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SCHOLARS SCOPE

VOL. I | ISSUE I | 2025

DEPARTMENT OF COMPUTER APPLICATION

Integral University, Dashauli, Lucknow,
Uttar Pradesh-226026.

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ABOUT INTEGRAL UNIVERSITY

Integral University, a seat of educational excellence, is a premier university in Lucknow, the capital city of the state of Uttar Pradesh, India. It was established under the Act Number 9 of 2004 by the State Government. The University is duly approved by the University Grants Commission (UGC) under section 21(f) and 128 of the UGC Act. 1956, Medical Council of India, Pharmacy Council of India, Indian Nursing Council, Council of Architecture Bar Council of India, Indian Association of Physiotherapists, National Council for Teacher Education, UP State Medical Faculty, Integral University, one of the premier educational institutions in India has been awarded A+ grade by the National Assessment and Accreditation Council (NAAC) in the second cycle of accreditation.

ABOUT THE DEPARTMENT

The Department of Computer Application at Integral University is dedicated to providing high-quality education, research, and innovation in the field of computing and information technology. The department offers a range of programs, including BCA, MCA, and Ph.D., designed to equip students with cutting-edge knowledge in areas such as artificial intelligence, data science, cyber security, software development, and cloud computing. With a team of experienced faculty members, state-of-the-art laboratories, and a research-driven environment, the department emphasizes both theoretical knowledge and practical application. Through industry collaborations, workshops, and hands-on projects, students are prepared to meet the evolving demands of the IT sector. The department strives to cultivate a culture of innovation and lifelong learning, empowering students to excel in academia, industry, and entrepreneurship while contributing to technological advancements for a better future.

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THRUST AREAS

RESEARCH PROFILE OF CA

1	Enrolled Research Scholars	43
2	Awarded PhD Degree	31
3	Journal Publications	168
4	Conference Proceedings	85
5	Book Chapters	124
6	Books	22
7	Patents	20
8	Projects	2

*As of June 2025

SCHOLAR SCOPE

The Department of Computer Application at Integral University has consistently been at the forefront of academic and research excellence since its inception in 2003. This document, Scholar Scope, serves as a testament to the dedication and intellectual rigor of our Ph.D. scholars who have successfully completed their research and those currently engaged in pioneering studies across various domains of Computer Science & Application.

This compilation provides an insightful overview of groundbreaking research contributions in emerging fields such as Big Data Analytics, Cloud Computing, Image Processing, Web Engineering, Blockchain, and Software Engineering. Our scholars have embraced the latest advancements in technology to propose innovative solutions to contemporary challenges, thereby enriching the academic community and industry alike.

Through this publication, we aim to showcase the extensive research endeavors of our scholars, highlighting their contributions to technological advancements and the development of efficient, scalable, and secure computational solutions. This document will serve as a valuable resource for students, researchers, and academicians, offering a glimpse into the progressive research culture fostered by the department.

We extend our gratitude to all scholars, supervisors, and faculty members who have contributed to the development of this research archive. Their commitment to excellence and perseverance continue to elevate the standards of the Department of Computer Application at Integral University.

Prof. Mohammad Faisal
Head of Department
Department of Computer Application
Integral University, Lucknow

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RESEARCH TOPIC	Analysis and Design of Multi Objective Workflow Scheduling in Cloud Computing

NAME	Mr. Md Khalid Jamal	ENROLLMENT NO.	2001208
RESEARCH AREA	Cloud Computing	ENROLLMENT YEAR	2020
SUPERVISOR	Prof. Mohammad Faisal	AWARDED YEAR	2025

ABSTRACT

Cloud computing, with its on-demand resource provisioning and scalability, has emerged as a transformative technology. Workflow scheduling, a critical component of cloud computing, involves optimally allocating tasks to available resources to maximize efficiency and minimize costs. However, the complexity of modern workflows and the diverse objectives of cloud users necessitate sophisticated scheduling algorithms. This thesis presents a comprehensive investigation of multi-objective workflow scheduling in cloud computing. By considering multiple objectives such as minimizing , cost, and energy consumption, this research aims to develop effective scheduling strategies that cater to the diverse requirements of cloud applications. A key challenge in multi-objective workflow scheduling is the inherent conflict between the objectives. For instance, minimizing make span often requires allocating more resources, leading to increased costs and energy consumption. To address this issue, a multi-objective optimization framework is proposed in this thesis. This framework integrates various optimization techniques, such as genetic algorithms, particle swarm optimization, and ant colony optimization, to explore the trade-offs between different objectives and identify Pareto-optimal solutions. Heuristic algorithms play a crucial role in efficiently solving the NP-hard problem of workflow scheduling. This thesis develops several heuristic algorithms tailored to multi-objective optimization.

These algorithms incorporate domain-specific knowledge and employ intelligent search strategies to find near-optimal solutions within reasonable time constraints. To evaluate the performance of the proposed algorithms, rigorous experiments are conducted using real-world workflow benchmarks and cloud infrastructure simulations. The algorithms are compared against existing state-of-the-art methods in terms of make span, cost, and energy xvi consumption. The results demonstrate the effectiveness of the proposed approaches in achieving a balance between the competing objectives. Case studies are presented to illustrate the applicability of the research findings in different cloud computing scenarios. For example, in scientific computing, the focus is on minimizing make span to expedite simulations and analyses. In data-intensive applications, cost optimization is paramount to reduce operational expenses. In real-time systems, low latency and energy efficiency are critical factors. The proposed algorithms are shown to be adaptable to these diverse requirements, providing tailored scheduling solutions for various cloud workloads. In conclusion, this thesis contributes to the advancement of multi-objective workflow scheduling in cloud computing. By developing effective optimization frameworks and heuristic algorithms, this research provides practical solutions for optimizing the performance and resource utilization of cloud-based applications. The findings of this thesis have the potential to significantly impact the adoption and efficiency of cloud computing in various domains

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RESEARCH TOPIC	Development of a Framework to Mitigate Vulnerable Latency Junction in IOT

NAME	Ms. Eram Fatima Siddiqui	ENROLLMENT NO.	1901036
RESEARCH AREA	Cloud Computing	ENROLLMENT YEAR	2019
SUPERVISOR	Dr. Tasneem Ahmed	AWARDED YEAR	2025

ABSTRACT

The integration of Internet of Things (IoT) and Fog Computing (FC) is revolutionizing real-time data processing by decentralizing computations and enhancing responsiveness. However, latency remains a significant challenge, particularly in time-sensitive applications like autonomous systems and industrial automation. Latency bottlenecks, known as latency junctions, arise from inefficient data transfer between IoT devices, fog nodes, and cloud servers, often resulting in delays, data loss, and security risks. This research addresses these issues through a hybrid task offloading strategy that splits tasks between local devices and nearby fog or edge servers. Tasks are executed in parallel, optimizing performance and reducing total computation time. A theoretical framework validates this approach, demonstrating reduced latency and better resource management compared to traditional offloading models. Statistical tests such as Shapiro-Wilk and Z-tests confirm the effectiveness of this method.

Building on this, a Game Theory-Based Task Latency Reduction IoT (GTBTL-IoT) model is proposed. It leverages partial task offloading and parallel processing using both local and edge resources. The model improves workload distribution, reduces delays by up to 59%, and significantly enhances performance, making it suitable for real-time applications in IoT-MEC environments. Additionally, a decision-tree-based framework for real-time healthcare decision-making using fog computing is proposed. Trained with the Pima Indian Diabetes dataset, it classifies patient risk levels using biosensor data and suggests optimal offloading strategies for timely treatment. The system outperforms existing models, achieving 88% improvement in performance. Future work will focus on refining these frameworks through secure communication protocols, advanced task partitioning, and integration with cloud analytics. These advancements aim to establish ultra-low latency, scalable, and secure Fog-IoT environments capable of supporting diverse real-time applications across multiple industries.

