

Forecasting time series using Vector Autoregressive Model

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Abstract

In this study, a vector Autoregressive model was used to analysis the relationship between two time series as well as forecasting. Two financial time series have been used, which are a series of global monthly oil price and global monthly gold price in dollars for a period from January 2015 to Jun 2019. It has 54 monthly values, where the data has been transferred to get the Stationarity, Diekey Fuller test for the Stationarity was conducted. The best three order for model was determined through a standard Akaike information AIC, it is VAR(7) , VAR(8) and VAR(10) respectively. The comparison was made between selected orders by AIC based on the accuracy measure and mean square error (MSE). It turns out that less MSE value of the VAR(10) model. Some tests were conducted like Lagrange-multiplier, Portmanteau, Jarque - Bera to residuals for the selected model, with forecasting for the VAR(10) model for the period from Jun 2019 to Jun 2021 , It is 24 monthly value. It turns out that less MSE for forecasting value for oil price series is to VAR(7) model and less MSE for forecasting value for gold price series is VAR(10) model. The results have been computed through the Stata program.

Keywords: Lagrange-multiplier test, Mean square error, Portmanteau test, Standard Akaike information model.

2010 MSC: Please write mathematics subject classification of your paper here.

1. Introduction

The Vector Autoregressive Models are important models in describing the dynamic behavior of economic variables, studying interactions and analyzing their relationship as well as in forecasting

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Time Series Forecasting By Using Seasonal Autoregressive

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Time Series Forecasting By Using Seasonal Autoregressive:

Time Series Forecasting Using Generative AI Bangalore Vijay Kumar Vishwas, Sri Ram Macharla, 2025-03-24 Time Series Forecasting Using Generative AI introduces readers to Generative Artificial Intelligence Gen AI in time series analysis offering an essential exploration of cutting edge forecasting methodologies The book covers a wide range of topics starting with an overview of Generative AI where readers gain insights into the history and fundamentals of Gen AI with a brief introduction to large language models The subsequent chapter explains practical applications guiding readers through the implementation of diverse neural network architectures for time series analysis such as Multi Layer Perceptrons MLP WaveNet Temporal Convolutional Network TCN Bidirectional Temporal Convolutional Network BiTCN Recurrent Neural Networks RNN Long Short Term Memory LSTM Deep AutoRegressive DeepAR and Neural Basis Expansion Analysis NBEATS using modern tools Building on this foundation the book introduces the power of Transformer architecture exploring its variants such as Vanilla Transformers Inverted Transformer iTransformer DLinear NLinear and Patch Time Series Transformer PatchTST Finally The book delves into foundation models such as Time LLM Chronos TimeGPT Moirai and TimesFM enabling readers to implement sophisticated forecasting models tailored to their specific needs This book empowers readers with the knowledge and skills needed to leverage Gen AI for accurate and efficient time series forecasting By providing a detailed exploration of advanced forecasting models and methodologies this book enables practitioners to make informed decisions and drive business growth through data driven insights if supportLists endif Understand the core history and applications of Gen AI and its potential to revolutionize time series forecasting if supportLists endif Learn to implement different neural network architectures such as MLP WaveNet TCN BiTCN RNN LSTM DeepAR and NBEATS for time series forecasting if supportLists endif Discover the potential of Transformer architecture and its variants such as Vanilla Transformers iTransformer DLinear NLinear and PatchTST for time series forecasting if supportLists endif Explore complex foundation models like Time LLM Chronos TimeGPT Moirai and TimesFM if supportLists endif Gain practical knowledge on how to apply Gen AI techniques to real world time series forecasting challenges and make data driven decisions Who this book is for Data Scientists Machine learning engineers Business Aanalysts Statisticians Economists Financial Analysts Operations Research Analysts Data Analysts Students [Time Series Forecasting using Deep Learning](#) Ivan Gridin, 2021-10-15 Explore the infinite possibilities offered by Artificial Intelligence and Neural Networks KEY FEATURES Covers numerous concepts techniques best practices and troubleshooting tips by community experts Includes practical demonstration of robust deep learning prediction models with exciting use cases Covers the use of the most powerful research toolkit such as Python PyTorch and Neural Network Intelligence DESCRIPTION This book is amid at teaching the readers how to apply the deep learning techniques to the time series forecasting challenges and how to build prediction models using PyTorch The readers will learn the fundamentals of PyTorch in the early stages of the book Next the

time series forecasting is covered in greater depth after the programme has been developed You will try to use machine learning to identify the patterns that can help us forecast the future results It covers methodologies such as Recurrent Neural Network Encoder decoder model and Temporal Convolutional Network all of which are state of the art neural network architectures Furthermore for good measure we have also introduced the neural architecture search which automates searching for an ideal neural network design for a certain task Finally by the end of the book readers would be able to solve complex real world prediction issues by applying the models and strategies learnt throughout the course of the book This book also offers another great way of mastering deep learning and its various techniques

