Intelligent Computer Mathematics International Conference Cicm 2015 Washington Dc Usa July 13 17 2015 Proceedings Lecture Notes In Computer Science

Fourth edition of International Conference on Intelligent Computing and Optimization took place at December 30-31, 2021, via ZOOM. Objective was to celebrate "Compassion and Wisdom" with researchers, scholars, experts and investigators in Intelligent Computing and Optimization worldwide, to share knowledge, experience, innovation--marvelous opportunity for discourse and mutuality by novel research, invention and creativity.

This book constitutes the refereed proceedings of the 10th International Conference on Intelligent Computer Mathematics, CICM 2017, held in Edinburgh, Scotland, in July 2017. The 22 full papers and 3 abstracts of invited papers presented were carefully reviewed and selected from a total of 40 submissions. The papers are organized in three tracks: the Calculemus track examining the integration of symbolic computation and mechanized reasoning; the Digital Mathematics Libraries track dealing with math-aware technologies, standards, algorithms, and processes; the Mathematical Knowledge Management track being concerned with all aspects of managing mathematical knowledge, in informal, semi-formal, and formal settings. An additional track Systems and Projects contains descriptions of systems and relevant projects, both of which are key to a research topic where theory and practice interact on explicitly represented knowledge.

This book constitutes the joint refereed proceedings of the 11th International Conference on Artificial Intelligence and Symbolic Computation, AISC 2012, 19th Symposium on the Integration of Symbolic Computation and Mechanized Reasoning, Calculemus 2012, 5th International Workshop on Digital Mathematics Libraries, DML 2012, 11th International Conference on Mathematical Knowledge Management, MKM 2012, Systems and Projects, held in Bremen, Germany as CICM 2012, the Conferences on Intelligent Computer Mathematics. The 13 revised full papers out of 19 submissions for MKM 2012, 6 revised full papers out of 9 submissions for Calculemus 2012, 6 revised full papers out of 8 submissions for AISC 2012, 2 revised full papers out of 3 submissions for DML 2012, and 11 revised full papers out of 12 submissions for Systems and Project track presented were carefully reviewed and selected, resulting in 38 papers from a total of 52 submissions.

This book constitutes the refereed proceedings of the 15th International Conference on Intelligent Computer Mathematics, CICM 2022, held in Tbilisi, Georgia, in September 2022. The 17 full papers, 1 project/ survey paper, 4 short papers, and 2 abstracts of invited papers presented were carefully reviewed and selected from a total of 37 submissions. The papers focus on theoretical and practical solutions for these challenges including computation, deduction, narration, and data management.

Artificial Intelligence in Medicine

Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy

12th International Conference, CICM 2019, Prague, Czech Republic, July 8—12, 2019, Proceedings

14th International Conference, CICM 2021, Timisoara, Romania, July 26—31, 2021, Proceedings

The Universal Computer

This easy-to-understand book discusses applications of current technologies and the foundations for their extension into emerging areas in the future. It includes research presented at two conferences: 5th International IBM Cloud Academy Conference, 2017, held in Wrocław, Poland. 5th Asia-Pacific Conference on Computer Assisted and System Engineering, 2017, held in Guilin, China. These conferences focused on system and application engineering, including achievements in the interdisciplinary topics of cloud computing, big data, IoT and mobile communications. Featuring 19 chapters, the book has the potential to influence current and future research and applications combining the best attributes of computing, mathematics, artificial intelligence, biometrics and software engineering to create a comprehensive research application domain.

This book covers original research and the latest advances in symbolic, algebraic and geometric computation; computational methods for differential and difference equations, symbolic-numerical computation; mathematics software design and implementation; and scientific and engineering applications based on features, invited talks, special sessions and contributed papers presented at the 9th (in Fukuoka, Japan in 2009) and 10th (in Beijing China in 2012) Asian Symposium on Computer Mathematics (ASCM). Thirty selected and refereed articles in the book present the conference participants' ideas and views on researching mathematics using computers.

Intelligent Computer Mathematics14th International Conference, CICM 2021, Timisoara, Romania, July 26-31, 2021, ProceedingsSpringer Nature

The Applications of Computer Algebra (ACA) conference covers a wide range of topics from Coding Theory to Differential Algebra to Quantam Computing, focusing on the interactions of these and other areas with the discipline of Computer Algebra. This volume provides the latest developments in the field as well as its applications in various domains, including communications, modelling, and theoretical physics. The book will appeal to researchers and professors of computer algebra, applied mathematics, and computer science, as well as to engineers and computer scientists engaged in research and development.

