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22nd European Conference, ADBIS 2018
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Proceedings

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Leonid Andreevich Kalinichenko

10 June 1937 – 17 July 2018



One of the pioneers of the theory of databases passed away. The name of Leonid Andreevich is rightly associated with the development of promising directions in databases, the founding of an influential scientific school, the creation of two regularly held international scientific conferences. Leonid Andreevich Kalinichenko received his Ph.D. degree from the Institute of Cybernetics, Kiev, Ukraine, in 1968 and his degree of Doctor of Sciences from the Moscow State University in 1985. Both degrees in Computer Science.

He served as Head of the Laboratory for Compositional Information Systems Development Methods at the Institute of Informatics Problems of the Russian Academy of Science, Moscow. As Professor, he taught at the Moscow State University (Computer Science department) courses on distributed object technologies and object-oriented databases. His research interests included: interoperable heterogeneous information resource mediation, heterogeneous information resource integration, semantic interoperability, compositional development of information systems, middleware architectures, digital libraries.

His pioneering work on database model transformation (VLDB 1978) and fundamental book on data integration “Methods and tools for heterogeneous database integration” (Moscow, 1983) were ahead of time. His theoretical studies of semantic interoperability attracted attention of the international community in the 90s, when interoperability became a hot topic. He is also a co-author of the four books: “SLANG - programming system for discrete event system simulation” (Kiev, 1969), “Computers with advanced interpretation systems” (Kiev, 1970), “Computer networks” (Moscow, 1977), “Database and knowledge base machines” (Moscow, 1990). He had a number of papers in journals and conference proceedings and served as PC member for numerous international conferences.

During the last few years his activities and work were devoted to problems in data intensive domains. In 2013–2016 he initiated several research projects aiming at conceptual modeling and data integration within distributed computational infrastructures. He also launched a Master program “Big data: infrastructures and methods for problem solving” at Lomonosov Moscow State University.

In addition to his own research, Leonid spent significant energy on integration of database research communities in different countries. He had a key role in the organization of a series of East-West workshops (Klagenfurt and Moscow), as well as of the ADBIS series of international workshops held in Moscow in 1993-1996. This series of workshops was transformed into ADBIS (Advances in Data Bases and Information Systems) conference series. He also established the “Russian Conference on Digital Libraries” (RCDL) in 1999, transformed into “Data Analytics and Management in Data Intensive Domains” conference (DAMDID/RCDL) in 2015. Finally, he launched the Moscow Chapter of ACM SIGMOD in 1992. Monthly seminars of this chapter play significant role in shaping local research and professional communities in Russia.

L.A. Kalinichenko was a member of the ACM, the Chair of the Moscow ACM SIGMOD Chapter, the Chair of the Steering Committee of the European Conference “Advances in Databases and Information Systems” (ADBIS), the Chair of the Steering Committee of the Russian Conference on Digital Libraries (RCDL), a Member of the Editorial Board of the International Journal “Distributed and Parallel Databases”, Kluwer Academic Publishers. All of us will remember him for what he did to build a wider community in Europe overcoming the divisions that had existed for decades. We, the members of the Steering Committee, remember him as a very generous person and an excellent scientist.

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Preface

The 22nd East-European Conference on Advances in Databases and Information Systems (ADBIS 2018) took place in Budapest, Hungary, during September 2–5, 2018. The ADBIS series of conferences aims at providing a forum for the dissemination of research accomplishments and at promoting interaction and collaboration between the database and information systems research communities from Central and East European countries and the rest of the world. The ADBIS conferences provide an international platform for the presentation of research on database theory, development of advanced DBMS technologies, and their advanced applications. As such, ADBIS has created a tradition with editions held in St. Petersburg (1997), Poznań (1998), Maribor (1999), Prague (2000), Vilnius (2001), Bratislava (2002), Dresden (2003), Budapest (2004), Tallinn (2005), Thessaloniki (2006), Varna (2007), Pori (2008), Riga (2009), Novi Sad (2010), Vienna (2011), Poznań (2012), Genova (2013), Ohrid (2014), Poitiers (2015), Prague (2016), and Nicosia (2017). The conferences are initiated and supervised by an international Steering Committee consisting of representatives from Armenia, Austria, Bulgaria, Czech Republic, Cyprus, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Italy, Latvia, Lithuania, FYR Macedonia, Poland, Russia, Serbia, Slovakia, Slovenia, and the Ukraine.