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RESEARCH TOPIC	Design and Development of a Blockchain based Framework for Electronic Record Management

NAME	Mrs. Abida Khanam	ENROLLMENT NO.	2001140
RESEARCH AREA	Blockchain Technology	ENROLLMENT YEAR	2020
SUPERVISOR	Dr. Mohammad Faizan Farooqui	AWARDED YEAR	2024

ABSTRACT

The digitization of healthcare systems demands secure and efficient management of electronic health records (EHRs). While EHRs improve accessibility, data sharing, and patient care, they face critical challenges, including data security vulnerabilities, privacy concerns, scalability limitations, and insufficient patient control. Centralized systems are especially prone to single points of failure, data breaches, and inefficiencies in handling large volumes of medical records. This research proposes a blockchain-based framework to address these challenges, integrating advanced technologies for secure and decentralized EHR management. Key innovations include the use of the InterPlanetary File System (IPFS) for distributed data storage, Elliptic Curve Cryptography (ECC) for robust encryption, and Genetic Algorithms for efficient data retrieval and processing. Together, these components enhance system scalability, security, and privacy while ensuring responsiveness under high demand.

The framework is implemented using Hyperledger Fabric, an open-source blockchain platform that supports secure and scalable healthcare applications. Hyperledger Fabric's smart contracts enable automated access control, while its permissioned architecture safeguards sensitive healthcare data. This practical implementation underscores the framework's feasibility for real-world adoption. A comparative analysis demonstrates the framework's superiority over existing solutions in terms of security, privacy, scalability, and performance. Finite State Machine (FSM) modeling validates the system's reliability and robustness across diverse healthcare processes, confirming its ability to meet real-world demands. By addressing the pressing challenges of modern healthcare systems, this research provides a transformative solution for EHR management. It combines blockchain technology with advanced optimization techniques to ensure data integrity, patient empowerment, and operational efficiency. This work not only contributes to the theoretical understanding of blockchain in healthcare but also establishes a foundation for practical applications, benefiting both academia and the healthcare industry.

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RESEARCH TOPIC	An Improved K-means Clustering Technique on High Dimensional Data

NAME	Mr. Afroj Alam	ENROLLMENT NO.	1901019
RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2019
SUPERVISOR	Dr. Muhammad Kalamuddin Ahmad	AWARDED YEAR	2024

ABSTRACT

The rise of high-dimensional data in fields like bioinformatics, image processing, disease prediction, and market analysis demands efficient clustering methods. Traditional K-means, despite its simplicity, struggles with issues like sensitivity to initial centroids, local minima, empty clusters, and reduced accuracy in high- dimensional spaces. This study enhances K-means clustering by integrating it with nature-inspired metaheuristic optimization techniques, namely Particle Swarm Optimization (PSO), Firefly Algorithm (FA), and Chaos Game Optimization (CGO). Additionally, Kernel Principal Component Analysis (KPCA) is employed to reduce the computational burden and dimensionality of large datasets. The hybrid algorithms leverage the global search capabilities of metaheuristics and the local search efficiency of K-means. PSO optimizes the search process through efficient exploration and exploitation of the search space. FA, inspired by fireflies' bioluminescent communication, excels in multimodal optimization by avoiding local minima through its adaptive attractiveness mechanism. CGO, based on chaotic systems, enhances search diversity, reducing premature convergence.

These methods were rigorously evaluated on high-dimensional benchmark datasets using metrics such as silhouette score, Davies-Bouldin index, intra-cluster distances, and computational time. Experimental results demonstrate that the hybrid algorithms significantly outperform traditional K-means in clustering accuracy, robustness, and efficiency. K-means-PSO balances exploration and exploitation to form higher-quality clusters. K-means-FA avoids local minima, while K-means-CGO achieves globally optimal solutions through chaotic search patterns. Notably, the Chaos Game Optimization-based Recurrent Neural Network (CGO-RNN) enhances early cardiac disease prediction accuracy. KPCA further aids by extracting relevant features, reducing computational complexity. Theoretical analysis confirms that the hybrid algorithms maintain polynomial time complexity while ensuring enhanced convergence. Practical applications include consumer segmentation, disease prediction, and gene expression analysis. The proposed methods achieved success rates of up to 98.99%, with K-means-FA showing the best intra-cluster distance performance. This research makes significant contributions to data mining and machine learning by introducing robust tools for analyzing high-dimensional datasets.

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RESEARCH TOPIC	A Framework for Requirement Management in Agile Software Development

NAME	Mr. Kashif Asad	ENROLLMENT NO.	1601016
RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2016
SUPERVISOR	Dr. Mohammad Faizan Farooqui	AWARDED YEAR	2024
CO-SUPERVISOR	Dr. Mohd. Muqeem		

ABSTRACT

Agile Software Development (ASD) addresses the challenges of evolving requirements across various sectors, with Requirement Management (RM) being critical for successful product development. This research emphasizes Requirement Prioritization (RP) as a key factor in improving planning, scheduling, and budget management within Agile methodologies. It explores Agile Requirement Engineering and compares RM practices across frameworks such as SCRUM, Kanban, XP, DSDM, and FDD, focusing on Quality Requirement (QR) management in dynamic environments. The study acknowledges the complexities of managing shifting requirements in Agile projects, despite their inherent flexibility. It highlights the significance of effective RM in ensuring stakeholder satisfaction and enhancing organizational value. To address these challenges, the research proposes a novel framework designed to improve the adaptability and efficiency of RM processes in Agile project lifecycles. Central to the framework is the Analytic Hierarchy Process (AHP), used to prioritize and classify requirements into Small Change Requests (SCRs) and Large Change Requests (LCRs). By considering factors such as complexity, impact, and timelines, this approach ensures systematic prioritization and informed decision-making.

The framework's effectiveness is validated through a case study, demonstrating its practical application in real-world Agile projects. The classification of SCRs and LCRs enhances collaboration, aligns development objectives with stakeholder needs, and streamlines decision-making processes. The research also introduces the AgileRM tool, a web-based application developed on the WAMP platform (Windows, Apache, MySQL, PHP). AgileRM automates the RM framework, enabling efficient requirement administration, stakeholder management, and integration with other technologies. The tool is scalable and designed to support transparency, collaboration, and continuous improvement, in line with Agile principles. By addressing the intricacies of Agile Requirement Management, this study provides a structured approach to handling change requests, ensuring project adaptability and improved outcomes. The proposed framework and tool contribute significantly to Agile methodologies by offering actionable strategies to tackle the challenges of evolving requirements, ultimately enhancing project efficiency, stakeholder satisfaction, and organizational value.

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RESEARCH TOPIC	A Novel Approach for Analyzing Security Issues on Different Layers of Fog Computing

NAME	Mr. Aftab Alam Abdussami	ENROLLMENT NO.	1701023
RESEARCH AREA	IDS/IPS in Fog Computing	ENROLLMENT YEAR	2017
SUPERVISOR	Dr. Mohammad Faizan Farooqui	AWARDED YEAR	2024

ABSTRACT

The Modified Active Electro-location-based Electric Fish Optimization (MAE-EFO) meta-heuristic is introduced as an improved approach for feature selection, aiming to enhance the efficiency of intrusion detection systems (IDSs). Feature selection plays a crucial role in reducing the dimensionality of data, thereby minimizing the complexity of the training process and improving computational efficiency. The MAE-EFO technique refines the conventional Electric Fish Optimization (EFO) algorithm by incorporating active electro-location principles, which enhance its ability to identify optimal feature subsets. This process ensures that only the most relevant features are retained, leading to better model performance. To further improve the accuracy and adaptability of the IDS, Incremental Deep Neural Networks (I-DNNs) are employed for intrusion detection. Unlike traditional deep learning models that require retraining from scratch when new data is introduced, I-DNNs facilitate incremental learning, allowing the model to adapt dynamically to newly observed data patterns. This incremental learning mechanism ensures that the system remains robust and responsive to emerging cybersecurity threats without requiring excessive computational resources.

