

# A Survey On Channel Estimation In Mimo Ofdm Systems

IF YOU ALLY CRAVING SUCH A REFERRED **A SURVEY ON CHANNEL ESTIMATION IN MIMO OFDM SYSTEMS** EBOOK THAT WILL GIVE YOU WORTH, ACQUIRE THE ENTIRELY BEST SELLER FROM US CURRENTLY FROM SEVERAL PREFERRED AUTHORS. IF YOU DESIRE TO HILARIOUS BOOKS, LOTS OF NOVELS, TALE, JOKES, AND MORE FICTIONS COLLECTIONS ARE ALONG WITH LAUNCHED, FROM BEST SELLER TO ONE OF THE MOST CURRENT RELEASED.

YOU MAY NOT BE PERPLEXED TO ENJOY EVERY BOOK COLLECTIONS A SURVEY ON CHANNEL ESTIMATION IN MIMO OFDM SYSTEMS THAT WE WILL ENTIRELY OFFER. IT IS NOT IN THE REGION OF THE COSTS. ITS VIRTUALLY WHAT YOU NEED CURRENTLY. THIS A SURVEY ON CHANNEL ESTIMATION IN MIMO OFDM SYSTEMS , AS ONE OF THE MOST LIVELY SELLERS HERE WILL UNCONDITIONALLY BE IN THE MIDST OF THE BEST OPTIONS TO REVIEW.

**ENABLING TECHNOLOGIES FOR NEXT GENERATION WIRELESS COMMUNICATIONS** - MOHAMMED USMAN 2020-12-28

ENABLING TECHNOLOGIES FOR NEXT GENERATION WIRELESS COMMUNICATIONS PROVIDES UP-TO-DATE INFORMATION ON EMERGING TRENDS IN WIRELESS SYSTEMS, THEIR ENABLING TECHNOLOGIES AND THEIR EVOLVING APPLICATION PARADIGMS. THIS BOOK INCLUDES THE LATEST TRENDS AND DEVELOPMENTS TOWARD NEXT GENERATION WIRELESS COMMUNICATIONS. IT HIGHLIGHTS THE REQUIREMENTS OF NEXT GENERATION WIRELESS SYSTEMS, LIMITATIONS OF EXISTING TECHNOLOGIES IN DELIVERING THOSE REQUIREMENTS AND THE NEED TO DEVELOP RADICAL NEW TECHNOLOGIES. IT FOCUSES ON BRINGING TOGETHER INFORMATION ON VARIOUS TECHNOLOGICAL DEVELOPMENTS THAT ARE ENABLERS VITAL TO FULFILLING THE REQUIREMENTS OF FUTURE WIRELESS COMMUNICATION SYSTEMS AND THEIR APPLICATIONS. TOPICS DISCUSSED INCLUDE SPECTRUM ISSUES, NETWORK PLANNING, SIGNAL PROCESSING, TRANSMITTER, RECEIVER, ANTENNA TECHNOLOGIES, CHANNEL CODING, SECURITY AND APPLICATION OF MACHINE LEARNING AND DEEP LEARNING FOR WIRELESS COMMUNICATION SYSTEMS. THE BOOK ALSO PROVIDES INFORMATION ON ENABLING BUSINESS MODELS FOR FUTURE WIRELESS SYSTEMS. THIS BOOK IS USEFUL AS A RESOURCE FOR RESEARCHERS AND PRACTITIONERS WORLDWIDE, INCLUDING INDUSTRY PRACTITIONERS, TECHNOLOGISTS, POLICY DECISION-MAKERS, ACADEMICIANS, AND GRADUATE STUDENTS.

**SOFT COMPUTING AND SIGNAL PROCESSING** - V. SIVAKUMAR REDDY 2021-05-20

THIS BOOK PRESENTS SELECTED RESEARCH PAPERS ON CURRENT DEVELOPMENTS IN THE FIELDS OF SOFT COMPUTING AND SIGNAL PROCESSING FROM THE THIRD INTERNATIONAL CONFERENCE ON SOFT COMPUTING AND SIGNAL PROCESSING (ICSCSP 2020). THE BOOK COVERS TOPICS SUCH AS SOFT SETS, ROUGH SETS, FUZZY LOGIC, NEURAL NETWORKS, GENETIC ALGORITHMS AND MACHINE LEARNING AND DISCUSSES VARIOUS ASPECTS OF THESE TOPICS, E.G., TECHNOLOGICAL CONSIDERATIONS, PRODUCT IMPLEMENTATION AND APPLICATION ISSUES.

**PROCEEDINGS OF THE SECOND INTERNATIONAL CONFERENCE ON ELECTRONICS, COMMUNICATION AND AEROSPACE TECHNOLOGY (ICECA 2018)** - 2018

**CELL-FREE MASSIVE MIMO** - GIOVANNI INTERDONATO 2020-09-09

THE FIFTH GENERATION OF MOBILE COMMUNICATION SYSTEMS (5G) IS NOWADAYS A REALITY. 5G NETWORKS ARE BEEN DEPLOYED ALL OVER THE WORLD, AND THE FIRST 5G-CAPABLE DEVICES (E.G., SMARTPHONES, TABLETS, WEARABLE, ETC.) ARE ALREADY COMMERCIALY AVAILABLE. 5G SYSTEMS PROVIDE UNPRECEDENTED LEVELS OF CONNECTIVITY AND QUALITY OF SERVICE (QoS) TO COPE WITH THE INCESSANT GROWTH IN THE NUMBER OF CONNECTED DEVICES AND THE HUGE INCREASE IN DATA-RATE DEMAND. MASSIVE MIMO (MULTIPLE-INPUT MULTIPLE-OUTPUT) TECHNOLOGY PLAYS A KEY ROLE IN 5G SYSTEMS. THE UNDERLYING PRINCIPLE OF THIS TECHNOLOGY IS THE USE OF A LARGE NUMBER OF CO-LOCATED ANTENNAS AT THE BASE STATION, WHICH COHERENTLY TRANSMIT/RECEIVE SIGNALS TO/FROM MULTIPLE USERS. THIS SIGNAL CO-PROCESSING AT MULTIPLE ANTENNAS LEADS TO MANIFOLD BENEFITS: ARRAY GAIN, SPATIAL DIVERSITY AND SPATIAL USER MULTIPLEXING. THESE ELEMENTS ENABLE TO MEET THE QoS REQUIREMENTS ESTABLISHED FOR THE 5G SYSTEMS. THE MAJOR BOTTLENECK OF MASSIVE MIMO SYSTEMS AS WELL AS OF ANY CELLULAR NETWORK IS THE INTER-CELL INTERFERENCE, WHICH AFFECTS SIGNIFICANTLY THE CELL-EDGE USERS, WHOSE PERFORMANCE IS ALREADY DEGRADED BY THE PATH ATTENUATION. TO OVERCOME THESE LIMITATIONS AND PROVIDE UNIFORMLY EXCELLENT SERVICE TO ALL THE USERS WE NEED A MORE RADICAL APPROACH: WE NEED TO CHALLENGE THE CELLULAR PARADIGM. IN THIS REGARD, CELL-FREE MASSIVE MIMO CONSTITUTES THE PARADIGM SHIFT. IN THE CELL-FREE PARADIGM, IT IS NOT THE BASE STATION SURROUNDED BY THE USERS, BUT RATHER IT IS EACH USER BEING SURROUNDED BY SMALLER, SIMPLER, SERVING BASE STATIONS REFERRED TO AS ACCESS POINTS (APs). IN SUCH A SYSTEM, EACH USER EXPERIENCES BEING IN THE CELL-CENTER, AND IT DOES NOT EXPERIENCE ANY CELL BOUNDARIES. HENCE, THE TERMINOLOGY

CELL-FREE. AS A RESULT, USERS ARE NOT AFFECTED BY INTER-CELL INTERFERENCE, AND THE PATH ATTENUATION IS SIGNIFICANTLY REDUCED DUE TO THE PRESENCE OF MANY APs IN THEIR PROXIMITY. THIS LEADS TO IMPRESSIVE PERFORMANCE. ALTHOUGH APPEALING FROM THE PERFORMANCE VIEWPOINT, THE DESIGNING AND IMPLEMENTATION OF SUCH A DISTRIBUTED MASSIVE MIMO SYSTEM IS A CHALLENGING TASK, AND IT IS THE OBJECT OF THIS THESIS. MORE SPECIFICALLY, IN THIS THESIS WE STUDY: PAPER A) THE LARGE POTENTIAL OF THIS PROMISING TECHNOLOGY IN REALISTIC INDOOR/OUTDOOR SCENARIOS WHILE ALSO ADDRESSING PRACTICAL DEPLOYMENT ISSUES, SUCH AS CLOCK SYNCHRONIZATION AMONG APs, AND COST-EFFICIENT IMPLEMENTATIONS. WE PROVIDE AN EXTENSIVE DESCRIPTION OF A CELL-FREE MASSIVE MIMO SYSTEM, EMPHASIZING STRENGTHS AND WEAKNESSES, AND POINTING OUT DIFFERENCES AND SIMILARITIES WITH EXISTING DISTRIBUTED MULTIPLE ANTENNA SYSTEMS, SUCH AS COORDINATED MULTIPoint (CoMP). PAPER B) HOW TO PRESERVE THE SCALABILITY OF THE SYSTEM, BY PROPOSING A SOLUTION RELATED TO DATA PROCESSING, NETWORK TOPOLOGY AND POWER CONTROL. WE CONSIDER A REALISTIC SCENARIO WHERE MULTIPLE CENTRAL PROCESSING UNITS SERVE DISJOINT SUBSETS OF APs, AND COMPARE THE SPECTRAL EFFICIENCY PROVIDED BY THE PROPOSED SCALABLE FRAMEWORK WITH THE CANONICAL CELL-FREE MASSIVE MIMO AND CoMP. PAPER C) HOW TO IMPROVE THE SPECTRAL EFFICIENCY (SE) IN THE DOWNLINK (DL), BY DEVISING TWO DISTRIBUTED PRECODING SCHEMES, REFERRED TO AS LOCAL PARTIAL ZERO-FORCING (ZF) AND LOCAL PROTECTIVE PARTIAL ZF, THAT PROVIDE AN ADAPTABLE TRADE-OFF BETWEEN INTERFERENCE CANCELATION AND BOOSTING OF THE DESIRED SIGNAL, WITH NO ADDITIONAL FRONT-HAUL OVERHEAD, AND THAT ARE IMPLEMENTABLE BY APs WITH VERY FEW ANTENNAS. WE DERIVE CLOSED-FORM EXPRESSIONS FOR THE ACHIEVABLE SE UNDER THE ASSUMPTION OF INDEPENDENT RAYLEIGH FADING CHANNEL, CHANNEL ESTIMATION ERROR AND PILOT CONTAMINATION. THESE CLOSED-FORM EXPRESSIONS ARE THEN USED TO DEVISE OPTIMAL MAX-MIN FAIRNESS POWER CONTROL. PAPER D) HOW TO FURTHER IMPROVE THE SE BY LETTING THE USER ESTIMATE THE DL CHANNEL FROM DL PILOTS, INSTEAD OF RELYING SOLELY ON THE KNOWLEDGE OF THE CHANNEL STATISTICS. WE DERIVE AN APPROXIMATE CLOSED-FORM EXPRESSION OF THE DL SE FOR CONJUGATE BEAMFORMING (CB), AND ASSUMING INDEPENDENT RAYLEIGH FADING. THIS EXPRESSION ACCOUNTS FOR BEAMFORMED DL PILOTS, ESTIMATION ERRORS AND PILOT CONTAMINATION AT BOTH THE AP AND THE USER SIDE. WE DEVISE A SEQUENTIAL CONVEX APPROXIMATION ALGORITHM TO GLOBALLY SOLVE THE MAX-MIN FAIRNESS POWER CONTROL OPTIMIZATION PROBLEM, AND A GREEDY ALGORITHM FOR UPLINK (UL) AND DL PILOT ASSIGNMENT. THE LATTER CONSISTS IN JOINTLY SELECTING THE UL AND DL PILOT PAIR, FOR EACH USER, THAT MAXIMIZES THE SMALLEST SE IN THE NETWORK. PAPER E) A PRECODING SCHEME THAT IS MORE SUITABLE WHEN ONLY THE CHANNEL STATISTICS ARE AVAILABLE AT THE USERS, REFERRED TO AS ENHANCED NORMALIZED CB. IT CONSISTS IN NORMALIZING THE PRECODING VECTOR BY ITS SQUARED NORM IN ORDER TO REDUCE THE FLUCTUATIONS OF THE EFFECTIVE CHANNEL SEEN AT THE USER, AND THEREBY TO BOOST THE CHANNEL HARDENING. THE PERFORMANCE ACHIEVED BY THIS SCHEME IS COMPARED

