Engineering Village™

1. **GoF Design Patterns in a Smart City System**
Ngaogate, W. **Source:** *Journal of Software*, v 14, n 5, 220-6, May 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.5.220-226; **Publisher:** Academy Publisher, Finland

Author affiliation:
Ubon Ratchathani University, Warinchamrab, Thailand

Abstract: This paper demonstrates how GoF software design patterns can be applied in a smart city system. By giving a case study, observer pattern and composite pattern are used. SoA architecture is applied for showing how a system with heterogeneous devices is structured. Novice software engineers might use this demonstration as a guide for building up a smart city system. (27 refs.) **Inspec controlled terms:** service-oriented architecture - smart cities

Uncontrolled terms: smart city system - GoF software design patterns - observer pattern - composite pattern - SoA architecture - novice software engineers

Classification Code: C7100 Business and administrative computing - C6110B Software engineering techniques

IPC Code: G06F9/44 - G06Q10/00 - H04L29/00

Treatment: Practical (PRA)

Database: Inspec

2. **Using Complex Numbers in Website Ranking Calculations: A Non-ad hoc Alternative to Google's PageRank**
Sugihara, K. **Source:** *Journal of Software*, v 14, n 2, 58-64, Feb. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.2.58-64; **Publisher:** Academy Publisher, Finland

Author affiliation:
Nanzan University, 18 Yamazato, Showa, Japan

Abstract: This paper presents an alternative to Google's PageRank, i.e., it presents an algorithm used to calculate the score for a webpage using complex numbers that overcomes the problems inherent in Google's method. This algorithm was inspired by eigenvector centrality in social network analyses and is designed to reproduce the ranking results of Google's PageRank and to satisfy the condition of soundness. This algorithm can be developed further to achieve more desirable outcomes. (16 refs.)
Inspec controlled terms: eigenvalues and eigenfunctions - number theory - search engines - social networking (online) - Web sites

Uncontrolled terms: complex numbers - Google PageRank - Website ranking calculations - eigenvector centrality - social network analyses

Classification Code: C7210N Information networks - C1160 Combinatorial mathematics -

C7250N Search engines - C4140 Linear algebra (numerical analysis)

IPC Code: G06F17/30

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

3. **A Service-Oriented Non-intrusive Software Fault-Tolerant Programming Model**
Shuanghui Yi; Rong Li **Source:** *Journal of Software*, v 14, n 8, 350-5, Aug. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.8.350-355; **Publisher:** Academy Publisher, Finland

Author affiliation:
National Key Laboratory for Complex Systems Simulation, China

Abstract: Only through good design can we obtain the high dependability of the software. How to establish the high dependability of the software from the design is the current problem to be solved. Existing objectoriented programming methods and techniques cannot adapt to service-oriented credibility design requirements. This paper will propose a non-intrusive software fault-tolerant programming model based on the research of the fault-tolerant ability of service-affecting service. By establishing service fault-tolerant design and development model, the flexible compilation of trusted attributes is realized. (5 refs.) **Inspec controlled terms:** object-oriented methods - object-oriented programming - service-oriented architecture - software fault tolerance

Uncontrolled terms: service-oriented credibility design requirements - service fault-tolerant design

- service-affecting service - service-oriented nonintrusive software fault-tolerant programming model

Classification Code: C6110B Software engineering techniques - C6110F Formal methods - C6110J Object-oriented programming

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

4. **Color Image Watermarking Based on Octonion Discrete Cosine Transform**
Shuang She; Guoheng Huang; Lianglun Cheng **Source:** *Journal of Software*, v 14, n 1, 13-23, Jan. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.1.13-23; **Publisher:** Academy Publisher, Finland

Author affiliation:
Guangdong University of Technology, School of Automation, Guangdong, China

Abstract: There are few watermarking algorithms for color images. In most traditional watermarking algorithms, transforms are applied to each component of the color model individually resulting in less robust experimental results. Therefore, we propose a color image watermarking algorithm which is a high-dimensional algorithm. First, Octonion Discrete Cosine Transform (ODCT) and its inverter transform (IODCT) are proven. Then, a novel color image watermarking technique based on ODCT is proposed. Experimental results show that it not only has good anti to compression ability, but also has robustness to noise, filtering and rotation attacks. (16 refs.) **Inspec controlled terms:** discrete cosine

transforms - image coding - image colour analysis - image watermarking - watermarking

Uncontrolled terms: Octonion Discrete Cosine Transform - color images - traditional watermarking algorithms - color model - robust experimental results - color image watermarking algorithm - high-dimensional algorithm - novel color image watermarking technique

Classification Code: B6135 Optical, image and video signal processing - B6135C Image and video coding - B0230 Integral transforms - C5260B Computer vision and image processing techniques - C1130 Integral transforms

IPC Code: G06T - G06T1/00 - G06T9/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

5. **On Auto-measuring of Applications Usability for Blind People**
Mohamed, M.H.; Elfaki, A.O.; Johar, M.G.M. **Source:** *Journal of Software*, v 14, n 4, 146-52, April 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.4.146-152; **Publisher:** Academy Publisher, Finland

Author affiliation:
Management and Science University, Sudan
University of Tabuk, Saudi Arabia

Abstract: Usability of computer systems is the most important successful factor for blind people.

AutoMeasuring of usability is a recent concept that guarantees the result is clear from human biases. This paper investigates the metrics that could be used to develop usability auto-measuring system. First, metrics are extracted from literature, and then directed questionnaire has been conducted to prove the correctness of the selected metrics. The results of questionnaires proved the correctness of the selected metrics. Finally, we have prepared for experiment to test the selected the metrics. (9 refs.)
Inspec controlled terms: handicapped aids - human factors

Uncontrolled terms: selected metrics - applications usability - blind people - computer systems - human biases - usability auto-measuring system - successful factor - directed questionnaire

Classification Code: C7850 Computer assistance for persons with handicaps - C0240 Ergonomic aspects of computing

Treatment: Practical (PRA)

Database: Inspec

6. **Strengths and weakness of traditional and agile processes - a systematic review**
Mirza, M.S.; Datta, S. **Source:** *Journal of Software*, v 14, n 5, 209-19, May 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.5.209-219; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of Houston-Clear Lake, Houston, TX, United States

Abstract: In the software industry, there are several processes and methodologies that exist. The

traditional processes and Agile methodologies have their own strengths and weaknesses. Agile methodologies overcome some of the weaknesses of traditional processes. Although in the recent years Agile methodologies have been used by software development companies, there is still a high ratio of software failures when compared with core engineering processes. The adoption of these processes in software development could alleviate software failures. This systematic study reviews the strengths and weaknesses of both traditional processes and Agile processes. The search strategy resulted in 91 papers, of which 25 primary studies are investigated between 2012 and 2019. The detailed search strategy has been presented in this study along with future directions. (25 refs.) **Inspec controlled terms:** DP industry - software development management - software prototyping

Uncontrolled terms: agile methodologies - software development companies - software failures - core engineering processes - agile processes - systematic review - software industry

Classification Code: C6110B Software engineering techniques - C0310F Software management

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

7. **The Software Gene-Based Test Set Automatic Generation Framework for Antivirus Software**
Liang Bai; Yu Rao; Shiwei Lu; Xu Liu; Yiyi Hu **Source:** *Journal of Software*, v 14, n 10, 449-56, Oct. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.10.449-456; **Publisher:** Academy Publisher, Finland

Author affiliation:
CNCERT, China
Shanghai Roar Panda Network Technology Co., Ltd., China

Abstract: After studying the existing test set generation methods of antivirus software and sample analysis methods based on manual experience, the paper proposes a software gene-based test set automatic generation framework for antivirus software. Most of current test set automatic generation frameworks have problems of unstable performance, time-consuming, and the fact that its test set cannot well reflect the density distribution character of the original dataset. In this paper, some improvements are made to resolve above problems. Experiment results show that the framework can efficiently generate the test sample set with the volume no more than one tenth of the original data set, meanwhile the distribution characteristics of the original dataset can be retained. (24 refs.) **Inspec controlled terms:** computer viruses - program testing

Uncontrolled terms: software gene-based test set automatic generation framework - antivirus software - test sample set - sample analysis - density distribution character

Classification Code: C6150G Diagnostic, testing, debugging and evaluating systems - C6130S Data security

IPC Code: G06F11/36 - G06F21/00

Treatment: Practical (PRA)

Database: Inspec

8. **A Structural Complexity Metric Method for Complex Information Systems**
Aimin Luo; Mengmeng Zhang; Yi Mao; Yuxiao Kou; Xiaoxue Zhang **Source:** *Journal of Software*, v 14, n 7, 332-9, July 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.7.332-339; **Publisher:** Academy Publisher, Finland

Author affiliation:
National University of Defense Technology, Science and Technology on Information Systems Engineering Laboratory, Hunan, China
State Key Laboratory of Air Traffic Management System and Technology, China

Abstract: A system structure is deemed as a trade-off between requirements and complexity. An effective measurement of structural complexity is the basis of choosing a reasonable system structure. In this paper, a structural complexity evaluation model of information systems is established through three factors: subsystem complexity, interactional complexity, and topological complexity. In addition, we introduce quantitative calculation methods related to the three factors. Finally, the proposed model is verified by the case of an air defense suppression system. (21 refs.) **Inspec controlled terms:** information systems - software metrics