WHAT YOU WILL LEARN

Work with the Encoder Decoder concept and Temporal Convolutional Network mechanics Learn the basics of neural architecture search with Neural Network Intelligence Combine standard statistical analysis methods with deep learning approaches Automate the search for optimal predictive architecture Design your custom neural network architecture for specific tasks Apply predictive models to real world problems of forecasting stock quotes weather and natural processes

WHO THIS BOOK IS FOR This book is written for engineers data scientists and stock traders who want to build time series forecasting programs using deep learning Possessing some familiarity of Python is sufficient while a basic understanding of machine learning is desirable but not needed

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Modern Time Series Forecasting with Python Manu Joseph, 2022-11-24 Build real world time series forecasting systems which scale to millions of time series by applying modern machine learning and deep learning concepts

Key Features Explore industry tested machine learning techniques used to forecast millions of time series Get started with the revolutionary paradigm of global forecasting models Get to grips with new concepts by applying them to real world datasets of energy forecasting

Book Description We live in a serendipitous era where the explosion in the quantum of data collected and a renewed interest in data driven techniques such as machine learning ML has changed the landscape of analytics and with it time series forecasting This book filled with industry tested tips and tricks takes you beyond commonly used classical statistical methods such as ARIMA and introduces to you the latest techniques from the world of ML This is a comprehensive guide to analyzing visualizing and creating state of the art forecasting systems complete with common topics such as ML and deep learning DL as well as rarely touched upon topics such as global forecasting models cross validation strategies and forecast metrics You ll begin by exploring the basics of data handling data visualization and classical statistical methods before moving on to ML and DL models for time series forecasting This book takes you on a hands on journey in which you ll develop state of the art ML linear regression to gradient boosted trees and DL feed forward neural networks LSTMs and transformers models on a real world dataset along

with exploring practical topics such as interpretability By the end of this book you ll be able to build world class time series forecasting systems and tackle problems in the real world What you will learn Find out how to manipulate and visualize time series data like a pro Set strong baselines with popular models such as ARIMA Discover how time series forecasting can be cast as regression Engineer features for machine learning models for forecasting Explore the exciting world of ensembling and stacking models Get to grips with the global forecasting paradigm Understand and apply state of the art DL models such as N BEATS and Autoformer Explore multi step forecasting and cross validation strategies Who this book is for The book is for data scientists data analysts machine learning engineers and Python developers who want to build industry ready time series models Since the book explains most concepts from the ground up basic proficiency in Python is all you need Prior understanding of machine learning or forecasting will help speed up your learning For experienced machine learning and forecasting practitioners this book has a lot to offer in terms of advanced techniques and traversing the latest research frontiers in time series forecasting

Proceedings of the International Conference on Mathematical Sciences and Statistics 2022 (ICMSS 2022) Nadiyah Wahi,Muhammad Aslam Mohd Safari,Roslan Hasni,Fatimah Abdul

Razak,Ibragimov Gafurjan,Anwar Fitrianto,2023-02-10 This is an open access book The ICMSS2022 is an international conference jointly organised by the Department of Mathematics and Statistics Faculty of Science Universiti Putra Malaysia together with the Banasthali University Jaipur India This international conference aims to give exposure and to bring together academicians researchers and industry experts for intellectual growth The ICMSS2022 serves as a platform for the scientific community members to exchange ideas and approaches to present research findings and to discuss current issues and topics related to mathematics statistics as well as their applications Objectives to present the most recent discoveries in mathematics and statistics to serve as a platform for knowledge and information sharing between experts from industries and academia to identify and create potential collaboration among participants The organising committee of ICMSS2022 welcomes all delegates to deliberate over various aspects related to the conference themes and sub themes