WITH THE CB SCHEME WITH DL TRAINING (DESCRIBED IN PAPER D). PAPER F) A MAXIMUM- LIKELIHOOD-BASED METHOD TO ESTIMATE THE CHANNEL STATISTICS IN THE UL, ALONG WITH AN ACCOMPANYING PILOT TRANSMISSION SCHEME, THAT IS PARTICULARLY USEFUL IN LINE- OF-SIGHT OPERATION AND IN SCENARIOS WITH RESOURCE CONSTRAINTS. PILOTS ARE STRUCTURALLY PHASE-ROTATED OVER DIFFERENT COHERENCE BLOCKS TO CREATE AN EFFECTIVE STATISTICAL DISTRIBUTION OF THE RECEIVED PILOT SIGNAL THAT CAN BE EFFICIENTLY EXPLOITED BY THE AP WHEN PERFORMING THE PROPOSED ESTIMATION METHOD. THE OVERALL CONCLUSION IS THAT CELL-FREE MASSIVE MIMO IS NOT A UTOPIA, AND A PRACTICAL, DISTRIBUTED, SCALABLE, HIGH-PERFORMANCE SYSTEM CAN BE IMPLEMENTED. TODAY IT REPRESENTS A HOT RESEARCH TOPIC, BUT TOMORROW IT MIGHT REPRESENT A KEY ENABLER FOR BEYOND-5G TECHNOLOGY, AS MASSIVE MIMO HAS BEEN FOR 5G. LA QUINTA GENERAZIONE DEI SISTEMI RADIOMOBILI CELLULARI (5G) [1] OGGI UNA REALTÀ [2]. LE RETI 5G SI STANNO DIFFONDENDO IN TUTTO IL MONDO E I DISPOSITIVI 5G (AD ESEMPIO SMARTPHONES, TABLETS, INDOSSABILI, ECC.) SONO GIÀ DISPONIBILI SUL MERCATO. I SISTEMI 5G GARANTISCONO LIVELLI DI CONNETTIVITÀ [3] E DI QUALITÀ [4] DI SERVIZIO SENZA PRECEDENTI, PER FRONTEGGIARE L'INCESSANTE CRESCITA DEL NUMERO DI DISPOSITIVI CONNESSI ALLA RETE E DELLA DOMANDA DI DATI AD ALTA VELOCITÀ [5]. LA TECNOLOGIA MASSIVE MIMO (MULTIPLE- INPUT MULTIPLE-OUTPUT) RIVESTE UN RUOLO FONDAMENTALE NEI SISTEMI 5G. IL PRINCIPIO ALLA BASE DI QUESTA TECNOLOGIA [6] L'IMPIEGO DI UN ELEVATO NUMERO DI ANTENNE COLLOCATE NELLA BASE STATION (STAZIONE RADIO BASE) LE QUALI TRASMETTONO/RICEVONO SEGNALI, IN MANIERE COERENTE, A/DA PIÙ TERMINALI UTENTE. QUESTO CO-PROCESSAMENTO DEL SEGNALE DA PARTE DI PIÙ ANTENNE APPORTA MOLTEPLICI BENEFICI: GUADAGNO DI ARRAY, DIVERSITÀ SPAZIALE E MULTIPLAZIONE DEGLI UTENTI NEL DOMINIO SPAZIALE. QUESTI ELEMENTI CONSENTONO DI RAGGIUNGERE I REQUISITI DI SERVIZIO STABILITI PER I SISTEMI 5G. TUTTAVIA, IL LIMITE PRINCIPALE DEI SISTEMI MASSIVE MIMO, COSÌ COME DI OGNI RETE CELLULARE, [7] RAPPRESENTATO DALLA INTERFERENZA INTER-CELLA (OVVERO L'INTERFERENZA TRA AREE DI COPERTURA GESTITE DA DIVERSE BASE STATIONS), LA QUALE RIDUCE IN MODO SIGNIFICATIVO LE PERFORMANCE DEGLI UTENTI A BORDO CELLA, GIÀ DEGRADATE DALLE ATTENUAZIONI DEL SEGNALE DOVUTE ALLA CONSIDEREBILE DISTANZA DALLA BASE STATION. PER SUPERARE QUESTE LIMITAZIONI E FORNIRE UNA QUALITÀ [8] DEL SERVIZIO UNIFORMEMENTE ECCELLENTE A TUTTI GLI UTENTI, [9] NECESSARIO UN APPROCCIO PIÙ RADICALE E GUARDARE OLTRE IL CLASSICO PARADIGMA CELLULARE CHE CARATTERIZZA LE ATTUALI ARCHITETTURE DI RETE. A TAL PROPOSITO, CELL-FREE MASSIVE MIMO (MASSIVE MIMO SENZA CELLE) COSTITUISCE UN CAMBIO DI PARADIGMA: OGNI UTENTE [10] CIRCONDATO E SERVITO CONTEMPORANEAMENTE DA NUMEROSE, SEMPLICI E DI DIMENSIONI RIDOTTE BASE STATIONS, DENOMINATE ACCESS POINTS (PUNTI DI ACCESSO ALLA RETE). GLI ACCESS POINTS COOPERANO PER SERVIRE TUTTI GLI UTENTI NELLA LORO AREA DI COPERTURA CONGIUNTA, ELIMINANDO L'INTERFERENZA INTER-CELLA E IL CONCETTO STESSO DI CELLA. NON RISENTENDO PIÙ DELL'EFFETTO "BORDO-CELLA", GLI UTENTI POSSONO USUFRUIRE DI QUALITÀ [11] DI SERVIZIO E VELOCITÀ [12] DATI ECCELLENTE. SEBBENE ATTRAENTE DAL PUNTO DI

VISTA DELLE PERFORMANCE, L'IMPLEMENTAZIONE DI UN TALE SISTEMA DISTRIBUITO È UNA OPERAZIONE IMPEGNATIVA ED È OGGETTO DI QUESTA TESI. PIÙ SPECIFICAMENTE, QUESTA TESI DI DOTTORATO TRATTA: ARTICOLO A) L'ENORME POTENZIALE DI QUESTA PROMETTENTE TECNOLOGIA IN SCENARI REALISTICI SIA INDOOR CHE OUTDOOR, PROPONENDO ANCHE DELLE SOLUZIONI DI IMPLEMENTAZIONE FLESSIBILI ED A BASSO COSTO. ARTICOLO B) COME PRESERVARE LA SCALABILITÀ DEL SISTEMA, PROPONENDO SOLUZIONI DISTRIBUITE RIGUARDANTI IL PROCESSAMENTO E LA CONDIVISIONE DEI DATI, L'ARCHITETTURA DI RETE E L'ALLOCAZIONE DI POTENZA, OVVERO COME OTTIMIZZARE I LIVELLI DI POTENZA TRASMESSA DAGLI ACCESS POINTS PER RIDURRE L'INTERFERENZA TRA UTENTI E MIGLIORARE LE PERFORMANCE. ARTICOLO C) COME MIGLIORARE L'EFFICIENZA SPETTRALE IN DOWNLINK (DA ACCESS POINT VERSO UTENTE) PROPONENDO DUE SCHEMI DI PRE-CODIFICA DEI DATI DI TRASMISSIONE, DENOMINATI LOCAL PARTIAL ZERO-FORCING (ZF) E LOCAL PROTECTIVE PARTIAL ZF, CHE FORNISCONO UN PERFETTO COMPROMESSO TRA CANCELLAZIONE DELL'INTERFERENZA TRA UTENTI ED AMPLIFICAZIONE DEL SEGNALE DESIDERATO. ARTICOLO D) COME MIGLIORARE L'EFFICIENZA SPETTRALE IN DOWNLINK PERMETTENDO AL TERMINALE UTENTE DI STIMARE LE INFORMAZIONI SULLE CONDIZIONI ISTANTANEE DEL CANALE DA SEQUENZE PILOTA, PIUTTOSTO CHE BASARSI SU INFORMAZIONI STATISTICHE ED A LUNGO TERMINE, COME CONVENZIONALMENTE PREVISTO. ARTICOLO E) IN ALTERNATIVA ALLA SOLUZIONE PRECEDENTE, UNO SCHEMA DI PRE-CODIFICA CHE È PIÙ ADATTO AL CASO IN CUI GLI UTENTI HANNO A DISPOSIZIONE ESCLUSIVAMENTE INFORMAZIONI STATISTICHE SUL CANALE PER POTER EFFETTUARE LA DECODIFICA DEI DATI. ARTICOLO F) UN METODO PER PERMETTERE AGLI ACCESS POINTS DI STIMARE, IN MANIERA RAPIDA, LE CONDIZIONI DI CANALE SU BASE STATISTICA, FAVORITO DA UNO SCHEMA DI TRASMISSIONE DELLE SEQUENZE PILOTA BASATO SU ROTAZIONE DI FASE. REALIZZARE UN SISTEMA CELL-FREE MASSIVE MIMO PRATICO, DISTRIBUITO, SCALABILE E PERFORMANTE NON È UNA UTOPIA. OGGI QUESTO CONCEPT RAPPRESENTA UN ARGOMENTO DI RICERCA INTERESSANTE, ATTRAENTE E STIMOLANTE MA IN FUTURO POTREBBE COSTITUIRE UN FATTORE CHIAVE PER LE TECNOLOGIE POST-5G, PROPRIO COME MASSIVE MIMO LO È STATO PER IL 5G. DEN FEMTE GENERATIONENS MOBILKOMMUNIKATIONSSYSTEM (5G) È NUMERA EN VERKLIGHET. 5G-NÄTVERKET R UTPLACERADE PÅ ETT FLERTAL PLATSER VÄRLDEN ÖVER OCH DE FÖRSTA 5G-KAPABLA TERMINALERNA (SOM SMARTA TELEFONER, SURFPLATTOR, KROPPSBURNA APPARATER, ETC.) R REDAN KOMMERSIELLT TILLGÄNGLIGA. 5G-SYSTEMEN KAN TILLHANDAHLÅLLA TIDIGARE ÖVERTRAFFADE NIVÅER AV UPPKOPPLING OCH SERVICEKVALITET OCH R DESIGNADE FÖR EN FORTSATT OAVBRUTEN TILLVÄXT I ANTALET UPPKOPPLADE APPARATER OCH KANDE DATATAKTSKRAV. MASSIV MIMO-TEKNOLOGI (ENG: MULTIPLE-INPUT MULTIPLE-OUTPUT) SPELAR EN NYCKELROLL I DAGENS 5G-SYSTEM. PRINCIPEN BAKOM DENNA TEKNIK R ANVÄNDNINGEN AV ETT STORT ANTAL SAMLOKALISERADE ANTENNER VID BASSTATIONEN, DÄR NEDLÄNSKANALEN MED HJÄLP AV NEDLÄNSKPILOTER, ISTÄLLET FÖR ATT BARA FÖRLITA SIG PÅ KUNSKAP OM KANALSTATISTIK; E) EN VERIFIERINGSMETOD FÖR NEDLÄNSK SOM R MER LÖPPLIGT NÄR ENDAST KANALSTATISTIKEN R TILLGÄNGLIG FÖR ANVÄNDARNAS PRESTANDAN SOM UPPNÅS GENOM DETTA SCHEMA JÄMFÖRS MED EN UTKÄND VARIANT AV DEN NEDLÄNSK-

