

Earth Observation

RADAR REMOTE SENSING

Applications and Challenges

Edited by

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CHAPTER 11

Flood inundation mapping from synthetic aperture radar and optical data using support vector machine: a case study from Kopili River basin during Cyclone Amphan

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1. Introduction

Floods are one of the most frequent natural disasters in the northeastern states of India, including Assam, West Bengal, and Odisha (Jain et al., 2006; Mohapatra, 2003). These states are sensitive to phenomenal changes and damage caused by floods every year because of their richness in the ecological biodiversity of the Sundarbans and Assam Himalaya ranges (Dixit and Bera, 2012). The Ganges and Brahmaputra rivers are the biggest rivers of India in terms of their size as well as the intensity of flood events (Uddin et al., 2019). Most flood events from the Ganges and Brahmaputra rivers occur in these states. Kopili River is one of the most important tributaries of Brahmaputra River; it flows from Sikkim and Assam states. There are various natural and man-made reasons for the increasing flood events in India (Jain et al., 2006). Primary reasons for the floods are excessive rainfall during the monsoon period, river course changes due to erosion, and some anthropogenic reasons such as dam breaches (Tripathi, 2015). In addition, glacial lake outburst floods, rapid snow melting in the upper Himalayas, and landslides are important causes of flash floods specifically in northern India (Bhatt et al., 2014). Floods are considered even more dangerous in the coastal states of India. Catastrophic storms originating in the ocean are a primary reason for these floods. Such phenomena are destructive when they enter the land with high-speed winds and rainfall (Hassan et al., 2020). Cyclone Amphan was one of the largest cyclones in history; it originated in the Bay of Bengal in May 2020. Amphan disrupted the living habitats of all of West Bengal, Odisha, and Assam states. The highest impact of Amphan was reported in Bangladesh (Hassan et al., 2020). All of this combined to attract the attention of researchers to study floods across the world. Studies involve continuous monitoring, mapping, and risk analysis of

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Chapter 11

Data Warehouse Support for Policy Enforcement Rule Formulation

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ABSTRACT

It is believed that a data warehouse is for operational decision making. Recently, a proposal was made to support decision making for formulating policy enforcement rules that enforce policies. These rules are expressed in the WHEN-IF-THEN form. Guidelines are proposed to elicit two types of actions, triggering actions that cause the policy violation and the corresponding correcting actions. The decision-making problem is that of selecting the most appropriate correcting action in the event of a policy violation. This selection requires information. The elicited information is unstructured and is “early.” This work is extended by proposing a method to directly convert early information into its multi-dimensional form. For this, an early information mode is proposed. The proposed conversion process is a fully automated one. Further, the tool support is extended to accommodate the conversion process. The authors also apply the method to a health domain.

INTRODUCTION

Traditionally a data warehouse (DW) supports operational work related decision-making (Inmon, 2005). Recent proposals address the full range of corporate decision making. (Prakash and Prakash, 2015) address the issue of providing support for policy formulation decisions. (Prakash and Gupta, 2014) support decision making for formulating policy enforcement rules (PER).

(Prakash, 2010) showed that there is in fact a decision continuum that exists in the decision making environment of an organization. The outer most layer of the continuum is where policy formulation decisions are taken. Once policies have been formulated, policy enforcement rules are formulated. PER formulation decisions form the next inner layer. PERs enforce policies in the organization. Once the policy enforcement rules are formulated, operational decisions are taken. Operational decision form

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Classification and Predictive Analysis of the Stocks Listed with NIFTY50

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ABSTRACT

Indian stock market has its prominent position in the globe. In 2018, the healthy economic growth in India has supported its stock market and become one of the largest stock market in the world. India's ascent reflects the growing blow of emerging markets. It also indicates its economy is positioned for sustained growth, even if the manufacturing sector is not firing on all cylinders.

SENSEX and NIFTY are considered as the barometers of Indian stock market. Approximately 1600 companies are listed on National Stock Exchange of India Ltd. (NSE), from which fifty companies are listed with the prestigious index NIFTY50. The NIFTY50, is the leading index on the NSE, which is commonly known as NIFTY. It is derived from economic research and is created for the interest of investors, who wants to invest and trade in Indian equities. The NIFTY 50 stocks comprises of leading Indian companies from various sectors. The stocks of listed companies are relatively less volatile and offer a rather steady return. The NIFTY 50 covers major sectors of the Indian economy and offers great exposure to the investment managers to Indian stock market in one's competent portfolio. The companies listed with NIFTY50, show significantly diversified behavior with respect to their price movements. Thus, the risk and returns associated with the stocks found to be wide-ranging in nature. Also, the range of the beta factors of these stocks is significantly varied.