From ML Algorithms to GenAI & LLMs Aman Kharwal,2024-10-22 From ML Algorithms to GenAI LLMs Written by Aman Kharwal founder of Statso io is the second edition of the book Machine Learning Algorithms Handbook This book offers a comprehensive and expanded guide through the evolving world of machine learning and generative AI Whether you are an experienced data scientist or just starting this edition delivers practical insights and clear explanations of essential concepts like regression classification clustering deep learning and time series forecasting This edition introduces two new chapters Mastering GenAI and LLMs and Understanding GANs for Generative AI with a Hands on Project which provide deep dives into large language models and generative adversarial networks GANs With hands on Python code snippets and real world project examples the book bridges the gap between theory and application offering you the tools to apply machine learning techniques effectively Additional highlights include performance evaluation methods data preprocessing techniques feature

engineering and a quick reference appendix for tuning machine learning models The book equips you with the necessary skills to navigate modern machine learning and AI which makes it an essential resource for anyone interested in the field

Revolutionizing Healthcare Treatment With Sensor Technology Das, Sima,Bhowmick, Parijat,Kitmo, Dr.,2024-05-28 Traditional patient care and treatment approaches often lack the personalized and interactive elements necessary for effective healthcare delivery This means that the healthcare industry must find innovative solutions to improve patient outcomes enhance rehabilitation processes and optimize resource utilization There is a gap between the traditional approach and the need for innovation that highlights the importance of a comprehensive understanding of emerging technologies including Kinect Sensor technology and the potential to transform healthcare practices with this tech Revolutionizing Healthcare Treatment With Sensor Technology addresses this critical need by thoroughly exploring how Kinect Sensor technology can revolutionize patient care and treatment methodologies By repurposing and customizing Kinect Sensor for healthcare applications this book showcases how depth sensing cameras infrared sensors and advanced motion tracking can capture and interpret real time patient movements and interactions This book is ideal for healthcare professionals hospital administrators researchers patients caregivers and healthcare technology developers seeking to leverage Kinect Sensor technology for enhanced healthcare delivery Through detailed case studies and practical examples experts can learn how to integrate Kinect Sensor into various medical settings to gain valuable insights into patients physical capabilities monitor their progress and create personalized treatment plans

Cyclostationarity: Theory and Methods – IV Fakher Chaari,Jacek Leskow,Radoslaw Zimroz,Agnieszka Wyłomańska,Anna Dudek,2019-07-31 This book gathers contributions presented at the 10th Workshop on Cyclostationary Systems and Their Applications held in Gr dek nad Dunajcem Poland in February 2017 It includes twelve interesting papers covering current topics related to both cyclostationary and general non stationary processes Moreover this book which covers both theoretical and practical issues offers a practice oriented guide to the analysis of data sets with non stationary behavior and a bridge between basic and applied research on nonstationary processes It provides students researchers and professionals with a timely guide on cyclostationary systems nonstationary processes and relevant engineering applications

Construction Analytics Mohsen Shahandashti,Bahram Abediniangerabi,Ehsan Zahed,Soojin Kim,2023-04-24 This text covers R program coding for the implementation of two essential data analytics for practical construction problems The first part of this book explains time series basics models and forecasting approaches in the context of the construction industry accompanied by practical examples in construction The second part describes the concept of investment valuation for construction projects and provides both deterministic and probabilistic techniques to conduct investment valuation on construction projects R code scripts are provided in this book for solving practical problems in the construction industry This book is also equipped with an R Package entitled cdar to provide the necessary functions for performing investment valuation The book maximizes students understanding of the necessary

theoretical background of data analytics and explains the implementation of data analytics techniques to solve the actual problems in the construction industry Mathematics and Science Education International Seminar 2021 (MASEIS 2021)

M. Lutfi Firdaus, Aprina Defianti, 2023-03-29 This is an open access book We warmly invite you to participate in Mathematics and Science Education International Seminar that was held on November 13th 2021 in Bengkulu Indonesia Since participants may come from different countries with variety of backgrounds the conference is an excellent forum for participants to exchange research findings and ideas on mathematics and science and to build networks for further collaborations The disruption era is related to the development of the industrial revolution 4.0 and society 5.0 era Industrial revolution 4.0 era is marked by massive digital technology development in all aspects Digital technology transformation is applied in human life and it is known as human centered society Development of digital technology has been influence some aspects such as education environment and society Using digital technology does not only gives negative impacts but also positive impacts It is important to strengthen sustainable education that has insight into conservation and local wisdom in this era for a better society **Healthcare Management Engineering: What Does This Fancy Term Really Mean?**