A key innovation of the proposed framework lies in the optimization of testing weights using MAE-EFO. By fine-tuning the weights during testing, the model effectively minimizes the error difference between projected and actual outcomes, thereby improving classification accuracy. The proposed method has been evaluated using benchmark intrusion detection datasets as well as additional datasets, demonstrating its effectiveness in real-world applications. When compared to other state-of-the-art IDS models, the proposed MAE-EFO-enhanced I-DNN framework consistently achieves superior performance. Results indicate a higher detection rate coupled with a significantly lower false positive rate, especially when tested in a simulated fog computing environment. These findings highlight the potential of the proposed approach to enhance the reliability and efficiency of intrusion detection in modern, decentralized computing ecosystems.

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RESEARCH TOPIC	Analysis and Design of a Framework for Risk Prediction and Estimation for Software Design

NAME	Mr. Tabrez Khan	ENROLLMENT NO.	1801066
RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2018
SUPERVISOR	Prof. Mohammad Faisal	AWARDED YEAR	2024

ABSTRACT

The software industry has expanded to include nearly every facet of modern life, making it a crucial component of the global economy. As an integral part of the broader IT sector, the software industry influences various domains, from business operations and healthcare to education and entertainment. With the increasing reliance on software solutions, the industry is subject to continuous evolution, driven by technological advancements and changing customer expectations. Clients and professionals frequently modify their demands, leading to shifts in consumer behavior and professional practices. These continuous changes introduce uncertainties, making it difficult to predict future requirements accurately. Consequently, the risks associated with software development are in constant flux, impacting overall productivity and the success rate of software projects.

In today's fast-paced digital era, software development faces numerous challenges due to the rapidly changing technological landscape. Risks, which are often difficult to anticipate and quantify, play a significant role in the high failure rate of software initiatives. Many software projects do not meet their intended goals due to unforeseen complications arising from these risks. Therefore, effective risk management is critical to achieving successful software development outcomes. Research has highlighted that one of the most important aspects of software engineering is the ability to monitor and estimate risks, particularly during the software design phase. However, accurately identifying risks remains a challenge due to the dynamic nature of user requirements and market trends.

Failures in software projects can be attributed to a combination of factors, including ambiguous project requirements, poor risk assessment, and evolving technological paradigms. These risks have a direct impact on software quality, development budgets, and delivery schedules. The primary objectives of this research are to identify key factors that contribute to successful software development, examine the sources and causes of risks, and analyze the relationship between identified risks and their contributing factors. Understanding these relationships is essential for mitigating risks and ensuring efficient software project execution.

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RESEARCH TOPIC	Development of a Prediction Technique in Big Data: An Unsupervised and Supervised Learning Perspective

NAME	Mr. Mirza Ghazanfar Beg	ENROLLMENT NO.	1801068
RESEARCH AREA	Machine Learning	ENROLLMENT YEAR	2018
SUPERVISOR	Prof. Mohammad Faisal	AWARDED YEAR	2024
CO-SUPERVISOR	Dr. S. K. Nayak		

ABSTRACT

In the realm of data science and artificial intelligence, the landscape has been fundamentally reshaped by the emergence of big data engineering. Data can range up from abstract ideas to concrete measurements including, but not limited to statistics. This evolution has propelled the development of advanced systems, fostering the creation of superior technologies that enrich our understanding of physical phenomena. Central to this transformative process is the pivotal role played by machine learning (ML). This study evaluates supervised and unsupervised ML algorithms for predicting illnesses in Mechanical Data Engineering. Determining their effectiveness aids researchers in selecting appropriate ones. Supervised ML, widely used in data mining, shows potential in leveraging health data for illness prediction. The study aims to reveal trends in ML system performance, advancing proactive healthcare and pandemic readiness. ML models aid in categorizing and prioritizing risk factors, potentially estimating infection rates. Proposing a hybrid ML method for pandemic prediction, it offers an alternative to traditional compartment models, improving outbreak detection and containment strategies.

The primary results of the study aim to pinpoint the most efficient and proactive strategies for prevention by forecasting the promptness of virus spread and to reduce the mortality rate using Hybrid Model. The forecasting would help provide early preparation and mitigation strategies to counter the negative impact of the pandemic on the healthcare system. These strategies could aid in promptly addressing shortages of drugs, medical personnel, and other essential resources, as well as to streamline resource allocation in regulatory policymaking processes. Data science confronts the hurdles of handling vast datasets by leveraging high-performance computing and systematic architectures. This approach aims to unlock the vast potential of big data analytics. By integrating advanced analytical methods and high-performance computing, data science facilitates the interpretation of intricate datasets, fostering innovation and informed decision-making across various domains.

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RESEARCH TOPIC	Analysis and Design of Knowledge Based Framework for Multi-Agent System in Web Mining

NAME	Mr. Arshad Ali	ENROLLMENT NO.	1701029
RESEARCH AREA	Web Mining	ENROLLMENT YEAR	2017
SUPERVISOR	Dr. Mohammad Faizan Farooqui	AWARDED YEAR	2024

ABSTRACT

The increasing complexity of web information and its growing significance in web mining necessitate the development of advanced knowledge representation and management frameworks. This study undertakes an analysis and design of a tailored knowledge-based framework for a multi-agent system dedicated to web mining. The framework aims to streamline the extraction, integration, and utilization of knowledge from diverse web sources through a distributed and collaborative approach. The analysis phase delves into understanding the requirements and challenges of web mining within a multi-agent system. Various web mining techniques are examined, and key components and functionalities for an effective knowledge-based framework are identified. Additionally, the suitability of multi-agent systems for web mining tasks is investigated.

Drawing from these insights, the design phase outlines a comprehensive architecture for the knowledge-based framework. Distributed knowledge representation techniques are incorporated to enable agents to capture and store web mining knowledge systematically. Mechanisms for knowledge integration are integrated to intelligently combine information from different sources, while facilitating collaboration among agents to share and exchange knowledge, thereby enhancing the system's collective intelligence. Dynamic knowledge updates allow agents to adapt to changing web environments seamlessly. The effectiveness of the proposed framework is evaluated through experiments using real-world web mining scenarios, demonstrating its capability to efficiently handle complex tasks and improve knowledge extraction, integration, and utilization within a multi-agent system. In conclusion, this analysis and design of a knowledge-based framework for a multi-agent system in web mining contribute to advancing knowledge management techniques in this field. The proposed framework offers an efficient and collaborative approach to extract valuable knowledge from the web, providing a solid foundation for further research and development in web mining.

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RESEARCH TOPIC	Development of Flood Monitoring and early warning System based on IoT using Satellite Images

NAME	Mr. Mohammed Siddique	ENROLLMENT NO.	1801075
RESEARCH AREA	Image Processing	ENROLLMENT YEAR	2018
SUPERVISOR	Dr. Tasneem Ahmed	AWARDED YEAR	2024
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ABSTRACT

The Sentinel-1A (SAR) images help in flood mapping and analyzing the situation much more precisely and can distinguish the water body and land areas. The study areas for identifying flood-prone regions include the vulnerable north Indian cities of Basti (26.8140° N, 82.7630° E), Ayodhya (26.7922° N, 82.1998° E), Prayagraj (25.4358° N, 81.8463° E) and Gorakhpur (26.7606° N, 83.3732° E). The implementation of Supervised RF and KNN classification and Unsupervised K-Means classification, with in-depth analysis using post-classification, and accuracy assessment of the processed images provided a detailed evaluation of the results and discussion by distinguishing water, urban, vegetation, and bare soil regions. The overall accuracy and the Kappa Coefficient statistics of classified images are generated as a metric for in-depth analysis and compared to attain better inter-class discrimination.