Uncontrolled terms: structural complexity metric method - complex information systems - reasonable system structure - structural complexity evaluation model - subsystem complexity - interactional complexity - topological complexity - quantitative calculation methods - air defense suppression system

Classification Code: C7100 Business and administrative computing - C6110S Software metrics

IPC Code: G06F9/44 - G06Q10/00

Treatment: Practical (PRA)

Database: Inspec

9. **An Empirical Investigation of Effort Estimation in Mobile Apps Using Agile Development Process**
Altaleb, A.; Gravell, A. **Source:** *Journal of Software*, v 14, n 8, 356-69, Aug. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.8.356-369; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of Southampton, School of Electronics and Computer Science, United Kingdom

Abstract: Effort estimation is essential in order for a project manager and development team members to be able to successfully plan for a software project. The planning and development of mobile applications present many challenges. The aim of this study is to provide and report an overview on the state of the practice of effort estimation techniques that companies use for their mobile app projects. This study focuses on organisations which apply the Agile development process during their projects. We conducted structured and semi-structured interviews with 20 Agile practitioners at 18 different organisations. The results revealed that Planning Poker (PP) and Expert Judgment (EJ) were the most frequently used estimation techniques in mobile app projects. (25 refs.) **Inspec controlled terms:** mobile computing - project management - software development management - software

maintenance - software prototyping - team working

Uncontrolled terms: mobile applications - effort estimation techniques - mobile app projects - Agile development process - Agile practitioners - Planning Poker - project manager - development team members - software project - structured interviews - semi-structured interviews - Expert Judgment

Classification Code: B6250F Mobile radio systems - C6190V Mobile, ubiquitous and pervasive computing - C6110B Software engineering techniques - C0310F Software management

IPC Code: G06F9/44 - H04B7/00 - H04B7/26 - H04W

Treatment: Practical (PRA)

Database: Inspec

10. **Comparing DSP Software Performance Prediction Models at Source Code Level - From Analytical to Statistical**
Erh-Wen Hu; Weihua Liu; Bogong Su; Jian Wang **Source:** *Journal of Software*, v 14, n 6, 247-56, June 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.6; **Publisher:** Academy Publisher, Finland

Author affiliation:
William Paterson University, Dept. of Computer Science, Wayne, NJ, United States
Ericsson, Mobile Broadband Software Design, Ottawa, ON, Canada

Abstract: Efficient performance prediction at source code level is essential in reducing the turnaround time of software development, particularly when the source code is subject to changes due to modification of problem specification. In this paper, we investigate and compare five performance prediction models from practical standpoint to determine the usefulness of these models. To verify the effectiveness of these models, we select a set of functions from PHY DSP Benchmark and TIC64 DSP processor for experiment. Comparing the predicted performance to the actual measured execution time, we observed that the relative prediction error generated from two of the five models are low and can thus be used for practical purposes. (14 refs.) **Inspec controlled terms:** digital signal processing chips - software performance evaluation

Uncontrolled terms: relative prediction error - DSP software performance prediction models - source code level - efficient performance prediction - turnaround time - software development - PHY DSP Benchmark - TIC64 DSP processor - predicted performance - actual measured execution time

Classification Code: C1140Z Other topics in statistics - C6110B Software engineering techniques - C6110R Software performance evaluation

IPC Code: G06F9/44

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

11. **Functional Requirement on Proofreading System**
Sari, D.L.; Niswatin, C. **Source:** *Journal of Software*, v 14, n 5, 192-9, May 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.5.192-199; **Publisher:** Academy Publisher, Finland

Author affiliation:
Politeknik Kota Malang, Tlogowaru No.3, Malang, East, Indonesia

Abstract: This research aims to have an analysis on functional requirements to build the proofreading system. It is used to justify the appropriateness of functional requirements which gained from interview to the project owners and end users' questionnaires. Kano method is applied to compare both of data from interview and questionnaires. It classifies the provides features into some categories to measure the users' satisfaction level. The result of Kano evaluation shows that only one out of 17 features is not important in the perspective of users. In contrast, other features are important for them, however, each of features should be determined into its priority to develop the system using Kano. The system development must be started from features which are prioritized the criteria be (M) followed by one-dimensional (O) then attractive (A). There are 6 features which are differently perceived between lectures' and students' point of view. This differentiation makes project owners difficult to prioritize the features development since the weaknesses of Kano which could not disclose the users' reasons.. (12 refs.) **Inspec controlled terms:** human factors - natural language processing

Uncontrolled terms: features development - system development - Kano evaluation - end users - project owners - proofreading system - functional requirement

Classification Code: C6180N Natural language processing - C0240 Ergonomic aspects of computing

IPC Code: G06F17/20

Treatment: Practical (PRA)

Database: Inspec

12. **Applying Spring Security Framework and OAuth2 To Protect Microservice Architecture API**
Quy Nguyen; Baker, O. **Source:** *Journal of Software*, v 14, n 6, 257-64, June 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.6.257-264; **Publisher:** Academy Publisher, Finland

Author affiliation:
Southern Institute of Technology, New Zealand

Abstract: Since 2014, Microservice Architecture (MSA) has been widely applied and deployed by big companies such as Google, Netflix and Twitter. This is a way of architecting software systems in which the services of a single application are decomposed then deployed and executed separately. This research examines the possibility of applying Spring Security Framework and OAuth2 to secure microservice APIs which are built on top of Spring Framework. By developing a Proof of Concept (POC) of an Inventory Management System using MSA on top of Spring Framework, Spring Security Framework and OAuth2. we have conducted security tests over the POC using unit testing and manual testing techniques to examine if there are any vulnerabilities and we were able to show and confirm the effectiveness of the Spring Security Framework and OAuth2 in securing Spring-based APIs. (12 refs.)
Inspec controlled terms: application program interfaces - authorisation - program testing - software architecture

Uncontrolled terms: MSA - OAuth2 - security tests - securing Spring-based APIs - Microservice Architecture API - architecting software systems - microservice APIs - spring security framework - Google - Netflix - Twitter - proof of concept - inventory management system - unit testing technique - manual testing technique

Classification Code: C6130S Data security - C6150E General utility programs - C6150G Diagnostic, testing, debugging and evaluating systems - C6110B Software engineering techniques

IPC Code: G06F9/00 - G06F9/44 - G06F11/36 - G06F21/00

Treatment: Practical (PRA)

Database: Inspec

13. **EFTSA: evaluation framework for twitter sentiment analysis**
Alsaeedi, A. **Source:** *Journal of Software*, v 14, n 1, 24-35, Jan. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.1.24-35; **Publisher:** Academy Publisher, Finland

Author affiliation:
Taibah University, Department of Computer Science, Saudi Arabia

Abstract: Sentiment analysis is a characteristic task that aims to detect the sentiment of opinions in content. Twitter sentiment analysis (TSA) is a promising field that has gained attention in the last decade. Investigators in the TSA field have faced difficulties comparing existing TSA techniques, as there is no agreed systematic framework. This means that the evaluation of existing techniques relies

on selecting different datasets without meaningful justification. Another issue that arises when comparing different TSA techniques is that there are no unified metrics. Some researchers select classification accuracy and others choose recall, precision, and F-measure metrics. In this paper, we propose a framework called Evaluation Framework for Twitter Sentiment Analysis (EFTSA) for TSA evaluation based on individual or multiple datasets. This would help researchers compare their Twitter sentiment approaches against others. (37 refs.) **Inspec controlled terms:** data mining - natural language processing - pattern classification - social networking (online) - text analysis

Uncontrolled terms: evaluation framework - twitter sentiment analysis - TSA field - existing TSA techniques - agreed systematic framework - comparing different TSA techniques - TSA evaluation - Twitter sentiment approaches

Classification Code: C1140Z Other topics in statistics - C6130 Data handling techniques - C6130D Document processing techniques - C6170K Knowledge engineering techniques - C6180N Natural language processing - C7120 Financial computing - C7210N Information networks - C0230 Economic, social and political aspects of computing

IPC Code: G06F7/00 - G06F15/18 - G06F17/20 - G06F17/21 - G06Q30/00 - G06Q40/00 - G06N5/04

Treatment: Practical (PRA)

Database: Inspec

14. **Software Productivity in DevOps**

Qin Liu; Yidan Qin; Hongming Zhu; Hongfei Fan **Source:** *Journal of Software*, v 14, n 3, 129-37, March 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.3.129-137; **Publisher:** Academy Publisher, Finland

Author affiliation:
Tongji University, Cao'an Highway, China

Abstract: The investigation of multi-source, heterogeneous, multi-cycle data in DevOps has been attracting lots of attention in recent years. Although productivity is crucial for assuring instant release of DevOps, it has not been well studied based on merging effort features and unobserved cost features for open source software. An innovative software productivity estimation model in DevOps is proposed in this paper by recasting the definition of effort and cost. The proposed productivity model takes account of committed ldquooutcomesrdquo as cost instead of traditional man-month, and extended effort to consist of various commits (code, issue, scripts). Four open source projects are studied, with 95481 commits and 95828 issues in total. The experiment results illustrate the productivity changes with life cycle. The non-traditional code work ratio in productivity can represent iteration frequency of a software production and increases drastically before important releases. Thus we can monitor the life cycle and predicting large change of a production with productivity. (10 refs.) **Inspec controlled terms:** innovation management - iterative methods - productivity - project management - public domain software - software development management

