic classification of financial reimbursement budget items is crucial for enhancing the efficiency and accuracy of

← Submissions with an Editorial Office Decision for Author

Page: 1 of 1 (2 total completed submissions)

Results per page: 10

Action	Manuscript Number	Title	Initial Date Submitted	Current Status	Date Final Disposition Set	Final Disposition
View Submission Author Response View Decision Letter View Publication Fee Send E-mail	PONE-D-24-45687	ViNet-RF: An Automatic Classification Model for Financial Reimbursement Budget Items	Nov 6 2024 6:08AM	Completed Accept	Mar 21 2025 11:08AM	Accept

Date of publication xxxx 00, 0000, date of current version xxxx 00, 0000.

Digital Object Identifier 10.1109/ACCESS.2024.0429000

YOLOv9-AAG: Distinguishing Birds and Drones in Infrared and Visible Light Scenarios

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ABSTRACT The ability to distinguish between birds and drones is essential for applications in wildlife preservation, aviation security, and defense operations. Reliable identification not only reduces the risk of bird strikes and monitors potential drone threats but also fosters the development of a secure and intelligent ecological environment. However, achieving high precision in recognition under complex and dynamic conditions remains a significant hurdle. To overcome this, we present an advanced detection framework, YOLOv9-AKConv-AFF-GSConv (YOLOv9-AAG), which substantially improves the accuracy of distinguishing birds from drones even in various poses and enhances generalization capabilities in both infrared and visible light scenarios. The framework incorporates several key advancements. First, the GSConv is embedded into the head of the RepNSCPELAN4-AKConv module, enabling efficient extraction of edge and contour information without incurring additional computational cost. Second, the inclusion of the Attentional Feature Fusion (AFF) mechanism within AKConv amplifies the representation of shape features, particularly under challenging environments and multimodal scenarios. Lastly, the optimized AKConv module is effectively integrated with the original RepNSCPELAN4 model, facilitating more accurate and robust feature extraction for small targets, including birds and drones. Experimental evaluations underscore the effectiveness of the proposed framework. On an optical dataset containing multiple bird and drone targets, YOLOv9-AAG achieved recognition accuracy rates of 78.2%, while on an infrared dataset, it reached 86.1%. These results reflect improvements of 7.4% and 6.0%, respectively, over the baseline YOLOv9 model. Additionally, the F1 scores increased by 5.9% and 2.8%. On the publicly available CUB-200-2011 dataset and a combined dataset of visible and infrared images, the model attained mean Average Precision (mAP) scores of 81.9% and 81.6%, respectively, outperforming cutting-edge approaches, including YOLOv9, YOLOv10, and YOLOv11. Furthermore, It was also tested on two videos of drones and birds, the experimental results demonstrated an average detection accuracy of approximately 72% for small bird targets and 80% for drones, highlighting the model's practical capability to effectively distinguish between these two classes.

INDEX TERMS distinction between birds and drones; infrared and visible light scenes; dynamic AKConv convolution; GSConv convolution; AFF attention mechanism

I. INTRODUCTION

THE visual similarity between birds and drones has become a significant challenge across multiple fields. In civil aviation, the misidentification of birds and drones could lead to aviation accidents, posing serious threats to flight safety [42], [43], [50]. In ecological conservation, such er-

rors can disrupt scientific research and hinder the accurate monitoring of bird behavior [1], [2], [3]. In military defense, the ability to accurately distinguish between birds and drones is crucial, as it not only impacts national security but also directly affects the stability and reliability of defense systems [48], [49]. Consequently, developing advanced recognition



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申请学院： (001) 林学院

考生类别： 应届毕业生

申请年度： 2025

Article

Improving Forest Above-Ground Biomass Estimation Accuracy Using Multi-Source Remote Sensing and Optimized Least Absolute Shrinkage and Selection Operator Variable Selection Method

Er Wang ^{1,2}, Tianbao Huang ^{1,2}, Zhi Liu ^{1,2}, Lei Bao ^{1,2}, Binbing Guo ^{1,2}, Zhibo Yu ^{1,2}, Zihang Feng ^{1,2}, Hongbin Luo ^{1,2} and Guanglong Ou ^{1,2,*}