The present study is an attempt to analysis the fifty stocks of NIFTY50 based on the returns offered by the stocks, risk associated with these stocks and their respective beta factors. The weekly data of past years have been collected and used to calculate the returns, risk and beta factors associated with the fifty stocks listed in NIFTY50. Using cluster analysis, the fifty stocks of NIFTY50 are classified into segments based on their respective returns, risk and beta values. Further for each segment, a predictive model for returns is Proposed.

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Beta Factor; Classification NIFTY50; Stocks; Cluster Analysis;
Predictive Model; Return, Risk

1. INTRODUCTION

Indian stock market has its prominent position in the globe. It is one of the largest stock markets in the world. India's economic growth will continue to propel market capitalization higher. India's ascent reflects the growing blow of emerging markets. It also indicates its economy is positioned for sustained growth, even if the manufacturing sector is not firing on all cylinders.

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The companies listed with NIFTY50, show significantly diversified behavior with respect to their price movements. Thus, the risk and returns associated with the stocks found to be wide-ranging in nature. Also, the range of the beta factors of these stocks is significantly varied. As the risk return and beta are the important tools to analyses the stock market.

1.1 Concept of Risk

Risk is interconnected with any investment. Risk can be variability of return, loss of capital invested, no return or less return and variability of returns. The risk and the return are positively correlated. A security that yields consistent returns over a period is termed as risk free security.

Risk is defined as the uncertainty of return on investment. The higher difference between the expected and the actual return denotes higher risk. Investment and return are complementary to each other and the investment decision involves a trade-off between the two, return and risk.

SKILL INDIA: A Catalyst to Nation Building

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A Literature Review on Role of Skill India in Promoting Self Employment

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ABSTRACT

Skill development is important for any nation as it improves the efficiency, ability and quality of work which is indeed needed for increase in productivity and quality of work, process or product which results into the economic growth of the nation. Skilled workforce is an asset for any nation for economic development this need has been recognized and skill India is launched by the Indian Government. Skill development has emerged as national priority for which a number of measures have been taken and in process for future. In this context, present paper studies and analyses the present status of skill development in India. The research objective of the study are as follows:

1. *To analyse the skill India programme in the context of promoting self-employment.*
2. *To review the existing literature on skill India programme promoting self-employment.*
3. *To discuss the components of PMKVY, skill India course and schemes under skill India.*

The research study is mainly descriptive in nature is based on secondary data & information which is collected from the concern sources and are as per the need of research. The relevant books document of various ministry department s & organizations, articles, paper & website are used in this study. The study concluded that the reach of policies, plans and schemes is needed to the every member of the society, this can achieve at more fast pace if private sector, education institution, financial institutions etc collaborate for the same goal of skill development. The skill development will raise the efficiency level of the work force and raise the employability of youth and contribute in economic growth.

Keywords: Challenges, Employment, Polices, Skill Development, training.

1. INTRODUCTION

Skill development is important for any nation as it improves the efficiency, ability and quality of work which is indeed needed for increase in productivity and quality of work, process or product which results into the economic growth of the nation.

India is the home of second largest population of the world and the home of world largest youth population which is more than 54% of the population is below the age of 28, hence employability is really a challenge for India. With the help of skill development the challenge can be converted into opportunity. There is a great need for India to train and skill the young youth for the better development of the society. There are millions of engineers graduating every year in India and when it comes to employability, only 20% of them are employable. India is more focused to train and skill in the workforce. According to a survey, only 25% of the Indian workforce has undergone a skill development program and India requires a greater number of skilled workforces. According to the WTO, World Trade Organization, the GDP level can increase up to 3%-5% in 2035, if India focuses on skill development and training which helps individual in employability, personality development, work efficiency and increase in career opportunities.

Skill India or the National Skills Development Mission of India is a campaign launched by Prime Minister Narendra Modi. It is managed by the National Skills Development Corporation of India.

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Edited by
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Sourav Kanti Addya



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Foreword

Efficient and secure cloud management of the data gathered by the ever-increasing number of sensors in IoT (Internet of Things) paradigm is crucial for the operational success of many different key applied scenarios, such as smart cities, industry 4.0, precision agriculture, and digital health, to name a few. In this context, the book "Cloud Network Management: An IoT Based Framework," edited by Sanjay Kumar Biswas and Sourav Kanti Adhya, is very welcome since it brings contributions from prestigious institutions from different parts of the world, such as MIT, Virginia Tech, SUNY Buffalo, and Auckland University of Technology, among others. The book content should be thus of great value for those interested in getting knowledge about the latest scientific and technological advances in cloud network management in the support for IoT applied scenarios.