Computer Mathematics

15th International Conference, CICM 2022, Tbilisi, Georgia, September 19—23, 2022, Proceedings

Proceedings of the 4th International Conference on Intelligent Computing and Optimization 2021 (ICO2021)

13th International Conference, CICM 2020, Bertinoro, Italy, July 26—31, 2020, Proceedings

Modelling and Simulation in Science, Technology and Engineering Mathematics

This book constitutes the refereed proceedings of the 14th International Conference on Intelligent Computer Mathematics, CICM 2021, held in Timisoara, Romania, in July 2021*. The 12 full papers, 7 system descriptions, 1 system entry, and 3 abstracts of invited papers presented were carefully reviewed and selected from a total of 38 submissions. The papers focus on advances in formalization, automatic theorem proving and learning, search and classification, teaching and geometric reasoning, and logic and systems, among other topics. * The conference was held virtually due to the COVID-19 pandemic.

The breathtakingly rapid pace of change in computing makes it easy to overlook the pioneers who began it all. Written by Martin Davis, respected logician and researcher in the theory of computation, The Universal Computer: The Road from Leibniz to Turing explores the fascinating lives, ideas, and discoveries of seven remarkable mathematicians. It tells the stories of the unsung heroes of the computer age – the logicians. The story begins with Leibniz in the 17th century and then focuses on Boole, Frege, Cantor, Hilbert, and Gödel, before turning to Turing. Turing's analysis of algorithmic processes led to a single, all-purpose machine that could be programmed to carry out such processes—the computer. Davis describes how this incredible group, with lives as extraordinary as their accomplishments, grappled with logical reasoning and its mechanization. By investigating their achievements and failures, he shows how these pioneers paved the way for modern computing. Bringing the material up to date, in this revised edition Davis discusses the success of the IBM Watson on Jeopardy, reorganizes the information on incompleteness, and adds information on Konrad Zuse. A distinguished prize-winning logician, Martin Davis has had a career of more than six decades devoted to the important interface between logic and computer science. His expertise, combined with his genuine love of the subject and excellent storytelling, make him the perfect person to tell this story.

This book constitutes the refereed proceedings of the International Conference on Intelligent Computer Mathematics, CICM 2015, held in Washington, DC, USA, in July 2015. The 16 full papers and 9 short papers presented together with two invited talks plus one abstract were carefully reviewed and selected from a total of 43 submissions. The papers are organized in topical sections following the tracks of the conference: Invited Talks; Calculemus; Digital Mathematics Libraries; Mathematical Knowledge Management; Projects and Surveys; Systems and Data.

This three-volume set of books presents advances in the development of concepts and techniques in the area of new technologies and contemporary information system architectures. It guides readers through solving specific research and analytical problems to obtain useful knowledge and business value from the data. Each chapter provides an analysis of a specific technical problem, followed by the numerical analysis, simulation and implementation of the solution to the problem. The books constitute the refereed proceedings of the 2017 38th International Conference "Information Systems Architecture and Technology," or ISAT 2017, held on September 17-19, 2017 in Szklarska Poręba, Poland. The conference was organized by the Computer Science and Management Systems Departments, Faculty of Computer Science and Management, Wroclaw University of Technology, Poland. The papers have been organized into topical parts: Part I— includes discourses on topics including, but not limited to, Artificial Intelligence Methods, Knowledge Discovery and Data Mining, Big Data, Knowledge Discovery and Data Mining, Knowledge Based Management, Internet of Things, Cloud Computing and High Performance Computing, Distributed Computer Systems, Content Delivery Networks, and Service Oriented Computing. Part II—addresses topics including, but not limited to, System Modelling for Control, Recognition and Decision Support, Mathematical Modelling in Computer System Design, Service Oriented Systems and Cloud Computing and Complex Process Modeling. Part III—deals with topics including, but not limited to, Modeling of Manufacturing Processes, Modeling an Investment Decision Process, Management of Innovation, Management of Organization.