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Abstract: Estimation of forest above-ground biomass (AGB) using multi-source remote sensing data is an important method to improve the accuracy of the estimate. However, selecting remote sensing factors that can effectively improve the accuracy of forest AGB estimation from a large amount of data is a challenge when the sample size is small. In this regard, the Least Absolute Shrinkage and Selection Operator (Lasso) has advantages for extensive redundant variables but still has some drawbacks. To address this, the study introduces two Least Absolute Shrinkage and Selection Operator Lasso-based variable selection methods: Least Absolute Shrinkage and Selection Operator Genetic Algorithm (Lasso-GA) and Variance Inflation Factor Least Absolute Shrinkage and Selection Operator (VIF-Lasso). Sentinel 2, Sentinel 1, Landsat 8 OLI, ALOS-2 PALSAR-2, Light Detection and Ranging, and Digital Elevation Model (DEM) data were used in this study. In order to explore the variable selection capabilities of Lasso-GA and VIF-Lasso for remote sensing estimation of forest AGB. It compares Lasso-GA and VIF-Lasso with Boruta, Random Forest Importance Selection, Pearson Correlation, and Lasso for selecting remote sensing factors. Additionally, it employs eight machine learning models—Random Forest (RF), Extreme Gradient Boosting (XGBoost), Support Vector Machine (SVM), Bayesian Regression Neural Network (BRNN), Elastic Net (EN), K-Nearest Neighbors (KNN), Extremely Randomized Trees (ETR), and Stochastic Gradient Boosting (SGBoost)—to estimate forest AGB in Wuyi Village, Zhenyuan County. The results showed that the optimized Lasso variable selection could improve the accuracy of forest biomass estimation. The VIF-Lasso method results in a BRNN model with an R^2 of 0.75 and an RMSE of 16.48 Mg/ha. The Lasso-GA method results in an ETR model with an R^2 of 0.73 and an RMSE of 16.70 Mg/ha. Compared to the optimal SGBoost model with the Lasso variable selection method (R^2 of 0.69, RMSE of 18.63 Mg/ha), the VIF-Lasso method improves R^2 by 0.06 and reduces RMSE by 2.15 Mg/ha, while the Lasso-GA method improves R^2 by 0.04 and reduces RMSE by 1.93 Mg/ha. From another perspective, they also demonstrated that the RX sample count and sensitivity provided by LiDAR, as well as the Horizontal Transmit, Vertical Receive provided by Microwave Radar, along with the feature variables (Mean, Contrast, and Correlation) calculated from the Green, Red, and NIR bands of optical remote sensing in 7×7 and 5×5 windows, play an important role in forest AGB estimation. Therefore, the optimized Lasso variable selection method shows strong potential for forest AGB estimation using multi-source remote sensing data.

Keywords: forest aboveground biomass; machine learning algorithm; remote sensing; Lasso optimization; small sample

Article

Improving Forest Above-Ground Biomass Estimation Accuracy Using Multi-Source Remote Sensing and Optimized Least Absolute Shrinkage and Selection Operator Variable Selection Method

Er Wang^{1,2}, Tianbao Huang^{1,2}, Zhi Liu^{1,2}, Lei Bao^{1,2}, Binbing Guo^{1,2}, Zhibo Yu^{1,2}, Zihang Feng^{1,2}, Hongbin Luo^{1,2} and Guanglong Ou^{1,2,*}

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Citation: Wang, E.; Huang, T.; Liu, Z.; Bao, L.; Guo, B.; Yu, Z.; Feng, Z.; Liao, H.; Ou, G. Improving Forest Above-Ground Biomass Estimation Accuracy Using Multi-Source Remote Sensing and Optimized Least Absolute Shrinkage and Selection Operator Variable Selection Method. *Remote Sens.* **2024**, *16*, 4497. <https://doi.org/10.3390/rs16234497>

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Abstract: Estimation of forest above-ground biomass (AGB) using multi-source remote sensing data is an important method to improve the accuracy of the estimate. However, selecting remote sensing factors that can effectively improve the accuracy of forest AGB estimation from a large amount of data is a challenge when the sample size is small. In this regard, the Least Absolute Shrinkage and Selection Operator (Lasso) has advantages for extensive redundant variables but still has some drawbacks. To address this, the study introduces two Least Absolute Shrinkage and Selection Operator Lasso-based variable selection methods: Least Absolute Shrinkage and Selection Operator Genetic Algorithm (Lasso-GA) and Variance Inflation Factor Least Absolute Shrinkage and Selection Operator (VIF-Lasso). Sentinel 2, Sentinel 1, Landsat 8 OLI, ALOS-2 PALSAR-2, Light Detection and Ranging, and Digital Elevation Model (DEM) data were used in this study. In order to explore the variable selection capabilities of Lasso-GA and VIF-Lasso for remote sensing estimation of forest AGB. It compares Lasso-GA and VIF-Lasso with Boruta, Random Forest Importance Selection, Pearson Correlation, and Lasso for selecting remote sensing factors. Additionally, it employs eight machine learning models—Random Forest (RF), Extreme Gradient Boosting (XGBoost), Support Vector Machine (SVM), Bayesian Regression Neural Network (BRNN), Elastic Net (EN), K-Nearest Neighbors (KNN), Extremely Randomized Trees (ETR), and Stochastic Gradient Boosting (SGBoost)—to estimate forest AGB in Wuyi Village, Zhenyuan County. The results showed that the optimized Lasso variable selection could improve the accuracy of forest biomass estimation. The VIF-Lasso method results in a BRNN model with an R^2 of 0.75 and an RMSE of 16.48 Mg/ha. The Lasso-GA method results in an ETR model with an R^2 of 0.73 and an RMSE of 16.70 Mg/ha. Compared to the optimal SGBoost model with the Lasso variable selection method (R^2 of 0.69, RMSE of 18.63 Mg/ha), the VIF-Lasso method improves R^2 by 0.06 and reduces RMSE by 2.15 Mg/ha, while the Lasso-GA method improves R^2 by 0.04 and reduces RMSE by 1.93 Mg/ha. From another perspective, they also demonstrated that the RX sample count and sensitivity provided by LiDAR, as well as the Horizontal Transmit, Vertical Receive provided by Microwave Radar, along with the feature variables (Mean, Contrast, and Correlation) calculated from the Green, Red, and NIR bands of optical remote sensing in 7×7 and 5×5 windows, play an important role in forest AGB estimation. Therefore, the optimized Lasso variable selection method shows strong potential for forest AGB estimation using multi-source remote sensing data.