DATATAKTER SAMT MÖJLIGT RÄTT FLERA ANVÄNDARE UTNYTTJAR SAMMA RADIORESURSER VIA RUMSLIG ANVÄNDARMULTIPLEXERING. EFTERSOM EN SIGNAL KAN GÅ GENOM FLERA OLIKA, MÖJLIGEN ÖBEROENDE KANALER, SÄRSÄTTETS DEN FÖR FLERA OLIKA FÖRÖRDRINGAR SAMTIDIGT. DENNA MÖJLIGHET KAR KVALITETEN PÅ SIGNALEN VID MOTTAGAREN OCH FÖRÖRDRINGAR RADIOLÖSNENS ROBUSTHET OCH TILLFÖRLITLIGHET. DETTA GÅR DET MÖJLIGT ATT UPPFYLLA DE HÖGA KRAVEN PÅ SERVICEKVALITET SOM FASTSTÄLLTS FÖR 5G-SYSTEMEN. DEN FÖRSTA BEGRÄNSNINGEN FÖR MASSIVA MIMO-SYSTEM SÄRSLIGT SOM FÖR ALLA CELLULÄRA MOBILNÄTVERKEN R STÖRNINGAR FRÅN ANDRA CELLER SOM PÅVERKAR ANVÄNDARE PÅ CELLKANTEN VÄSENTLIGT, VARS PRESTANDA REDAN BEGRÄNSAS AV STRUKTURERAD MPNINGEN PÅ RADIOKANALEN. FÖR ATT ÖVERVINNA DESSA BEGRÄNSNINGAR OCH FÖR ATT KUNNA TILLHANDAHLÅLLA SAMMA UTMÄRKTA SERVICEKVALITET TILL ALLA ANVÄNDARE BEHÖVER VI ETT MER RADIKALT ANGREPPSSÄTT: VI MÅSTE UTMANA CELLPARADIGMET. I DETTA AVSEENDE UTGÖR CELLFRI MASSIV-MIMO TEKNIK ETT PARADIGMSKIFTE. I CELLFRI MASSIV-MIMO R UTGÖRINGSPUNKTEN INTE ATT BASSTATIONEN R ÖMGIVEN AV ANVÄNDARE SOM DEN BETJÄNAR, UTAN SNARARE ATT VARJE ANVÄNDARE ÖMGES AV BASSTATIONER SOM DE BETJÄNAS AV. DESSA BASSTATIONER, OFTA MINDRE OCH ENKLARE, KALLAS ACCESSPUNKTER (AP). I ETT SÄNDANT SYSTEM UPPLIVER VARJE ANVÄNDARE ATT DEN BEFINNERS I CENTRUM AV SYSTEMET OCH INGEN ANVÄNDARE UPPLIVER NÄRGA CELLGRÄNSER. DÄRAV TERMINOLOGIN CELLFRI. SOM ETT RESULTAT AV DETTA PÅVERKAS INTE ANVÄNDARNAS AV INTER-CELLSTÖRNINGAR OCH STRUKTURERAD MPNINGEN REDUCERAS KRAFTIGT PÅ GRUND AV NÄRVARON AV MÖJLIGEN ACCESSPUNKTER I VARJE ANVÄNDARENS NÄRHET. DETTA LEDER TILL IMPONERANDE PRESTANDA. ÖVENOM DET R TILLTALANDE UR ETT PRESTANDAPERSPEKTIV SÄRSLIGT R UTFORMNINGEN OCH IMPLEMENTERINGEN AV ETT SÄNDANT DISTRIBUTERAT MASSIVT MIMO-SYSTEM EN UTMANANDE UPPGIFT, OCH DET R SYFTET MED DENNA AVHANDLING ATT STUDERA DETTA. MER SPECIFIKT STUDERAR VI I DENNA AVHANDLING: A) DEN MYCKET STORA POTENTIALEN MED DENNA TEKNIK I REALISTISKA INOMHUS- SÄRSLIGT SOM UTMANANDE SCENARIER, SAMT HUR MAN HANTERAR PRAKTISKA IMPLEMENTERINGSPROBLEM, SÄRSÄNT SOM KLOCKSYNKRONISERING BLAND ACCESSPUNKTER OCH KOSTNADEFFEKTIVA IMPLEMENTERINGAR; B) HUR MAN SKA ÖPPNÅ SKALBARHET I SYSTEMET GENOM ATT FÖRESLÅ LÖSNINGAR RELATERADE TILL DATABEHANDLING, NÄTVERKSTOPOLOGI OCH EFFEKTKONTROLL; C) HUR MAN KAR DATAHASTIGHETEN I NEDLÄNSKEN MED HJÄLP AV TVÄNYUTVECKLADE DISTRIBUTERADE VERIFIERINGSMETODER SOM TILLHANDAHLÅLLER EN AVVÄGNING MELLAN STÖRNINGSSUNDERTRYCKNING OCH FÖRSTÄRKNING AV ÖNSKADE SIGNALER, UTAN ATT ÖSKA MÖJLIGEN INTERN SIGNALERING TILL DE DISTRIBUTERADE ACCESSPUNKTERNA, OCH SOM KAN IMPLEMENTERAS I ACCESSPUNKTER MED MYCKET FÖRANTENNER; D) HUR MAN KAN FÖRÖRDRINGAR PRESTANDAN YTTRELLIGARE GENOM ATT LÖSA ANVÄNDAREN ESTIMERA NEDLÄNSKANALEN MED HJÄLP AV NEDLÄNSKPILOTER, ISTÄLLET FÖR ATT BARA FÖRLITA SIG PÅ KUNSKAP OM KANALSTATISTIK; E) EN VERIFIERINGSMETOD FÖR NEDLÄNSK SOM R MER LÖPPLIGT NÄR ENDAST KANALSTATISTIKEN R TILLGÄNGLIG FÖR ANVÄNDARNAS PRESTANDAN SOM UPPNÅS GENOM DETTA SCHEMA JÄMFÖRS MED EN UTKÄND VARIANT AV DEN NEDLÄNSK-

PILOTBASERADE METODEN (BESKRIVET I FÖREGÅENDE PUNKT); FÖRE EN METOD FÖR ATT UPPSKATTA KANALSTATISTIKEN I UPPLÖSNINGEN, SAMT EN FÖR TJÄNDE PILOTS FÖR ÖPPNINGSMETODER SOM FÖR SKILT ANVÄNDBART VID DIREKTVISNING (LINE-OF-SIGHT) OCH I SCENARIER MED RESURSBEGRENSNINGAR. DEN FÖR VERGRIPANDE SLUTSATSEN FÖR ATT CELLFRI MASSIV MIMO INTE FÖR EN UTOPI, OCH ATT ETT DISTRIBUTERAT, SKALBART, SAMT HÖGPRESTERANDE SYSTEM KAN IMPLEMENTERAS PRAKTISKT. IDAG REPRESENTERAR DETTA ETT HETT FORSKNINGSMÖNNE, MEN SNART KAN DET VISA SIG VARA EN VIKTIG MÖJLIGHET FÖR EN TEKNIK BORTOM DAGENS SYSTEM, PÅ SAMMA SÄTT SOM CENTRALISERAD MASSIV MIMO HAR VARIT FÖR DE NYA 5G-SYSTEMEN.

*5G AND BEYOND* - PARAG CHATTERJEE 2022-05-11

THE INTERNET OF THINGS (IoT) HAS SEEN THE EVENTUAL SHIFT TO THE "INTERNET OF EVERYTHING" IN THE RECENT YEARS, UNVEILING ITS UBIQUITOUS PRESENCE SPANNING FROM SMART TRANSPORTS TO SMART HEALTHCARE, FROM SMART EDUCATION TO SMART SHOPPING. WITH THE 5G ROLLOUTS ACROSS THE DIFFERENT COUNTRIES OF THE WORLD, IT RAISES NEWER PERSPECTIVES TOWARD THE INTEGRATION OF 5G IN IoT. FOR IoT-BASED SMART DEVICES, 5G NOT ONLY MEANS SPEED, BUT ALSO BETTER STABILITY, EFFICIENCY, AND MORE SECURE CONNECTIVITY. THE REACH OF 5G IN IoT IS EXTENDING IN MULTIFARIOUS AREAS LIKE SELF-DRIVING VEHICLES, SMART GRIDS FOR RENEWABLE ENERGY, AI-ENABLED ROBOTS ON FACTORY FLOORS, INTELLIGENT HEALTHCARE SERVICES . . . THE ENDLESS LIST IS THE REAL FUTURE OF 5G IN IoT. FEATURES: FUNDAMENTAL AND APPLIED PERSPECTIVES TO 5G INTEGRATION IN IoT TRANSDISCIPLINARY VISION WITH ASPECTS OF ARTIFICIAL INTELLIGENCE, INDUSTRY 4.0, AND HANDS-ON PRACTICE TOOLS DISCUSSION OF TRENDING RESEARCH ISSUES IN 5G AND IoT AS 5G TECHNOLOGIES CATALYZE A PARADIGM SHIFT IN THE DOMAIN OF IoT, THIS BOOK SERVES AS A REFERENCE FOR THE RESEARCHERS IN THE FIELD OF IoT AND 5G, PROFFERING THE LANDSCAPE TO THE TRENDING ASPECTS AS WELL AS THE KEY TOPICS OF DISCUSSION IN THE YEARS TO COME.

*INTELLIGENT MULTI-MODAL DATA PROCESSING* - SOHAM SARKAR 2021-04-06

A COMPREHENSIVE REVIEW OF THE MOST RECENT APPLICATIONS OF INTELLIGENT MULTI-MODAL DATA PROCESSING INTELLIGENT MULTI-MODAL DATA PROCESSING CONTAINS A REVIEW OF THE MOST RECENT APPLICATIONS OF DATA PROCESSING. THE EDITORS AND CONTRIBUTORS – NOTED EXPERTS ON THE TOPIC – OFFER A REVIEW OF THE NEW AND CHALLENGING AREAS OF MULTIMEDIA DATA PROCESSING AS WELL AS STATE-OF-THE-ART ALGORITHMS TO SOLVE THE PROBLEMS IN AN INTELLIGENT MANNER. THE TEXT PROVIDES A CLEAR UNDERSTANDING OF THE REAL-LIFE IMPLEMENTATION OF DIFFERENT STATISTICAL THEORIES AND EXPLAINS HOW TO IMPLEMENT VARIOUS STATISTICAL THEORIES. INTELLIGENT MULTI-MODAL DATA PROCESSING IS AN AUTHORITATIVE GUIDE FOR DEVELOPING INNOVATIVE RESEARCH IDEAS FOR INTERDISCIPLINARY RESEARCH PRACTICES. DESIGNED AS A PRACTICAL RESOURCE, THE BOOK CONTAINS TABLES TO COMPARE STATISTICAL ANALYSIS RESULTS OF A NOVEL TECHNIQUE TO THAT OF THE STATE-OF-THE-ART TECHNIQUES AND ILLUSTRATIONS IN THE FORM OF ALGORITHMS TO ESTABLISH A PRE-PROCESSING AND/OR

POST-PROCESSING TECHNIQUE FOR MODEL BUILDING. THE BOOK ALSO CONTAINS IMAGES THAT SHOW THE EFFICIENCY OF THE ALGORITHM ON STANDARD DATA SET. THIS IMPORTANT BOOK: INCLUDES AN IN-DEPTH ANALYSIS OF THE STATE-OF-THE-ART APPLICATIONS OF SIGNAL AND DATA PROCESSING CONTAINS CONTRIBUTIONS FROM NOTED EXPERTS IN THE FIELD OFFERS INFORMATION ON HYBRID DIFFERENTIAL EVOLUTION FOR OPTIMAL MULTILEVEL IMAGE THRESHOLDING PRESENTS A FUZZY DECISION BASED MULTI-OBJECTIVE EVOLUTIONARY METHOD FOR VIDEO SUMMARISATION WRITTEN FOR STUDENTS OF TECHNOLOGY AND MANAGEMENT, COMPUTER SCIENTISTS AND PROFESSIONALS IN INFORMATION TECHNOLOGY, INTELLIGENT MULTI-MODAL DATA PROCESSING BRINGS TOGETHER IN ONE VOLUME THE RANGE OF MULTI-MODAL DATA PROCESSING.

**PROCEEDING OF FIFTH INTERNATIONAL CONFERENCE ON MICROELECTRONICS, COMPUTING AND COMMUNICATION SYSTEMS** - VIJAY NATH 2021-09-09

THIS BOOK PRESENTS HIGH-QUALITY PAPERS FROM THE FIFTH INTERNATIONAL CONFERENCE ON MICROELECTRONICS, COMPUTING & COMMUNICATION SYSTEMS (MCCS 2020). IT DISCUSSES THE LATEST TECHNOLOGICAL TRENDS AND ADVANCES IN MEMS AND NANO-ELECTRONICS, WIRELESS COMMUNICATION, OPTICAL COMMUNICATION, INSTRUMENTATION, SIGNAL PROCESSING, IMAGE PROCESSING, BIOENGINEERING, GREEN ENERGY, HYBRID VEHICLES, ENVIRONMENTAL SCIENCE, WEATHER FORECASTING, CLOUD COMPUTING, RENEWABLE ENERGY, RFID, CMOS SENSORS, ACTUATORS, TRANSDUCERS, TELEMETRY SYSTEMS, EMBEDDED SYSTEMS AND SENSOR NETWORK APPLICATIONS. IT INCLUDES PAPERS BASED ON ORIGINAL THEORETICAL, PRACTICAL AND EXPERIMENTAL SIMULATIONS, DEVELOPMENT, APPLICATIONS, MEASUREMENTS AND TESTING. THE APPLICATIONS AND SOLUTIONS DISCUSSED HERE PROVIDE EXCELLENT REFERENCE MATERIAL FOR FUTURE PRODUCT DEVELOPMENT.

**PROCEEDINGS OF INTERNATIONAL CONFERENCE ON FRONTIERS IN COMPUTING AND SYSTEMS** - DEBOTOSH BHATTACHARJEE 2020-11-23

THIS BOOK GATHERS OUTSTANDING RESEARCH PAPERS PRESENTED AT THE INTERNATIONAL CONFERENCE ON FRONTIERS IN COMPUTING AND SYSTEMS (COMSYS 2020), HELD ON JANUARY 13-15, 2019 AT JALPAIGURI GOVERNMENT ENGINEERING COLLEGE, WEST BENGAL, INDIA AND JOINTLY ORGANIZED BY THE DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING AND DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING. THE BOOK PRESENTS THE LATEST RESEARCH AND RESULTS IN VARIOUS FIELDS OF MACHINE LEARNING, COMPUTATIONAL INTELLIGENCE, VLSI, NETWORKS AND SYSTEMS, COMPUTATIONAL BIOLOGY, AND SECURITY, MAKING IT A RICH SOURCE OF REFERENCE MATERIAL FOR ACADEMIA AND INDUSTRY ALIKE.

**ADVANCED HYBRID INFORMATION PROCESSING** - GUAN GUI 2019-11-28

THIS TWO-VOLUME SET LNICST 301-302 CONSTITUTES THE POST-CONFERENCE PROCEEDINGS OF THE THIRD EAI INTERNATIONAL CONFERENCE ON ADVANCED HYBRID INFORMATION PROCESSING, ADHIP 2019, HELD IN NANJING, CHINA, IN SEPTEMBER 2019. THE 101 PAPERS PRESENTED WERE SELECTED FROM 237 SUBMISSIONS AND FOCUS ON HYBRID

BIG DATA PROCESSING. SINCE INFORMATION PROCESSING HAS ACTED AS AN IMPORTANT RESEARCH DOMAIN IN SCIENCE AND TECHNOLOGY TODAY, IT IS NOW TO DEVELOP DEEPER AND WIDER USE OF HYBRID INFORMATION PROCESSING, ESPECIALLY INFORMATION PROCESSING FOR BIG DATA. THERE ARE MORE REMAINING ISSUES WAITING FOR SOLVING, SUCH AS CLASSIFICATION AND SYSTEMIZATION OF BIG DATA, OBJECTIVE TRACKING AND BEHAVIOR UNDERSTANDING IN BIG MULTIMEDIA DATA, ENCODING AND COMPRESSION OF BIG DATA.