The program of ADBIS 2018 included keynotes, research papers, thematic workshops, and a doctoral consortium. The conference attracted 69 paper submissions from 46 countries from all continents. After rigorous reviewing by the Program Committee (102 reviewers and 14 subreviewers from 28 countries in the PC), the 17 papers included in this LNCS proceedings volume were accepted as full contributions, making an acceptance rate of 25% for full papers and 41% in common. As a token of the appreciation of the longstanding, successful cooperation with ADBIS, Springer sponsored for ADBIS 2018 a best paper award. Furthermore, the Program Committee selected 11 more papers as short contributions. Authors of ADBIS papers come from 19 countries. The six workshop organizations acted on their own and accepted 24 papers for the AI*QA, BIGPMED, CSACDB, M2U, BigDataMAPS, and Current Trends in contemporary Information Systems and their Architectures (less than 43% acceptance rate of each workshop) workshops and three from the Doctoral Consortium. Short papers, workshop papers, and a summary of contributions from ADBIS 2018 workshops are published in a companion volume entitled *New Trends in Databases and Information Systems* in the Springer series *Communications in Computer and Information Science*. All papers were evaluated by at least three reviewers. The selected papers span a wide spectrum of topics in databases and related technologies, tackling challenging problems and presenting inventive and efficient solutions. In this volume, these papers are organized according to the seven sessions: (1) Information Extraction and Integration, (2) Data Mining and Knowledge Discovery, (3) Indexing, Query Processing, and Optimization, (4) Data Quality and Data Cleansing, (5) Distributed

Data Platforms, Including Cloud Data Systems, Key-Value Stores, and Big Data Systems, (6) Streaming Data Analysis, (7) Web, XML and Semi-structured Databases.

For this edition of ADBIS 2018, we had three keynote talks: the first was by Alexander S. Szalay from John Hopkins University, USA, on “Database-centric Scientific Computing,” the second by Volker Markl on “Mosaics in Big Data,” and the third by Peter Z. Revesz from the University of Nebraska-Lincoln, USA, on “Spatio-Temporal Data Mining of Major European River and Mountain Names Reveals Their Near Eastern and African Origins.”

The best papers of the main conference and workshops were invited to be submitted to special issues of the following journals: *Information Systems* and *Informatica*. We would like to express our gratitude to every individual who contributed to the success of ADBIS 2018. Firstly, we thank all authors for submitting their research paper to the conference. However, we are also indebted to the members of the community who offered their precious time and expertise in performing various roles ranging from organizational to reviewing roles — their efforts, energy, and degree of professionalism deserve the highest commendations. Special thanks to the Program Committee members and the external reviewers for their support in evaluating the papers submitted to ADBIS 2018, ensuring the quality of the scientific program. Thanks also to all the colleagues, secretaries, and engineers involved in the conference and workshops organization, particularly Altagra Business Services and Travel Agency Ltd. for the endless help and support. A special thank you goes to the members of the Steering Committee, and in particular its chair, Leonid Kalinichenko, and his co-chair, Yannis Manolopoulos, for all their help and guidance. Finally, we thank Springer for publishing the proceedings containing invited and research papers in the LNCS series. The Program Committee work relied on EasyChair, and we thank its development team for creating and maintaining the platform; it offered great support throughout the different phases of the reviewing process. The conference would not have been possible without our supporters and sponsors: Faculty of Informatics of the Eötvös Loránd University, Pázmány-Eötvös Foundation, and ACM Hungarian Chapter.



July 2018

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Abstract of Invited Talks

Spatio-Temporal Data Mining of Major European River and Mountain Names Reveals Their Near Eastern and African Origins


Peter Z. Revesz 

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Abstract. This paper presents a spatio-temporal data mining regarding the origin of the names of the 218 longest European rivers. The study shows that 35.2 percent of these river names originate in the Near East and Southern Caucasus. The study also investigates the origin of European mountain names. It is shown that at least 26 mountain names originate from Africa.

Keywords: Data mining · Etymology · Mountain · River · Spatio-temporal

Database-Centric Scientific Computing (in Memoriam Jim Gray)

Alexander S. Szalay 

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Abstract. Working with Jim Gray, we set out more than 20 years ago to design and build the archive for the Sloan Digital Sky Survey (SDSS), the SkyServer. The SDSS project collected a huge data set over a large fraction of the Northern Sky and turned it into an open resource for the world's astronomy community. Over the years the project has changed astronomy. Now the project is faced with the problem of how to ensure that the data will be preserved and kept alive for active use for another 15 to 20 years. At the time there were very few examples to learn from and we had to invent much of the system ourselves. The paper discusses the lessons learned, future directions and recalls some memorable moments of our collaboration.

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