Uncontrolled terms: innovative software productivity estimation model - DevOps - productivity model - committed outcomes - traditional man-month - open source projects - productivity changes - life cycle - nontraditional code work ratio - software production - multisource - multicycle data - instant release - effort features - unobserved cost features - open source software

Classification Code: C6110B Software engineering techniques - C0310F Software management

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

15. **Point Cloud Data Processing and Analysis for 3D Measurement of Ship Hull Plate**
Guiyang Deng; Lianglun Cheng; Xiaoqing Dong **Source:** *Journal of Software*, v 14, n 4, 182-91, April 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.4.182-191; **Publisher:** Academy Publisher, Finland

Author affiliation:
Guangdong University of Technology, School of Automation, Guangdong, China
Hanshan Normal University, School of Physics and Electronic Engineering, Guangdong, China

Abstract: In this paper, the 3D measurement of the hull plate is used as the background. It analyzes the principle of laser three-dimensional scanning. The independent k-neighbor problem is considered to improve the method of law loss propagation adjustment, at point cloud data segmentation. It improves the K-neighbor point cloud data boundary feature extraction algorithm. A point cloud reduction algorithm based on K-d tree space partitioning and local curvature threshold is proposed, and the algorithm flow is given. Finally, the related algorithms are simulated and tested, and the results also verify the feasibility of the above method, meet the needs of hull plate measurement. (13 refs.) **Inspec controlled terms:** cloud computing - feature extraction - plates (structures) - ships

Uncontrolled terms: laser three-dimensional scanning - independent k-neighbor problem - law loss propagation adjustment - point cloud data segmentation - K-neighbor point cloud data boundary feature extraction algorithm - point cloud reduction algorithm - local curvature threshold - algorithm flow - hull plate measurement - point cloud data processing - 3D measurement - ship hull plate - K-d tree space partitioning

Classification Code: C6190J Internet software - C7210N Information networks

IPC Code: B63B - G06F9/44

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

16. **Using Reverse Engineering for Building Ontologies with Deeper Taxonomies from Relational Databases**
Sbai, S.; Louhdi, M.R.C.; Behja, H.; Zemmouri, E.-M.; Rabab, C. **Source:** *Journal of Software*, v 14, n 3, 138-45, March 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.3.138-145; **Publisher:** Academy Publisher, Finland

Author affiliation:
Hassan II University, High National School of Electricity and Mechanics, Morocco
Hassan II University, Faculty of Sciences Ain Chock, Morocco
High National School of Arts and Crafts (ENSAM), Morocco

Abstract: The relational model is characterized by its high quality and has been widely used by information systems. However, unlike the conceptual model, the relational model is semantically poor since it doesn't enable the representation of inheritance. In this paper, we present an algorithmic approach to extract generalization/ specialization inheritance hierarchies. We perform a reverse engineering by analyzing stored data. Finally, we evaluated our approach by conducting several experiments on relational databases. The results were satisfying in terms of recovering the tables lost during the transformation from the entity relationship model to the relational model. (18 refs.) **Inspec controlled terms:** entity-relationship modelling - inheritance - ontologies (artificial intelligence) - relational databases - reverse engineering

Uncontrolled terms: building ontologies - deeper taxonomies - relational databases - relational model - information systems - conceptual model - reverse engineering - entity relationship model - specialization inheritance hierarchie

Classification Code: C6170K Knowledge engineering techniques - C6120 File organisation - C6160D Relational databases

IPC Code: G06F12/00 - G06F15/18 - G06F17/30 - G06N5/04

Treatment: Practical (PRA)

Database: Inspec

17. **Reliability Centered Multi-objective Optimization Analysis Method for Equipment-intensive**

Systems

Li Jingyao; Cheng Lianglun; Huang Guoheng **Source:** *Journal of Software*, v 14, n 12, 559-72, Dec. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.12.559-572; **Publisher:** Academy Publisher, Finland

Author affiliation:

Guangdong University of Technology, School of Automation, Guangdong, China

Guangdong University of Technology, School of Computer Science, Guangdong, China

Abstract: Aiming at the lack of foundation for the maintenance strategy of equipment-intensive enterprises. This paper is based on the analytic hierarchy process to obtain the importance of equipment in the system, which qualify the equipment operation data and expert experience data by layer. Firstly, the system is modeled according to correlation, and then the consistency evaluation matrix is constructed. Finally, the reliability ratio can be used to simplify the system model. For the equipment-intensive systems such as a metro station system, the experimental data can match well with the empirical data. This method is able to achieve reliability-centered, which can also make the system a promotion efficiency of maintenance decisions and a reduction in the cost of operation and maintenance. (11 refs.) **Inspec controlled terms:** analytic hierarchy process - decision making - fuzzy reasoning - fuzzy set theory - maintenance engineering - optimisation - reliability

Uncontrolled terms: reliability centered multiobjective optimization analysis method - equipment-intensive systems - maintenance strategy - equipment-intensive enterprises - analytic hierarchy process - equipment operation data - expert experience data - reliability ratio - system model - metro station system - empirical data - reliability-centered

Classification Code: B0260 Optimisation techniques - C1180 Optimisation techniques - C1160 Combinatorial mathematics - E1020 Maintenance and reliability

Treatment: Practical (PRA)

Database: Inspec

18. **Ideal Pattern of Business and IS Alignment for Improving e-Government Services in Saudi Arabia**

Alfadhel, S.A.; Shaofeng Liu; Oderanti, F.O. **Source:** *Journal of Software*, v 14, n 2, 92-106, Feb. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.2.92-106; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of Plymouth, Plymouth Graduate School of Management, United Kingdom
University of Hertfordshire Hatfield, Hertfordshire Business School, United Kingdom

Abstract: Over the past few years, governments from all over the world are losing general public trust. This lack of public trust presents a significant challenge to public officers, citizens and politicians as it decreases community confidence in public officers and political performance and generates disappointment with community support and services. Alignment is a process where every stakeholder in the government infrastructure works together to achieve common business objectives. The aim of this paper is to study a comprehensive pattern (strategic, structural, social and cultural) of alignment with the aim of improving government services in Saudi Arabia. The data has been collected from different e-government experts from the Kingdom of Saudi Arabia. Study result indicates that public trust and e-government goals can be attained through establishing strong alignment between information systems (IS) departments and other government agencies. (32 refs.) **Inspec controlled terms:** business data processing - government data processing - information systems -

organisational aspects - politics - public administration - strategic planning

Uncontrolled terms: different e-government experts - e-government goals - strong alignment - comprehensive pattern - common business objectives - government infrastructure works - community support - political performance - public officers - community confidence - politicians - general public trust - governments - Saudi Arabia - improving e-government services - government agencies

Classification Code: C7130 Public administration - C7210N Information networks - C7100 Business and administrative computing

IPC Code: G06Q10/00 - G06Q50/26

Treatment: Practical (PRA)

Database: Inspec

19. **Towards Denial-of-Service Memory Vulnerabilities**
Tianhan Lu; Yu-Ju Lee; Wen-Wei Liao **Source:** *Journal of Software*, v 14, n 9, 36-49, Sept. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.9.423-436; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of Colorado Boulder, Department of Computer Science, Boulder, CO 80309-0430, United States
University of Colorado Boulder Cooperative, Institute for Research in Environmental Sciences,

Boulder, CO, United States

Abstract: We address the problem of verifying a program to be free of Denial-of-Service memory vulnerabilities. More specifically, we define a program to be safe from DoS attacks if its memory usage at any time during execution is linear to sizes of its inputs. We design an analysis algorithm that verifies if a program satisfies this definition, and reports code snippets in the program that may cause a nonlinear amount of memory usage in case the verification fails. We also formally prove the correctness of our algorithm w.r.t. the above definition. Our experimental results indicate that the analysis algorithm is both effective and efficient. (17 refs.) **Inspec controlled terms:** computer network security - program diagnostics - program verification - security of data - software reliability - storage management - telecommunication security

Uncontrolled terms: memory usage - analysis algorithm - towards Denial-of-Service memory - Denial-of-Service memory vulnerabilities - DoS attacks - reports code snippets

Classification Code: B6210L Computer communications - C6130S Data security - C6150G Diagnostic, testing, debugging and evaluating systems - C6110B Software engineering techniques - C6120 File organisation

IPC Code: G06F9/44 - G06F11/36 - G06F12/00 - G06F21/00 - H04K1/00 - H04L12/28 - H04W12/00

Treatment: Practical (PRA)

Database: Inspec

20. **Programming is diagramming is programming**

Al-Fedaghi, S.; Haidar, E. **Source:** *Journal of Software*, v 14, n 9, 410-22, Sept. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.9.410-422; **Publisher:** Academy Publisher, Finland

Author affiliation:
Kuwait University, Computer Engineering Department, P.O. Box 5969, Kuwait
Kuwait Anti-Corruption Authority, Nazaha, Kuwait