To ensure the highest accuracy, a novel hybrid (integrated) approach is implemented in which the accuracy was higher than the RF classification. Additionally, the processed sentinel images are stacked together to implement the flood mapping. As an additional verification process to identify inundation levels during floods, an embedded module is built that generates the output data to ensure changes in water levels validated with the inundation levels identified by processing the Sentinel-1 images. The Deep Learning (DL) Convolutional Neural Network (Conv1D) and Naïve Forecast (NF) models have been utilized for the flood prediction and to evaluate the efficacy of outcomes from time-series datasets from five years of Sentinel-1 images. Additionally, the coherent change detection and DL models for prediction of changes along with the comparative analysis have been performed. A Flood Monitoring and Early Warning System (FMEWS) has been developed, which provides insight into all the flood monitoring data to the concerned users. The effectiveness of the system is evaluated by testing the alert system which sends warning emails to the concerned authorities.

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RESEARCH TOPIC	Design of an Efficient Framework for Requirement Change Management

NAME	Mr. Syed Adnan Afaq	ENROLLMENT NO.	1701064
RESEARCH AREA	Requirement Engineering	ENROLLMENT YEAR	2017
SUPERVISOR	Prof. Mohammad Faisal	AWARDED YEAR	2024

ABSTRACT

Requirement change management is a critical process in software development, aimed at effectively handling and controlling changes to project requirements throughout the software development lifecycle. Its primary objectives are to analyze, evaluate, and implement modifications while ensuring minimal negative impacts on scope, cost, schedule, and quality. By embracing requirement change, software systems can adapt to evolving user needs, market demands, and technological advancements, leading to higher levels of satisfaction and competitiveness.

However, requirement change introduces complexity, requiring meticulous impact analysis to minimize disruptions in project timelines and existing functionalities. This study emphasizes the importance of processes such as change identification, prioritization, and impact analysis in requirement change management. It explores different management approaches, including Traditional/Sequential and Agile methods, catering to specific needs and contexts of software development projects.

The research employs a systematic review methodology to identify the causes and attributes of requirement change, including evolving business needs, stakeholder input, technological advancements, regulatory requirements, and scope creep. These factors drive modifications in requirements to align with changing circumstances and ensure compliance.

The study aims to investigate various causes and attributes of requirement change, propose an efficient framework for requirement change management, and perform thorough change impact analysis, ultimately enhancing the overall efficiency and effectiveness of software development processes.

A proposed framework for effective requirement change management comprises four major parts: requirement elicitation and analysis, change identification, prioritization, and impact analysis. Stakeholder input is crucial in the requirement elicitation stage, followed by comparison of requirement documents using a two-phase comparison tool in the change identification phase. Prioritization of changed requirements is facilitated by a fuzzy approach, considering parameters such as difficulty index and change rating. Finally, impact analysis is conducted to assess the effects on cost, time, and human resources. The framework's implementation and validation are conducted using a finite-state machine, supported by a case study and survey questionnaires with industry experts.

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RESEARCH TOPIC	Development of an Effective Technique to Perform Audit Testing of Web Services

NAME	Mr. Anwar Bari	ENROLLMENT NO.	12065
RESEARCH AREA	Web Services	ENROLLMENT YEAR	2012
SUPERVISOR	Dr. Mohammad Faizan Farooqui	AWARDED YEAR	2024

ABSTRACT

In recent years, there has been a rapid expansion in Web Services techniques and applications across various domains A web service is an independent software component with a well-defined interface, offering a set of operations accessible via the Internet. Web services evolve rapidly to keep up with technological advancements and changing business requirements, introducing new features, addressing defects, and improving performance. Audit testing involves a systematic retesting of system components to confirm that changes have not inadvertently altered system behavior, relying on previous test cases and outcome comparisons. The research introduces an audit testing strategy to evaluate whether a service maintains compliance with test cases and Quality of Service (QoS) assertions throughout its lifecycle.

The research introduces a framework to develop a technique for audit testing specifically tailored for web services. The proposed framework introduces an automated approach to conduct audit testing of web services. This extensive report is generated through the analysis of numerous request-response pairs associated with the standard interoperability of UDDI registries, WSDL documents, and SOAP messages. The consistency report plays a critical role in identifying the need for audit testing in a web service, providing guidance on appropriate steps for test case selection, minimization, and prioritization. The development of an effective technique for audit testing of web services is a dynamic and continuous process that must adapt to the ever-changing technological landscape, the evolving nature of web services, and the shifting sands of regulations. Continuous improvement and collaboration among stakeholders are essential to ensure the continued reliability of web services, ultimately safeguarding the digital ecosystem for users and organizations alike.

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RESEARCH TOPIC	Development of Big Data Analytical Techniques for Satellite Images Retrieval for Land Surface Monitoring

NAME	Mr. Saurabh Srivastava	ENROLLMENT NO.	1701046
RESEARCH AREA	Image Processing	ENROLLMENT YEAR	2017
SUPERVISOR	Dr. Tasneem Ahmed	AWARDED YEAR	2023

ABSTRACT

Satellites capture Earth's surface images with varying resolutions, aiding applications like land use classification, agriculture monitoring, and urban surveillance. Managing the vast data generated by satellites requires advanced techniques. Traditional methods struggle with the complexity and volume of satellite data, but big data analysis offers a solution for extracting meaningful insights. To improve satellite image retrieval and quality assessment, a feature-based image retrieval (FBIR) system is proposed, initially for Landsat-8 images. To expand its scope, an advanced similarity-based neural network (SBNN) is introduced, enabling retrieval of both Landsat-8 and Sentinel-2 images. The system allows users to select specific bands, enhancing usability. The FBIR system's quality images support studies like urban area and deforestation monitoring.

In urban monitoring, a semi-supervised deep learning model is developed to classify land cover and measure land surface temperature (LST) using Sentinel-2 and Landsat-8 images. The model analyzes images from 2017 to 2021, revealing a concerning increase in urban areas and LST in Lucknow City. Trend analysis suggests a further rise in urbanization and temperature by 2031, posing risks. Deforestation monitoring employs machine learning and deep learning techniques on Sentinel-2 images. A forest monitoring approach detects changes over six years, highlighting the alarming decline in forest area, particularly in the Kukrail forest range in Lucknow. The proposed deep learning-based change detection outperforms traditional methods in accuracy and performance metrics. The study concludes with key findings and future research directions, underscoring the importance of efficient monitoring mechanisms for environmental conservation.

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RESEARCH TOPIC	Analysis and Design of an Efficient Method to Measure Semantic Similarity Between Words and Sentences of Software Requirements

NAME	Mr. Farooq Ahmad	ENROLLMENT NO.	1701074
RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2017
SUPERVISOR	Prof. Mohammad Faisal	AWARDED YEAR	2023

ABSTRACT

Measurement of sentence similarity is crucial in natural language processing. Sentence similarity must be reliably measured. Semantic symmetry between two sentences is measured by sentence similarity, regardless of word order or context. Sentence similarity can be measured several ways. Two primary ways for determining semantic similarity are knowledge-based and corpus-based, distributive methods. These methodologies excel in natural language processing and are widely utilised for sentence similarity evaluation. In natural language processing, sentence structure and word structure are also crucial. This work is divides the research into two parts:

The study introduced HydMethod, a hybrid approach that incorporates semantic data from lexical databases, word embeddings, corpus statistics, and implied word order. Our method uses lexical databases to simulate human common-sense knowledge, which can be tailored to other areas using corpus statistics. Thus, the method applies to many fields. Our research utilised two standard datasets, Pilot Short Text Semantic Similarity Benchmark and MS paraphrase, to prove the effectiveness of our suggested technique. The suggested method beats existing approaches on both datasets, achieving the highest correlation value for word and sentence similarity. It increases by up to 32% more than word vector or WorldNet-based methods. The algorithm's similarity metric for Rubenstein and Goodenough word and phrase pairs has a strong Pearson correlation coefficient of 0.8953.