**FOUNDATIONS OF USER-CENTRIC CELL-FREE MASSIVE MIMO** - ZLEM TUGFE DEMIR 2021-01-25

MODERN DAY CELLULAR MOBILE NETWORKS USE MASSIVE MIMO TECHNOLOGY TO EXTEND RANGE AND SERVICE MULTIPLE DEVICES WITHIN A CELL. THIS HAS BROUGHT TREMENDOUS IMPROVEMENTS IN THE HIGH PEAK DATA RATES THAT CAN BE HANDLED. NEVERTHELESS, ONE OF THE CHARACTERISTICS OF THIS TECHNOLOGY IS LARGE VARIATIONS IN THE QUALITY OF SERVICE DEPENDENT ON WHERE THE END USER IS LOCATED IN ANY GIVEN CELL. THIS BECOMES INCREASINGLY PROBLEMATIC WHEN WE ARE CREATING A SOCIETY WHERE WIRELESS ACCESS IS SUPPOSED TO BE UBIQUITOUS. WHEN PAYMENTS, NAVIGATION, ENTERTAINMENT, AND CONTROL OF AUTONOMOUS VEHICLES ARE ALL RELYING ON WIRELESS CONNECTIVITY THE PRIMARY GOAL FOR FUTURE MOBILE NETWORKS SHOULD NOT BE TO INCREASE THE PEAK RATES, BUT THE RATES THAT CAN BE GUARANTEED TO THE VAST MAJORITY OF THE LOCATIONS IN THE GEOGRAPHICAL COVERAGE AREA. THE CELLULAR NETWORK ARCHITECTURE WAS NOT DESIGNED FOR HIGH-RATE DATA SERVICES BUT FOR LOW-RATE VOICE SERVICES, THUS IT IS TIME TO LOOK BEYOND THE CELLULAR PARADIGM AND MAKE A CLEAN-SLATE NETWORK DESIGN THAT CAN REACH THE PERFORMANCE REQUIREMENTS OF THE FUTURE. THIS MONOGRAPH CONSIDERS THE CELL-FREE NETWORK ARCHITECTURE THAT IS DESIGNED TO REACH THE AFOREMENTIONED GOAL OF UNIFORMLY HIGH DATA RATES EVERYWHERE. THE AUTHORS INTRODUCE THE CONCEPT OF A CELL-FREE NETWORK BEFORE LAYING OUT THE FOUNDATIONS OF WHAT IS REQUIRED TO DESIGN AND BUILD SUCH A NETWORK. THEY COVER THE FOUNDATIONS OF CHANNEL ESTIMATION, SIGNAL PROCESSING, PILOT ASSIGNMENT, DYNAMIC COOPERATION CLUSTER FORMATION, POWER OPTIMIZATION, FRONTHAUL SIGNALING, AND SPECTRAL EFFICIENCY EVALUATION IN UPLINK AND DOWNLINK UNDER DIFFERENT DEGREES OF COOPERATION AMONG THE ACCESS POINTS AND ARBITRARY LINEAR COMBINING AND PRECODING. THIS MONOGRAPH PROVIDES THE READER WITH ALL THE FUNDAMENTAL INFORMATION REQUIRED TO DESIGN AND BUILD THE NEXT GENERATION MOBILE NETWORKS WITHOUT BEING HINDERED BY THE INHERENT RESTRICTIONS OF MODERN CELLULAR-BASED TECHNOLOGY.

**EXPERT CLOUDS AND APPLICATIONS** - I. JEENA JACOB 2022-08-17

THE BOOK FEATURES ORIGINAL PAPERS FROM INTERNATIONAL CONFERENCE ON EXPERT CLOUDS AND APPLICATIONS (ICOECA 2022), ORGANIZED BY GITAM SCHOOL OF TECHNOLOGY, BANGALORE, INDIA, DURING 3-4 FEBRUARY 2022. IT COVERS NEW RESEARCH INSIGHTS ON ARTIFICIAL INTELLIGENCE, BIG DATA, CLOUD COMPUTING, SUSTAINABILITY, KNOWLEDGE-BASED EXPERT SYSTEMS. THE BOOK DISCUSSES INNOVATIVE RESEARCH FROM ALL

ASPECTS INCLUDING THEORETICAL, PRACTICAL, AND EXPERIMENTAL DOMAINS THAT PERTAIN TO THE EXPERT SYSTEMS, SUSTAINABLE CLOUDS, AND ARTIFICIAL INTELLIGENCE TECHNOLOGIES.

**FUNDAMENTALS OF MASSIVE MIMO** - THOMAS L. MARZETTA 2016-11-17

WRITTEN BY PIONEERS OF THE CONCEPT, THIS IS THE FIRST COMPLETE GUIDE TO THE PHYSICAL AND ENGINEERING PRINCIPLES OF MASSIVE MIMO. ASSUMING ONLY A BASIC BACKGROUND IN COMMUNICATIONS AND STATISTICAL SIGNAL PROCESSING, IT WILL GUIDE READERS THROUGH KEY TOPICS IN MULTI-CELL SYSTEMS SUCH AS PROPAGATION MODELING, MULTIPLEXING AND DE-MULTIPLEXING, CHANNEL ESTIMATION, POWER CONTROL, AND PERFORMANCE EVALUATION. THE AUTHORS' UNIQUE CAPACITY-BOUNDING APPROACH WILL ENABLE READERS TO CARRY OUT EFFECTIVE SYSTEM PERFORMANCE ANALYSES AND DEVELOP ADVANCED MASSIVE MIMO TECHNIQUES AND ALGORITHMS. NUMEROUS CASE STUDIES, AS WELL AS PROBLEM SETS AND SOLUTIONS ACCOMPANYING THE BOOK ONLINE, WILL HELP READERS PUT KNOWLEDGE INTO PRACTICE AND ACQUIRE THE SKILL SET NEEDED TO DESIGN AND ANALYZE COMPLEX WIRELESS COMMUNICATION SYSTEMS. WHETHER YOU ARE A GRADUATE STUDENT, RESEARCHER, OR INDUSTRY PROFESSIONAL WORKING IN THE FIELD OF WIRELESS COMMUNICATIONS, THIS WILL BE AN INDISPENSABLE GUIDE FOR YEARS TO COME.

**CIRCUITS, SIGNALS, AND SPEECH AND IMAGE PROCESSING** - RICHARD C. DORF 2018-10-03

IN TWO EDITIONS SPANNING MORE THAN A DECADE, THE ELECTRICAL ENGINEERING HANDBOOK STANDS AS THE DEFINITIVE REFERENCE TO THE MULTIDISCIPLINARY FIELD OF ELECTRICAL ENGINEERING. OUR KNOWLEDGE CONTINUES TO GROW, AND SO DOES THE HANDBOOK. FOR THE THIRD EDITION, IT HAS EXPANDED INTO A SET OF SIX BOOKS CAREFULLY FOCUSED ON A SPECIALIZED AREA OR FIELD OF STUDY. EACH BOOK REPRESENTS A CONCISE YET DEFINITIVE COLLECTION OF KEY CONCEPTS, MODELS, AND EQUATIONS IN ITS RESPECTIVE DOMAIN, THOUGHTFULLY GATHERED FOR CONVENIENT ACCESS. CIRCUITS, SIGNALS, AND SPEECH AND IMAGE PROCESSING PRESENTS ALL OF THE BASIC INFORMATION RELATED TO ELECTRIC CIRCUITS AND COMPONENTS, ANALYSIS OF CIRCUITS, THE USE OF THE LAPLACE TRANSFORM, AS WELL AS SIGNAL, SPEECH, AND IMAGE PROCESSING USING FILTERS AND ALGORITHMS. IT ALSO EXAMINES EMERGING AREAS SUCH AS TEXT-TO-SPEECH SYNTHESIS, REAL-TIME PROCESSING, AND EMBEDDED SIGNAL PROCESSING. EACH ARTICLE INCLUDES DEFINING TERMS, REFERENCES, AND SOURCES OF FURTHER INFORMATION. ENCOMPASSING THE WORK OF THE WORLD'S FOREMOST EXPERTS IN THEIR RESPECTIVE SPECIALTIES, CIRCUITS, SIGNALS, AND SPEECH AND IMAGE PROCESSING FEATURES THE LATEST DEVELOPMENTS, THE BROADEST SCOPE OF COVERAGE, AND NEW MATERIAL ON BIOMETRICS.

**RESOURCE ALLOCATION AND MIMO FOR 4G AND BEYOND** - FRANCISCO RODRIGO PORTO CAVALCANTI 2013-10-23

THIS BOOK WILL BE A COMPREHENSIVE COLLECTION OF ADVANCED CONCEPTS RELATED TO 4TH GENERATION WIRELESS COMMUNICATION SYSTEMS. IT WILL BE DIVIDED INTO TWO MAIN PARTS: RESOURCE ALLOCATION AND TRANSCIVER ARCHITECTURES. THESE TWO RESEARCH AREAS ARE AT THE CORE OF THE RECENT ADVANCES EXPERIMENTED BY WIRELESS

COMMUNICATION SYSTEMS. EACH CHAPTER WILL COVER A RELEVANT, TIMELY, TOPIC WITH TWO FOCUSES: A FIRST PART WHICH IS OF TUTORIAL AND SURVEY NATURE, REVIEWS THE STATE OF THE ART IN THAT TOPIC, FOLLOWED BY A MORE DEEP TREATMENT INCLUDING CURRENT RESEARCH TOPICS, CASE STUDIES AND PERFORMANCE ANALYSIS.

LARGE MIMO SYSTEMS - A. CHOCKALINGAM 2014-02-06

THIS EXCLUSIVE COVERAGE OF THE OPPORTUNITIES, TECHNOLOGICAL CHALLENGES, SOLUTIONS, AND STATE OF THE ART OF LARGE MIMO SYSTEMS PROVIDES AN IN-DEPTH DISCUSSION OF ALGORITHMS FOR LARGE MIMO SIGNAL PROCESSING, SUITED FOR LARGE MIMO SIGNAL DETECTION, PRECODING AND LDPC CODE DESIGNS. AN IDEAL RESOURCE FOR RESEARCHERS, DESIGNERS, DEVELOPERS AND PRACTITIONERS IN WIRELESS COMMUNICATIONS.

INVENTIVE COMPUTATION AND INFORMATION TECHNOLOGIES - S. SMYS 2023-03-01

THIS BOOK IS A COLLECTION OF BEST SELECTED PAPERS PRESENTED AT THE FOURTH INTERNATIONAL CONFERENCE ON INVENTIVE COMPUTATION AND INFORMATION TECHNOLOGIES (ICICIT 2022), ORGANIZED DURING AUGUST 25-26, 2022. THIS BOOK INCLUDES PAPERS IN THE RESEARCH AREA OF INFORMATION SCIENCES AND COMMUNICATION ENGINEERING. THIS BOOK PRESENTS NOVEL AND INNOVATIVE RESEARCH RESULTS IN THEORY, METHODOLOGY AND APPLICATIONS OF COMMUNICATION ENGINEERING AND INFORMATION TECHNOLOGIES.

MIMO-OFDM WIRELESS COMMUNICATIONS WITH MATLAB - Yong Soo Cho 2010-08-20

MIMO-OFDM IS A KEY TECHNOLOGY FOR NEXT-GENERATION CELLULAR COMMUNICATIONS (3GPP-LTE, MOBILE WiMAX, IMT-ADVANCED) AS WELL AS WIRELESS LAN (IEEE 802.11A, IEEE 802.11N), WIRELESS PAN (MB-OFDM), AND BROADCASTING (DAB, DVB, DMB). IN MIMO-OFDM WIRELESS COMMUNICATIONS WITH MATLAB®, THE AUTHORS PROVIDE A COMPREHENSIVE INTRODUCTION TO THE THEORY AND PRACTICE OF WIRELESS CHANNEL MODELING, OFDM, AND MIMO, USING MATLAB® PROGRAMS TO SIMULATE THE VARIOUS TECHNIQUES ON MIMO-OFDM SYSTEMS. ONE OF THE ONLY BOOKS IN THE AREA DEDICATED TO EXPLAINING SIMULATION ASPECTS COVERS IMPLEMENTATION TO HELP CEMENT THE KEY CONCEPTS USES MATERIALS THAT HAVE BEEN CLASSROOM-TESTED IN NUMEROUS UNIVERSITIES PROVIDES THE ANALYTIC SOLUTIONS AND PRACTICAL EXAMPLES WITH DOWNLOADABLE MATLAB® CODES SIMULATION EXAMPLES BASED ON ACTUAL INDUSTRY AND RESEARCH PROJECTS PRESENTATION SLIDES WITH KEY EQUATIONS AND FIGURES FOR INSTRUCTOR USE MIMO-OFDM WIRELESS COMMUNICATIONS WITH MATLAB® IS A KEY TEXT FOR GRADUATE STUDENTS IN WIRELESS COMMUNICATIONS. PROFESSIONALS AND TECHNICIANS IN WIRELESS COMMUNICATION FIELDS, GRADUATE STUDENTS IN SIGNAL PROCESSING, AS WELL AS SENIOR UNDERGRADUATES MAJORING IN WIRELESS COMMUNICATIONS WILL FIND THIS BOOK A PRACTICAL INTRODUCTION TO THE MIMO-OFDM TECHNIQUES. INSTRUCTOR MATERIALS AND MATLAB® CODE EXAMPLES AVAILABLE FOR DOWNLOAD AT [WWW.WILEY.COM/GO/CHOMIMO](http://www.wiley.com/go/chomimo)

WITS 2020 - SAAD BENNANI 2021-07-21

THIS BOOK PRESENTS PEER-REVIEWED ARTICLES FROM THE 6TH INTERNATIONAL CONFERENCE

ON WIRELESS TECHNOLOGIES, EMBEDDED AND INTELLIGENT SYSTEMS (WITS 2020), HELD AT FEZ, MOROCCO. IT PRESENTS ORIGINAL RESEARCH RESULTS, NEW IDEAS AND PRACTICAL LESSONS LEARNT THAT TOUCH ON ALL ASPECTS OF WIRELESS TECHNOLOGIES, EMBEDDED AND INTELLIGENT SYSTEMS. WITS IS AN INTERNATIONAL CONFERENCE THAT SERVES RESEARCHERS, SCHOLARS, PROFESSIONALS, STUDENTS AND ACADEMICIANS LOOKING TO FOSTER BOTH WORKING RELATIONSHIPS AND GAIN ACCESS TO THE LATEST RESEARCH RESULTS. TOPICS COVERED INCLUDE TELECOMS & WIRELESS NETWORKING ELECTRONICS & MULTIMEDIA EMBEDDED & INTELLIGENT SYSTEMS RENEWABLE ENERGIES.