Abstract: It is said that "programming is writing is programming." Both programming and writing involve high-level plans. Programming involves understanding the problem, creating a design, and coding. In this paper, we further explore the nature of programming based on the concept that "programming is diagramming." A diagram can be coded, and both the code and diagram approximate the conceptual (mental) form of the programmer behind both. We adopt a new diagramming technique called a thinging machine (TM) and build a TM diagram of the solution to the involved problem, which is sliced to produce program statements, much as flowcharts are converted to code. The TM introduces a simplified form with its five basic operations, which are repeated throughout the flow of events until reaching the end of the solution description. A case study is given that establishes an account through which a user can apply for a modeled job. The resulting diagram and program point to a viable approach to developing computer programs. (21 refs.) **Inspec controlled terms:** flowcharting - software engineering

Uncontrolled terms: program statements - program point - computer programs - high-level plans - diagram approximate - diagramming technique - thinging machine - TM diagram - flowcharts

Classification Code: C6110B Software engineering techniques

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

21. **An Effective Recommendation Algorithm Based on Multi-Source Information**
Tang, L.; Wang, K. **Source:** *Journal of Software*, v 14, n 3, 107-15, March 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.3.107-115; **Publisher:** Academy Publisher, Finland

Author affiliation:
Northeast Forestry University, College of Mechanical and Electronical Engineering, Heilongjiang, China

Abstract: This paper proposes an effective recommendation algorithm based on multi-source information, which employs the user feature information and image feature information to handle the problems in recommender system, such as data sparsity, cold start user problem and cold start item problem. The proposed algorithm is as follow. Firstly, this paper presents a denoising auto-encoder to handle the problem of data sparsity and cold start user problem. It can learn the hidden features with nonlinearity of user and item. In addition, the paper proposes collaborative filtering algorithm based on multi-features of items. This approach employs the convolutional neural network to extract features of the image. Then combine the features of the image and the activities of the users to solve the problems of data sparsity and cold start item problem. The proposed method mentioned above is tested with dataset called MovieLens. The results of the experiment show that the proposed method has competitive performance. (15 refs.) **Inspec controlled terms:** collaborative filtering - convolutional

neural nets - feature extraction - learning (artificial intelligence) - recommender systems

Uncontrolled terms: cold start user problem - hidden features - collaborative filtering algorithm - data sparsity - cold start item problem - effective recommendation algorithm - multisource information - user feature information - recommender system - image feature information - convolutional neural network - MovieLens

Classification Code: C7210N Information networks - C7250R Information retrieval techniques - C5260B Computer vision and image processing techniques - C6170K Knowledge engineering techniques

IPC Code: G06F15/18 - G06F17/30 - G06T - G06N5/04 - H04N21/466 - G06N3/02

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

22. **Theme Division and Team Activities Interactive Teaching Method for Software Engineering**
Yi Yang; Dekuang Yu **Source:** *Journal of Software*, v 14, n 7, 340-9, July 2019; **ISSN:** 1796-217X; **Publisher:** Academy Publisher, Finland

Author affiliation:
Southern Medical University, School of Biomedical Engineering, Guangdong Province, China

Abstract: With abstract content and complex process relationship in software engineering course,

under the traditional classroom teaching method, students find it hard to grasp the core of this subject, let alone apply it in actual software projects. In order to improve the learning outcomes of software engineering, we proposed the theme division and team activity interactive teaching method by which students can truly understand and use the tools, processes and methods of modern software engineering. Based on the content attributes of the software life cycle and each stage, the themes are extracted and constructed. With instructor's guidance, students carry out team activities, including team form-up, tasks collection, group learning, topic reporting, defense review, and team feedback. The interactive teaching ways between the instructors and the learners promote the latter to actively participate in problem research and discussion, use software engineering principles and methods to solve design, development and management problems in software engineering, and enhance their technique ability and teamwork awareness. (7 refs.) **Inspec controlled terms:** computer aided instruction - computer science education - educational courses - engineering education - software engineering - teaching - team working

Uncontrolled terms: theme division - team activities interactive teaching method - complex process relationship - software engineering course - traditional classroom teaching method - actual software projects - team activity interactive teaching method - modern software engineering - software life cycle - interactive teaching ways

Classification Code: B0120 Education and training - C0220 Computing education and training - C0110 Control education and training - C6110B Software engineering techniques - C7810C Computer-aided instruction - E0250 Education and training

IPC Code: G06F9/44 - G09B5/00

Treatment: Practical (PRA)

Database: Inspec

23. **Color Classification of Vehicles Based on Two-Layer Salincy, Illumination-Invariant Transformation, and Adaptive KNN**
Qihua Huang; Qilv Li; Guoheng Huang **Source:** *Journal of Software*, v 14, n 10, 479-87, Oct. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.10.479-487; **Publisher:** Academy Publisher, Finland

Author affiliation:
Guangdong University of Technology, School of Automation, China

Abstract: In the process of color classification of vehicles, the accurate segmentation of color regions and the elimination of non-color interference regions remain to be dealt with. Therefore, a vehicle color algorithm based on two-layer saliency map, illumination invariant transformation, and adaptive KNN is proposed in this paper. A two-layer saliency map is used to remove interference regions independent of the color of vehicles. The graph is transformed and finally classified based on the adaptive k nearest neighbor algorithm. The experimental results demonstrate that the method can accurately extract the body of the vehicles to a certain extent, and preprocessed with illumination invariance transformation, colors of vehicles can be accurately classified even in dark and reflective environments. The further work of this study is to extract slightly deeper features and directly obtain the preliminary saliency graph based on the decoder processing. (10 refs.) **Inspec controlled terms:** feature extraction - image classification - image colour analysis - image segmentation - nearest neighbour methods - object detection

Uncontrolled terms: color classification - two-layer salincy - illumination-invariant transformation

- adaptive KNN - color regions - noncolor interference regions - vehicle color algorithm - two-layer saliency map - illumination invariant transformation - adaptive k nearest neighbor algorithm - illumination invariance transformation - preliminary saliency graph - decoder processing

Classification Code: B6135 Optical, image and video signal processing - C5260B Computer vision and image processing techniques - C6266

IPC Code: G06F17/18 - G06N5/00 - G06T - G06N20/00

Treatment: Practical (PRA)

Database: Inspec

24. **A Theoretical Validation of Component Point**
Wijayasiriwardhane, T.; Lai, R. **Source:** *Journal of Software*, v 14, n 1, 1-12, Jan. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.1.1-12; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of Kelaniya, Faculty of Science, Sri Lanka
La Trobe University, Department of Computer Science and Information Technology, Melbourne, VIC, Australia

Abstract: The system-level size measures are important in software project management as tasks such as planning and estimating the cost and schedule of software development can be performed more accurately when a size estimate of the entire system is available. However, due to the black-box nature

of software components, traditional software measures are not adequate for Component-Based Systems (CBS). We have developed a Function Point (FP) like measure, named Component Point (CP), for measuring the system-level size of a CBS specified in Unified Modeling Language. In this paper, we present a theoretical validation of the CP measure using mathematics and show that not only the CP measure holds all the mathematical conditions necessary for a size measure, but it can also be used in Component-Based Software Development (CBSD) in a similar way that FP and its extensions are used in other software development paradigms. (41 refs.) **Inspec controlled terms:** project management - software development management - software metrics - Unified Modeling Language

Uncontrolled terms: Component-Based Systems - CBS - Function Point - FP - Unified Modeling Language - theoretical validation - CP measure - Component-Based Software Development - software development paradigms - system-level size measures - software project management - black-box nature - software components - traditional software measures - Component Point

Classification Code: C6110B Software engineering techniques - C6110F Formal methods - C6110S Software metrics - C0310F Software management

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

25. **Design and Implementation of Smart Travel System Based on Android**

Wenxiao Zhan; Dayu Dai; Zhongliang Cai **Source:** *Journal of Software*, v 14, n 9, 400-9, Sept. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.9.400-409; **Publisher:** Academy Publisher, Finland

Author affiliation:
Wuhan University, School of Resource and Environmental and Science, China

Abstract: With the rapid development of the mobile GIS, LBS and its extended application bring lots of convenience to people's life. Under such circumstances, using LBS mobile applications to do travel itinerary planning has become a popular new trend. However, existing LBS systems can only mechanically recommend one kind of tourist attractions at the same time and do route planning from one attraction to the next, which is very inconvenient and cumbersome. To revise this defect, this paper develops a smart travel mobile electronic map system based on android. Besides the traditional functions such as real-time positioning, this system can intelligently recommend the tourist attractions which the users may be interested in due to the relevant information input by the users. At the same time, it can also provide the overall route planning among these attractions, as well as the weather conditions during the tour, which realize the intelligent planning of travel itinerary. (10 refs.) **Inspec controlled terms:** geographic information systems - mobile computing - planning - travel industry

Uncontrolled terms: real-time positioning - smart travel mobile electronic map system - LBS systems - popular new trend - LBS mobile applications - people - extended application - mobile GIS - android - smart travel system - intelligent planning - attraction - route planning - tourist attractions

Classification Code: B6250F Mobile radio systems - C6190V Mobile, ubiquitous and pervasive computing - C6170K Knowledge engineering techniques - C7840 Geography and cartography computing