The second part of the work introduced ReSim, a framework for discovering software needs similarities, to enhance reusability and ensure accurate identification. ReSim measures software requirement similarity, which is significant. Researchers employ several well-known similarity measurement methods to compare software requirements. Common methods for measuring this include dice, jaccard, and cosine coefficients. However, new research has introduced improved algorithms based on WordNet, Word Embedding, and corpus statistics. ReSim measures similarity using the semantic-based hybrid method (HydMethod). Thus, on the PURE dataset, ReSim beats other methods.

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RESEARCH TOPIC	Development and Analysis of Satellite Image Based Change Detection Monitoring Algorithm in Area Under Major Fruit Crops in Uttar Pradesh

NAME	Mr. Harish Chandra Verma	ENROLLMENT NO.	1701036
RESEARCH AREA	Image Processing	ENROLLMENT YEAR	2017
SUPERVISOR	Dr. Tasneem Ahmed	AWARDED YEAR	2023

ABSTRACT

Accurate classification and area estimation of mango orchards is an important task for a policy decision by the government for its area expansion and monitoring, providing subsidies to the farmers, crop insurance, and yield estimation. Satellite images play a crucial role in the accurate classification and area estimation of fruit crops and it is observed that satellite images are also playing an important role in orchard monitoring. India is the second largest fruit producer in the world and mango is a major fruit crop grown in India. Fruit crops are crucial for improving land productivity and the economic condition of farmers by increasing income, employment generation, and providing nutritional security. For managing the crops in a better way and bringing more area under fruit crops, the information on the current status of change in crop area must be known.

The study revealed that mango crop can be classified with high accuracy using Landsat 8 OLI images. It also showed that with this multi-temporal image, the classification can be performed for perennial fruit crops like mango, with a high degree of accuracy. This type of study is useful for crop planning, making a decision on the development of infrastructure and crop area expansion. For mango crop, the use of satellite images for assessment of the area is feasible due to the medium to the big orchard that is perennial. In this work, an improved technique i.e. LR-PCA based on the fusion of LR and PCA that allows the detection of multitemporal changes from satellite images, is developed. Using this method change image of the mango crop is derived and change detection accuracies are computed using field data. From the results of the accuracy assessment of change detection in the area under mango crop for Lucknow, it is found that determining the optimal value of 'N' for computing a suitable threshold value is quite a time taking and difficult task.

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RESEARCH TOPIC	A Framework to Minimize the Impact of Requirement Uncertainty in Software Projects

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RESEARCH AREA	Requirement Engineering	ENROLLMENT YEAR	2016
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ABSTRACT

Software engineering is a dynamic activity, which causes the requirements to be changed due to the uncertainty present in the requirements at the beginning stage of requirement elicitation. These uncertainties present in the requirements are defined as "Requirement Uncertainty," and they have been identified as the most significant and crucial challenges throughout the development of software projects. Even though requirement uncertainty cannot be circumvented, it can reduce the possibility of fulfilling the stakeholders' need for the software product. These late-coming changes must be avoided and should be managed effectively if necessary to be incorporated. The causes of requirement uncertainty cannot be trounced completely, yet some internal causes can be handled efficiently to minimise its impact on the other parameters of software project development. It has a pessimistic impact on all the phases of the software development life cycle.

According to statistics, requirement uncertainty accounts for 86% of change requests, and more than half of the requirements are regularly updated before a software project is delivered. Additionally, requirement uncertainty outlays 200 times more in the later phases than in the earlier phases. These factors provide the impetus to begin exploring for and attempting to figure out a solution in this domain of paramount importance. To handle these issues, a framework named the Refine Requirement Specification Framework (RRSF)is proposed. The proposed framework will help to manage requirement uncertainty and reduce its impact. It addresses three core problem areas of Requirement Uncertainty that is uncertainty source analysis, Identification, Assessment and Management. The proposed framework is validated using the SPSS tool to validate the impact of requirements uncertainty on other parameters using correlation coefficient values.

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RESEARCH TOPIC	A Framework for Identification and Mitigation of Fraudulent Online Transactions using Deep Learning

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ABSTRACT

The online payment transaction with the plastic money card is a system in which the user carries out all the transactions at any time and from any place in a very trusted, relaxed and ensured mode. This is assured because all the security arrangements and management which are very important for the online payment transaction system and all arrangements have been done well in collaboration with the Government and the financial institution. That is, all the security measures have been put in place by the financial institution to carry out the online payment transaction. The use of information and communication technology is to make human life easy. Therefore, all over the world is being equipped digitally and everyone can do their work smoothly and easily. One important outcome of the information and communication technology and digital technology is the online payment transaction with the plastic money card. It is growing with exponential growth. The easiness and growth of the online payment transaction influences the fraudsters in the form of the online payment transaction fraud.

Although, financial and government authorities have taken all the necessary measures in terms of security for restricting online payment transaction fraud. But, the literature review was showing that cybercriminals, hackers or fraudsters find new ways to commit the online payment transaction fraud and as a consequence, financial authorities are updating the existing online payment transaction system with new security features at the end of the user. The aim of this research work is to secure the end of the user and prevent online payment transaction fraud through advanced authentication and fraud detection mechanisms. The results obtained after establishing and executing proposed frameworks and a model are very appreciable and online payment transactions have been proven to be able to a great extent in preventing fraud.

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RESEARCH TOPIC	Development of Dependability Estimation Framework: An Object Oriented Design Phase Perspective

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ABSTRACT

Software systems are used in many areas, their failure can lead to loss of time and money. Developing systematic ways to relate the software dependability attributes provides a base for making objective decisions about design trade-offs. It enables engineers to make reasonably accurate predictions about dependability attributes that are free from biased and hidden assumptions. The ultimate objective is the ability to quantitatively evaluate multiple attributes of software dependability to arrive at a better overall system. Software Dependability is a useful measure in planning and controlling the resources during the development process so that high quality software can be developed. It is also a useful measure for giving users confidence about software correctness. In this research work, the endeavour is to discover the attributes for dependability and to classify them as per their nature and type.

The approach for the selection of software dependability factors and sub-factors has been a critical matter in the research of software engineering for a long time, and it is mainly because of the importance of dependability in software development. The consideration of dependability and its different factors and subfactors is required, at the same time in most of the software design and development problems and it is dependent on the individual judgments made by experts in the field of software engineering. For the selection of suitable factors according to the problem, the analytic hierarchy process (AHP) technique is widely used and accepted in cases of decision-making. After the evolution of fuzzy set theory, a derivative of AHP known as Fuzzy AHP which is derived by combining the principles of fuzzy set theory with the AHP technique. The aim behind the development of fuzzy AHP is to deal with the uncertainty and fuzziness. Although after the increasing popularity of the fuzzy AHP, a little research has been performed with respect to the software dependability, for calculating priority weight of factors and subfactors by this approach, called fuzzy AHP. Therefore, the main focus of this research work is on the calculation of weight-ages of factors and sub-factors of software dependability.