Alexander Kolker, 2011-12-02 This Briefs Series book illustrates in depth a concept of healthcare management engineering and its domain for hospital and clinic operations Predictive and analytic decision making power of management engineering methodology is systematically compared to traditional management reasoning by applying both side by side to analyze 26 concrete operational management problems adapted from hospital and clinic practice The problem types include clinic bed and operating rooms capacity patient flow staffing and scheduling resource allocation and optimization forecasting of patient volumes and seasonal variability business intelligence and data mining and game theory application for allocating cost savings between cooperating providers Detailed examples of applications are provided for quantitative methods such as discrete event simulation queuing analytic theory linear and probabilistic optimization forecasting of a time series principal component decomposition of a data set and cluster analysis and the Shapley value for fair gain sharing between cooperating participants A summary of some fundamental management engineering principles is provided The goal of the book is to help to bridge the gap in mutual understanding and communication between management engineering professionals and hospital and clinic administrators The book is intended primarily for hospital clinic leadership who are in charge of making managerial decisions This book can also serve as a compendium of introductory problems projects for graduate students in Healthcare Management and Administration as well as for MBA programs with an emphasis in Healthcare Signal Processing in Medicine and Biology

Ammar Ahmed, Joseph Picone, 2025-09-19 Signal Processing in Medicine and Biology Applications of Deep Learning to the Health Sciences presents expanded versions of selected papers from the 2023 IEEE Signal Processing in Medicine and Biology Symposium IEEE SPMB at Temple University The symposium presents multidisciplinary research across a wide range of topics in the life sciences The Neural Engineering Data Consortium hosts

the symposium to promote machine learning and big data applications in bioengineering Topics covered include if supportLists endif Signal and image analysis e g EEG ECG MRI if supportLists endif Machine learning data mining and classification if supportLists endif Big data resources and applications if supportLists endif Applications of quantum computing if supportLists endif Digital pathology if supportLists endif Computational biology if supportLists endif Genomics genetics proteomics Applications of particular interest at the 2023 symposium included digital pathology computational biology genomics genetics and proteomics The book features tutorials and examples of successful applications that will appeal to many professionals and researchers in signal processing medicine and biology For students and professionals new to the field the book offers an easy to understand introduction to various bioengineering topics For professionals active in the field it provides essential algorithmic details on valuable benchmarks for the technology

Mathematical Modeling using Fuzzy Logic Abhijit Pandit, 2021-05-19 Mathematical Modeling using Fuzzy Logic has been a dream project for the author Fuzzy logic provides a unique method of approximate reasoning in an imperfect world This text is a bridge to the principles of fuzzy logic through an application focused approach to selected topics in engineering and management The many examples point to the richer solutions obtained through fuzzy logic and to the possibilities of much wider applications There are relatively very few texts available at present in fuzzy logic applications The style and content of this text is complementary to those already available New areas of application like application of fuzzy logic in modeling of sustainability are presented in a graded approach in which the underlying concepts are first described The text is broadly divided into two parts the first treats processes materials and system applications related to fuzzy logic and the second delves into the modeling of sustainability with the help of fuzzy logic This book offers comprehensive coverage of the most essential topics including Treating processes materials system applications related to fuzzy logic Highlighting new areas of application of fuzzy logic Identifying possibilities of much wider applications of fuzzy logic Modeling of sustainability with the help of fuzzy logic The level enables a selection of the text to be made for the substance of undergraduate graduate and postgraduate level courses There is also sufficient volume and quality for the basis of a postgraduate course A more restricted and judicious selection can provide the material for a professional short course and various university level courses

Practical Data Science with Jupyter Prateek Gupta, 2021-03-01 Solve business problems with data driven techniques and easy to follow Python examples KEY FEATURES _ Essential coverage on statistics and data science techniques _ Exposure to Jupyter PyCharm and use of GitHub _ Real use cases best practices and smart techniques on the use of data science for data applications DESCRIPTION This book begins with an introduction to Data Science followed by the Python concepts The readers will understand how to interact with various database and Statistics concepts with their Python implementations You will learn how to import various types of data in Python which is the first step of the data analysis process Once you become comfortable with data importing you will clean the dataset and after that will gain an understanding about various