IPC Code: G06F9/44 - H04B7/00 - H04B7/26 - H04W - G06N5/04

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

26. **Software defect data mining: a survey of severity analysis**
Wenjie Liu **Source:** *Journal of Software*, v 14, n 10, 457-78, Oct. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.10.457-478; **Publisher:** Academy Publisher, Finland

Author affiliation:
Dalian University of Technology, School of Software Technology, China

Abstract: Open source software USES software defect tracking system, which can effectively manage the related information of software defects, and build software defect data warehouse in the form of defect report. The severity attribute of software defect report can determine the important indicators such as the repairers, solving time and repairing rate of software defect. Much research on software defects focuses on severity analysis. In order to evaluate the work in the field of severity analysis, this paper reviews the existing studies. In particular, this paper introduces the main methods of severity study, and expounds the statistical characteristics analysis of severity attribute in software defect report data set. According to the research status, the research of severity analysis is divided into qualitative analysis and quantitative analysis, and analyzed in detail. At the same time, each part is empirically analyzed based on data from the Mozilla project and Eclipse project datasets. On this basis, this paper summarizes the existing work of severity analysis of defect report, and points out some possible

problems in the work. (88 refs.) **Inspec controlled terms:** data mining - data warehouses - public domain software - software metrics - software quality - software reliability

Uncontrolled terms: severity attribute - software defect report data - severity analysis - software defect data mining - open source software - software defect tracking system - software defect data warehouse - severity study - statistical characteristics analysis

Classification Code: C6110B Software engineering techniques - C6110S Software metrics - C6130 Data handling techniques - C6160Z Other DBMS - C6170K Knowledge engineering techniques - C1140Z Other topics in statistics

IPC Code: G06F7/00 - G06F9/44 - G06N5/04

Treatment: Practical (PRA)

Database: Inspec

27. **Command Information System Structure Complexity Analysis Method**
Yuxiao Kou; Aimin Luo; Yi Mao; Xiaoxue Zhang; Zhen Shu **Source:** *Journal of Software*, v 14, n 8, 370-9, Aug. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.8.370-379; **Publisher:** Academy Publisher, Finland

Author affiliation:
National University of Defense Technology, Science and Technology on Information Systems Engineering Laboratory, Hunan, China

State Key Laboratory of Air Traffic Management System and Technology, China

Abstract: Based on the structural characteristics of command information system, the super-network model of the system is established. In the system, the four types of basic units with different functions are the supernetwork nodes. And the information flow motifs defined by the specific information flow structure are the edges of the super-network. Then, based on the entropy theory, the x- information flow motif entropy, the n- information flow motif entropy and the n(t) information flow motif entropy are defined. The three levels of entropy are superimposed as an index to measure the structural complexity of the CISR system. Verification is carried out through a case of a joint air defense system in a certain area. (6 refs.) **Inspec controlled terms:** command and control systems - entropy - graph theory - military computing - military systems - network theory (graphs)

Uncontrolled terms: information flow motifs - information flow structure - entropy theory - structural complexity - joint air defense system - command information system structure complexity analysis method - structural characteristics - super-network model - CISR system - n-information flow motif entropy - x-information flow motif entropy

Classification Code: C7465 Military engineering computing - C1160 Combinatorial mathematics

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

28. **$AMPM_3$ criteria of algorithm summation for classifying datamining of software quality management**

Yangyuen, K.T.; Suppamit, T.; Mungsing, S. **Source:** *Journal of Software*, v 14, n 1, 36-46, Jan. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.1.36-46; **Publisher:** Academy Publisher, Finland

Author affiliation:
Rattana Bundit University, 306 Ladproud Rd., Thailand
Sripatum University, School of Information Technology, 2410, 2 Phahonytthin Rd., Chatuchuck, Thailand

Abstract: This research has the objective to present the algorithm summation method of AMPM3 criteria for reducing attributes in data mining classification of software quality management. Moreover, the programs used to analyze in this research are WE-KA and MATLAB and the techniques used to predict the equation and the accuracy are Decision Tree, Rule-Based, Naiumlve Bayesian and KNN. Besides, the results of analyzing the Algorithm with AMPM3 criteria are to reduce the attributes from searching from the relationship of regression analyzing and the regression analysis that are the analyzing from the relationships between 2 variables for finding the similarities between questions and model documents by searching from the patterns of designing. Then, it has the steps as these following: 1) Preparation of Information 2) Selection of Information 3) Practicing Information Set and Test 4) Processing of Information 5) Creation of Model for analyzing the information relationship and effectiveness measurement to reduce attributions. (21 refs.) **Inspec controlled terms:** data mining - decision trees - pattern classification - quality management - regression analysis - software quality

Uncontrolled terms: algorithm summation method - AMPM3 criteria - data mining classification - software quality management - regression analyzing - Information 2 - Information 5 - information relationship - attributions

Classification Code: C6170K Knowledge engineering techniques - C1140Z Other topics in statistics - C1160 Combinatorial mathematics - C6110B Software engineering techniques - C6130 Data handling techniques

IPC Code: G06F7/00 - G06F9/44 - G06F15/18 - G06N5/04

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

29. **PLAC: Partitioning Based Lazy Classification**
Wei Song; He Jiang; Fan Ma; Qinbao Song; Guangtao Wang **Source:** *Journal of Software*, v 14, n 2, 65-91, Feb. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.2.65-91; **Publisher:** Academy Publisher, Finland

Author affiliation:
University of California at Berkeley, Department of Electrical Engineering and Computer Sciences, Berkeley, CA, United States
Dalian University of Technology, School of Software Technology, China
Xi'an Jiaotong University, Department of Computer Science and Technology, China

Abstract: Traditional classification methods cannot well capture the characteristics of complex problems, thus leading to poor performance. In this paper, we propose a new framework named Partition based LAzy Classification (PLAC) to better characterize complex problems by dividing the training data space into smaller and easier-to-learn partitions. In PLAC, only the nearest partition of a

new instance is used to train a local classifier that is finally used to classify the new instance. As the partitioning is performed based on information gain before receiving a new instance, the resulting partitions are groups of similar instances and the chance of the nearest instances of the new instance coming from different regions by accident is reduced. Moreover, our method uses only one partition to conduct a prediction and employs the caching mechanism to avoid work replication during classification, thus efficiency is improved. An extensive experimental evaluation on 40 real world data sets shows that PLAC effectively improves the performance of base classifiers and outperforms existing mainstream ensemble methods. (33 refs.) **Inspec controlled terms:** learning (artificial intelligence) - pattern classification

Uncontrolled terms: PLAC - partitioning based lazy Classification - traditional classification methods - complex problems - Partition based LAzy Classification - training data space - nearest partition - resulting partitions - similar instances - nearest instances - base classifiers

Classification Code: C6170K Knowledge engineering techniques - C1160 Combinatorial mathematics - C6130 Data handling techniques

IPC Code: G06F7/00 - G06F15/18 - G06N5/04

Treatment: New development (NEW); Practical (PRA)

Database: Inspec

30. **A Prediction and Prevention Model of Requirements Change driven by the Improvement of Project Teams with Case Studies**

Yuqing Yan; Zhenhua Zhang **Source:** *Journal of Software*, v 14, n 2, 47-57, Feb. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.2.47-57; **Publisher:** Academy Publisher, Finland

Author affiliation:
Guangdong University of Foreign Studies, School of Mathematics and Statistics, China

Abstract: Requirements change management is a vital part of software project management. The existing literature on requirements change focuses on its technical aspects and is less concerned with the combination of personnel and technology. Few studies have focused on predicting and preventing changes in requirements and finding change predictors from the sociotechnical viewpoint. In this study, we examined prediction and prevention mechanisms of requirements volatility based on the analysis of change causes by stressing both the human and technical roles. Two case studies (a questionnaire and an interview) were done to validate the study. An online questionnaire was used to quantitatively analyze and explain the significance of human factors, including the emotional characteristics of developers. The result of the interview was applied to qualitatively illustrate the necessity and importance of effectively constructing and managing project teams to decrease the requirements change rate and enhance the software success rate. The prediction and prevention model established in this study was validated by a model called "3P + 2C", described in the interview. The paper concludes by suggesting to researchers four practical issues around the proposed model for further study. (36 refs.)
Inspec controlled terms: formal specification - human factors - management of change - project management - software development management - systems analysis

Uncontrolled terms: project teams - requirements change management - software project management - prevention mechanisms - human roles - technical roles - requirements change rate - prevention model - change predictors - sociotechnical viewpoint - emotional characteristics - software success rate

Classification Code: C0310F Software management - C6110F Formal methods - C0240 Ergonomic aspects of computing

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

31. **Automation Testing for Order to Cash Process in Microsoft Dynamics 365**
Roy, A.V.; Ali, S. **Source:** *Journal of Software*, v 14, n 11, 548-58, Nov. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.11.548-558; **Publisher:** Academy Publisher, Finland

Author affiliation:
AGI Education Limited, 190 Great South Road Epsom, New Zealand