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Chapter 3

The Survey, Research Challenges, and Opportunities in ICN

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Content-Based Image Retrieval Using Local Derivative Laplacian Co-occurrence Pattern

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Abstract. For accessing images from huge repository in an easy manner, the images are required to be properly indexed. Content-Based Image Retrieval (CBIR) is a field which deals with finding solutions to such problems. This paper proposes a new multiresolution descriptor namely, Local Derivative Laplacian Co-occurrence Pattern (LDLCP) for CBIR. Gray level image is subjected to four-level Laplacian of Gaussian filtering in order to perform multiresolution processing of image. Local Derivative Pattern descriptors of resulting four-level filtered image is computed to extract local information from the image. Finally, the Gray-Level Co-occurrence Matrix is used for constructing feature vector. Corel-1K and Corel-5K datasets have been used to test the proposed descriptor and its performance is measured using precision and recall metrics.

Keywords: CBIR · Image retrieval · Laplacian of Gaussian · Local Derivative Pattern · Gray-Level Co-occurrence pattern

1 Introduction

Capturing the images is quite easy nowadays resulting in huge repository of different types of images. For an easy access, proper organization of images is very important. To solve such problems, image retrieval systems play an important role. Image retrieval systems are categorized broadly into two classes-Text-Based Image Retrieval (TBIR) systems and Content-Based Image Retrieval systems (CBIR). TBIR systems use keywords to retrieve relevant images from dataset. But such systems are not considered to be very efficient as manual annotation of huge repository of images is needed, and retrieval of visually similar images is difficult. In CBIR systems, the image itself is provided in the form of query from which features are extracted. This results in construction of a feature vector of that particular image which is then matched with other images in the repository. Based on similarity measurement, visually similar images get retrieved [1].



U-Net-Based Approach for Segmentation of Tables from Scanned Pages

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Abstract. The purpose of Table Segmentation, which is a part of document layout analysis (DLA), is to identify and segment the region of interest from the document while ignoring the rest of the page. We present a deep learning approach for segmentation of tables from a rich variety of documents and explain the effect of preprocessing, distortion correction on the output of deep learning model. Our method is based on the U-net architecture wherein convolution operations extract features from the image and de-convolution operation creates a new image with the desired segmentation. The robustness of our model is verified by testing the proposed system on the ICDAR 2013, ICDAR 2019, Marmot datasets and some randomly clicked images. Our model outperforms all the other methods presented in ICDAR 2019 table segmentation competition with an F score of 0.9694.

Keywords: Convolution neural network · Document layout analysis · Deep learning · Semantic segmentation

1 Introduction

Due to the boom of the internet and its availability to a large section of the population around the world, a huge amount of data is put on the web every second and it is increasing rapidly. A big chunk of this data is available as images. Thus, we need to perform segmentation of different elements of the document viz. text, graphics, tables in order to index these files in the search engine, monitor illegal activity, perform information retrieval, effective compression and storage. This is required so that all these components could be dealt with separately and properly digitized. However, segmentation of tables is still a vital issue in document layout analysis due to varying layout like ruled and unruled tables, different length of text within the table. These layouts could be found in a variety of documents available like magazines, newspapers, scanned pages, comics and

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RADDPG: Resource Allocation in Cognitive Radio with Deep Reinforcement Learning

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Abstract – Various quality assessment parameters for multimedia traffic in the wireless network depends on reckoning Quality of Experience (QoE) from Quality of Service (QoS). Mean Opinion Score (MOS) is the extensively used network quality metric for integrated (data and video) traffic management and resource allocation. This work mainly studies an uplink underlay Dynamic Spectrum Access (DSA) optimization problem that utilizes the Deep Reinforcement Learning (DRL) algorithm for simultaneous QoE enhancement and interference management within a tolerable limit. A Resource Allocation Deep Deterministic Policy Gradient (RADDPG) algorithm is proposed for joint quality improvement and distortion maintenance. In this work, the Deterministic Policy Gradient method merges Deep Q Network (DQN) along with the policy gradient actor-critic framework to choose suitable actions for improving the learning process speed, stability and computation time therefore accomplishing precise estimations. Simulation result shows that the proposed RADDPG method outperforms the existing Q and DQN learning algorithm.

Index Terms – Cognitive Radio, Spectrum, Deep Reinforcement Learning, Neural Network

I. INTRODUCTION

In 5G, we are witnessing exponential growth in wireless multimedia traffic and innovative transformations in the network design. The satisfaction of the end-user with overall network Quality of Experience (QoE) is a significant attribute in next-generation technology. Several studies focus on various quality assessment parameters for heterogeneous transmission and estimating QoE from Quality of Service (QoS). MOS is the extensively used immanent quality assessment metric for multimedia (data and video) traffic handling and resource allocation [1].

