

## A NOVEL FINE-GRAINED SENTIMENT EXPLORATION APPROACH FOR MOVIE REVIEWS

Jibran Mir and Dr. Azhar Mahmood

### ABSTRACT

The aspect-based sentiment analysis technique has two main tasks, aspect identification, and opinion determination. The aspect identification task is further categorized into two sub-tasks: explicit and implicit aspects classification. Many aspect identification techniques have been proposed for the product and service domain, however, fewer techniques have been proposed for the movie application domain. These techniques can only identify movie-specific aspects such as “Scene”, “Movie” or “Actor”, and have ignored the NER (named entity recognition) problem. In this research, MAIM (Movie aspect identification model) is proposed for the movie application domain, which is capable of extracting not only movie-specific aspects but also handling NER problems such as person names and movie titles. The main contributions of this study include the classification of infrequent aspects, detection of NER, removal of irrelevant aspects, and identification of four different types of implicit sentences and mapping them to explicit aspects. MAIM is based on a hybrid technique and uses BiLSTM-CRF (Bidirectional long short term – conditional random field) on movie reviews for explicit aspect identification. Moreover, rule-based and word-embedding approaches are used to map implicit sentences into explicit aspects. The experimental results of MAIM show that explicit aspect identification has a 0.89 f1 score and implicit movie aspect mapping has a 0.76 f1 score on the Large Movie dataset. In addition, the MIAM is applied based on third-party annotation as well, it performed effectively and has a 0.81 f1-score. The implicit aspects mapping of MAIM is also compared with state-of-the-art techniques NMFIAD and ML-KB+ by validating on five different customer review datasets and achieving an f1 score of 0.93.

**Keywords:** Explicit Aspects Identification, Relevant Aspect Extraction, BiLSTM, Feature Set, Word2vec, Implicit Aspects Mapping.

## PERFORMANCE IMPROVEMENT OF IEEE 802311 WLAN, IEEE 802.15.4 LR-WPAN, IEEE802.15.6 WBAN THROUGH CONTENTION WINDOW OPTIMIZATION

Imran Ali Qureshi and Dr. Sohail Asghar

### ABSTRACT

The significance of IEEE standards is paramount, particularly in the realm of wireless technology, driven by the imperatives of low-cost, low-power, low-complexity, and the pursuit of enhanced network performance. However, inherent challenges, notably collision avoidance and energy consumption optimization among sensors, pose significant hurdles. The incessant attempts by nodes to transmit data elevate the risk of collisions and escalate energy consumption, thereby compromising success ratio (SR), fairness index (FI), increasing collision rate (CR), packet loss ratio (PLR), packet delay (PD), and energy consumption (EC). Progress in wireless technologies necessitates overcoming these challenges, with standards such as IEEE 802.11 WLAN, IEEE 802.15.4 LRWPAN, and IEEE 802.15.6 WBAN offering the potential for a pervasive network that can enhance efficiency and provide superior services to a diverse user base. This research endeavors to ameliorate the aforementioned challenges by focusing on optimizing the contention window (CW), conducting proof-of-concept deployments, and evaluating the performance of the proposed methodology. The research methodology comprises three sub-parts, each tailored to enhance performance through CW optimization in WLAN, LR-WPAN, and WBAN. The objective is to develop and showcase a wireless system architecture suitable for WLAN, LR-WPAN, and WBAN, employing simulation on fundamental algorithms (BEB algorithm, REB algorithm, and ABEB algorithm) as well as the proposed model using simulation tools such as MATLAB, NS3, fuzzylite, and OMNeT++ in an experimental environment. The study's first part involves the implementation of three algorithms, empirically validating the proposed GF-CWO technique in the context of WLAN. Similarly, the second part employs five algorithms, empirically validating the proposed GFCO technique in the context of LR-WPAN. The final part implements and empirically validates the proposed FuCWO and GFuCWO techniques in the context of WBAN, introducing two algorithms for FuCWO and three for GFuCWO. Simulation results confirm that GF-CWO, GFCO, FuCWO, and GFuCWO effectively enhance performance. The key benefits of this research lie in mitigating real-life communication problems and introducing novel techniques to optimize CW in WLAN, LR-WPAN, and WBAN. Leveraging state-of-the-art methods such as the genetic fuzzy mechanism, this research demonstrates enhanced performance compared to existing techniques. The findings are poised to contribute significantly to the research community's understanding of the identified problem and pave the way for further exploration of techniques in this domain.