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RESEARCH TOPIC	Development of an Effective Model to Enhance the Security Level of Semantic Web Services

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ABSTRACT

In today's digital age, semantic Web services have grown progressively. Today various types of services like digital-trade, social networking, and online payment of various services, etc., are used by the user through the Semantic Web. The Semantic Web has emerged as a powerful medium for using online services. The use of semantic Web services greatly simplified the life of the common citizen. The increasing use of the Semantic Web has attracted the attention of various users and today they are sharing all their private and confidential information through these services. In the current scenario, the security issues are a major concern for the proper functioning of Semantic Web services. Whatever the facilities attained by the users or customers through Web services must have a concrete level of secure access, so that unauthorised access or usage may be prohibited to make their activities secure.

The confidential and personal information of any organisation is stored on these systems. Access Control ensures that the requesting user has to meet certain criteria to access these systems. In most cases, it has been observed that access control only provides protection against external threats. In most cases, it has been observed that access control only provides protection against external threats. There is no provision for detecting internal assails. Therefore, there is a need for a mechanism that can be able to detect the malicious behaviour of previously authorised users. A feasible framework is presented to address aforesaid requirements to convalesce security in semantic Web services. Through review of literature, various aspects related to security in Semantic Web Services have been identified and they have been amalgamated in the framework. The framework is designed with three aspects of semantic Web services. The first aspect is protection against legitimate insiders. The second aspect is the use of dispersed databases to manage different types of data in digital-trade Web services. The third aspect is the protection of semantic Web services from network assails such Denial-of-Service (DoS) and Man-in-the-Middle (MITM) assail.

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RESEARCH TOPIC	Development of Security Testing Process Software Design Perspective

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ABSTRACT

Software security refers to the protection against the illegal actions that are undesirable and detrimental for the system. To assure the proper level of software security the system must be tested in an efficient manner that is called software security testing. It is performed to test the system for the vulnerabilities to confirm whether the system is protected from the threats and intruders. Development of the security testing process is a crucial task which should cover all the aspects of securing the system against threats. Rework and expenditure for securing applications against future attacks is also the matter of concern. There are various incidences of repercussions due to data security breaches.

The aim of this research is to provide an efficient and robust framework for security testing at design phase. The proposed framework is composed of four stages- Inception Stage, Preparatory Stage, Execution Stage and Assessment Stage. In the current scenario, the characteristics of the object oriented paradigm should go through for the proper security. In order to quantify the effect of these properties on the software security, a security metric called SMBC is designed. Further, a security grading tool called SMBC has been developed. SMBC tool is a static application security testing tool and grades any application software in one of the six categories defined. The case study has been performed for better understanding of the implementation of the proposed framework. Theoretical validation of the proposed framework has been done through Weyuker's properties. Statistical validation and analysis of the proposed framework has been performed through Analytic Hierarchy Process (AHP), Chi-square test and MATLAB. Various data have been plotted and analysed against the required dimensions. The comparative study of the proposed framework has been performed through F-test. The proposed framework identifies the security flaws at the design phase before proceeding to further phases of software development.

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RESEARCH TOPIC	Addressing Security at Requirement Phase by Implementing Secure Requirement Specification Framework

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RESEARCH AREA	Software Security	ENROLLMENT YEAR	2011
SUPERVISOR	Dr. Sandeep Kumar Nayak	AWARDED YEAR	2017

ABSTRACT

Security is a multidimensional attribute. The imperative principle of security is to control unauthorised access of valuable property. Software security is about understanding software-induced security risks and how to manage them. Good software security practices leverage good software engineering practice and involve thinking about security early in the software lifecycle, knowing and understanding common problems including gathering requirements, designing for security and subjecting all software artifacts to thorough objective risk analyses and testing. Security goals pertain to such questions as to what we are going to secure and from whom? How can we get rid of the attackers? What should we do to secure our software? In this regard the primary step is to know 'how much is the impact'. Can we measure it? Lard Kelvin states 'we can't control if we can't measure'.

A viable framework is being presented for assessing software security that requires an urgent need to examine the behavior of software's multifaceted nature. The study shows that requirement of software is having significant negative impact on security of software. The amplified requirement is inherently responsible for unusually high failure rates and economic impact potential of security breaches for software. The controlled behaviour of requirements with effective strategies to respond to security improvements may lead to producing secure software with maximum favourable impact. The classification of requirement elements according to their need and importance having strong correlation with security that enables in identifying components with high-risk impact. This is done by studying the sensitivity of the application risk to variations in software components structure and its relative data. The first component referred to the development of a framework to identify security and requirement factors at an early phase of development of software and correlate these attributes in order to quantify security through requirements. The second component of study is to implement the proposed framework to develop security quantification models. The third component of study is to confirm how developed security models are helpful for security improvement using software requirement constructs.

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RESEARCH TOPIC	Design of a Framework to Manage Requirement Volatility During SDLC

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RESEARCH AREA	Requirement Engineering	ENROLLMENT YEAR	2010
SUPERVISOR	Prof. Md. Rizwan Beg	AWARDED YEAR	2017

ABSTRACT

Software Engineering being a dynamic activity causes the requirement to be changed at any time of the development life cycle. These requirement changes are defined as Requirement Volatility and reported as one of the most considerable and critical issues during the software development process. Even though requirement volatility cannot be circumvented as it can reduce the possibility of fulfilling the stakeholders' need for the software product. These late coming changes must be avoided and should be managed effectively if necessary to be incorporated. The causes of requirement volatility cannot be trounced completely yet some internal causes can be handled efficiently to minimise its impact on the later phases of the software development life cycle. It has a pessimistic impact on all the phases of software development life cycle. Studies suggest that 86% of the change requests are allied to Requirement Volatility and it is frequently more than 50% of the requirements are changed before the delivery of a software project. Additionally Requirement Volatility outlays 200 times more in the later phases than implementing in the earlier phases. These facts are the motivation to start searching and try to find solutions in this domain of paramount importance.

In this study, several aspects of Requirement Volatility along with causes and reasons are Studied. An efficient framework for managing requirement volatility during Software development life cycle has been proposed. The framework is named as Stable Requirement Specification Framework (SRSF).The proposed framework will manage the requirement volatility and helps to reduce the effect of changes made all over the project. It addresses three core problem areas of Requirement Volatility that is Prediction, Identification, Assessment and management. As prediction of Requirement volatility at an early stage can reduce the possibility of more damage. A requirement volatility Prediction method using Bayesian Network is proposed and it is implemented with NETICA Tool. An algorithm for detection of Volatile requirements has been presented through the Inspection process. For analysing the impacts of requirement volatility, a Changeability Analysis through Adaptive Neuro Fuzzy Approach is proposed.

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RESEARCH TOPIC	Design and Development of a Methodology for Estimating the Efforts of a Software Project in Dynamic Environment

NAME	Mr. Sheenu Rizvi	ENROLLMENT NO.	10050
RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2010
SUPERVISOR	Prof. Syed Qamar Abbas	AWARDED YEAR	2016

ABSTRACT

Software effort estimation is the task of approximating the amount of work required to develop a software project. The reasons for effort estimation include project approval, project management, understanding by the development team members and defining the project tasks. Software effort estimation is not a precise science. Accurately estimating software effort has become a great issue for software engineers. Estimates done at the proposal stage has high degree of inaccuracy, where requirements for the scope are not defined to the lowest details, but as the project progresses and requirements are elaborated, accuracy and confidence on estimate increases. Clearly there is a strong need for better software effort estimation methods.