18th Symposium, Calculemus 2011, and 10th International Conference, MKM 2011, Bertinoro, Italy, July 18-23, 2011, Proceedings

9th International Conference, AISC 2008 15th Symposium, Calculemus 2008 7th International Conference, MKM 2008 Birmingham, UK, July 28 - August 1, 2008, Proceedings

CICM 2014 Joint Events: Calculemus, DML, MKM, and Systems and Projects 2014, Coimbra, Portugal, July 7-11, 2014. Proceedings

Kalamata, Greece, July 20-23 2015

This book constitutes the joint refereed proceedings of Calculemus 2014, Digital Mathematics Libraries, DML 2014, Mathematical Knowledge Management, MKM 2014 and Systems and Projects, S&P 2014, held in Coimbra, Portugal, during July 7-11, 2014 as four tracks of CICM 2014, the Conferences on Intelligent Computer Mathematics. The 26 full papers and 9 Systems and Projects descriptions presented together with 5 invited talks were carefully reviewed and selected from a total of 55 submissions. The Calculemus track of CICM examines the integration of symbolic computation and mechanized reasoning. The Digital Mathematics Libraries track - evolved from the DML workshop series - features math-aware technologies, standards, algorithms and processes towards the fulfillment of the dream of a global DML. The Mathematical Knowledge Management track of CICM is concerned with all aspects of managing mathematical knowledge in the informal, semi-formal and formal settings. The Systems and Projects track presents short descriptions of existing systems or on-going projects in the areas of all the other tracks of the conference.

The LNAI series reports state-of-the-art results in computer science research, development, and education, at a high level and in both printed and electronic form. Enjoying tight cooperation with the R&D community, as well as with prestigious organizations and societies, LNAI has grown into the most comprehensive computer science research forum avaiable. The scope of LNAI spans the whole range of artificial intelligence and intelligent Information processing incliding interdisciplinary topics in a variety of application fields. In parallel to the printed book, each new volume is published electronically in LNCS Online.

This volume contains selected papers of the proceedings of the first Hellenic Conference on Mathematics and Informatics (HERMIS '92). The main theme for HERMIS '92 Conference was Computer Mathematics, with special emphasis on Computational Mathematics, Operational Research and Statistics, and Mathematics in Economic Science. The presented papers of the HERMIS Conference have been classified into the following technical sessions: Numerical solution of Differential Equations, Parallel Processing and Parallel Algorithms, Optimization and Approximation, Algorithms in Operational Research and Control Theory, Statistical Methods and Analysis, Mathematics in Economic Science, Artificial Intelligence and Data Bases Technology.In addition, a number of selected research articles published recently in the Hellenic Mathematical Society Bulletin in the form of special issues on Computer Mathematics (Volumes 31 and 32) are also included.

For 80 years, mathematics has driven fundamental innovation in computing and communications. This timely book provides a panorama of some recent ideas in mathematics and how they will drive continued innovation in computing, communications and AI in the coming years. It provides a unique insight into how the new techniques that are being developed can be used to provide theoretical foundations for technological progress, just as mathematics was used in earlier times by Turing, von Neumann, Shannon and others. Edited by leading researchers in the field, chapters cover the application of new mathematics in computer architecture, software verification, quantum computing, compressed sensing, networking, Bayesian inference, machine learning, reinforcement learning and many other areas.

21st International Conference, Krakow, Poland, June 16—18, 2021, Proceedings, Part III

Computational Science – ICCS 2021

11th International Conference, CICM 2018, Hagenberg, Austria, August 13-17, 2018, Proceedings

ODS, First Hybrid Conference, Rome, Italy, September 14-17, 2021

16th Symposium, Calculemus 2009, 8th International Conference, MKM 2009, Held as Part of CICM 2009, Grand Bend, Canada, July 6-12, 2009. Proceedings

This book presents new knowledge and recent developments in all aspects of computational techniques, mathematical modeling, energy systems, applications of fuzzy sets and intelligent computing. The book is a collection of best selected research papers presented at the International Conference on "Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy," organized by the Department of Mathematics, Pandit Deendayal Petroleum University, in association with Forum for Interdisciplinary Mathematics, Institution of Engineers (IEI) – Gujarat and Computer Society of India (CSI) – Ahmedabad. The book provides innovative works of researchers, academicians and students in the area of interdisciplinary mathematics, statistics, computational intelligence and renewable energy.