**Keywords:** Performance Improvement, IEEE 802311 WLAN, IEEE 802.15.4 LR-WPAN, IEEE802.15.6 WBAN, Contention Window Optimization.

## SELF-ADAPTIVE CONGESTION CONTROL MODEL FOR WIRELESS SENSOR NETWORK

Kabeer Ahmed Bhatti and Dr. Sohail Asghar

### ABSTRACT

Wireless Sensor Networks (WSNs) have garnered significant attention from researchers due to their diverse functionalities, including sensing information, data gathering, and forwarding for various event-based applications. The challenge arises in handling the substantial volume of data generated over time, leading to network congestion. This congestion, resulting from the many-to-one communication pattern in WSN applications, can deplete energy, degrade Quality of Service (QoS), and impact overall network performance. Existing congestion control algorithms like Congestion Control and Fairness (CCF), Priority-based congestion control protocol (PCCP), Congestion Detection and Avoidance (CODA), and Enhanced Congestion Detection and Avoidance (ECODA) lack self-adaptive mechanisms to optimize source node transmission rates. To address these shortcomings, this research introduces four mechanisms. Firstly, the Multi-objective Fuzzy Krill Herd Algorithm (MFKHA) incorporates a Fuzzy Congestion Detection (FCD) mechanism, a weighted fair queuing mechanism, and a self-adaptive sending rate optimization algorithm. Simulation results in MATLAB demonstrate that MFKHA outperforms PSOGSA with increased transmitting rates and throughput, and reduced delay, packet loss, queue size, energy consumption, and congestion level. Secondly, the Progressive Fuzzy PSO PID (PFP-PID) controller introduces a fuzzy logic-based reference positioning mechanism and a self-adaptive source sending rate optimization mechanism. Simulations in Network Simulation (NS)-3 show significant improvements in packet delivery ratio, packet loss, delay, and queue length deviation compared to existing controllers. The third mechanism, N3-Bifold-PID, is a hybrid solution of Non-dominated Sorting Genetic Algorithm (NSGA-III) and PID, dynamically configuring gains and employing a novel Bifold-objective fitness function. NS-3 simulations demonstrate enhanced packet delivery ratio and reduced packet loss, time delay, and queue length deviation compared to CFPID. Lastly, the NSGA-III Multi-objective PID (N3-MPID) extends N3-BPID by considering additional indexes in the fitness function, leading to improved packet delivery ratio and decreased packet loss, delay, and queue length deviation compared to counterparts. This research not only addresses network congestion issues but also contributes to academia through publications in international journals and supports industry by integrating advanced algorithms into network devices.

**Keywords:** Multi-Objective, Fuzzy Logic Controller, Krill Herd, PSO, NSGA-III, PID Controller, LR-WPAN, Congestion Control, Source Rate Optimization, IEEE-802.15.4.