LTE - THE UMTS LONG TERM EVOLUTION - STEFANIA SESIA 2011-08-29

"WHERE THIS BOOK IS EXCEPTIONAL IS THAT THE READER WILL NOT JUST LEARN HOW LTE WORKS BUT WHY IT WORKS" ADRIAN SCRASE, ETSI VICE-PRESIDENT, INTERNATIONAL PARTNERSHIP PROJECTS FOLLOWING ON THE SUCCESS OF THE FIRST EDITION, THIS BOOK IS FULLY UPDATED, COVERING THE LATEST ADDITIONS TO LTE AND THE KEY FEATURES OF LTE-ADVANCED. THIS BOOK BUILDS ON THE SUCCESS OF ITS PREDECESSOR, OFFERING THE SAME COMPREHENSIVE SYSTEM-LEVEL UNDERSTANDING BUILT ON EXPLANATIONS OF THE UNDERLYING THEORY, NOW EXPANDED TO INCLUDE COMPLETE COVERAGE OF RELEASE 9 AND THE DEVELOPING SPECIFICATIONS FOR LTE-ADVANCED. THE BOOK IS A COLLABORATIVE EFFORT OF MORE THAN 40 KEY EXPERTS REPRESENTING OVER 20 COMPANIES ACTIVELY PARTICIPATING IN THE DEVELOPMENT OF LTE, AS WELL AS ACADEMIA. THE BOOK HIGHLIGHTS PRACTICAL IMPLICATIONS, ILLUSTRATES THE EXPECTED PERFORMANCE, AND DRAWS COMPARISONS WITH THE WELL-KNOWN WCDMA/HSPA STANDARDS. THE AUTHORS NOT ONLY PAY SPECIAL ATTENTION TO THE PHYSICAL LAYER, GIVING AN INSIGHT INTO THE FUNDAMENTAL CONCEPTS OF OFDMA-FDMA AND MIMO, BUT ALSO COVER THE HIGHER PROTOCOL LAYERS AND SYSTEM ARCHITECTURE TO ENABLE THE READER TO GAIN AN OVERALL UNDERSTANDING OF THE SYSTEM. KEY NEW FEATURES: COMPREHENSIVELY UPDATED WITH THE LATEST CHANGES OF THE LTE RELEASE 8 SPECIFICATIONS, INCLUDING IMPROVED COVERAGE OF RADIO RESOURCE MANAGEMENT RF ASPECTS AND PERFORMANCE REQUIREMENTS PROVIDES DETAILED COVERAGE OF THE NEW LTE RELEASE 9 FEATURES, INCLUDING: eMBMS, DUAL-LAYER BEAMFORMING, USER EQUIPMENT POSITIONING, HOME eNODEBs / FEMTOCELLS AND PICO CELLS AND SELF-OPTIMIZING NETWORKS EVALUATES THE LTE SYSTEM PERFORMANCE INTRODUCES LTE-ADVANCED, EXPLAINING ITS CONTEXT AND MOTIVATION, AS WELL AS THE KEY NEW FEATURES INCLUDING: CARRIER AGGREGATION, RELAYING, HIGH-ORDER MIMO, AND COOPERATIVE MULTI-POINT TRANSMISSION (CoMP). INCLUDES AN ACCOMPANYING WEBSITE CONTAINING A COMPLETE LIST OF ACRONYMS RELATED TO LTE AND LTE-ADVANCED, WITH A BRIEF DESCRIPTION OF EACH ([HTTP://WWW.WILEY.COM/GO/SESIAS\\_THEUMTS](http://www.wiley.com/go/sesia_theumts)) THIS BOOK IS AN INVALUABLE REFERENCE FOR ALL RESEARCH AND DEVELOPMENT ENGINEERS INVOLVED IN IMPLEMENTATION OF LTE OR LTE-ADVANCED, AS WELL AS GRADUATE AND PHD STUDENTS IN WIRELESS COMMUNICATIONS. NETWORK OPERATORS, SERVICE PROVIDERS AND R&D MANAGERS WILL ALSO FIND THIS BOOK INSIGHTFUL.

THE ELECTRICAL ENGINEERING HANDBOOK - SIX VOLUME SET - RICHARD C. DORF  
2018-12-14

IN TWO EDITIONS SPANNING MORE THAN A DECADE, THE ELECTRICAL ENGINEERING HANDBOOK STANDS AS THE DEFINITIVE REFERENCE TO THE MULTIDISCIPLINARY FIELD OF ELECTRICAL ENGINEERING. OUR KNOWLEDGE CONTINUES TO GROW, AND SO DOES THE HANDBOOK. FOR THE THIRD EDITION, IT HAS GROWN INTO A SET OF SIX BOOKS CAREFULLY FOCUSED ON SPECIALIZED AREAS OR FIELDS OF STUDY. EACH ONE REPRESENTS A CONCISE YET DEFINITIVE COLLECTION OF KEY CONCEPTS, MODELS, AND EQUATIONS IN ITS RESPECTIVE DOMAIN, THOUGHTFULLY GATHERED FOR CONVENIENT ACCESS. COMBINED, THEY CONSTITUTE THE MOST COMPREHENSIVE, AUTHORITATIVE RESOURCE AVAILABLE. CIRCUITS, SIGNALS, AND SPEECH AND IMAGE PROCESSING PRESENTS ALL OF THE BASIC INFORMATION RELATED TO ELECTRIC CIRCUITS AND COMPONENTS, ANALYSIS OF CIRCUITS, THE USE OF THE LAPLACE TRANSFORM, AS WELL AS SIGNAL, SPEECH, AND IMAGE PROCESSING USING FILTERS AND ALGORITHMS. IT ALSO EXAMINES EMERGING AREAS SUCH AS TEXT TO SPEECH SYNTHESIS, REAL-TIME PROCESSING, AND EMBEDDED SIGNAL PROCESSING. ELECTRONICS, POWER ELECTRONICS, OPTOELECTRONICS, MICROWAVES, ELECTROMAGNETICS, AND RADAR DELVES INTO THE FIELDS OF ELECTRONICS, INTEGRATED CIRCUITS, POWER ELECTRONICS, OPTOELECTRONICS, ELECTROMAGNETICS, LIGHT WAVES, AND RADAR, SUPPLYING ALL OF THE BASIC INFORMATION REQUIRED FOR A DEEP UNDERSTANDING OF EACH AREA. IT ALSO DEVOTES A SECTION TO ELECTRICAL EFFECTS AND DEVICES AND EXPLORES THE EMERGING FIELDS OF MICROLITHOGRAPHY AND POWER ELECTRONICS. SENSORS, NANOSCIENCE, BIOMEDICAL ENGINEERING, AND INSTRUMENTS PROVIDES THOROUGH COVERAGE OF SENSORS, MATERIALS AND NANOSCIENCE, INSTRUMENTS AND MEASUREMENTS, AND BIOMEDICAL SYSTEMS AND DEVICES, INCLUDING ALL OF THE BASIC INFORMATION REQUIRED TO THOROUGHLY UNDERSTAND EACH AREA. IT EXPLORES THE EMERGING FIELDS OF SENSORS, NANOTECHNOLOGIES, AND BIOLOGICAL EFFECTS. BROADCASTING AND OPTICAL COMMUNICATION TECHNOLOGY EXPLORES COMMUNICATIONS, INFORMATION THEORY, AND DEVICES, COVERING ALL OF THE BASIC INFORMATION NEEDED FOR A THOROUGH UNDERSTANDING OF THESE AREAS. IT ALSO EXAMINES THE EMERGING AREAS OF ADAPTIVE ESTIMATION AND OPTICAL COMMUNICATION. COMPUTERS, SOFTWARE ENGINEERING, AND DIGITAL DEVICES EXAMINES DIGITAL AND LOGICAL DEVICES, DISPLAYS, TESTING, SOFTWARE, AND COMPUTERS, PRESENTING THE FUNDAMENTAL CONCEPTS NEEDED TO ENSURE A THOROUGH UNDERSTANDING OF EACH FIELD. IT TREATS THE EMERGING FIELDS OF PROGRAMMABLE LOGIC, HARDWARE DESCRIPTION LANGUAGES, AND PARALLEL COMPUTING IN DETAIL. SYSTEMS, CONTROLS, EMBEDDED SYSTEMS, ENERGY, AND MACHINES EXPLORES IN DETAIL THE FIELDS OF ENERGY DEVICES, MACHINES, AND SYSTEMS AS WELL AS CONTROL SYSTEMS. IT PROVIDES ALL OF THE FUNDAMENTAL CONCEPTS NEEDED FOR THOROUGH, IN-DEPTH UNDERSTANDING OF EACH AREA AND DEVOTES SPECIAL ATTENTION TO THE EMERGING AREA OF EMBEDDED SYSTEMS. ENCOMPASSING THE WORK OF THE WORLD'S FOREMOST EXPERTS IN THEIR RESPECTIVE SPECIALTIES, THE ELECTRICAL ENGINEERING HANDBOOK, THIRD EDITION REMAINS THE MOST

CONVENIENT, RELIABLE SOURCE OF INFORMATION AVAILABLE. THIS EDITION FEATURES THE LATEST DEVELOPMENTS, THE BROADEST SCOPE OF COVERAGE, AND NEW MATERIAL ON NANOTECHNOLOGIES, FUEL CELLS, EMBEDDED SYSTEMS, AND BIOMETRICS. THE ENGINEERING COMMUNITY HAS RELIED ON THE HANDBOOK FOR MORE THAN TWELVE YEARS, AND IT WILL CONTINUE TO BE A PLATFORM TO LAUNCH THE NEXT WAVE OF ADVANCEMENTS. THE HANDBOOK'S LATEST INCARNATION FEATURES A PROTECTIVE SLIPCASE, WHICH HELPS YOU STAY ORGANIZED WITHOUT OVERWHELMING YOUR BOOKSHELF. IT IS AN ATTRACTIVE ADDITION TO ANY COLLECTION, AND WILL HELP KEEP EACH VOLUME OF THE HANDBOOK AS FRESH AS YOUR LATEST RESEARCH.

MASSIVE IoT ACCESS FOR 6G - ZHEN GAO 2022-07-01

THE INTERNET-OF-THINGS (IoT) REVOLUTION HAS TRIGGERED THE NEED OF MASSIVE CONNECTIVITY FOR BILLIONS OF DEVICES REQUIRING A SYSTEM CAPACITY WHICH IS FAR BEYOND THE CURRENT NETWORK DESIGNS THAT CAN BE SUPPORTED. THIS EMERGING REQUIREMENT HAS RESHAPED THE SOCIETY AND INDUSTRY IN PURSUING EFFICIENT COMMUNICATION PARADIGM. IN PARTICULAR, MASSIVE MACHINE-TYPE COMMUNICATIONS (MMTC) WILL BE A PRIME DRIVER FOR ENABLING THE VISION OF SCALABLE IoT WITH HETEROGENEOUS APPLICATIONS, WHERE THE MASSIVE ACCESS IS OF PARAMOUNT IMPORTANCE. THIS BOOK DISCUSSES IMPORTANT MASSIVE IoT SCENARIOS AND THE KEY TECHNICAL REQUIREMENTS OF THE CORRESPONDING MASSIVE ACCESS. WE REVIEW THE STATE-OF-THE-ART IoT STANDARDS AND MMTC SOLUTIONS, AND SUMMARIZE THE LIMITATIONS OF THE EXISTING SCHEMES FROM THE PERSPECTIVES OF THE NETWORK ARCHITECTURE, RANDOM ACCESS PROCEDURE, AND MULTIPLE ACCESS TECHNIQUES. HERE, WE SPECIFY THE MASSIVE ACCESS CHALLENGES AND REVEAL THAT THE FACILITATION OF MTC INVOKES A DRAMATICALLY DIFFERENT ACCESS SCHEME FROM CURRENT ONES MAINLY DESIGNED FOR HUMAN-CENTRIC COMMUNICATIONS. MOREOVER, WE PROPOSE SEVERAL PROMISING MASSIVE ACCESS SOLUTIONS TO OVERCOME THE LIMITATIONS, WHERE SUFFICIENT THEORETICAL MODEL AND ALGORITHM DESIGN GUIDANCE ARE PROVIDED. BESIDES, DETAILED SIMULATION AND ENGINEERING IMPLEMENTATION METHODS ARE ALSO INCLUDED.