Keywords: forest aboveground biomass; machine learning algorithm; remote sensing; Lasso optimization; small sample



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考生类别：	往届毕业生
申请年度：	2025

4、 外语能力证书

报告编号：（2024）SWFU012555

论文收录/引用检索报告

项目名称：西南林业大学王一洁发表论文被 SCI 收录、期刊影
响因子及中科院 JCR 分区情况

委 托 人：王一洁

委托日期：2024 年 06 月 24 日

完成日期：2024 年 06 月 27 日

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一、项目的技术要求

西南林业大学王一洁发表论文被 SCI 收录、期刊影响因子及中科院 JCR 分区情况。

1.标题: Predicting the potential distribution of *Dendrolimus punctatus* and its host *Pinus massoniana* in China under climate change conditions

作者: Wang, YJ (Wang, Yijie) [1];Zhao, YJ (Zhao, Youjie) [1];Miao, GT (Miao, Guangting) [1];Zhou, XT (Zhou, Xiaotao) [1];Yu, CJ (Yu, Chunjiang) [1];Cao, Y (Cao, Yong) [1]

二、情报检索情况:

1. 检索数据库: Science Citation Index Expanded (SCI-E) 网络版
Journal Citation Reports (JCR)
中科院 JCR 分区数据库

2. 检索式: 略

三、检出文献情况 (编号、名称、文献题目及出处)

(一) SCI-E 收录

1.标题: Predicting the potential distribution of *Dendrolimus punctatus* and its host *Pinus massoniana* in China under climate change conditions

作者: Wang, YJ (Wang, Yijie) [1];Zhao, YJ (Zhao, Youjie) [1];Miao, GT (Miao, Guangting) [1];Zhou, XT (Zhou, Xiaotao) [1];Yu, CJ (Yu, Chunjiang) [1];Cao, Y (Cao, Yong) [1]

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ISSN: 1664-462X

(三) 期刊影响因子(IF)

期 刊 全 称	影 响 因 子	
	2023	五年影响因子
FRONTIERS IN PLANT SCIENCE	4.100	5.300

(四) 中国科学院 JCR 期刊分区(2023 年)

期刊全称	ISSN	所属大类	大类分区	Top 期刊
FRONTIERS IN PLANT SCIENCE	1664-462X	生物学	2	是

四、检索结论

依照用户委托，通过国际联机数据库检索，具体结果如下：

- (一) SCI 收录：西南林业大学王一洁以第一作者发表的 1 篇论文已被 SCI-E 收录；
- (二) 期刊影响因子见上表；
- (三) 中国科学院 JCR 期刊分区见上表。

以上检索结论已经清华大学图书馆信息服务中心验证，并可在 SCI-E、JCR、中国科学院 JCR 期刊分区数据库中检索、验证。

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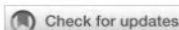
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2024 年 06 月 27 日



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Predicting the potential distribution of *Dendrolimus punctatus* and its host *Pinus massoniana* in China under climate change conditions

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Chunjiang Yu and Yong Cao*

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Introduction: *Dendrolimus punctatus*, a major pest endemic to the native *Pinus massoniana* forests in China, displays major outbreak characteristics and causes severe destructiveness. In the context of global climate change, this study aims to investigate the effects of climatic variations on the distribution of *D. punctatus* and its host, *P. massoniana*.

Methods: We predict their potential suitable distribution areas in the future, thereby offering a theoretical basis for monitoring and controlling *D. punctatus*, as well as conserving *P. massoniana* forest resources. By utilizing existing distribution data on *D. punctatus* and *P. massoniana*, coupled with relevant climatic variables, this study employs an optimized maximum entropy (MaxEnt) model for predictions. With feature combinations set as linear and product (LP) and the regularization multiplier at 0.1, the model strikes an optimal balance between complexity and accuracy.

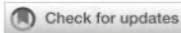
Results: The results indicate that the primary climatic factors influencing the distribution of *D. punctatus* and *P. massoniana* include the minimum temperature of the coldest month, annual temperature range, and annual precipitation. Under the influence of climate change, the distribution areas of *P. massoniana* and its pests exhibit a high degree of similarity, primarily concentrated in the region south of the Qinling–Huaihe line in China. In various climate scenarios, the suitable habitat areas for these two species may expand to varying degrees, exhibiting a tendency to shift toward higher latitude regions. Particularly under the high emission scenario (SSP5-8.5), *D. punctatus* is projected to expand northwards at the fastest rate.