visualization charts This book focuses on how to apply feature engineering techniques to make your data more valuable to an algorithm The readers will get to know various Machine Learning Algorithms concepts Time Series data and a few real world case studies This book also presents some best practices that will help you to be industry ready This book focuses on how to practice data science techniques while learning their concepts using Python and Jupyter This book is a complete answer to the most common question that how can you get started with Data Science instead of explaining Mathematics and Statistics behind the Machine Learning Algorithms WHAT YOU WILL LEARN _ Rapid understanding of Python concepts for data science applications _ Understand and practice how to run data analysis with data science techniques and algorithms _ Learn feature engineering dealing with different datasets and most trending machine learning algorithms _ Become self sufficient to perform data science tasks with the best tools and techniques WHO THIS BOOK IS FOR This book is for a beginner or an experienced professional who is thinking about a career or a career switch to Data Science Each chapter contains easy to follow Python examples TABLE OF CONTENTS 1 Data Science Fundamentals 2 Installing Software and System Setup 3 Lists and Dictionaries 4 Package Function and Loop 5 NumPy Foundation 6 Pandas and DataFrame 7 Interacting with Databases 8 Thinking Statistically in Data Science 9 How to Import Data in Python 10 Cleaning of Imported Data 11 Data Visualization 12 Data Pre processing 13 Supervised Machine Learning 14 Unsupervised Machine Learning 15 Handling Time Series Data 16 Time Series Methods 17 Case Study 1 18 Case Study 2 19 Case Study 3 20 Case Study 4 21 Python Virtual Environment 22 Introduction to An Advanced Algorithm CatBoost 23 Revision of All Chapters Learning Intelligent Systems and Machine Learning Sachi Nandan Mohanty,Vicente Garcia Diaz,G. A. E. Satish Kumar,2023-07-09 This two volume set constitutes the refereed proceedings of the First EAI International Conference on Intelligent Systems and Machine Learning ICISML 2022 held in Hyderabad India in December 16 17 2022 The 75 full papers presented were carefully reviewed and selected from 209 submissions The conference focuses on Intelligent Systems and Machine Learning Applications in Health care Digital Forensic Intelligent Communication Wireless Networks Internet of Things IoT Applications Social Informatics and Emerging Applications *Data Mining Using SAS Enterprise Miner* Randall Matignon,2007-08-13 The most thorough and up to date introduction to data mining techniques using SAS Enterprise Miner The Sample Explore Modify Model and Assess SEMMA methodology of SAS Enterprise Miner is an extremely valuable analytical tool for making critical business and marketing decisions Until now there has been no single authoritative book that explores every node relationship and pattern that is a part of the Enterprise Miner software with regard to SEMMA design and data mining analysis Data Mining Using SAS Enterprise Miner introduces readers to a wide variety of data mining techniques and explains the purpose of and reasoning behind every node that is a part of the Enterprise Miner software Each chapter begins with a short introduction to the assortment of statistics that is generated from the various nodes in SAS Enterprise Miner v4 3 followed by detailed explanations of configuration settings that are located within each node Features of the book include The exploration of node

relationships and patterns using data from an assortment of computations charts and graphs commonly used in SAS procedures A step by step approach to each node discussion along with an assortment of illustrations that acquaint the reader with the SAS Enterprise Miner working environment Descriptive detail of the powerful Score node and associated SAS code which showcases the important of managing editing executing and creating custom designed Score code for the benefit of fair and comprehensive business decision making Complete coverage of the wide variety of statistical techniques that can be performed using the SEMMA nodes An accompanying Web site that provides downloadable Score code training code and data sets for further implementation manipulation and interpretation as well as SAS IML software programming code This book is a well crafted study guide on the various methods employed to randomly sample partition graph transform filter impute replace cluster and process data as well as interactively group and iteratively process data while performing a wide variety of modeling techniques within the process flow of the SAS Enterprise Miner software Data Mining Using SAS Enterprise Miner is suitable as a supplemental text for advanced undergraduate and graduate students of statistics and computer science and is also an invaluable all encompassing guide to data mining for novice statisticians and experts alike

Deep Learning Models for Economic Research Andrzej Dudek,2025-10-21 In today s data driven world the ability to make sense of complex high dimensional datasets is crucial for economists and data scientists Traditional quantitative methods while powerful often struggle to keep up with the complexities of modern economic challenges This book bridges this gap integrating cutting edge machine learning techniques with established economic analysis to provide new more accurate insights The book offers a comprehensive approach to understanding and applying neural networks and deep learning models in the context of conducting economic research It starts by laying the groundwork with essential quantitative methods such as cluster analysis regression and factor analysis then demonstrates how these can be enhanced with deep learning techniques like recurrent neural networks RNNs convolutional neural networks CNNs and transformers By guiding readers through real world examples complete with Python code and access to datasets it showcases the practical benefits of neural networks in solving complex economic problems such as fraud detection sentiment analysis stock price forecasting and inflation factor analysis Importantly the book also addresses critical concerns about the black box nature of deep learning offering interpretability techniques like Local Interpretable Model agnostic Explanations LIME and SHapley Additive exPlanations SHAP to demystify model predictions The book is essential reading for economists data scientists and professionals looking to deepen their understanding of AI s role in economic modeling It is also an accessible resource for non experts interested in how machine learning is transforming economic analysis *Fun with Machine Learning* Arockia Liborious,Dr. Rik Das,2023-03-23 Learn how to use AutoML to leverage Machine Learning for solving business problems KEY FEATURES Get familiar with the common machine learning problems and understand how to solve them Understand the importance of different types of data and how to work with them effectively Learn how to use machine learning and AutoML