ARTIFICIAL INTELLIGENCE RESEARCH - ANBAN PILLAY 2022-11-30

THIS BOOK CONSTITUTES THE REFEREED PROCEEDINGS OF THE THIRD SOUTHERN AFRICAN CONFERENCE ON ARTIFICIAL INTELLIGENCE RESEARCH, SACAIR 2022, HELD IN STELLENBOSCH, SOUTH AFRICA, IN DECEMBER 2022. THE 26 PAPERS PRESENTED WERE THOROUGHLY REVIEWED AND SELECTED FROM THE 73 SUBMISSIONS. THEY ARE ORGANIZED ON THE TOPICAL SECTIONS ON ALGORITHMIC, DATA DRIVEN AND SYMBOLIC AI; SOCIO-TECHNICAL AND HUMAN-CENTERED AI; RESPONSIBLE AND ETHICAL AI.

ADVANCED HYBRID INFORMATION PROCESSING - GUANGLU SUN 2018-02-01

THIS BOOK CONSTITUTES THE REFEREED PROCEEDINGS OF THE FIRST INTERNATIONAL CONFERENCE ON ADVANCED HYBRID INFORMATION PROCESSING, ADHIB 2017, HELD IN HARBIN, CHINA, IN JULY 2017. THE 64 FULL PAPERS WERE SELECTED FROM 134 SUBMISSIONS AND FOCUS ON ADVANCED METHODS AND APPLICATIONS FOR HYBRID

INFORMATION PROCESSING.

SPACE-TIME CODES AND MIMO SYSTEMS - MOHINDER JANKIRAMAN 2004

ANNOTATION "THIS RESOURCE TAKES PROFESSIONALS STEP BY STEP FROM THE BASICS OF MIMO THROUGH VARIOUS CODING TECHNIQUES, TO CRITICAL TOPICS SUCH AS MULTIPLEXING AND PACKET TRANSMISSION. PRACTICAL EXAMPLES ARE EMPHASIZED AND MATHEMATICS IS KEPT TO A MINIMUM, SO READERS CAN QUICKLY AND THOROUGHLY UNDERSTAND THE ESSENTIALS OF MIMO. THE BOOK TAKES A SYSTEMS VIEW OF MIMO TECHNOLOGY THAT HELPS PROFESSIONALS ANALYZE THE BENEFITS AND DRAWBACKS OF ANY MIMO SYSTEM."--BOOK JACKET.TITLE SUMMARY FIELD PROVIDED BY BLACKWELL NORTH AMERICA, INC. ALL RIGHTS RESERVED.

**MASSIVE MIMO SYSTEMS** - KAZUKI MARUTA 2020-07-03

MULTIPLE-INPUT, MULTIPLE-OUTPUT (MIMO), WHICH TRANSMITS MULTIPLE DATA STREAMS VIA MULTIPLE ANTENNA ELEMENTS, IS ONE OF THE MOST ATTRACTIVE TECHNOLOGIES IN THE WIRELESS COMMUNICATION FIELD. ITS EXTENSION, CALLED 'MASSIVE MIMO' OR 'LARGE-SCALE MIMO', IN WHICH BASE STATION HAS OVER ONE HUNDRED OF THE ANTENNA ELEMENTS, IS NOW SEEN AS A PROMISING CANDIDATE TO REALIZE 5G AND BEYOND, AS WELL AS 6G MOBILE COMMUNICATIONS. IT HAS BEEN THE FIRST DECADE SINCE ITS FUNDAMENTAL CONCEPT EMERGED. THIS SPECIAL ISSUE CONSISTS OF 19 PAPERS AND EACH OF THEM FOCUSES ON A POPULAR TOPIC RELATED TO MASSIVE MIMO SYSTEMS, E.G. ANALOG/DIGITAL HYBRID SIGNAL PROCESSING, ANTENNA FABRICATION, AND MACHINE LEARNING INCORPORATION. THESE ACHIEVEMENTS COULD BOOST ITS REALIZATION AND DEEPEN THE ACADEMIC AND INDUSTRIAL KNOWLEDGE OF THIS FIELD.

ICT SYSTEMS AND SUSTAINABILITY - MILAN TUBA 2022-01-04

THIS BOOK PROPOSES NEW TECHNOLOGIES AND DISCUSSES FUTURE SOLUTIONS FOR ICT DESIGN INFRASTRUCTURES, AS REFLECTED IN HIGH-QUALITY PAPERS PRESENTED AT THE 6TH INTERNATIONAL CONFERENCE ON ICT FOR SUSTAINABLE DEVELOPMENT (ICT4SD 2021), HELD IN GOA, INDIA, ON 5-6 AUGUST 2021. THE BOOK COVERS THE TOPICS SUCH AS BIG DATA AND DATA MINING, DATA FUSION, IoT PROGRAMMING TOOLKITS AND FRAMEWORKS, GREEN COMMUNICATION SYSTEMS AND NETWORK, USE OF ICT IN SMART CITIES, SENSOR NETWORKS AND EMBEDDED SYSTEM, NETWORK AND INFORMATION SECURITY, WIRELESS AND OPTICAL NETWORKS, SECURITY, TRUST, AND PRIVACY, ROUTING AND CONTROL PROTOCOLS, COGNITIVE RADIO AND NETWORKS, AND NATURAL LANGUAGE PROCESSING. BRINGING TOGETHER EXPERTS FROM DIFFERENT COUNTRIES, THE BOOK EXPLORES A RANGE OF CENTRAL ISSUES FROM AN INTERNATIONAL PERSPECTIVE.

DATA ANALYTICS AND MANAGEMENT - ASHISH KHANNA 2021-01-04

THIS BOOK INCLUDES ORIGINAL UNPUBLISHED CONTRIBUTIONS PRESENTED AT THE INTERNATIONAL CONFERENCE ON DATA ANALYTICS AND MANAGEMENT (ICDAM 2020), HELD AT JAN WYZYKOWSKI UNIVERSITY, POLAND, DURING JUNE 2020. THE BOOK COVERS THE TOPICS IN DATA ANALYTICS, DATA MANAGEMENT, BIG DATA, COMPUTATIONAL INTELLIGENCE, AND COMMUNICATION NETWORKS. THE BOOK PRESENTS INNOVATIVE WORK BY

LEADING ACADEMICS, RESEARCHERS, AND EXPERTS FROM INDUSTRY WHICH IS USEFUL FOR YOUNG RESEARCHERS AND STUDENTS.

**COMPUTATIONAL SCIENCE AND ITS APPLICATIONS - ICCSA 2022** - OSVALDO GERVASI 2022-07-14

THE EIGHT-VOLUME SET LNCS 13375 - 13382 CONSTITUTES THE PROCEEDINGS OF THE 22ND INTERNATIONAL CONFERENCE ON COMPUTATIONAL SCIENCE AND ITS APPLICATIONS, ICCSA 2022, WHICH WAS HELD IN MALAGA, SPAIN DURING JULY 4 - 7, 2022. THE FIRST TWO VOLUMES CONTAIN THE PROCEEDINGS FROM ICCSA 2022, WHICH ARE THE 57 FULL AND 24 SHORT PAPERS PRESENTED IN THESE BOOKS WERE CAREFULLY REVIEWED AND SELECTED FROM 279 SUBMISSIONS. THE OTHER SIX VOLUMES PRESENT THE WORKSHOP PROCEEDINGS, CONTAINING 285 PAPERS OUT OF 815 SUBMISSIONS. THESE SIX VOLUMES INCLUDES THE PROCEEDINGS OF THE FOLLOWING WORKSHOPS: ADVANCES IN ARTIFICIAL INTELLIGENCE LEARNING TECHNOLOGIES: BLENDED LEARNING, STEM, COMPUTATIONAL THINKING AND CODING (AAILT 2022); WORKSHOP ON ADVANCEMENTS IN APPLIED MACHINE-LEARNING AND DATA ANALYTICS (AAMDA 2022); ADVANCES IN INFORMATION SYSTEMS AND TECHNOLOGIES FOR EMERGENCY MANAGEMENT, RISK ASSESSMENT AND MITIGATION BASED ON THE RESILIENCE (ASTER 2022); ADVANCES IN WEB BASED LEARNING (AWBL 2022); BLOCKCHAIN AND DISTRIBUTED LEDGERS: TECHNOLOGIES AND APPLICATIONS (BDLTA 2022); BIO AND NEURO INSPIRED COMPUTING AND APPLICATIONS (BIONCA 2022); CONFIGURATIONAL ANALYSIS FOR CITIES (CA CITIES 2022); COMPUTATIONAL AND APPLIED MATHEMATICS (CAM 2022), COMPUTATIONAL AND APPLIED STATISTICS (CAS 2022); COMPUTATIONAL MATHEMATICS, STATISTICS AND INFORMATION MANAGEMENT (CMSIM); COMPUTATIONAL OPTIMIZATION AND APPLICATIONS (COA 2022); COMPUTATIONAL ASTROCHEMISTRY (COMPASTRO 2022); COMPUTATIONAL METHODS FOR POROUS GEOMATERIALS (COMPOR 2022); COMPUTATIONAL APPROACHES FOR SMART, CONSCIOUS CITIES (CASCC 2022); CITIES, TECHNOLOGIES AND PLANNING (CTP 2022); DIGITAL SUSTAINABILITY AND CIRCULAR ECONOMY (DISCE 2022); ECONOMETRICS AND MULTIDIMENSIONAL EVALUATION IN URBAN ENVIRONMENT (EMEUE 2022); ETHICAL AI APPLICATIONS FOR A HUMAN-CENTERED CYBER SOCIETY (ETHICAI 2022); FUTURE COMPUTING SYSTEM TECHNOLOGIES AND APPLICATIONS (FISTA 2022); GEOGRAPHICAL COMPUTING AND REMOTE SENSING FOR ARCHAEOLOGY (GCRSARCHEO 2022); GEODESIGN IN DECISION MAKING: META PLANNING AND COLLABORATIVE DESIGN FOR SUSTAINABLE AND INCLUSIVE DEVELOPMENT (GDM 2022); GEOMATICS IN AGRICULTURE AND FORESTRY: NEW ADVANCES AND PERSPECTIVES (GeoForAgr 2022); GEOGRAPHICAL ANALYSIS, URBAN MODELING, SPATIAL STATISTICS (GEOG-AN-MOD 2022); GEOMATICS FOR RESOURCE MONITORING AND MANAGEMENT (GRMM 2022); INTERNATIONAL WORKSHOP ON INFORMATION AND KNOWLEDGE IN THE INTERNET OF THINGS (IKIT 2022); 13TH INTERNATIONAL SYMPOSIUM ON SOFTWARE QUALITY (ISSQ 2022); LAND USE MONITORING FOR SUSTAINABILITY (LUMS 2022); MACHINE LEARNING FOR SPACE AND EARTH OBSERVATION DATA (MALSEOD 2022);



BUILDING MULTI-DIMENSIONAL MODELS FOR ASSESSING COMPLEX ENVIRONMENTAL SYSTEMS (MES 2022); MODELS AND INDICATORS FOR ASSESSING AND MEASURING THE URBAN SETTLEMENT DEVELOPMENT IN THE VIEW OF ZERO NET LAND TAKE BY 2050 (MOVEto0 2022); MODELLING Post-COVID CITIES (MPCC 2022); ECOSYSTEM SERVICES: NATURE'S CONTRIBUTION TO PEOPLE IN PRACTICE. ASSESSMENT FRAMEWORKS, MODELS, MAPPING, AND IMPLICATIONS (NC2P 2022); NEW MOBILITY CHOICES FOR SUSTAINABLE AND ALTERNATIVE SCENARIOS (NEMOB 2022); 2ND WORKSHOP ON PRIVACY IN THE CLOUD/EDGE/IoT WORLD (PCEIoT 2022); PSYCHO-SOCIAL ANALYSIS OF SUSTAINABLE MOBILITY IN THE PRE- AND POST-PANDEMIC PHASE (PSYCHE 2022); PROCESSES, METHODS AND TOOLS TOWARDS RESILIENT CITIES AND CULTURAL HERITAGE PRONE TO SOD AND ROD DISASTERS (RES 2022); SCIENTIFIC COMPUTING INFRASTRUCTURE (SCI 2022); SOCIO-ECONOMIC AND ENVIRONMENTAL MODELS FOR LAND USE MANAGEMENT (SEMLUM 2022); 14TH INTERNATIONAL SYMPOSIUM ON SOFTWARE ENGINEERING PROCESSES AND APPLICATIONS (SEPA 2022); PORTS OF THE FUTURE - SMARTNESS AND SUSTAINABILITY (SMARTPORTS 2022); SMART TOURISM (SMARTTOURISM 2022); SUSTAINABILITY PERFORMANCE ASSESSMENT: MODELS, APPROACHES AND APPLICATIONS TOWARD INTERDISCIPLINARY AND INTEGRATED SOLUTIONS (SPA 2022); SPECIFICS OF SMART CITIES DEVELOPMENT IN EUROPE (SPEED 2022); SMART AND SUSTAINABLE ISLAND COMMUNITIES (SSIC 2022); THEORETICAL AND COMPUTATIONAL CHEMISTRY AND ITS APPLICATIONS (TCCMA 2022); TRANSPORT INFRASTRUCTURES FOR SMART CITIES (TISC 2022); 14TH INTERNATIONAL WORKSHOP ON TOOLS AND TECHNIQUES IN SOFTWARE DEVELOPMENT PROCESS (TTSDP 2022); INTERNATIONAL WORKSHOP ON URBAN FORM STUDIES (UFORM 2022); URBAN REGENERATION: INNOVATIVE TOOLS AND EVALUATION MODEL (URITEM 2022); INTERNATIONAL WORKSHOP ON URBAN SPACE AND MOBILITIES (USAM 2022); VIRTUAL AND AUGMENTED REALITY AND APPLICATIONS (VRA 2022); ADVANCED AND COMPUTATIONAL METHODS FOR EARTH SCIENCE APPLICATIONS (WACM4ES 2022); ADVANCED MATHEMATICS AND COMPUTING METHODS IN COMPLEX COMPUTATIONAL SYSTEMS (WAMCM 2022).