Discussion: By 2050, its migration direction is expected to closely align with that of *P. massoniana*, indicating that the pine forests will continue to be affected by the pest. These findings provide crucial empirical references for region-specific prevention of *D. punctatus* infestations and for the rational utilization and management of *P. massoniana* resources.

KEYWORDS

climate change, *Dendrolimus punctatus*, *Pinus massoniana*, species distribution modeling, MaxEnt model

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Article

Estimation of the Aboveground Carbon Storage of *Dendrocalamus giganteus* Based on Spaceborne Lidar Co-Kriging

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Keywords: *Dendrocalamus giganteus*; aboveground carbon storage; GEDI; ICESat-2/ATLAS; Landsat 9; Co-Kriging; Stacking-RR



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1. Introduction

Aboveground carbon (AGC) storage is a crucial indicator that reflects the fundamental traits of terrestrial ecosystems, their carbon sequestration capacity, and the assessment of ecosystem quality, forest structural functions, and production potential. Consequently, AGC has garnered significant attention and research interest within the academic community in recent years [1]. Remote sensing technology fulfills the requirements for monitoring and analyzing forest resources and ecological processes across various scales [2]. For AGC

Estimation of Above-ground Biomass for *Dendrocalamus giganteus* Utilizing Spaceborne LiDAR GEDI Data

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Index Terms—*Dendrocalamus giganteus*, Relative Growth Equation, GEDI, Above-ground Biomass, Machine Learning, Stacking Model Integration.

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I. INTRODUCTION

FOREST above-ground biomass (AGB) is one of the important indicators to evaluate forest productivity, terrestrial ecosystem function, and sustainable forest management [1]. Traditional ground sampling survey methods have high accuracy, but they cost a lot of manpower, material resources, and financial resources, are not time-efficient, and have certain damage to vegetation [2]. The combination of remote sensing data and sample site data can meet the needs of monitoring and analysis of forest resources and ecological processes at different scales while saving investigation costs [1], [3]. Unfortunately, it is difficult for traditional optics to obtain vertical forest information, which is easily saturated and affected by weather [4], [5]. SAR is not affected by weather conditions but has varying degrees of signal saturation [6], and is greatly affected by terrain fluctuation [7]. Compared with traditional remote sensing, LiDAR data has a strong ability to obtain the

three-dimensional structure of forests [8]. It is an active remote sensing technology capable of collecting large-scale data by utilizing short-wavelength laser pulses that can penetrate the forest canopy, offering strong penetration through vegetation. Unlike optical remote sensing and SAR, LiDAR does not suffer from light saturation issues [9], and its estimation accuracy is higher [10], [11]. These advantages provide significant benefits in forest structural parameter estimation. Mean et al. [12] found that SLICER full-waveform LiDAR data predicted the maximum biomass of coniferous forests along the Pacific coast up to 1300 t/ha, which provided an important basis for applying the LiDAR system to solve the saturation point problem of biomass estimation. LiDAR technology is divided into spaceborne, ground-based, and airborne [13], [14], [15], [16]. Ground-based and airborne are not suitable for large-area assessment [13], [17]. Spaceborne LiDAR can cover the whole world and obtain data at low cost [18]. It is suitable for regional-scale estimation and has been successfully applied in many countries around the world [19], [20], [21], [22], [23]. ICESat-2/ATLAS and GEDI are currently in operation [24].

When estimating forest structure parameters at the regional scale, spaceborne lidars such as ICESat-2/ATLAS and GEDI have become important data sources and powerful tools for efficient estimation [25]. Using photon counting technology, ICESat-2/ATLAS emits micro pulses with low energy, each pulse can only receive a few signal photons [26], with short duration, weak signal [27], easy to be affected by noise, large deviations for many forest types and coverage conditions [28], and poor ability to penetrate dense tree crowns. As a result, canopy extraction is difficult [29], which brings great challenges to data processing and estimation. However, GEDI is the first full-waveform data specially designed for the study of forest structure, and the pulse signal emitted by GEDI has high energy and long duration [26], and the crown penetration of GEDI is stronger than that of ICESat-2/ATLAS [30]. Some researchers [27], [31] compared the ability of these two information sources to predict forest structure parameters and found that the prediction ability of GEDI data was stronger than that of ICESat-2/ATLAS. Due to the discontinuous spatial sampling distribution of LiDAR data, it is impossible to achieve seamless coverage [32], so data extrapolation by other means is necessary [20]. Many researchers use GEDI spaceborne LiDAR to estimate biomass in combination with data from other sensors. For example, Silva et al. [31] simulated spaceborne LiDAR data (GEDI, ICESat-2) using ALS, and estimated forest biomass in Sonoma County, United States based on AGB empirical model. Qi et al. [33] simulated GEDI footprint points in three forest types, namely temperate mixed forest, mountain coniferous forest, and tropical rain forest, and used InSAR for data extrapolation, and found that the forest biomass estimation results had the highest accuracy in temperate mixed forest when comparing the sample plots of 1 ha size. Based on the data of GEDI, ICESat-2, and NISAR, Duncanson et al. [34] established the biomass models of evergreen coniferous forests, evergreen