This book constitutes the refereed proceedings of the 12th International Conference on Intelligent Computer Mathematics, CICM 2019, held in Prague, Czech Republic, in July 2019. The 19 full papers presented were carefully reviewed and selected from a total of 41 submissions. The papers focus on digital and computational solutions which are becoming the prevalent means for the generation, communication, processing, storage and curation of mathematical information. Separate communities have developed to investigate and build computer based systems for computer algebra, automated deduction, and mathematical publishing as well as novel user interfaces. While all of these systems excel in their own right, their integration can lead to synergies offering significant added value.

mathematicians, computer scientists, and engineers in their every-day business. In total, 37 papers were submitted to AISC.

This book is addressed to researchers in operations research, data science and artificial intelligence. It collects selected contributions from the first hybrid "Optimization and Decision Science - ODS2021" international conference on the theme Optimization and Artificial Intelligence and Data Sciences, which was held in Rome 14-17 September 2021 and organized by AIRO, the Italian Operations Research Society and the Department of Statistical Sciences of Sapienza University of Rome. The book offers new and original contributions on different methodological optimization topics, from Support Vector Machines to Game Theory Network Models, from Mathematical Programming to Heuristic Algorithms, and Optimization Methods for a number of emerging problems from Truck and Drone delivery to Risk Assessment, from Power Networks Design to Portfolio Optimization. The articles in the book can give a significant edge to the general themes of sustainability and pollution reduction, distributive logistics, healthcare management in pandemic scenarios and clinical trials, distributed computing, scheduling, and many others. For these reasons, the book is aimed not only at researchers in the Operations Research community but also for practitioners facing decision-making problems in these areas and to students and researchers from other disciplines, including Artificial Intelligence, Computer Sciences, Finance, Mathematics, and Engineering.

Optimization in Artificial Intelligence and Data Sciences

Smart Innovations in Engineering and Technology

10th International Conference, AISC 2010, 17th Symposium, Calculemus 2010, and 9th International Conference, MKM 2010, Paris, France, July 5-10, 2010. Proceedings

Foundations of Computational Mathematics

9th Asian Symposium (ASCM2009), Fukuoka, December 2009, 10th Asian Symposium (ASCM2012), Beijing, October 2012, Contributed Papers and Invited Talks

This book constitutes the refereed proceedings of the 13th International Conference on Intelligent Computer Mathematics, CICM 2020, held in Bertinoro, Italy, in July 2020*. The 15 full papers, 1 invited paper and 2 abstracts of invited papers presented were carefully reviewed and selected from a total of 35 submissions. The papers focus on advances in automated theorem provers and formalization, computer algebra systems and their libraries, and applications of machine learning, among other topics. * The conference was held virtually due to the COVID-19 pandemic.

Collection of papers by leading researchers in computational mathematics, suitable for graduate students and researchers.

This book constitutes the joint refereed proceedings of three international events, namely the 18th Symposium on the Integration of Symbolic Computation and Mechanized Reasoning, Calculemus 2011, the 10th International Conference on Mathematical Knowledge Management, MKM 2011, and a new track on Systems and Projects descriptions that span both the Calculemus and MKM topics, all held in Bertinoro, Italy, in July 2011. All 51 submissions passed through a rigorous review process. A total of 15 papers were submitted to Calculemus, of which 9 were accepted. Systems and Projects track 2011 there have been 12 papers selected out of 14 submissions while MKM 2011 received 22 submissions, of which 9 were accepted for presentation and publication. The events focused on the use of AI techniques within symbolic computation and the application of symbolic computation to AI problem solving; the combination of computer algebra systems and automated deduction systems; and mathematical knowledge management, respectively.

This volume contains the peer-reviewed proceedings of the International Conference on Modelling and Simulation (MS-17), held in Kolkata, India, 4th-5th November 2017, organized by the Association for the Advancement of Modelling and Simulation Techniques in Enterprises (AMSE, France) in association with the Institution of Engineering Technology (IET, UK), Kolkata Network. The contributions contained here showcase some recent advances in modelling and simulation across various aspects of science and technology. This book brings together articles describing applications of modelling and simulation techniques in fields as diverse as physics, mathematics, electrical engineering, industrial electronics, control, automation, power systems, energy and robotics. It includes a special section on mechanical, fuzzy, optical and opto-electronic control of oscillations. It provides a snapshot of the state of the art in modelling and simulation methods and their applications, and will be of interest to researchers and engineering professionals from industry, academia and research organizations.