Abstract: This discusses the software automation testing of Microsoft Dynamics (MSD) 365 in finance and operations modules. To perform automation testing, order to cash process was selected. The aim of this research is to build an effective testing framework for order to cash process in MSD 365. A test for order to cash process was designed to do the automation testing in MSD. In this research, Agile-based Scrum method was followed. Adoption of Agile methodology is beneficial for whole team and daily stand-up meetings in agile methodology helped in raising the issues. Daily meetings with the development team have helped in getting valuable feedback on changes that needs to be incorporated for improving the quality of automation testing script. This approach helped us in reducing the overall

time for implementation the code and leading to increase work productivity. However, the main contribution of this research is the proposed solution to overcome some of the key challenges faced during the automation of web application. The second main contribution of this research is the automation testing for order to cash process in MSD 365 which could be beneficial for organizations. This will help organizations in reducing the effort of manual testing and the overall time needed for test execution. (10 refs.) **Inspec controlled terms:** DP industry - program testing - software development management - software prototyping

Uncontrolled terms: cash process - software automation testing - Microsoft Dynamics 365 - effective testing framework - MSD 365 - agile methodology - automation testing script - manual testing - test execution

Classification Code: C6110B Software engineering techniques - C6150G Diagnostic, testing, debugging and evaluating systems - C0310F Software management

IPC Code: G06F9/44 - G06F11/36

Treatment: Practical (PRA)

Database: Inspec

32. **Advisor-Advisee Relationship Mining Based on Co-author Network**
Shaohong Zhang; Zongbao Yang; Jianyu Liu; Zhiqian Zhang; Xiaofei Xing; Ying Gao **Source:** *Journal of Software*, v 14, n 9, 388-99, Sept. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.9.388-399; **Publisher:** Academy Publisher, Finland

Author affiliation:
GuangZhou University, Department of Computer Science, China

Abstract: Advisor-advisee relationship among scholars is important in the academia circle. It contains abundant information about the academic inheritance, advisor recommendation and the forming of research communities, etc. The advisor-advisee relationship is always hiding behind the co-author network, however, there are some challenges when mining this kind of relationship. This relationship is always changing with time, the size of labeled data is limited and the authors' name ambiguity, etc. Previous works are focused on various aspects, including the citation network, the publication network and the co-author network, etc. To our best knowledge, all of these works are focused on the whole network, and none of them considered the credit allocation of the authors in each paper. Therefore, the relationship mining results may be influenced greatly by some high degree nodes. In this paper, we proposed a new method to solve this problem with the scholar data in DBLP. The credit allocation of each author is calculated, and the co-author network of DBLP is cut into smaller networks based on the characteristic. Then, the advisor-advisee relationship among researchers is mined based on these smaller co-author network. The results show that, the accuracy of this model is about 62.5%, however, this is an unsupervised method, which could save the time of training model and will not be influenced by the uncompleted training data set. (27 refs.) **Inspec controlled terms:** data mining - network theory (graphs) - unsupervised learning

Uncontrolled terms: advisor-advisee relationship mining - citation network - publication network - smaller co-author network - unsupervised method - credit allocation - DBLP

Classification Code: C6130 Data handling techniques - C6170K Knowledge engineering techniques - C1160 Combinatorial mathematics

IPC Code: G06F7/00 - G06N5/04 - G06N20/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

33. **An Informative Test Code Approach in Code Writing Problem for Java Collections Framework in Java Programming Learning Assistant System**
Ei Ei Mon; Funabiki, N.; Kuribayashi, M.; Wen-Chung Kao **Source:** *Journal of Software*, v 14, n 5, 200-8, May 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.5.200-208; **Publisher:** Academy Publisher, Finland

Author affiliation:
Okayama University, Department of Electrical and Communication Engineering, Japan
National Taiwan Normal University, Department of Electrical Engineering, Taiwan

Abstract: To enhance Java programming educations, we have developed a Java Programming Learning Assistant System (JPLAS). In JPLAS, the code writing problem asks a student to implement a source code that passes the given test code on JUnit, where the details of the implementation are described in the test code. Previously, we confirmed the effectiveness of this informative test code approach in studying three object-oriented programming concepts for Java. In this paper, we present its application to studying Java Collections Framework (JCF). JCF enables us to handle a group of objects by offering appropriate libraries, which is expected to be mastered by the students. For evaluations, we generated five informative test codes for JCF, and asked 19 students from Japan, Myanmar, China, and

Indonesia to implement the source codes. Then, all of them completed the source codes passing the test codes, while certain students did not use the expected JCF library functions. (10 refs.) **Inspec controlled terms:** computer science education - Java - learning management systems - object-oriented programming - program testing

Uncontrolled terms: source code - informative test code approach - object-oriented programming concepts - Java Collections Framework - JCF - Java programming learning assistant system - Java programming educations - JPLAS - code writing problem - JUnit - Japan - Myanmar - China - Indonesia

Classification Code: C7810C Computer-aided instruction - C0220 Computing education and training - C6110J Object-oriented programming - C6150G Diagnostic, testing, debugging and evaluating systems

IPC Code: G06F9/44 - G06F11/36 - G09B5/00 - G06Q50/20

Treatment: Practical (PRA)

Database: Inspec

34. **Program Synthesis and Vulnerability Injection Using a Grammar VAE**
Kosta, L.; Seaman, L.; Hongwei Xi **Source:** *Journal of Software*, v 14, n 6, 227-46, June 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.6.227-246; **Publisher:** Academy Publisher, Finland

Author affiliation:

Boston University, 111 Cummington Mall, Boston, MA 02215, United States
Draper, 555 Technology Square, Boston, MA 02139, United States

Abstract: The ability to automatically detect and repair vulnerabilities in code before deployment has become the subject of increasing attention. Some approaches to this problem rely on machine learning techniques, however the lack of datasets-code samples labeled as containing a vulnerability or not-presents a barrier to performance. We design and implement a deep neural network based on the recently developed Grammar Variational Autoencoder (VAE) architecture to generate an arbitrary number of unique C functions labeled in the aforementioned manner. We make several improvements on the original Grammar VAE: we guarantee that every vector in the neural network's latent space decodes to a syntactically valid C function; we extend the Grammar VAE into a context-sensitive environment; and we implement a semantic repair algorithm that transforms syntactically valid C functions into fully semantically valid C functions that compile and execute. Users can control the semantic qualities of output functions with our constraint system. Our constraints allow users to modify the return type, change control flow structures, inject vulnerabilities into generated code, and more. We demonstrate the advantages of our model over other program synthesis models targeting similar applications. We also explore alternative applications for our model, including code plagiarism detection and compiler fuzzing, testing, and optimization. (23 refs.) **Inspec controlled terms:** context-sensitive grammars - learning (artificial intelligence) - neural nets - program compilers - program testing - security of data

Uncontrolled terms: arbitrary number - aforementioned manner - original Grammar VAE - syntactically valid C function - context-sensitive environment - semantic repair algorithm - fully semantically valid C functions - semantic qualities - output functions - change control flow structures - inject vulnerabilities - program synthesis models - code plagiarism detection - compiler fuzzing - vulnerability - machine learning techniques - datasets-code samples - deep

neural network - grammar variational autoencoder architecture

Classification Code: C6150G Diagnostic, testing, debugging and evaluating systems - C6170K Knowledge engineering techniques - C1160 Combinatorial mathematics - C4210L Formal languages and computational linguistics - C5290 Neural computing techniques - C6130S Data security - C6150C Compilers, interpreters and other processors

IPC Code: G06F11/36 - G06F21/00 - G06N5/04 - G06F8/41 - G06N20/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

35. **Software Reuse in Organizations: A Survey in Moroccan Software Industry Context**
Younoussi, S.; el Rhaffari, I.; Amoud, M.; Roudies, O. **Source:** *Journal of Software*, v 14, n 4, 153-67, April 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.4.153-167; **Publisher:** Academy Publisher, Finland

Author affiliation:
Mohammed V University in Rabat, Ecole Mohammadia d'Ingeacutenieurs, Morocco

Abstract: A good software reuse process, contributes towards accelerating time to market of software products and reducing costs and efforts. Research raised that the adoption of software reuse is becoming a necessity for organizations to compete against others and stand out amongst them. Thereby many organizations try to invest in software reuse by identifying best reuse techniques, methods, and

practices. This paper presents a complete survey method with findings backed up with statistics. The goal is to evaluate in practice the adoption of techniques, methods and practices proposed by academics, and highlight the motivations as well as the difficulties to implement a successful reuse program by different types of organizations in Morocco. A descriptive survey of 84 software participants with different backgrounds (software managers, analysts, engineers and software developers) has been conducted, in order to identify the current state of software reuse in practice inside the Moroccan software industry. A complete survey method is presented, including the process, data collection, and analysis phases, as well as a discussion on the study's validity...The survey consisted of 28 questions, grouped into 4 sections and backed up our findings with statistics. A discussion was also given based on the comparison of the survey results with related literature and presented the main of our finding. It has been shown through statistics that even if most of organizations are aware of the strengths and benefits of software reuse, they don't consider reuse as part of the company's culture, and most of them didn't implement efficient software reuse programs and not apply the most effective reuse strategies, methods and practices. (34 refs.) **Inspec controlled terms:** DP industry - software reusability

Uncontrolled terms: Moroccan software industry context - software products - efficient software reuse programs - software reuse process - cost reduction - data collection