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一、检索结果附表

序号	论文信息	收录情况	期刊指标
1	Yang Huanfen, Qin Zhen, Shu Qingtai, Xu Li, Yu Jingge, Luo Shaolong, Wu Zaikun, Xia Cuifen, Yang Zhengdao. Estimation of Above-Ground Biomass for Dendrocalamus Giganteus Utilizing Spaceborne LiDAR GEDI Data. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 2025, 18: p 5271-5286.	EI	JCR影响因子(2023):4.7 JCR分区(2023):Q1区 中科院分区(2023升级版): 大类:地球科学2区 TOP期刊

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一、检索结果附表

序号	论文信息	收录情况	SCI引用	期刊指标
1	Yang Huanfen, Qin Zhen, Shu Qingtai, Xi Lei, Xia Cuifen, Wu Zaikun, Wang Mingxing, Duan Dandan. Estimation of the Aboveground Carbon Storage of Dendrocalamus giganteus Based on Spaceborne Lidar Co-Kriging. FORESTS, 2024, 15(8).	SCI	0次	JCR影响因子(2023):2.4 JCR分区(2023):Q1区 中科院分区(2023升级版): 大类:农林科学2区
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4、 外语能力证书

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Native Language: Chinese

Test Center Country: China

Test Center: STNRPCHN - Home Edition

Gender: Male

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Country of Birth: China

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Listening

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18

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Page 1 of 2

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Article

Mangrove Species Classification from Unmanned Aerial Vehicle Hyperspectral Images Using Object-Oriented Methods Based on Feature Combination and Optimization

Fankai Ye and Baoping Zhou *

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Abstract: Accurate and timely acquisition of the spatial distribution of mangrove species is essential for conserving ecological diversity. Hyperspectral imaging sensors are recognized as effective tools for monitoring mangroves. However, the spatial complexity of mangrove forests and the spectral redundancy of hyperspectral images pose challenges to fine classification. Moreover, finely classifying mangrove species using only spectral information is difficult due to spectral similarities among species. To address these issues, this study proposes an object-oriented multi-feature combination method for fine classification. Specifically, hyperspectral images were segmented using multi-scale segmentation techniques to obtain different species of objects. Then, a variety of features were extracted, including spectral, vegetation indices, fractional order differential, texture, and geometric features, and a genetic algorithm was used for feature selection. Additionally, ten feature combination schemes were designed to compare the effects on mangrove species classification. In terms of classification algorithms, the classification capabilities of four machine learning classifiers were evaluated, including K-nearest neighbor (KNN), support vector machines (SVM), random forests (RF), and artificial neural networks (ANN) methods. The results indicate that SVM based on texture features achieved the highest classification accuracy among single-feature variables, with an overall accuracy of 97.04%. Among feature combination variables, ANN based on raw spectra, first-order differential spectra, texture features, vegetation indices, and geometric features achieved the highest classification accuracy, with an overall accuracy of 98.03%. Texture features and fractional order differentiation are identified as important variables, while vegetation index and geometric features can further improve classification accuracy. Object-based classification, compared to pixel-based classification, can avoid the salt-and-pepper phenomenon and significantly enhance the accuracy and efficiency of mangrove species classification. Overall, the multi-feature combination method and object-based classification strategy proposed in this study provide strong technical support for the fine classification of mangrove species and are expected to play an important role in mangrove restoration and management.



Citation: Ye, F.; Zhou, B. Mangrove Species Classification from Unmanned Aerial Vehicle Hyperspectral Images Using Object-Oriented Methods Based on Feature Combination and Optimization. *Sensors* **2024**, *24*, 4108. <https://doi.org/10.3390/s24134108>

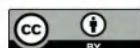
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Keywords: mangrove; feature combination; object-oriented; unmanned aerial vehicles; hyperspectral image classification

1. Introduction

Mangrove forests rank among the most productive ecosystems on Earth and act as natural barriers to tropical and subtropical coastlines [1,2]. Mangrove ecosystems play a critical role in seawater purification, wind and wave prevention, biodiversity maintenance, and carbon sequestration and storage [3–5], providing vital ecosystem services for coastal areas [6]. Unlike other forest ecosystems, mangrove ecosystems are notably fragile and susceptible to human activities and climate change [7]. Over recent decades, global mangrove forests have experienced significant degradation [8,9], with a reported decrease of approximately 35% between 1980 and 2005 [10–12]. Hence, precise monitoring of mangrove

174-74

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4、 外语能力证书

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证件号码：

学 校：西南林业大学



笔试成绩

准考证号：530060191120712

总 分：**428**

听 力：**156**

阅 读：**129**

写作和翻译：**143**

考试时间：2019年 6 月

口试成绩

准考证号：--

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Citation: Zhi B Y, Da P C, Hong B L. Study on Aboveground Biomass Estimation of *Pinus kesiya* var. *langbianensis* Based on PSO-SVR Model[J]. Journal of Southwest Forestry University, 2025, 46(0): 1-8. DOI: 10.11929/j.swfu.202502008