tools to solve real world problems

DESCRIPTION Fun with Machine Learning is an essential guide for anyone looking to learn about machine learning and how it can be used to make informed business decisions The book covers the basics of machine learning providing an overview of key concepts and terminology To fully understand machine learning it is important to have a basic understanding of statistics and mathematics The book provides a simple introduction to these topics making it easy for you to understand the core concepts One of the key features of the book is its focus on AutoML tools It introduces you to different AutoML tools and explains how to use them to simplify the data science processes The book also shows how machine learning can be used to solve real world business problems such as predicting customer churn detecting fraud and optimizing marketing campaigns By the end of the book you will be able to transform raw data into actionable insights with machine learning

WHAT YOU WILL LEARN Get a clear understanding of what machine learning is and how it works Learn how to perform regression analysis using Orange Understand how to implement classification In machine learning Get to know more about the clustering and association algorithms Analyze visualize manipulate and forecast time series data with Orange

WHO THIS BOOK IS FOR This book is for Machine Learning engineers Machine Learning enthusiasts Data Scientists beginners and students who are looking to implement machine learning techniques to solve real life business problems It is also a great resource for business leaders who are responsible for making data driven decisions

TABLE OF CONTENTS 1 Significance of Machine Learning in Today s Business 2 Know Your Data 3 Up and Running With Analytical Tools 4 Machine Learning in a Nutshell 5 Regression Analysis 6 Classification 7 Clustering and Association 8 Time Series Forecasting 9 Image Analysis 10 Tips and Tricks

Data Analytics for Renewable Energy Integration: Informing the Generation and Distribution of Renewable Energy Wei Lee Woon,Zeyar Aung,Oliver Kramer,Stuart Madnick,2017-11-24 This book constitutes revised selected papers from the 5th ECML PKDD Workshop on Data Analytics for Renewable Energy Integration DARE 2017 held in Skopje Macedonia in September 2017 The 11 papers presented in this volume were carefully reviewed and selected for inclusion in this book and handle topics such as time series forecasting the detection of faults cyber security smart grid and smart cities technology integration demand response and many others

Research Anthology on Artificial Neural Network Applications Management Association, Information Resources,2021-07-16 Artificial neural networks ANNs present many benefits in analyzing complex data in a proficient manner As an effective and efficient problem solving method ANNs are incredibly useful in many different fields From education to medicine and banking to engineering artificial neural networks are a growing phenomenon as more realize the plethora of uses and benefits they provide Due to their complexity it is vital for researchers to understand ANN capabilities in various fields The Research Anthology on Artificial Neural Network Applications covers critical topics related to artificial neural networks and their multitude of applications in a number of diverse areas including medicine finance operations research business social media security and more Covering everything from the applications and uses of artificial neural

networks to deep learning and non linear problems this book is ideal for computer scientists IT specialists data scientists technologists business owners engineers government agencies researchers academicians and students as well as anyone who is interested in learning more about how artificial neural networks can be used across a wide range of fields

Communication and Intelligent Systems Harish Sharma,Vivek Shrivastava,Ashish Kumar Tripathi,Lipo Wang,2025-08-27 This book gathers selected research papers presented at the Sixth International Conference on Communication and Intelligent Systems ICCIS 2024 organized by Maulana Azad National Institute of Technology MANIT Bhopal India during November 8 9 2024 This book presents a collection of state of the art research work involving cutting edge technologies for communication and intelligent systems Over the past few years advances in artificial intelligence and machine learning have sparked new research efforts around the globe which explore novel ways of developing intelligent systems and smart communication technologies The book presents single and multi disciplinary research on these themes to make the latest results available in a single readily accessible source The work is presented in four volumes

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Time Series Forecasting By Using Seasonal Autoregressive Introduction

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