Mathematics for Future Computing and Communications

Advances on Computer Mathematics and Its Applications

Applied Computational Intelligence

11th International Conference, AISC 2012, 19th Symposium, Calculemus 2012, 5th International Workshop, DML 2012, 11th International Conference, MKM 2012, Systems and Projects, Held as Part of CICM 2012, Bremen, Germany, July 8-13, 2012, Proceedings

The Road from Leibniz to Turing

This book constitutes the refereed proceedings of the 9th International Conference on Intelligent Computer Mathematics, CICM 2016, held in Bialystok, Poland, in July 2016. The 10 full papers and 2 short papers presented were carefully reviewed and selectedfrom a total of 41 submissions. The papers are organized in topical sections according to the five tracks of the conference: Calculemus; Digital Mathematics Libraries; Mathematical Knowledge Management; Surveys and Projects; and Systems and Data.

As computers and communications technology advance, greater opportunities arise for intelligent mathematical computation. While computer algebra, au- mated deduction and mathematical publishing each have long and successful histories, we are now seeing increasing opportunities for synergy among them. The Conferences on Intelligent Computer Mathematics (cicm 2009) is a c- lection of co-located meetings, allowing researchers and practitioners active in these related areas to share recent results and identify the next challenges. The speci?c areas of the cicm conferences and workshops are described below, but the unifying theme is the computerized handling of mathematical knowledge. The successful formalization of much of mathematics, as well as a better - derstanding of its internal structure, makes mathematical knowledge in many waysmore tractable than generalknowledge,as traditionally treatedin arti?cial intelligence. Similarly, we can also expect the problem of e?ectively using ma- ematical knowledge in automated ways to be much more tractable. This is the goal of the work in the cicm conferences and workshops. In the long view, so- ing the problems addressed by cicm is an important milestone in formulating the next generation of mathematical software.

The six-volume set LNCS 12742, 12743, 12744, 12745, 12746, and 12747 constitutes the proceedings of the 21st International Conference on Computational Science, ICCS 2021, held in Krakow, Poland, in June 2021. The total of 260 full papers and 57 short papers presented in this book set were carefully reviewed and selected from 635 submissions. 48 full and 14 short papers were accepted to the main track from 156 submissions; 212 full and 43 short papers were accepted to the workshops/ thematic tracks from 479 submissions. The papers were organized in topical sections named: Part I: ICCS Main Track Part II: Advances in High-Performance Computational Earth Sciences: Applications and Frameworks; Applications of Computational Methods in Artificial Intelligence and Machine Learning; Artificial Intelligence and High-Performance Computing for Advanced Simulations; Biomedical and Bioinformatics Challenges for Computer Science Part III: Classifier Learning from Difficult Data; Computational Analysis of Complex Social Systems; Computational Collective Intelligence; Computational Health Part IV: Computational Methods for Emerging Problems in (dis-)Information Analysis; Computational Methods in Smart Agriculture; Computational Optimization, Modelling and Simulation; Computational Science in IoT and Smart Systems Part V: Computer Graphics, Image Processing and Artificial Intelligence; Data-Driven Computational Sciences; Machine Learning and Data Assimilation for Dynamical Systems; MeshFree Methods and Radial Basis Functions in Computational Sciences; Multiscale Modelling and Simulation Part VI: Quantum Computing Workshop; Simulations of Flow and Transport: Modeling, Algorithms and Computation; Smart Systems: Bringing Together Computer Vision, Sensor Networks and Machine Learning; Software Engineering for Computational Science; Solving Problems with Uncertainty; Teaching Computational Science; Uncertainty Quantification for Computational Models *The conference was held virtually.*

This book constitutes the joint refereed proceedings of the 16th Symposium on the Integration of Symbolic Computation and Mechanized Reasoning, Calculemus 2009 and the 8th International Conference on Mathematical Knowledge Management, MKM 2009, held in Grand Bend, Canada, as CICM 2009, the Conferences on Intelligent Computer Mathematics.The 10 revised full papers and 4 invited talks for Calculemus 2009 and 16 revised full papers and 6 short communications for MKM 2009 presented together with 4 joint invited talks were carefully reviewed and selected from a total of 51 submissions. The papers of Calculemus 2009 cover all aspects of the interplay of mechanized reasoning and computer algebra, as well as the development of integrated systems that transcend both computer algebra and theorem proving. The focus of MKM 2009 lies at the intersection of mathematics and computer science with the goal of developing effective techniques, based on formal mathematics and software technology. The realm of mathematical information is an attractive candidate for testing innovative theoretical and technological solutions for content-based systems, interoperability, management of machine understandable information, and the semantic Web.