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基于PSO-SVR模型和分级变量选择的思茅松地上生物量估测研究

于志博^{1,2}, 陈大鹏^{1,2}, 罗洪斌^{1,2}

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+ 详细信息

Study on Aboveground Biomass Estimation of *Pinus kesiya* var. *langbianensis* Based on PSO-SVR Model

Zhibo Yu^{1,2}, Dapeng Chen^{1,2}, Hongbin Luo^{1,2}

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状态: R2

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Revisions Being Processed for Author					
Page 1 of 1 (1 total revision being processed)					
Article ID	Manuscript Number	Title	Date Submission Begins	Status Date	Current Status
Article ID	JAG-D-24-04658R2	A Precise Estimation Framework for Individual Tree AGB of <i>Pinus kesiya</i> var. <i>langbianensis</i> Utilizing Point Cloud Registration Optimization	Apr 21, 2023	Apr 21, 2025	Under Review

Page 1 of 1 (1 total revision being processed)

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A Precise Estimation Framework for Individual Tree AGB of *Pinus kesiya* var. *langbianensis* Utilizing Point Cloud Registration Optimization

Zhibo Yu^{a,b,1}, Yong Wu^{a,b,1}, Ziyu Zhang^{a,b}, Chi Lu^{a,b}, Hong Wang^{a,b}, Zhi Liu^{a,b}, Xiaoli Zhang^{a,b},
Lei Bao^{a,b}, Jie Pan^{a,b}, Guanglong Ou^{a,b,*}, Hongbin Luo^{a,b,*}

SCI 2 区: Remote Sensing

状态: R3

稿件号: Remote Sensing-3559883

Incomplete submissions (0) Under processing (1) Website Online (4) Rejected / Withdrawn / Archived (18)						
Manuscript ID	Journal	Section / Special Issue	Title	Status	Submission Date	
remotesensing-3559883 	Remote Sensing	SI: Remote Sensing Applications for Forest Ecosystem Monitoring and Spatial Modeling (2nd Edition)	An optimized multi-source point cloud registration strategy for natural forests across feature point matching	Revised version review	2025-03-16 09:45:38	

Article

A Multi-Source Point Cloud Registration Strategy for Natural Forests Based on Point Cloud Partitioning

Zhibo Yu^{1,2}, Yong Wu^{1,2}, Ziyu Zhang^{1,2}, Xiaoli Zhang^{1,2}, Chi Lu^{1,2}, Zhi Liu^{1,2}, Yuansu Xu^{1,2}, Hong Wang^{1,2}, Jie Pan^{1,2}, Guanglong Ou^{1,2}, Hongbin Luo^{1,2,*}



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申请年度：	2025

4、 外语能力证书

一、检索结果附表

序号	论文信息	收录情况	SCI引用	CNKI引用	期刊指标
1	Zhao Han, Zhang Tingwei, Ji Yongjie, Zhang Wangfei. Uncertainty analysis for forest height inversion using L / P band PolInSAR datasets and RVoG model over kryclan forest site. INTERNATIONAL JOURNAL OF APPLIED EARTH OBSERVATION AND GEOINFORMATION, 2024, 130.	SCI	总引:1次 他引:1次	-	JCR影响因子(2023):7.6 中科院分区(2023升级版): 大类:地球科学1区 TOP期刊
2	Zhao Han, Zhang Wangfei, Ji Yongjie, Han Zongtao. Retrieval of forest aboveground biomass via compact polarimetric SAR data. National Remote Sensing Bulletin, 2024, 28(9): p 2416-2426. 赵含, 张王菲, 姬永杰, 韩宗涛.简缩极化SAR数据支持的森林地上生物量反演. 遥感学报,2024,28(09):2416-2426.	EI	-	总引:0次 他引:0次	-
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Uncertainty analysis for forest height inversion using L / P band PolInSAR datasets and RVoG model over kryclan forest site

Han Zhao^a, Tingwei Zhang^a, Yongjie Ji^b, Wangfei Zhang^{a,*}^a Forestry College, Southwest Forestry University, Kunming 650224, China^b School of Geography and Ecotourism, Southwest Forestry University, Kunming 650224, China

ARTICLE INFO

Keywords:
 Uncertainty
 PolInSAR
 RVoG
 Forest height
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ABSTRACT