**RECENT INNOVATIONS IN COMPUTING** - PRADEEP KUMAR SINGH 2022-04-15

THIS BOOK FEATURES SELECTED PAPERS PRESENTED AT THE 4TH INTERNATIONAL CONFERENCE ON RECENT INNOVATIONS IN COMPUTING (ICRIC 2021), HELD ON JUNE 8-9, 2021 BY ELTE UNIVERSITY (ELTE), BUDAPEST, HUNGARY IN ASSOCIATION WITH MANY UNIVERSITIES; WSG POLAND, KNOWLEDGE UNIVERSITY, ERBIL. THE BOOK IS DIVIDED INTO TWO VOLUMES, AND IT INCLUDES THE LATEST RESEARCH IN THE AREAS OF SOFTWARE ENGINEERING, CLOUD COMPUTING, COMPUTER NETWORKS AND INTERNET TECHNOLOGIES, ARTIFICIAL INTELLIGENCE, INFORMATION SECURITY, DATABASE AND DISTRIBUTED COMPUTING, AND DIGITAL INDIA.

**MULTI-TECHNOLOGY POSITIONING** - JARI NURMI 2017-03-28

THIS BOOK PROVIDES AN OVERVIEW OF POSITIONING TECHNOLOGIES, APPLICATIONS AND

SERVICES IN A FORMAT ACCESSIBLE TO A WIDE VARIETY OF READERS. READERS WHO HAVE ALWAYS WANTED TO UNDERSTAND HOW SATELLITE-BASED POSITIONING, WIRELESS NETWORK POSITIONING, INERTIAL NAVIGATION, AND THEIR COMBINATIONS WORK WILL FIND GREAT VALUE IN THIS BOOK. READERS WILL ALSO LEARN ABOUT THE ADVANTAGES AND DISADVANTAGES OF DIFFERENT POSITIONING METHODS, THEIR LIMITATIONS AND CHALLENGES. COGNITIVE POSITIONING, ADDING THE BRAIN TO DETERMINE WHICH TECHNOLOGIES TO USE AT DEVICE RUNTIME, IS INTRODUCED AS WELL. COVERAGE ALSO INCLUDES THE USE OF POSITION INFORMATION FOR LOCATION BASED SERVICES (LBS), AS WELL AS CONTEXT-AWARE POSITIONING SERVICES, DESIGNED FOR BETTER USER EXPERIENCE.

**MASSIVE MIMO** - HIEN QUOC NGO 2015-01-16

THE LAST TEN YEARS HAVE SEEN A MASSIVE GROWTH IN THE NUMBER OF CONNECTED WIRELESS DEVICES. BILLIONS OF DEVICES ARE CONNECTED AND MANAGED BY WIRELESS NETWORKS. AT THE SAME TIME, EACH DEVICE NEEDS A HIGH THROUGHPUT TO SUPPORT APPLICATIONS SUCH AS VOICE, REAL-TIME VIDEO, MOVIES, AND GAMES. DEMANDS FOR WIRELESS THROUGHPUT AND THE NUMBER OF WIRELESS DEVICES WILL ALWAYS INCREASE. IN ADDITION, THERE IS A GROWING CONCERN ABOUT ENERGY CONSUMPTION OF WIRELESS COMMUNICATION SYSTEMS. THUS, FUTURE WIRELESS SYSTEMS HAVE TO SATISFY THREE MAIN REQUIREMENTS: i) HAVING A HIGH THROUGHPUT; ii) SIMULTANEOUSLY SERVING MANY USERS; AND iii) HAVING LESS ENERGY CONSUMPTION. MASSIVE MULTIPLE-INPUT MULTIPLE-OUTPUT (MIMO) TECHNOLOGY, WHERE A BASE STATION (BS) EQUIPPED WITH VERY LARGE NUMBER OF ANTENNAS (COLLOCATED OR DISTRIBUTED) SERVES MANY USERS IN THE SAME TIME-FREQUENCY RESOURCE, CAN MEET THE ABOVE REQUIREMENTS, AND HENCE, IT IS A PROMISING CANDIDATE TECHNOLOGY FOR NEXT GENERATIONS OF WIRELESS SYSTEMS. WITH MASSIVE ANTENNA ARRAYS AT THE BS, FOR MOST PROPAGATION ENVIRONMENTS, THE CHANNELS BECOME FAVORABLE, I.E., THE CHANNEL VECTORS BETWEEN THE USERS AND THE BS ARE (NEARLY) PAIRWISELY ORTHOGONAL, AND HENCE, LINEAR PROCESSING IS NEARLY OPTIMAL. A HUGE THROUGHPUT AND ENERGY EFFICIENCY CAN BE ACHIEVED DUE TO THE MULTIPLEXING GAIN AND THE ARRAY GAIN. IN PARTICULAR, WITH A SIMPLE POWER CONTROL SCHEME, MASSIVE MIMO CAN OFFER UNIFORMLY GOOD SERVICE FOR ALL USERS. IN THIS DISSERTATION, WE FOCUS ON THE PERFORMANCE OF MASSIVE MIMO. THE DISSERTATION CONSISTS OF TWO MAIN PARTS: FUNDAMENTALS AND SYSTEM DESIGNS OF MASSIVE MIMO. IN THE FIRST PART, WE FOCUS ON FUNDAMENTAL LIMITS OF THE SYSTEM PERFORMANCE UNDER PRACTICAL CONSTRAINTS SUCH AS LOW COMPLEXITY PROCESSING, LIMITED LENGTH OF EACH COHERENCE INTERVAL, INTERCELL INTERFERENCE, AND FINITE-DIMENSIONAL CHANNELS. WE FIRST STUDY THE POTENTIAL FOR POWER SAVINGS OF THE MASSIVE MIMO UPLINK WITH MAXIMUM-RATIO COMBINING (MRC), ZERO-FORCING, AND MINIMUM MEAN-SQUARE ERROR RECEIVERS, UNDER PERFECT AND IMPERFECT CHANNELS. THE ENERGY AND SPECTRAL EFFICIENCY TRADEOFF IS INVESTIGATED. SECONDLY, WE CONSIDER A PHYSICAL CHANNEL MODEL WHERE THE ANGULAR DOMAIN IS DIVIDED INTO A FINITE NUMBER OF DISTINCT DIRECTIONS. A LOWER BOUND ON THE CAPACITY IS DERIVED, AND THE EFFECT OF PILOT CONTAMINATION IN THIS FINITE-DIMENSIONAL

CHANNEL MODEL IS ANALYZED. FINALLY, SOME ASPECTS OF FAVORABLE PROPAGATION IN MASSIVE MIMO UNDER RAYLEIGH FADING AND LINE-OF-SIGHT (LoS) CHANNELS ARE INVESTIGATED. WE SHOW THAT BOTH RAYLEIGH FADING AND LoS ENVIRONMENTS OFFER FAVORABLE PROPAGATION. IN THE SECOND PART, BASED ON THE FUNDAMENTAL ANALYSIS IN THE FIRST PART, WE PROPOSE SOME SYSTEM DESIGNS FOR MASSIVE MIMO. THE ACQUISITION OF CHANNEL STATE INFORMATION (CSI) IS VERY IMPORTANT IN MASSIVE MIMO. TYPICALLY, THE CHANNELS ARE ESTIMATED AT THE BS THROUGH UPLINK TRAINING. OWING TO THE LIMITED LENGTH OF THE COHERENCE INTERVAL, THE SYSTEM PERFORMANCE IS LIMITED BY PILOT CONTAMINATION. TO REDUCE THE PILOT CONTAMINATION EFFECT, WE PROPOSE AN EIGENVALUE-DECOMPOSITION-BASED SCHEME TO ESTIMATE THE CHANNEL DIRECTLY FROM THE RECEIVED DATA. THE PROPOSED SCHEME RESULTS IN BETTER PERFORMANCE COMPARED WITH THE CONVENTIONAL TRAINING SCHEMES DUE TO THE REDUCED PILOT CONTAMINATION. ANOTHER IMPORTANT ISSUE OF CSI ACQUISITION IN MASSIVE MIMO IS HOW TO ACQUIRE CSI AT THE USERS. TO ADDRESS THIS ISSUE, WE PROPOSE TWO CHANNEL ESTIMATION SCHEMES AT THE USERS: I) A DOWNLINK "BEAMFORMING TRAINING" SCHEME, AND II) A METHOD FOR BLIND ESTIMATION OF THE EFFECTIVE DOWNLINK CHANNEL GAINS. IN BOTH SCHEMES, THE CHANNEL ESTIMATION OVERHEAD IS INDEPENDENT OF THE NUMBER OF BS ANTENNAS. WE ALSO DERIVE THE OPTIMAL PILOT AND DATA POWERS AS WELL AS THE TRAINING DURATION ALLOCATION TO MAXIMIZE THE SUM SPECTRAL EFFICIENCY OF THE MASSIVE MIMO UPLINK WITH MRC RECEIVERS, FOR A GIVEN TOTAL ENERGY BUDGET SPENT IN A COHERENCE INTERVAL. FINALLY, APPLICATIONS OF MASSIVE MIMO IN RELAY CHANNELS ARE PROPOSED AND ANALYZED. SPECIFICALLY, WE CONSIDER MULTIPAIR RELAYING SYSTEMS WHERE MANY SOURCES SIMULTANEOUSLY COMMUNICATE WITH MANY DESTINATIONS IN THE SAME TIME-FREQUENCY RESOURCE WITH THE HELP OF A MASSIVE MIMO RELAY. A MASSIVE MIMO RELAY IS EQUIPPED WITH MANY COLLOCATED OR DISTRIBUTED ANTENNAS. WE CONSIDER DIFFERENT DUPLEXING MODES (FULL-DUPLEX AND HALF-DUPLEX) AND DIFFERENT RELAYING PROTOCOLS (AMPLIFY-AND-FORWARD, DECODE-AND-FORWARD, TWO-WAY RELAYING, AND ONE-WAY RELAYING) AT THE RELAY. THE POTENTIAL BENEFITS OF MASSIVE MIMO TECHNOLOGY IN THESE RELAYING SYSTEMS ARE EXPLORED IN TERMS OF SPECTRAL EFFICIENCY AND POWER EFFICIENCY.

#### DATA ENGINEERING AND COMMUNICATION TECHNOLOGY - K. ASHOKA REDDY

THIS BOOK INCLUDES SELECTED PAPERS PRESENTED AT THE 4TH INTERNATIONAL CONFERENCE ON DATA ENGINEERING AND COMMUNICATION TECHNOLOGY (ICDECT 2020), HELD AT KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL, INDIA, DURING 25-6 SEPTEMBER 2020. IT FEATURES ADVANCED, MULTIDISCIPLINARY RESEARCH TOWARDS THE DESIGN OF SMART COMPUTING, INFORMATION SYSTEMS AND ELECTRONIC SYSTEMS. IT ALSO FOCUSES ON VARIOUS INNOVATION PARADIGMS IN SYSTEM KNOWLEDGE, INTELLIGENCE AND SUSTAINABILITY WHICH CAN BE APPLIED TO PROVIDE VIABLE SOLUTIONS TO DIVERSE PROBLEMS RELATED TO SOCIETY, THE ENVIRONMENT AND INDUSTRY.

**INTELLIGENT SYSTEM DESIGN** - SURESH CHANDRA SATAPATHY 2020-08-10

THIS BOOK PRESENTS A COLLECTION OF HIGH-QUALITY, PEER-REVIEWED RESEARCH PAPERS FROM THE 6TH INTERNATIONAL CONFERENCE ON INFORMATION SYSTEM DESIGN AND INTELLIGENT APPLICATIONS (INDIA 2019), HELD AT LENDI INSTITUTE OF ENGINEERING & TECHNOLOGY, INDIA, FROM 1 TO 2 NOVEMBER 2019. IT COVERS A WIDE RANGE OF TOPICS IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY, INCLUDING DATA MINING AND DATA WAREHOUSING, HIGH-PERFORMANCE COMPUTING, PARALLEL AND DISTRIBUTED COMPUTING, COMPUTATIONAL INTELLIGENCE, SOFT COMPUTING, BIG DATA, CLOUD COMPUTING, GRID COMPUTING AND COGNITIVE COMPUTING.