Intelligent Computing & Optimization

International Conference, CICM 2015, Washington, DC, USA, July 13-17, 2015, Proceedings.

Intelligent Computer Mathematics

Information Systems Architecture and Technology: Proceedings of 38th International Conference on Information Systems Architecture and Technology – ISAT 2017

Applications of Computer Algebra

?This book constitutes the refereed proceedings of the 11th International Conference on Intelligent Computer Mathematics, CICM 2018, held in Hagenberg, Austria, in August 2018. The 23 full papers presented were carefully reviewed and selected from a total of 36 submissions. The papers focos on the Calculemus, Digital Mathematics Libraries, and Mathematical Knowledge Management tracks which also correspond to the subject areas of the predecessor meetings. Orthogonally, the Systems and Projects track called for descriptions of digital resources, such as data and systems, and of projects, whether old, current, or new, and survey papers covering any topics of relevance to the CICM community.

This book constitutes the refereed proceedings of the 19th International Conference on Artificial Intelligence in Medicine, AIME 2021, held as a virtual event, in June 2021. The 28 full papers presented together with 30 short papers were selected from 138 submissions. The papers are grouped in topical sections on image analysis; predictive modelling; temporal data analysis; unsupervised learning; planning and decision support; deep learning; natural language processing; and knowledge representation and rule mining.

This book constitutes the joint refereed proceedings of the 10th International Conference on Artificial Intelligence and Symbolic Computation, AISC 2010, the 17th Symposium on the Integration of Symbolic Computation and Mechanized Reasoning, Calculemus 2010, and the 9th International Conference on Mathematical Knowledge Management, MKM 2010. All submissions passed through a rigorous review process. From the 25 papers submitted to AISC 2010, 9 were selected for presentation at the conference and inclusion in the proceedings volume. A total of 14 papers were submitted to Calculemus, of which 7 were accepted. MKM 2010 received 27 submissions, of which 16 were accepted for presentation and publication. The events focused on the use of AI techniques within symbolic computation and the application of symbolic computation to AI problem solving; the combination of computer algebra systems and automated deduction systems; and mathematical knowledge management, respectively.

?Formal Methods in Computer-Aided Design (FMCAD) is a conference series on the theory and applications of formal methods in hardware and system verification. FMCAD provides a leading forum to researchers in academia and industry for presenting and discussing ground-breaking methods, technologies, theoretical results, and tools for reasoning formally about computing systems. FMCAD covers formal aspects of computer-aided system design including verification, specification, synthesis, and testing.

Proceedings of the Fifth International Conference on Mathematics and Computing

9th International Conference, CICM 2016, Bialystok, Poland, July 25-29, 2016, Proceedings

19th International Conference on Artificial Intelligence in Medicine, AIME 2021, Virtual Event, June 15–18, 2021, Proceedings

Proceedings of the International Conference on Modelling and Simulation (MS-17)

ICMC 2019

This book features selected papers from the 5th International Conference on Mathematics and Computing (ICMC 2019), organized by the School of Computer Engineering, Kalinga Institute of Industrial Technology Bhubaneswar, India, on February 6 – 9, 2019. Covering recent advances in the field of mathematics, statistics and scientific computing, the book presents innovative work by leading academics, researchers and experts from industry.

The Design and Evolution of C++

10th International Conference, CICM 2017, Edinburgh, UK, July 17-21, 2017, Proceedings

16th Symposium, Calculemus 2009, 8th International Conference, MKM 2009, Grand Bend, Canada, July 6-12, 2009, Proceedings

12th International Conference, CICM 2019, Prague, Czech Republic, July 8-12, 2019, Proceedings

Proceedings of the First International Conference, MMCITRE 2020