Forest height, as a measure of the quantity and quality of forest resources, plays a significant role in the study of the ecological functions performed by forests. Although the polarimetric synthetic aperture radar interferometry (PolInSAR) technique has evolved as a potent method for forest height inversion, uncertainties still exist in the process of estimating forest height, and the uncertainties in predicted forest height directly lead into the uncertainty of terrestrial carbon stock calculation results. In this study, we took the Random Volume over Ground (RVoG) model as likelihood function and constructed a hierarchical Bayesian framework to calculate and reduce the uncertainty of forest height inversion using L / P band PolInSAR airborne data via RVoG model. Uncertainties resulted from five canopy types and three forest densities were analyzed, respectively. The results showed that among the five different canopy types, L band has the highest prediction accuracy in pure coniferous canopy with $Acc. = 0.90$. The uncertainty is extremely low for pure forest, with the ratio of uncertainty values of 0.09 for L band and 0.15 for the P band in pure coniferous canopy, and uncertainty values of 0.16 for L band and 0.11 for P band in pure broadleaf canopy, respectively. Furthermore, when the forest density is between 300 and 600 stems/ha, the ratio of uncertainties for the L band is 0.27, whereas the P band is 0.24. As forest density increases, the uncertainty in forest height estimates decreases for both bands. The changes in canopy types and forest density affect forest height estimation uncertainties obviously, the effects are different at each frequency. The forest height inversion accuracy of the L band in pure coniferous canopy surpasses that in other canopy types, with the lowest uncertainty. P band performed well in broadleaf canopy forest height inversion. The inversion uncertainties at both frequencies decrease with increase of forest densities.

1. Introduction

Forest height is an essential forest vertical structural characteristic that is closely associated with carbon stock coming from forest above-ground biomass (AGB) (Pang et al., 2022). Accurate forest height distribution knowledge plays a key role in monitoring forest development, disturbance, and degradation. Obtaining accurate forest height information plays a significant role for forest management, carbon circulation and worldwide warming researches (Xu et al., 2022; Kugler et al., 2015).

Longer-wavelength synthetic aperture radar (SAR) like L and P band have great forest penetration capabilities, excellent inversion accuracy and then have great potential for forest height inversion, especially when combined with polarimetric synthetic aperture radar interferometry (PolInSAR) techniques. (Cloude and Papathanassiou, 2003; Liao

et al., 2020; Wu et al., 2022). Given the implementation of European Space Agency's (ESA) P band BIOMASS SAR and L-band interferometric SAR satellite program of China, mapping forest height or AGB across the globe with measurements using L / P band PolInSAR datasets become available and necessary. This increased availability of data will further facilitate their extensive use in forest height inversion (Xing et al., 2023). Indeed, although PolInSAR methodology has been determined to be an efficient solution for forest height retrieval, there are still various uncertainties associated with the estimated results using this technique. These uncertainties in forest height estimated results can significantly affect the accuracy and quality of terrestrial carbon stock simulations and forecasts (Riel et al., 2018; Lang et al., 2022). Therefore, it is urgent to explore the uncertainties of the estimated forest height results using PolInSAR methodology.

The Random Volume over Ground (RVoG) model has become a

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序号	论文信息	收录情况	SCI引用	CNKI引用	期刊指标
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作者: Zhao Han,Zhang Tingwei, Ji Yongjie,Zhang Wangfei

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作者: Zhang, B (Zhang, Bing); Zhu, HB (Zhu, Hongbo); Song, WD (Song, Weidong); Zhu, JJ (Zhu, Jianjun); Dai, JG (Dai, Jiguang); Zhang, JC (Zhang, Jichao); Li, CJ (Li, Chengjin)

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Accession number:20244217193192

Title:Retrieval of forest aboveground biomass via compact polarimetric SAR data

Authors:Zhao, Han (1),Zhang, Wangfei (1),Ji, Yongjie (1),Han, Zongtao (2)

Author affiliation:(1) College of Forestry, Southwest Forestry University, Kunming; 650224, China; (2) Weihai Wuzhou Navi-Tech, Weihai; 264400, China

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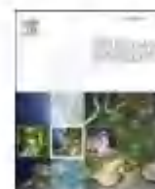
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Uncertainty analysis for forest height inversion using L / P band PolInSAR datasets and RVoG model over kryclan forest site

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ABSTRACT

Forest height, as a measure of the quantity and quality of forest resources, plays a significant role in the study of the ecological functions performed by forests. Although the polarimetric synthetic aperture radar interferometry (PolInSAR) technique has evolved as a potent method for forest height inversion, uncertainties still exist in the process of estimating forest height, and the uncertainties in predicted forest height directly lead into the uncertainty of terrestrial carbon stock calculation results. In this study, we took the Random Volume over Ground (RVoG) model as likelihood function and constructed a hierarchical Bayesian framework to calculate and reduce the uncertainty of forest height inversion using L / P band PolInSAR airborne data via RVoG model. Uncertainties resulted from five canopy types and three forest densities were analyzed, respectively. The results showed that among the five different canopy types, L band has the highest prediction accuracy in pure coniferous canopy with $Acc. = 0.90$. The uncertainty is extremely low for pure forest, with the ratio of uncertainty values of 0.09 for L band and 0.15 for the P band in pure coniferous canopy, and uncertainty values of 0.16 for L band and 0.11 for P band in pure broadleaf canopy, respectively. Furthermore, when the forest density is between 300 and 600 stems/ha, the ratio of uncertainties for the L band is 0.27, whereas the P band is 0.24. As forest density increases, the uncertainty in forest height estimates decreases for both bands. The changes in canopy types and forest density affect forest height estimation uncertainties obviously, the effects are different at each frequency. The forest height inversion accuracy of the L band in pure coniferous canopy surpasses that in other canopy types, with the lowest uncertainty. P band performed well in broadleaf canopy forest height inversion. The inversion uncertainties at both frequencies decrease with increase of forest densities.