Classification Code: C6110B Software engineering techniques

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

36. **SLA Compliance Checking and System Runtime Reconfiguration - A Model Based Approach**
Abbasipour, M.; Khendek, F.; Toeroe, M. **Source:** *Journal of Software*, v 14, n 11, 488-518, Nov. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.11.488-518; **Publisher:** Academy Publisher, Finland

Author affiliation:
Concordia University, Electrical and Computer Engineering, Montreal, QC, Canada
Ericsson, Montreal, QC, Canada

Abstract: Service providers aim at optimizing system resource utilization while ensuring the quality of service expressed in the Service Level Agreements (SLAs) is met. For this purpose, systems are reconfigured dynamically according to workload variations to satisfy the SLAs while using only the necessary resources. Whenever a dynamic reconfiguration is required because of low resource utilization or potential SLA violations, one or more triggers may be generated. These generated triggers invoke elasticity rules that define actions to be taken in each specific situation. The elasticity rules that are invoked at the same time may lead to actions that may impact each other. As a result, handling each trigger independently may threaten the stability of the system. In this paper, we propose a model-driven framework, which manages the compliance of SLAs and enables dynamic reconfiguration. We use UML models to describe all the artifacts in the framework. All SLA models are transformed into an SLA compliance model which is used at runtime to check SLA compliance and generate triggers when a dynamic reconfiguration is required. In this framework, the actions of the elasticity rules invoked simultaneously are correlated before their application. The proposed correlation is based on the relations between the triggers. We perform a preliminary evaluation of the approach. (42 refs.) **Inspec controlled terms:** cloud computing - contracts - customer services - quality of service - service-

oriented architecture - Unified Modeling Language - Web services

Uncontrolled terms: SLA compliance checking - system runtime reconfiguration - Service providers - system resource utilization - quality of service - Service Level Agreements - SLAs - necessary resources - dynamic reconfiguration - low resource utilization - trigger - elasticity rules - model-driven framework - UML models - SLA models - SLA compliance model

Classification Code: C6190J Internet software - C6110B Software engineering techniques - C6110F Formal methods

IPC Code: G06F9/44

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

37. **Fast 3D Post Estimation of Human Based on Optical Flow and Particle Filter**
Jiaying Lan; Guoheng Huang; Lianglun Cheng **Source:** *Journal of Software*, v 14, n 10, 437-48, Oct. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.10.437-448; **Publisher:** Academy Publisher, Finland

Author affiliation:
Guangdong University of Technology, School of Computer Science, Guangdong, China

Abstract: Aiming at the high computational complexity of the 3D pose estimation algorithm in the deep learning field, we propose a fast human pose estimation algorithm based on optical flow and

particle filter. The temporal correlation between video frames is applied to the algorithm. The first frame of the video is defined as a keyframe, which will serve as the output of the 3D pose estimate. Then the next frame is determined by the key frame algorithm whether it is a key frame. The key frame is estimated by the 3D human pose estimation algorithm, and the output result of the key frame is propagated to the non-key frame through the optical flow mechanism. Non-key frames are subjected to pose estimation through particle filter. In the 3D human pose estimation problem, we propose a unified equation for 3D human pose estimation from the RGB image, combining 2D joint estimation and 3D pose reconstruction. The proposed approach outperforms all state-of-the-art methods on Human3.6m achieving a relative error reduction greater than 30% on average. Our method significantly improves detection performance compared to the original algorithm, and the detection speed can be increased by an average of 43.75%. (25 refs.) **Inspec controlled terms:** computational complexity - correlation methods - deep learning (artificial intelligence) - image reconstruction - particle filtering (numerical methods) - pose estimation - stereo image processing

Uncontrolled terms: 3D human pose estimation algorithm - key frame algorithm - video frames - deep learning field - high computational complexity - fast 3D post estimation - 3D pose reconstruction - 2D joint estimation - particle filter - optical flow mechanism

Classification Code: B6135E Image recognition - B6140B Filtering methods in signal processing - B0240G Monte Carlo methods - B0240J Markov processes - B0290F Interpolation and function approximation (numerical analysis) - C5260B Computer vision and image processing techniques - C6260 - C1140G Monte Carlo methods - C1140J Markov processes - C4130 Interpolation and function approximation (numerical analysis)

IPC Code: G06K9/00 - G06T - H04N13/00 - G06N3/02 - G06N20/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

38. **The impact of the implementation of capability maturity model integration on user satisfaction: case study on software companies in Jordan**
Abu-Baker, M.I.K.; Abu-Zaid, M.K.S.; Alsawalqah, H.; Al-Shamayleh, Y.; Al-Shboul, B. **Source:** *Journal of Software*, v 14, n 7, 293-311, July 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.7.293-311; **Publisher:** Academy Publisher, Finland

Author affiliation:
Eskadenia Software, Jordan
Al-Balqa' Applied University, Faulty of Graduate Studies, Jordan
University of Jordan, King Abdullah II School of Information Technology, Jordan

Abstract: The Capability Maturity Model Integration, as part of the software process improvement, has been receiving attention due to the belief of its relevance to the customer satisfaction factor. This research aims at offering software companies in Jordan an overview of Capability Maturity Model Integration methodology and its benefits for the software industry. To study the impact of its implementation on customer satisfaction, through the quality of the software, and provide recommendations on increasing the awareness of Capability Maturity Model Integration, a quantitative study is designed. Four perspectives related to Capability Maturity Model Integration have been studied: the effect of its implementation on customer satisfaction as well as software quality, the effect of software quality on customer satisfaction, and the effect of its implementation on customer satisfaction through the software quality. The results concluded that there is a direct effect of

implementing Capability Maturity Model Integration on customer satisfaction and software quality. It also shows that higher software quality positively affects customer satisfaction; i.e. software quality plays a mediation role between the effect of Capability Maturity Model Integration implementation and the customer satisfaction. (50 refs.) **Inspec controlled terms:** Capability Maturity Model - customer satisfaction - DP industry - software process improvement - software quality

Uncontrolled terms: offering software companies - customer satisfaction factor - software quality - capability maturity model integration implementation - Jordan - user satisfaction

Classification Code: C6110B Software engineering techniques - C0310F Software management

IPC Code: G06F9/44

Treatment: Practical (PRA)

Database: Inspec

39. **Application of Rule-Based Expert Systems and DynamicLink Libraries to Enhance Hardware-in-The-Loop Simulation Results**
Ortega-Cabezas, P.M.; Colmenar-Santos, A.; Borge-Diez, D.; Blanes-Peiroacute, J.J. **Source:** *Journal of Software*, v 14, n 6, 265-92, June 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.6.265-292; **Publisher:** Academy Publisher, Finland

Author affiliation:
UNED, Department of Electric, Electronic and Control Engineering, Juan del Rosal, 12, Ciudad

Universitaria, Spain
Universidad de Leoacuten, Department of Electrical and Control Engineering, Campus de Vegazana s/n, Spain

Abstract: New and innovative techniques to validate software are needed to reduce cost and increase software quality. This research focuses on the validation of engine electronic control unit software by using expert systems (EXs) and dynamic link libraries (dlls) with the aim of checking if this technique performs better than traditional ones. To do this, a test-case database was built and run by using hardware-in-the-loop (HIL) simulations to validate a series of software modules (SMs) by using these techniques: the tester-in-the-loop, automation by using a Python script, the model-based testing and EXs combined with dlls with the aim of assessing several factors such as: productivity gain, bug detection skills, functional coverage assessment, ease to automate test-cases among others. Dlls and EXs improve the HIL success rate by 4.8%, 6% and 20% at least, for simple, fairly-complex, and highly-complex SMs, respectively. Between 9 and 13 more bugs were found when using the EXs and dlls compared with other techniques. Two of the bugs would have required software not initially planned as they were linked to environmental policies. The proposed technique can be applied to any types of a SM, especially in those cases in which traditional validation techniques fail. (36 refs.) **Inspec controlled terms:** database management systems - expert systems - program testing - software quality

Uncontrolled terms: software quality - engine electronic control unit software - EX - dynamic link libraries - test-case database - hardware-in-the-loop simulations - software modules - tester-in-the-loop - Python script - model-based testing - bug detection skills - functional coverage assessment - test-cases - HIL - SM - expert systems - dll

Classification Code: C6150G Diagnostic, testing, debugging and evaluating systems - C6160

Database management systems (DBMS) - C6170 Expert systems and other AI software and techniques - C0310F Software management - C6110B Software engineering techniques

IPC Code: G06F9/44 - G06F11/36 - G06F16/00

Treatment: Practical (PRA)

Database: Inspec

40. **Development of an Intelligent Job Recommender System for Freelancers using Client's Feedback Classification and Association Rule Mining Techniques**
Hossain, M.S.; Arefin, M.S. **Source:** *Journal of Software*, v 14, n 7, 312-31, July 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.7.312-331; **Publisher:** Academy Publisher, Finland

Author affiliation:
Chittagong University of Engineering and Technology, Dept. of Computer Science and Engineering, Bangladesh