## A MODEL BASED TESTING APPROACH FOR CONTEXT-AWARE MOBILE APPLICATIONS

Mirza Amir Mehmood and Dr. Muhammad Naeem Ahmed Khan

### ABSTRACT

Software testing has two primary goals. Testing can either be viewed, on the one hand, as a tool for achieving reliability: the objective is to test the software for defects in order to remove them and improve software reliability. Testing can also be seen as a means of gaining the confidence that the software is sufficiently reliable for its intended purpose: the aim is to assess reliability [1]. Testing software is a proven methodology of software engineering to assess, improve and demonstrate quality for the development of reliable software which is a crucial factor to the success of software engineering. This makes software testing the most widely utilized method for identification of software failures. To test an application, software test engineers have to generate tests for the application under test and execute those test on the application and check the test execution to identify defects. Software testing is well-known to be very costly thus research community developed automated testing techniques to reduce the laborious testing effort, cost and time. Automated testing poses at least two major technical challenges: the generation of adequate test cases and test data. Model-based software testing (MBT) addresses these challenges and makes it possible for software test engineers to use a consistent model-based approach and specification (for instance unified modelling language) for effective testing. In the modern era of mobile computing, context-aware computing is an emerging paradigm due to its widespread applications. Context-aware applications are gaining increasing popularity in our daily lives. This is because these applications can determine and can change their behavior according to the user's present context to help user in performing the task with no or minimum user input and enhance usability experience. Whereas, the context could be their location, who they are with, what the time of day is, nearby devices, what activity user is performing and so on. However, testing these applications is not straightforward since it poses several challenges, such as generating test data, designing context-coupled test case and so on. However, the testing process can be automated to a greater extent by employing model based testing technique for context-aware applications. To achieve this goal, it is necessary to automate model transformation, test data generation, and test case execution processes. In this thesis, we propose an approach for behavior modeling of context-aware applications by extending the UML activity diagram and propose an automated model transformation approach to transform the development model into the testing model. The objective of this thesis is to automate the context-coupled test case generation and execution. We propose an automated testing framework for functional, regression and end-to-end testing of context-aware applications capable of automated execution of keyword-based test case and test scenarios. We also present context quality confidence template for evaluating the quality of confidence for context-aware applications. The framework is implemented and empirical results showed that the techniques developed within the framework improve the efficiency of automated testing in comparison with manual testing. Furthermore, it is demonstrated that our functional testing framework can reduce the testing time and cost, thus enabling the test engineers to execute more testing cycles to attain a higher degree of test coverage.

**Keywords:** Model Based Testing, Context-Aware Application, Test Automation, Context-coupled Test Case.

## AN EFFICIENT BUFFER MANAGEMENT SCHEME USING FORWARD CHAINING (DATA DRIVEN) EXPERT SYSTEM IN OPPORTUNISTIC NETWORKS

Ahtesham Sajid and Prof. Dr. Khalid Hussain

### ABSTRACT

In the realm of opportunistic networks (OppNets), where nodes grapple with challenges like intermittent connectivity and prolonged delays, the role of buffer management strategies becomes pivotal. This study introduces a novel approach, "An efficient buffer management scheme using forward chaining (data-driven) expert system (FCDDDES)," to tackle issues related to storage-level congestion in OppNets. The prevalent "hop-by-hop" forwarding scheme and the widely used "store and carry" forward flooding mechanism often face storage-level congestion, impacting communication efficiency. The proposed FCDDDES scheme utilizes key parameters such as storage capacity, node contact history, and encounter frequency to prioritize bundles based on Time-to-Live (TTL) values between nodes. This strategic buffer management approach aims to enhance delivery ratios and various performance parameters. Comparative evaluations were conducted by implementing FCDDDES against the MaxProp protocol and three other contemporary buffer management techniques (OM-EBRP, CBM, and POB-R) in mobile opportunistic networks. The results indicate a notable performance improvement with FCDDDES, achieving a 93.47% delivery ratio at the network level and a 36% delivery ratio at the node level. The overall throughput reached 524 Kbps at the node level, showcasing its efficacy in optimizing network performance. The FCDDDES framework proves its merit in reducing the packet drop rate, achieving a significant reduction to 0.15. This study contributes to the ongoing discourse in the research community regarding efficient buffer management in Opportunistic Networks, providing valuable insights for future developments.