#### **COGNITIVE COMPUTING AND CYBER PHYSICAL SYSTEMS** - NISHU GUPTA 2023-03-24

THIS PROCEEDINGS CONSTITUTES THE POST-CONFERENCE PROCEEDINGS OF THE 3RD EAI INTERNATIONAL CONFERENCE ON COGNITIVE COMPUTING AND CYBER PHYSICAL SYSTEMS, IC4S 2022, HELD AT VISHNU INSTITUTE OF TECHNOLOGY, BHIMAVARAM IN ANDHRA PRADESH, INDIA, IN NOVEMBER 26-27, 2022. THE THEME OF IC4S 2022 WAS: COGNITIVE COMPUTING APPROACHES WITH DATA MINING AND MACHINE LEARNING TECHNIQUES. THE 22 FULL PAPERS WERE CAREFULLY REVIEWED AND SELECTED FROM 88 SUBMISSIONS. THE PAPERS ARE CLUSTERED IN THEMATICAL ISSUES AS FOLLOWS: MACHINE LEARNING AND ITS APPLICATIONS; CYBER SECURITY AND NETWORKING; IMAGE PROCESSING; IoT APPLICATIONS; SMART CITY ECO-SYSTEM AND COMMUNICATIONS.

#### **MMWAVE MASSIVE MIMO** - SHAHID MUMTAZ 2016-12-02

MMWAVE MASSIVE MIMO: A PARADIGM FOR 5G IS THE FIRST BOOK OF ITS KIND TO HINGE TOGETHER RELATED DISCUSSIONS ON MMWAVE AND MASSIVE MIMO UNDER THE UMBRELLA OF 5G NETWORKS. NEW NETWORKING SCENARIOS ARE IDENTIFIED, ALONG WITH FUNDAMENTAL DESIGN REQUIREMENTS FOR MMWAVE MASSIVE MIMO NETWORKS FROM AN ARCHITECTURAL AND PRACTICAL PERSPECTIVE. WORKING TOWARDS FINAL DEPLOYMENT, THIS BOOK UPDATES THE RESEARCH COMMUNITY ON THE CURRENT MMWAVE MASSIVE MIMO ROADMAP, TAKING INTO ACCOUNT THE FUTURE EMERGING TECHNOLOGIES EMANATING FROM 3GPP/IEEE. THE BOOK'S EDITORS DRAW ON THEIR VAST EXPERIENCE IN INTERNATIONAL RESEARCH ON THE FOREFRONT OF THE MMWAVE MASSIVE MIMO RESEARCH ARENA AND STANDARDIZATION. THIS BOOK AIMS TO TALK OPENLY ABOUT THE TOPIC, AND WILL SERVE AS A USEFUL REFERENCE NOT ONLY FOR POSTGRADUATES STUDENTS TO LEARN MORE ON THIS EVOLVING FIELD, BUT ALSO AS INSPIRATION FOR MOBILE COMMUNICATION RESEARCHERS WHO WANT TO MAKE FURTHER INNOVATIVE STRIDES IN THE FIELD TO MARK THEIR LEGACY IN THE 5G ARENA. CONTAINS TUTORIALS ON THE BASICS OF MMWAVE AND MASSIVE MIMO IDENTIFIES NEW 5G NETWORKING SCENARIOS, ALONG WITH DESIGN REQUIREMENTS FROM AN ARCHITECTURAL AND PRACTICAL PERSPECTIVE DETAILS THE LATEST UPDATES ON THE EVOLUTION OF THE MMWAVE MASSIVE MIMO ROADMAP, CONSIDERING FUTURE EMERGING TECHNOLOGIES EMANATING FROM 3GPP/IEEE INCLUDES CONTRIBUTIONS FROM LEADING EXPERTS IN THE FIELD IN MODELING AND PROTOTYPE DESIGN FOR MMWAVE MASSIVE MIMO DESIGN PRESENTS AN IDEAL REFERENCE THAT NOT ONLY HELPS POSTGRADUATE STUDENTS LEARN MORE IN THIS EVOLVING FIELD, BUT ALSO INSPIRES MOBILE COMMUNICATION RESEARCHERS TOWARDS

FURTHER INNOVATION

**FUNDAMENTALS OF WIRELESS COMMUNICATION** - DAVID TSE 2005-05-26

THIS TEXTBOOK TAKES A UNIFIED VIEW OF THE FUNDAMENTALS OF WIRELESS COMMUNICATION AND EXPLAINS CUTTING-EDGE CONCEPTS IN A SIMPLE AND INTUITIVE WAY. AN ABUNDANT SUPPLY OF EXERCISES MAKE IT IDEAL FOR GRADUATE COURSES IN ELECTRICAL AND COMPUTER ENGINEERING AND IT WILL ALSO BE OF GREAT INTEREST TO PRACTISING ENGINEERS.

**PROCEEDINGS OF FIRST INTERNATIONAL CONFERENCE ON COMPUTATIONAL ELECTRONICS FOR WIRELESS COMMUNICATIONS** - SANYOG RAWAT 2022-01-03

THIS BOOK INCLUDES HIGH-QUALITY PAPERS PRESENTED AT PROCEEDINGS OF FIRST INTERNATIONAL CONFERENCE ON COMPUTATIONAL ELECTRONICS FOR WIRELESS COMMUNICATIONS (ICWC 2021), HELD AT NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA, HARYANA, INDIA, DURING JUNE 11-12, 2021. THE BOOK PRESENTS ORIGINAL RESEARCH WORK OF ACADEMICS AND INDUSTRY PROFESSIONALS TO EXCHANGE THEIR KNOWLEDGE OF THE STATE-OF-THE-ART RESEARCH AND DEVELOPMENT IN COMPUTATIONAL ELECTRONICS WITH AN EMPHASIS ON WIRELESS COMMUNICATIONS. THE TOPICS COVERED IN THE BOOK ARE RADIO FREQUENCY AND MICROWAVE, SIGNAL PROCESSING, MICROELECTRONICS AND WIRELESS NETWORKS.

*WIRELESS COMMUNICATIONS* - ANDREAS F. MOLISCH 2022-11-15

AN IN-DEPTH AND COMPREHENSIVE TREATMENT OF WIRELESS COMMUNICATION TECHNOLOGY RANGING FROM THE FUNDAMENTALS TO THE NEWEST RESEARCH RESULTS THE EXPANDED AND COMPLETELY REVISED THIRD EDITION OF WIRELESS COMMUNICATIONS DELIVERS AN ESSENTIAL TEXT IN WIRELESS COMMUNICATION TECHNOLOGY THAT COMBINES MATHEMATICAL DESCRIPTIONS WITH INTUITIVE EXPLANATIONS OF THE PHYSICAL FACTS THAT ENABLE READERS TO ACQUIRE A DEEP UNDERSTANDING OF THE SUBJECT. THIS LATEST EDITION INCLUDES BRAND-NEW SECTIONS ON CUTTING EDGE RESEARCH TOPICS SUCH AS MASSIVE MIMO, POLAR CODES, HETEROGENEOUS NETWORKS, NON-ORTHOGONAL MULTIPLE ACCESS, AS WELL AS 5G CELLULAR STANDARDS, WiFi 6, AND BLUETOOTH LOW ENERGY. TOGETHER WITH THE RE-DESIGNED DESCRIPTIONS OF FUNDAMENTALS SUCH AS FADING, OFDM, AND MULTIPLE ACCESS, IT PROVIDES A THOROUGH TREATMENT OF ALL THE TECHNOLOGIES THAT UNDERLIE FIFTH-GENERATION AND BEYOND SYSTEMS. A COMPLIMENTARY COMPANION WEBSITE PROVIDES READERS WITH A WEALTH OF OLD AND NEW MATERIAL, INCLUDING INSTRUCTOR RESOURCES AVAILABLE UPON REQUEST. READERS WILL ALSO FIND: A THOROUGH INTRODUCTION TO THE APPLICATIONS AND REQUIREMENTS OF MODERN WIRELESS SERVICES, INCLUDING VIDEO STREAMING, VIRTUAL REALITY, AND INTERNET OF THINGS. COMPREHENSIVE EXPLORATIONS OF WIRELESS PROPAGATION MECHANISMS AND CHANNEL MODELS, RANGING FROM RAYLEIGH FADING TO ADVANCED MODELS FOR MIMO COMMUNICATIONS. DETAILED DISCUSSIONS OF SINGLE-USER COMMUNICATIONS FUNDAMENTALS, INCLUDING MODERN CODING TECHNIQUES, MULTI-CARRIER COMMUNICATIONS, AND SINGLE-USER MIMO. EXTENSIVE DESCRIPTION OF MULTI-USER COMMUNICATIONS, INCLUDING PACKET RADIO SYSTEMS, CDMA,

SCHEDULING, ADMISSION CONTROL, CELLULAR AND AD-HOC NETWORK DESIGN, AND MULTI-USER MIMO. IN-DEPTH EXAMINATIONS OF ADVANCED TOPICS IN WIRELESS COMMUNICATION, LIKE SPEECH AND VIDEO CODING, COGNITIVE RADIO, NOMA, NETWORK CODING, AND WIRELESS LOCALIZATION. A COMPREHENSIVE DESCRIPTION OF THE KEY WIRELESS STANDARDS, INCLUDING LTE, 5G, WiFi, BLUETOOTH, AND AN OUTLOOK TO BEYOND 5G SYSTEMS. PERFECT FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS WITH A BASIC KNOWLEDGE OF STANDARD COMMUNICATIONS, WIRELESS COMMUNICATIONS WILL ALSO EARN A PLACE IN THE LIBRARIES OF RESEARCHERS AND SYSTEM DESIGNERS SEEKING A ONE-STOP RESOURCE ON WIRELESS COMMUNICATION TECHNOLOGY.

**WIRELESS COMMUNICATIONS OVER RAPIDLY TIME-VARYING CHANNELS** - FRANZ HLAUWATSCH 2011-05-04

AS A RESULT OF HIGHER FREQUENCIES AND INCREASED USER MOBILITY, RESEARCHERS AND SYSTEMS DESIGNERS ARE SHIFTING THEIR FOCUS FROM TIME-INVARIANT MODELS TO CHANNELS THAT VARY WITHIN A BLOCK. WIRELESS COMMUNICATIONS OVER RAPIDLY TIME-VARYING CHANNELS EXPLAINS THE LATEST THEORETICAL ADVANCES AND PRACTICAL METHODS TO GIVE AN UNDERSTANDING OF RAPIDLY TIME VARYING CHANNELS, TOGETHER WITH PERFORMANCE TRADE-OFFS AND POTENTIAL PERFORMANCE GAINS, PROVIDING THE EXPERTISE TO DEVELOP FUTURE WIRELESS SYSTEMS TECHNOLOGY. AS WELL AS AN OVERVIEW OF THE ISSUES OF DEVELOPING WIRELESS SYSTEMS USING TIME-VARYING CHANNELS, THE BOOK GIVES EXTENSIVE COVERAGE TO METHODS FOR ESTIMATING AND EQUALIZING RAPIDLY TIME-VARYING CHANNELS, INCLUDING A DISCUSSION OF TRAINING DATA OPTIMIZATION, AS WELL AS PROVIDING MODELS AND TRANSCIVER METHODS FOR TIME-VARYING ULTRA-WIDEBAND CHANNELS. AN INTRODUCTION TO TIME-VARYING CHANNEL MODELS GIVES IN A NUTSHELL THE IMPORTANT ISSUES OF DEVELOPING WIRELESS SYSTEMS TECHNOLOGY USING TIME-VARYING CHANNELS EXTENSIVE COVERAGE OF METHODS FOR ESTIMATING AND EQUALIZING RAPIDLY TIME-VARYING CHANNELS, INCLUDING A DISCUSSION OF TRAINING DATA OPTIMIZATION, ENABLES DEVELOPMENT OF HIGH PERFORMANCE WIRELESS SYSTEMS CHAPTERS ON TRANSCIVER DESIGN FOR OFDM AND RECEIVER ALGORITHMS FOR MIMO COMMUNICATION CHANNELS OVER TIME-VARYING CHANNELS, WITH AN EMPHASIS ON MODERN ITERATIVE TURBO-STYLE ARCHITECTURES, DEMONSTRATES HOW THESE IMPORTANT TECHNOLOGIES CAN OPTIMIZE FUTURE WIRELESS SYSTEMS

**COMPUTATIONAL AND STATISTICAL METHODS IN INTELLIGENT SYSTEMS** - RADEK SILHAVY 2018-08-29

THIS BOOK PRESENTS REAL-WORLD PROBLEMS AND PIONEERING RESEARCH IN COMPUTATIONAL STATISTICS, MATHEMATICAL MODELING, ARTIFICIAL INTELLIGENCE AND SOFTWARE ENGINEERING IN THE CONTEXT OF INTELLIGENT SYSTEMS. IT GATHERS THE PEER-REVIEWED PROCEEDINGS OF THE 2ND COMPUTATIONAL METHODS IN SYSTEMS AND SOFTWARE 2018 (CoMeSySo 2018), A CONFERENCE THAT BROKE DOWN TRADITIONAL BARRIERS BY BEING HELD ONLINE. THE GOAL OF THE EVENT WAS TO PROVIDE AN INTERNATIONAL FORUM FOR DISCUSSING THE LATEST HIGH-QUALITY RESEARCH RESULTS.