Abstract: Most of the freelancer's time is killed in finding suitable jobs due to the huge number of freelance marketplaces. Freelancing sites send email notifications or show in newsfeed about posted jobs but most of them are irrelevant. Recommending relevant jobs to freelancers to minimize job finding time has drawn the attraction of researchers. Here, in this paper, we propose a recommender system to find out appropriate jobs for freelancers using client's feedback classification and Association rule mining techniques. After collecting the previous work history of freelancers, we analyze the sentiment of client's feedback using Logistic Regression and Linear Support Vector Machine model to

classify the completed jobs into two categories: positive and negative. We apply the Association rule mining technique to find out freelancer's frequent skillsets used in both categories of completed jobs. Then, we find out the jobs matched with the positive frequent skillsets using set operations. We also discard jobs that contain negative frequent skillsets. Finally, a collaborative filtering algorithm is applied considering the client's overall rating, the minimum budget/ hourly rate, deadline, re-hire, etc. to generate a more accurate recommendation. After extensive experiments on the real dataset collected from different online marketplaces, we are able to prove that our proposed method correctly recommends the appropriate jobs with 83.40% (Logistic Regression) and 84.03% (Linear SVM) accuracy. (43 refs.) **Inspec controlled terms:** collaborative filtering - data mining - pattern classification - recommender systems - regression analysis - sentiment analysis - set theory - support vector machines

Uncontrolled terms: freelancers - linear support vector machine model - association rule mining technique - positive frequent skillsets - negative frequent skillsets - intelligent job recommender system - freelance marketplaces - job finding time - clients feedback classification - freelancing sites - email notifications - sentiment analysis - logistic regression - set operations - collaborative filtering algorithm - linear SVM

Classification Code: C7250N Search engines - C7250R Information retrieval techniques - C6130D Document processing techniques - C6170K Knowledge engineering techniques - C7210N Information networks - C1140Z Other topics in statistics - C1160 Combinatorial mathematics

IPC Code: G06F17/21 - G06F17/27 - G06F17/28 - G06N5/04 - H04N21/466 - G06F16/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

41. **Fault Detection in Liquid-Propellant Rocket Engines Based on Improved PSO-BP Neural Network**

Ningning Li; Wei Xue; Xiang Guo; Liang Xu; Yuyang Wu; Yuan Yao **Source:** *Journal of Software*, v 14, n 8, 380-7, Aug. 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.8.380-387; **Publisher:** Academy Publisher, Finland

Author affiliation:
Tianjin University of Technology, Tianjin Key Laboratory for Control Theory & Applications in Complicated Systems, China
Beijing Aerospace Propulsion Institute, China
PICC Property and Casualty Company Limited, Big Data Center, China

Abstract: A method that uses an improved particle swarm optimization (PSO) algorithm combined with a backpropagation (BP) neural network is proposed to solve the problem of liquid-propellant rocket engine (LRE) failure detection. In the improved PSO algorithm, the global extremum is randomly perturbed by adding disturbance factor using the degree of particle aggregation around the global optimal value, and the individual extremum is randomly perturbed by adding disturbance factor using the number of particle extreme stagnation steps, disturbance factors are randomly added to individual extremum to diturb the particle's current search path, increasing the probability of particles jumping out of local extremum, avoiding the occurrence of local extremum, premature convergence or stagnation. In this paper, the improved algorithm is applied to the fault detection of a typical liquid rocket engine in steady state process. The simulation results show that, under the same conditions, the convergence speed of this PSO-BP method is obviously higher than that of BP neural network, and it

does not fall into the local extreme value. The accuracy of fault detection is also improved significantly. (14 refs.) **Inspec controlled terms:** backpropagation - failure analysis - fault diagnosis - mechanical engineering computing - neural nets - particle swarm optimisation - propellants - rocket engines

Uncontrolled terms: improved particle swarm optimization algorithm - backpropagation neural network - disturbance factor - particle aggregation degree - fault detection - local extreme value - liquid-propellant rocket engines - improved PSO-BP neural network - particle extreme stagnation - premature convergence - random perturbation

Classification Code: C7440 Civil and mechanical engineering computing - C1180 Optimisation techniques - C5290 Neural computing techniques - E1020 Maintenance and reliability - E2320 Engines - E0210G Optimisation - E0410H Mechanical engineering applications of IT

IPC Code: F02K9/00 - F41A1/00 - G06N20/00

Treatment: Practical (PRA); Theoretical or Mathematical (THR)

Database: Inspec

42. **Software adaptability metrics model using ordinary logistic regression**
Udo, E.N.; Akwukwuma, V.V.N. **Source:** *Journal of Software*, v 14, n 3, 116-28, March 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.3.116-128; **Publisher:** Academy Publisher, Finland

Author affiliation:

University of Uyo, Department of Computer Science, Akwa Ibom State, Nigeria
University of Benin, Department of Computer Science, Nigeria

Abstract: Adaptability is an important software quality characteristic and a major non-functional requirement in software and should therefore be given adequate attention during software quality measurement and predictions especially now that the environment in which software products operate becomes highly unpredictable due to rapid changes in hardware platform as well as changes in the operating system requirements. In this work the results from the analysis of object-oriented software source code using our previously developed software analyser to measure the values of some internal properties using object-oriented software metrics based on formulation of decision rules in conjunction with binary logic combination of the possible internal software properties which aided in the prediction of adaptability level of a given software, is used as the dataset for ordinal logistic regression analysis. This analysis was used to formulate the adaptability model based on proportional odds assumption. The results showed that software with low coupling, inheritance and complexity were more likely to be adaptable than those with high values. Conversely, software with low cohesion were less likely to be adaptable than those with high cohesion. High cohesion was associated with adaptability since its odds ratio (low/high) was 7.97 (>1) while low coupling, inheritance and complexity were associated with adaptability since their odds ratios (low/high) were 0.15, 0.22 and 0.05 (<1) respectively. The resulted model fitted the data well and the estimated cumulative odds were the same across all the ordinal categories, thus the proportional odds assumption held. (24 refs.) **Inspec controlled terms:** object-oriented programming - regression analysis - software metrics - software quality

Uncontrolled terms: low coupling - inheritance - odds ratio - resulted model - proportional odds assumption - software adaptability metrics model - ordinary logistic regression - important software quality characteristic - nonfunctional requirement - adequate attention - software quality measurement - software products - hardware platform - operating system requirements - object-

oriented software source code - developed software analyser - internal properties - object-oriented software metrics - binary logic combination - possible internal software properties - adaptability level - given software - ordinal logistic regression analysis - adaptability model - low cohesion - high cohesion

Classification Code: C6110B Software engineering techniques - C6110J Object-oriented programming - C6110S Software metrics - C1140Z Other topics in statistics

IPC Code: G06F9/44

Treatment: Practical (PRA); Product review (PRO)

Database: Inspec

43. **How Does the Data Set and the Number of Categories Affect CNN-based Image Classification Performance?**
Chao Luo; Xiaojie Li; Jing Yin; Jia He; Denggao; Jiliu Zhou **Source:** *Journal of Software*, v 14, n 4, 168-81, April 2019; **ISSN:** 1796-217X; **DOI:** 10.17706/jsw.14.4.168-181; **Publisher:** Academy Publisher, Finland

Author affiliation:
Chengdu University of Information Technology, China
Chongqing University of Technology, China

Abstract: Convolution neural network(CNN) has been widely applied in many fields and achieved

excellent results, especially in image classification tasks. As we all know, many factors affect the performance of image classification. In particular, the size of training data sets and the number of categories are important factors affecting performance. While for most people, a large number of training data set are difficult to obtain or need to do a classification task with a large number of categories. Thus, we consider two questions of this approach: How does the size of the data set affect performance? How does the number of categories affect performance? In order to figure out these two questions, we constructed two types of experiment: Experiment 1, changing the number of categories and exploring how the number of categories affects performance in image classification task. There are 7 groups experiment performed by increasing the number of categories and performed 5 times experiment in each group (35 times experiment in total). Observe the change in accuracy to analyze the impact of the number of categories on performance. Experiment 2, changing data set size and exploring how the data set size affect performance. For each k-classification experiment, we do 5 groups by increasing the size of the training set. There are 35 groups experiment performed 5 times experiment in each group (175 times experiment in total). Observe changes in accuracy to analyze the effect of data set size on performance. For the CNN-based network, the results of experiment 1 show that the more categories, the worse the performance, and the less categories, the better the performance. In addition, when the number of categories to be classified is large, sometimes better accuracy can be obtained. The results of experiment 2 show that the larger the training set, the higher the test accuracy. When the training data set are insufficient, better results can be obtained. Therefore, in classification experiment, when the data set size is small or the number of categories is large, we can do more experiments and retain the best results. Results of this paper not only can guide us to do experiments on image classification, but also have important guiding significance for other experiments based on deep learning. (37 refs.) **Inspec controlled terms:** image classification - learning (artificial intelligence) - neural nets - pattern classification

Uncontrolled terms: image classification task - 35 times experiment - k-classification experiment -

training set - 175 times experiment - training data set - important factors affecting performance

Classification Code: C5260B Computer vision and image processing techniques - C5290 Neural computing techniques - C6170K Knowledge engineering techniques

IPC Code: G06F15/18 - G06T - G06N5/04

Treatment: Practical (PRA); Experimental (EXP)

Database: Inspec