**Keywords:** OppNets, Throughput, Buffer Occupancy, Intermittent Connected Networks, Time to Live.

**FACIAL EXPRESSION RECOGNITION IN UNCONSTRAINED ENVIRONMENT**

Sajid Ali Khan and Dr. Ayaaz Hussain

**ABSTRACT**

Facial expressions are the most effective form of non-verbal communication which is used to express one's emotions. It not only expresses our expressions, but also communicates a wealth of information during social interaction. Facial expressions play an important and effective role in Human-Computer Interaction. Unlike humans, facial expression recognition is a challenging task for computers and research work in this domain can still be considered in seminal form. The prevalent facial expression techniques tend to provide accurate and impressive results for the images captured under controlled environment with a cooperative subject. However, majority of these techniques fail to provide adequate results for the images captured in uncontrolled environment. Achieving a higher classification accuracy rate for the images captured in uncontrolled environments is a major challenge being faced by researchers in this domain. There are many factors such as illumination, image orientations, noise and low-resolution, which hinder the development of facial expression recognition system in uncontrolled environment. Even the datasets prepared under the constrained environments sometimes need preprocessing before the classification stage. The core objective of this dissertation is to analyze existing techniques and develop an effective framework that is capable of classification of human facial expressions both under constrained and unconstrained environments. In this dissertation, we have explored, investigated and proposed frameworks to deal with two of the most common, influential and challenging issues that affect the accuracy of a facial expression recognition for images captured in an uncontrolled environment, namely illumination and low-resolution. First, a novel framework for feature extraction named Weber Local Binary Image Cosine Transform has been developed which not only extracts significant features by integrating features extracted using local binary pattern and weber local descriptor but also utilizes most discriminant features by applying the frequency-based components. Low-resolution and multi-orientation facial images have been used for the classification and a significant improvement in the classification accuracy rate has been achieved with the proposed framework. The developed framework has proved to be not only reliable but also computationally efficient across multiple datasets in the presence of noise and orientations. The Proposed framework has been tested on four datasets including JAFEE, MMI, CK+ and SFEW datasets. The second major contribution is the development of an illumination invariant technique. The proposed framework has been named Weber Local Binary Image Cosine Transform (WLBI-CT) and it advocates for the need of simultaneous contrast enhancement and brightness preservation for datasets containing real world images in unconstrained environment. The empirical results for the SFEW dataset are promising. In order to evaluate the performance of the proposed framework, rigorous set of experiments are presented in this thesis. The empirical results meet the standard quantitative measure criteria. The comparison of our work with various other state-of-the-art techniques is also presented using various benchmarks for these factors. The results are impressive even in the case of inclusion of noise and occlusion effects.

**Keywords:** Facial Expression Recognition, Unconstrained Environment.

## DYNAMIC AND ADAPTIVE FAULT TOLERANT SCHEDULING WITH QOS CONSIDERATION IN COMPUTATIONAL GRID

Sajjad Haider and Dr. Babar Nazir

### ABSTRACT

Implementing fault-tolerant scheduling in a computational grid is a challenging task. Proactive and reactive fault-tolerant scheduling techniques are commonly used in grids. Proactive approaches focus on the issues due to which faults are generated. Reactive approaches are activated after identification of failures. Different from existing fault-tolerant techniques, we present a novel, hybrid, dynamic, and adaptive fault-tolerant technique that effectively uses proactive and reactive approaches. The proactive fault-tolerant orchestrator employs a proactive approach, where resources are filtered on the basis of vicinity, availability, and reliability. Existing fault-tolerance techniques do not distinguish resources during selection, but the proposed algorithm prefers to employ local resources that result in low communication costs and less tendency towards failures. To find high availability of resources, a newly identified parameter that uses availability time is incorporated in the model for finding highly available resources using mean time between availability and mean time between unavailability. Reliability of nodes is an indispensable consideration, and the proposed system computes the reliability of nodes using factors like the success or failure ratio of jobs and types of encountered failures. The proposed model also employs an optimal resource identification algorithm that helps in the selection of optimal resources during the execution of the jobs. A list of reliable and optimal grid nodes identified using the proactive fault-tolerant orchestrator is passed to the reactive fault-tolerant orchestrator. The failure detector and predictor are the two components that work under the reactive fault-tolerant orchestrator and cater to network, prediction, and temperature-based hardware failures. For the detection of errors in an efficient and timely manner, push and pull models are also applied. Hardware failures are predicted based on device temperature and are carefully used for controlling the checkpoint intensity. Reduction in the number of checkpoints based on device temperature provides several performance benefits in terms of communication cost and reduced execution times. The performance of the proposed model is validated using the GridSim toolkit. Compared to contemporary techniques, experimental results exhibit efficiency and effectiveness of the proposed model with respect to several performance metrics like execution time, throughput, waiting and turnaround time, the number of checkpoints, and energy consumption.

**Keywords:** Dynamic and Adaptive Fault Tolerant Scheduling, QoS, Computational Grid.