Cognitive Radio (CR) is an intelligent radio working on the principle of Artificial Intelligence (AI) and can enhance spectrum utilization efficiency with flexible spectrum access policy. Efficient and smooth resource allocation to Secondary User (SU) without interfering with Primary User (PU) transmission is the primary function of a Cognitive Radio Network (CRN). An underlay CRN approach allows simultaneous PU and SU transmission only if the primary transmission interference is below the acceptable limit. This underlay system's output performance depends critically on robust and efficient resource allocation strategies, which can provide high-quality services for end-users [2-4].

Currently, the application of DRL in the field of dynamic spectrum access has gained attention in the literature. Researchers are highly motivated towards exploring high-performance model-free DRL methods for resource distribution and network quality parameter maximization. The author in [5] suggested a deep learning framework for joint transmission power adjustment and network throughput maximization in a vehicular network. In [6], a robust and proactive resource sharing optimization problem is learned by Deep Deterministic Policy Gradient (DDPG) method to maximize service quality. In [7], the author proposes a deep learning framework for resource management to comprehend the tradeoff between spectrum efficiency and energy consumption in CRN. The neural network combined with RL reduces the number of iterations required for converging into an optimal policy. In [8], two models for multi-agent power allocation based on the DDPG algorithm are proposed. This approach improves sampling efficiency and convergence speed for many users. As a result, for unknown environment dynamics, a model-free Deep Reinforcement learning proves to be a powerful and flexible policy.

Reinforcement Learning, a type of Machine Learning (ML), has attracted a great extent in radio resource management [12,13]. In one cognitive radio cycle, a decision-maker observes and learns the surrounding environment and modifies network parameters to maximize spectrum utilization efficiency. This operation of CR is similar to the RL procedure, in which an agent observes the environment or state, take appropriate actions to increase the overall reward of the network and finally update a Q matrix. An optimal policy π is found for taking appropriate actions using the Q matrix (state * action). However, if the number of states and action increases exponentially, updating the Q table becomes tedious, slow and impractical. Thus, a neural network is used in combination with RL in the form of a function approximator to compute Q-value and improve convergence speed. This neural network and RL combination are called Deep Q Network [14]. However, when the action set is continuous, resolving the optimization issue is relatively complex. Therefore, an in-depth deterministic policy gradient approach based on actor and critic network can be utilized for high dimensional and continuous action set.

A DDPG off-policy model-free algorithm consists of four neural networks: a) Q network b) Deterministic policy network c) Q-target network and d) Target-policy network. In this method, the actor's role is to directly map states into actions instead of providing a probability distribution over a

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ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (AIML) - APPLICATION DURING COVID-19

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ABSTRACT

Artificial intelligence and machine learning are two terms that are often used interchangeably, but in fact, one happens to be the subset of the other. AI refers to the bigger picture where intelligent systems are designed to imitate human behavior. Surely everyone has heard of and watched Sophia that happens to be a social humanoid robot which can display more than sixty facial expressions and stands out as an epitome of AI in its entirety. Machine learning, on the other hand, is a subset or an application of AI where the machines learn from data without being explicitly programmed. This chapter will attempt to describe the various machine learning algorithms that are building blocks for designing AI systems. The chapter also brings to light the application of AI and ML techniques towards combating a pandemic, such as the COVID-19 one.

INTRODUCTION

2.1 Capabilities of an AI system

For any AI system to perform as per expectation, it would need to possess the following capabilities (Russell & Norvig, 2016):

- *Natural language processing* to enable successful communication in global as well as regional languages.
- *Knowledge representation* to store the information that is fed into it.
- *Automated reasoning* to use the information stored for drawing conclusions
- *Machine learning* to detect patterns and extrapolate if required

2.2 Applications of AI Systems

There are several real world applications of AI systems, some of which are ubiquitous enough to be unnoticed (Mueller and Massaron, 2018) :

- **Fraud Detection Systems:** Credit card frauds and untracked transactions are something that is commonplace in the modern world. You immediately receive a message or an automated voice mail whenever your credit card is swiped at a POS. This is not by magic but is the work of AI that is embedded within the code of the credit card company.
- **Resource Scheduling:** Efficient utilization of resources is something that decides whether a project will be completed on time and/or on budget. For instance, in an assembly line, resources need to maximize at the bottleneck and the identity of this bottleneck is something that AI helps reveal.
- **Complex Analysis:** There is a limitation to the number of calculations a human can perform and a limited number of variables he can process. For instance, the aerodynamic design of a spacecraft factors hundreds of different variables and several forces at a time, the calculation and modeling of which only a supercomputer can perform.