This thesis focuses on the use of the COCOMO model and variations of this model due to the public description of the algorithm, available data, as well as prior use and research by the research client, NASA's Jet Propulsion Laboratory. COCOMO is a popular model, developed by Barry Boehm of USC, which defines a linear relationship between effort and code size. The model includes several cost drivers, such as programmer capability and required reliability, which affect the estimate either as a linear scalar value, or as a slight exponential change. In the present work artificial intelligence techniques like Artificial Neural Network (ANN), Adaptive Neuro Fuzzy Inference System (ANFIS), along with optimization technique like Simulated Annealing has been used for optimum model development for prediction of Development Effort Estimation using NASA project dataset, consisting of 63 software projects and further model assessment using Object Oriented software development approach. Next, a comparison of results based on the SA approach with ANN, ANFIS and COCOMO models has been presented proving the estimation utility of the SA approach. Comparing SA with ANN and ANFIS techniques for Software Development Effort estimation model development, it is seen that although the Neuro-fuzzy method ANFIS presented in this thesis shows a good potential to model complex, nonlinear and multivariate problems.

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RESEARCH TOPIC	Designing of an Efficient Model to Personalize the Web Usage Data

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RESEARCH AREA	Web Mining	ENROLLMENT YEAR	2010
SUPERVISOR	Prof. Qamar Abbas	AWARDED YEAR	2016

ABSTRACT

On web, data mining based approaches are quite usable to extract vital information related to users in situations where there is information overload. The objectives of web usage oriented personalised recommender systems are to guide web users in selecting and accessing their interesting items by automatically obtaining user preferences from the usage data and matching items with the preferences. In the past several years, recommendations have achieved greater interest because of the information diversity and availability. It also affects the user interest by delivering quite useful recommendation that helps in user frequent visits and their long time retention and association. Web based personalization systems have become a determined technology in a broad range of day to day applications, such as e-commerce, streaming social networks.

The development of recommendation algorithms and technologies has mostly focused on maximising the prediction accuracy of the user's interests. However, there is an increasing awareness in the field that there are other properties that have an impact on user satisfaction and business performance. To meet the expectations of users in modern recommender systems, it is essential to provide solutions to real time identified user. So, major goal of our dissertation is to provide integrated automatic recommendation to web user who interacted with web server. In particular, different aspects of recommendation techniques were studied, and to this end, we made three research contributions. First, we presented a tool for automatic user detection by capturing click behaviors of users from web usage log files; second, we proposed a clustering method to extract web user's transaction clusters; third we proposed a similarity based recommendation models which provide recommendation set to the web users. In addition, a versatile recommendation framework was also given, in which the proposed recommendation techniques were seamlessly integrated. We also provide an intensive analysis of preprocessing of Web Usage Log data. After cleaning and preprocessing of data, various interesting and useful information can be extracted and be processed by a recommendation system. Different evaluation criteria were implemented in this approach for evaluating recommendation technique in real-world recommendation applications.

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RESEARCH TOPIC	Design and Analysis of Migrating Parallel Web Crawler

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RESEARCH AREA	Web Mining	ENROLLMENT YEAR	2010
SUPERVISOR	Prof. Md. Rizwan Beg	AWARDED YEAR	2015
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ABSTRACT

World Wide Web (WWW) is a repository of web pages which are interlinked hypertext documents. Web page consists of contents as well as links to related pages, these links are called hyperlinks. Users use the Internet to access these web pages. Web browser is used to view the web pages that contain information in form of text, videos, images and multimedia and also navigate them using hyperlinks known as Uniform Resource Locators. Tim Berners-Lee proposed "using hypertext to link and access information in 1990". Following his ideas the websites are created using hypertext markup languages and are connected through the Internet. India is the third largest country of Internet users in Asia after China and Japan. WWW has grown in size many folds, distributed all over the world on web servers and is still growing at a phenomenal rate. It is difficult to search information from such huge collection of web pages and documents that are scattered over the Internet. It is challenging for the users to retrieve information even after knowing URLs as Web is constantly changing and so are the URLs. Web users use search engines or other information retrieval tools to find information from WWW. Web users require Web information retrieval support systems rather than Web information retrieval systems. As the size of the web increases and its contents become more diverse, the role of a Web crawler becomes even more important. In this thesis · The architecture for Effective Migrating Parallel Web Crawling approach with domain specific and incremental crawling is proposed. Domain specific crawling yields high quality pages.

The incremental crawling yields the fresh page. The crawler is implemented in Java. The implemented model supports all features of real time III tier architecture. Crawlers can be generously allowed to communicate among themselves or they cannot be allowed to communicate among themselves at all, both approaches put extra burden on network traffic. Here a fuzzy logic-based system is proposed and is implemented using MATLAB fuzzy logic toolbox which predict the load at particular node and route of network traffic. The architecture of migrating parallel web crawler is validated using finite state machine. Test cases are generated for the validation of the architecture.

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RESEARCH TOPIC	Design of an Efficient Framework for Requirement Elicitation

NAME	Mr. Mohd Muqeem	ENROLLMENT NO.	10032
RESEARCH AREA	Requirement Engineering	ENROLLMENT YEAR	2010
SUPERVISOR	Prof. Md. Rizwan Beg	AWARDED YEAR	2015

ABSTRACT

Requirement Engineering (RE) is one of the processes in software engineering, playing a vital role in ensuring the overall success of software projects. Using appropriate RE process models and techniques in a project is the first step towards increasing the overall quality of a software product. Requirements are attributes or something, which are discovered before building products. It is a condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed documents. A well-formed requirement is a statement of system functionality that satisfies customer needs. There exists a reciprocal interrelationship between human beings and machines for requirement gathering that can assist in producing quality software products. Requirements are commonly classified as functional and nonfunctional. A functional requirement is a requirement that specifies an action performed by a system without considering physical constraints. Non-functional requirement specifies system properties such as environmental, implementation constraints, performance, platform dependencies, maintainability, extensibility and reliability.

The overall objectives of this research have been to define and identify the key issues and problems of requirement elicitation and to propose an effective framework for requirement elicitation which could contribute towards the development of efficient software. The research has been oriented towards proposing an approach for pre domain development, which can assist in creating and managing stakeholder profiles. It assists in identifying key stakeholders using genetic algorithm, provides support to stakeholders interaction and classify them based on the NVC model. The work done is aimed towards selecting a suitable elicitation technique from a set of techniques considering evaluating factors using neural networks.

The elicited requirements are prioritised as early requirement prioritisation using a fuzzy based system. The proposed framework can be implemented by developing ReqElic tool and a case study is conducted to test the efficiency of the proposed framework, and finally the validation can be done through the FSM & SPSS tool.

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RESEARCH TOPIC	An Integrated Secure Framework for Electronic Commerce Transaction: Risk Assesment and Prevention

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RESEARCH AREA	Software Security	ENROLLMENT YEAR	2008
SUPERVISOR	Prof. Syed Qamar Abbas	AWARDED YEAR	2014

ABSTRACT

The field of electronic commerce and especially electronic payment systems has flourished in the past few years. The possibilities opened by the popularisation of the Internet have forced many companies and research teams to turn their eyes to this new commercial universe. The first problem that has to be addressed before the Internet could become a huge marketplace is finding a way to securely transfer monetary value over the network. In recent years, many systems have been proposed and implemented that allow two parties to transfer monetary value on a network of computers. Some of these protocols had significant implications on the way people do commerce on the Internet and new protocols are being deployed that may have much stronger implications in the development of the electronic marketplace. With a number of payment systems available, people now need ways to analyse these systems and choose the one most suitable to their needs. Providing secure and convenient authentication procedures for online payments is a major concern. Although there are several online payment mechanisms, credit cards and SSL are the most popular. Despite their high cost and unsuitability for low-value purchases, credit card payment systems are the most practical online payment option and are the most accepted for Internet purchases.