1. Introduction

Forest height is an essential forest vertical structural characteristic that is closely associated with carbon stock coming from forest above-ground biomass (AGB) (Pang et al., 2022). Accurate forest height distribution knowledge plays a key role in monitoring forest development, disturbance, and degradation. Obtaining accurate forest height information plays a significant role for forest management, carbon circulation and worldwide warming researches (Xu et al., 2022; Kugler et al., 2015).

Longer-wavelength synthetic aperture radar (SAR) like L and P band have great forest penetration capabilities, excellent inversion accuracy and then have great potential for forest height inversion, especially when combined with polarimetric synthetic aperture radar interferometry (PolInSAR) techniques. (Cloude and Papathanassiou, 2003; Liao

et al., 2020; Wu et al., 2022). Given the implementation of European Space Agency's (ESA) P band BIOMASS SAR and L-band interferometric SAR satellite program of China, mapping forest height or AGB across the globe with measurements using L / P band PolInSAR datasets become available and necessary. This increased availability of data will further facilitate their extensive use in forest height inversion (Xing et al., 2023). Indeed, although PolInSAR methodology has been determined to be an efficient solution for forest height retrieval, there are still various uncertainties associated with the estimated results using this technique. These uncertainties in forest height estimated results can significantly affect the accuracy and quality of terrestrial carbon stock simulations and forecasts (Riel et al., 2018; Lang et al., 2022). Therefore, it is urgent to explore the uncertainties of the estimated forest height results using PolInSAR methodology.

The Random Volume over Ground (RVoG) model has become a

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简缩极化SAR数据支持的森林地上生物量反演

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摘 要: 简缩极化CP (Compact Polarimetry) SAR作为一种国内外学者高度关注的新型SAR, 目前鲜有将其应用于森林地上生物量AGB (Above Ground Biomass) 反演研究。在全球气候变化及“双碳”目标下, 森林AGB的精确反演是当下亟待解决的热点问题。为探究CP SAR数据在森林AGB反演中的可行性, 以云南省昆明市宜良县小哨林区为研究区, 提取水平线性CP Stokes1模式、垂直线性CP Stokes2模式、 $\pi/4$ 线性模式及CTLR模式的4种CP SAR数据, 并基于波的二分性原理, 分别提取了各种模式的若干SAR参数, 利用基于快速迭代特征选择的K最近邻(KNN-FIFS)算法开展了研究。结果表明: 基于CTLR模式的森林AGB反演结果最优, $R^2=0.52$, RMSE=13.02 t/hm²; 联合4组CP SAR数据的森林AGB反演结果精度有明显提升, $R^2=0.58$, RMSE=12.16 t/hm²; KNN-FIFS适合于采用CP SAR参数进行森林AGB反演, 其反演结果与采用全极化SAR数据进行反演的差别并不明显。本研究提取的CP SAR参数中, 线极化度 m_1 、倾斜角 45° 或 135° 时的线极化分量功率值 g_2 等特征在森林AGB反演中表现出较高的适用性, 说明其能更好的表征森林信息。

关键词: 遥感, 森林AGB, GF-3, Stokes, 简缩极化SAR, KNN-FIFS

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1 引言

森林是陆地生态系统的主体, 在碳循环进程中对二氧化碳浓度变化及辐射能量交换起着决定性作用。森林作为最大的有机碳贮库, 在改善生态环境、减少温室气体、减缓全球气候变暖方面发挥着十分重要的作用(陶玉华, 2012)。森林地上生物量AGB (Above Ground Biomass) 是描述森林生态系统物质循环、能量流动的重要指标之一(魏雪梅, 2019), 其作为森林生态系统固碳能力的直观表达, 是评估森林生态系统碳收支的重要指标(张少伟等, 2019), 因此, 森林AGB的精确反演对碳循环、碳达峰、碳中和等研究具有重要意义。

合成孔径雷达SAR (Synthetic Aperture Radar)

数据由于获取的波长较长, 具有穿透云雾雨雪的能力, 能够全天时全天候工作, 同时可以穿透森林冠层, 能够反映树干和树枝的信息, 进而提供更准确的森林结构信息, 具有提高森林AGB反演精度的潜力(李增元和陈尔学, 2019)。全极化SAR即同时包含HH、HV、VH、VV等4种不同的极化状态的微波探测技术; 不同收发极化组合, 可获得较全面的森林散射信息。全极化SAR数据虽然可以获取丰富的信息, 但其数据下载速度、测绘带宽、能量消耗和天线技术等问题成为全极化SAR发展的一大掣肘, 为解决上述限制因素, 简缩极化CP (Compact Polarimetry) SAR方法被提出(Souyris等, 2005; Raney, 2007)。CP SAR本质上是一种双极化系统, 但相较于传统线性双极化SAR, CP SAR能够存储回波信号的相对相位,

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