Needham Schroeder Authentication Protocol is a basic scheme for authentication. Many systems employ the protocol in some form to achieve authentication. Due to heavy use of cryptographic primitives, such protocols normally become complex and hence difficult to verify. These protocols must be tested for their functional correctness before they are used. In many of the protocol errors have been detected, in spite of investing a lot of time in their design. Authentication protocol has to be designed in such a way that makes it robust against replay attacks by any intruder. We have used the formal B method for verification of correction of modified Needham-Schroeder Symmetric Key Protocol. Formal methods are the mathematical techniques having sound mathematical basis for writing the abstract specification of the system representing the critical system properties and verifying whether specifications satisfy the system requirements. Formal approaches offer rigorous system specification and verification to ensure correctness.

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RESEARCH TOPIC	Study of Software Quality Parameters and Development of an Effective Model

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RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2008
SUPERVISOR	Prof. Syed Qamar Abbas	AWARDED YEAR	2013

ABSTRACT

During the past 20 years, software has conquered an essential and critical role in our society. We increasingly depend on the features and services offered through computerised systems. Any modern product or service embeds and/or exploits some piece of software. As an example, companies sell (or plan to sell in the near future) systems to automate building operations and to embed Internet-features into home appliances. Unfortunately, software applications are complex products that are difficult to develop and test. Very often, software exhibits unexpected and undesired behaviours that may even cause severe problems and damages. One of the main directions pursued by researchers and practitioners is centred on the study and improvement of the process through which software is developed. The underlying assumption is that there is a direct correlation between the quality of the process and the quality of the developed software.

One general indication of engineering progress is that processes once thought of as complex and creative become systematic, repeatable and routine. A great deal of formal and anecdotal evidence exists that the typical quality of actual requirement specifications today is very poor. In practice, far too many requirements are ambiguous, incomplete, infeasible, unverifiable, inadequately prioritised, and mutually inconsistent. In fact, this poor quality of individual requirements and the requirements specifications that document them is a primary reason why so many projects continue to fail. A framework is proposed for process design. The proposed framework defines all the activities of the process design so as to improve the quality of the deliverables. It allows the specification of benchmarks against which achieved quality levels can be measured and provides guidance for building quality into software. The main purpose of the Quality Data Framework is to provide a structured approach to achieve quality data to be stored in the repository. Quality data stored in the repository minimises the chances of any failure in the later stages of the development lifecycle. The proposed framework finally converts the dirty data into quality data for the enhancement of the quality of the final product. GQM (Goal Question Metric) methodology is used to measure quality using metrics which describes how to incorporate data quality metrics to evaluate, improve and maintain levels of quality in an organization.

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RESEARCH TOPIC	A Study of Human Factors in Interactive Software and Designing of an Efficient User Interface Tool

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RESEARCH AREA	Software Engineering	ENROLLMENT YEAR	2008
SUPERVISOR	Prof. Syed Qamar Abbas	AWARDED YEAR	2013

ABSTRACT

Human Computer Interaction focuses on the interactions between human and computer systems, including the user interface and the underlying processes which produce the interactions. The contributing disciplines include computer science, cognitive science, human factors, software engineering, management science, psychology, sociology, and anthropology. Early research and development in human-computer interaction focused on issues directly related to the user interface. Some typical issues were the properties of various input and output devices, interface learn ability for new users versus efficiency and extensibility for experienced users, and the appropriate combination of interaction components such as command languages, menus, and graphical user interfaces (GUI). Recently, the field of human-computer interaction has changed and become more devoted to the processes and context for the user interface. Functionality of a system is defined by the set of actions or services that it provides to its users. However, the value of functionality is visible only when it becomes possible to be efficiently utilized by the user. Usability of a system with a certain functionality is the range and degree by which the system can be used efficiently and adequately to accomplish certain goals for certain users. The actual effectiveness of a system is achieved when there is a proper balance between the functionality and usability of a system.

The research work is focused on the development of Human Factor Based user interface using user interface tool. Designing such a system is a difficult task and our tool is intended to handle such cases. In user interface design, quality is defined as a high level of usability. In order to provide concept of usability in user interfaces, we have developed a new framework HFBUIT (Human Factor Based User Interface Tool). It gives structure to various aspect of user interface designing. Having defined our design goal, the design activities need to be defined. We started the design process by doing a thorough analysis of the problem situation. In the case of user interface design this means an analysis of the users, their work and their environment. Performing an analysis and using the gained knowledge effectively in design is not trivial. It is important to know what aspects of the usability are relevant and hence need to be described. Such clear conceptualizations help designers to see the important things when they are designing the user interface.

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RESEARCH TOPIC	Robotic Vision: An Approach for Face Localization and Recognition

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RESEARCH AREA	Computer Vision	ENROLLMENT YEAR	2006
SUPERVISOR	Prof. Bal Gopal	AWARDED YEAR	2011
CO-SUPERVISOR	Prof. Md. Rizwan Beg		

ABSTRACT

The technology, which is based on intelligence, is the future of science. A good intelligence system can be built with the smart sensing and a good knowledge base. Over the last decade, the face recognition is getting a high attention. Different algorithms and techniques are proposed for such work. Every computer based smart system should have some backing data on some parameter for decision making processes. A fast and efficient face localization approach will make the whole face recognition process powerful. This is required for many frontal face recognition applications like: passport, driving license, voter ID card PAN Card verification etc. Due to the natural behaviour, face is the most meaningful part of the human body. It can be easily observed through same technique. Face localization method should be simple, efficient and accurate. Different face localization techniques are available right now. If the background is moderate that mean background noise is low then face localizationbecomes an easy due to the diversified data of face area. Due to this diversification, the human face can be easily localized In this thesis, we studied the facial images through two different approaches for finding efficiently localized face. For our study and computational processes we used the Yale database and for facial component we used Cropped Yale database. The variations between the images of the same face due to illumination and viewing direction are almost always larger than the image variations due to a change in face identity. So, a dynamic threshold is required which compensate these anomalies. This threshold provides a pure black & white image which has more detailed accurate data about source image and we named it Average Value Threshold (AVT). A threshold always provides a clear facial cut-out of image. The GPVB of threshold image will provide clearer result comparatively normal image. The AVT (Average Value Threshold) provides the more clear view of facial images and it is also useful for further processing because the normal image does not provide such fine GPVB (Grayscale Pixel Value Band) as compare to AVT image.

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RESEARCH TOPIC	Analysis of Memory Architecture of Parallel Processing Computer

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RESEARCH AREA	Parallel Computing	ENROLLMENT YEAR	2006
SUPERVISOR	Prof. Bal Gopal	AWARDED YEAR	2011
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ABSTRACT

Parallel processing is an integral part of everyday life. The concept is so inbuilt in our existence that we benefit from it without realizing. When faced with a tough problem, we involve others to solve it more easily. This co-operation of more than one worker to facilitate the solution of a particular problem may be termed as parallel processing. The goal of parallel processing is thus to solve a given problem more rapidly, or to enable the solution of a problem that would otherwise be impracticable by a single worker. The principles of parallel processing are, however, not new, as evidence suggests that the computational devices used over 2000 years ago by the Greeks recognized and exploited such concepts.

The main focus of our thesis is on the memory architecture of parallel computer. In parallel computer architecture where lots of operations are performed simultaneously, so it become necessary that memory operation must be ordered. All processor having its own local memory like distributed memory architecture that is accessible only to that processor, requires very less memory ordering. But system like Distributed Shared Memory system where processors have common memory with single address space, allows all processor to access entire memory. As DSM system allows multiple processors to access memory location simultaneously, so it requires an abstract model for memory operations that allow using memory location correctly and maintaining memory consistency. The memory consistency plays important role in DSM system because it specifies order of memory operation. The thesis has addressed several important issues for distributed shared memory system. But it mainly concentrates on designing of distributed shared memory framework for memory consistency maintenance. The framework is designed with the help of memory consistency model and memory coherence. So appropriate memory consistency model and memory coherency is required for the proper design of the framework. The study defines & verifies various memory consistency models on unified framework for finding the appropriate memory consistency.

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