

**INTERNATIONAL
CONFERENCE**

ADVANCED COMPUTER INFORMATION TECHNOLOGIES



ACIT
2018

CEUR-WS.org/Vol-2300/Preface.pdf



1-3 JUNE



Ceske Budejovice,
CZECH REPUBLIC



ORGANIZERS :



TERNOPIL NATIONAL
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Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice



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DEGGENDORF INSTITUTE OF TECHNOLOGY, GERMANY

Conference Proceedings

**ADVANCED COMPUTER
INFORMATION TECHNOLOGIES
ACIT 2018**

June 1-3, 2018

International Conference

Ceske Budejovice, Czech Republic
June 1-3, 2018

ACIT 2018
International Conference
“Advanced Computer Information Technologies”

Organized by:

Ternopil National Economic University, Ukraine
University of South Bohemia, Czech Republic
Deggendorf Institute of Technology, Germany

Partners:

Ministry of Education and Science of Ukraine
Czechoslovakia Section of IEEE
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In the Conference proceedings the results of scientific research and development in the following areas: mathematical models of objects and processes, computer network technologies, specialized computer systems, artificial intelligence systems, software engineering, computer and network security, information and analytical support of economic activity, IT law: implementation problems and development prospects, smart grid are published.

The materials are intended for researchers, scientists, teachers, engineers and students.

Responsible for the issue Mykola Dyvak

*Approved for publication by the
Scientific Council of Ternopil National Economic University
(protocol No 2 on May 16, 2018)*

Papers are presented in authors edition

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Rector of Ternopil National Economic University,
Professor (Ukraine)



Tomas Machula

Rector of University of South Bohemia,
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Wolfgang Dorner

Head of Institute of Applied
Informatics,
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(Deggendorf Institute of
Technology, Germany)

Dear scientists, participants of the International Conference “Advanced Computer Information Technologies” ACIT’2018!

The development of civilization causes the rapid development of man-made sphere, which leaves a special trace in the economic, cultural, scientific progress of humanity. The accumulation of knowledge and experience, a stream of new ideas and inventions reveals new opportunities for society and creates new threats. By millennia absorbing huge layers of information, a person wants to separate useful information, use it for analysis and synthesis, find optimal solutions and build effective models.

Among the criteria for the successful existence of companies of the third millennium, there is the one that is based on the collection and processing of data in the monitoring of the environment.

Today, computer technologies with the organization of intelligent computing is experiencing a peak of prosperity. New software products are rapidly emerging, using such advanced technologies and types of tasks, the application of which can achieve significant economic benefits. Computer data processing and intelligent information analysis are now becoming an integral part of the concept of electronic data warehousing and intelligent computing technologies. Dynamic development of the intellectual sphere in any state is a significant factor in increasing the competitiveness of the economy, raising the standard of living of people, improving the quality of technological and environmental safety.

International Conference “Advanced Computer Information Technologies” ACIT’2018 brought together participants from 12 countries: Ukraine, Czech Republic, Germany, Poland, Austria, Russian Federation, Libya, Republic of Korea, India, Lebanon, Iraq, China.

This year, ACIT’2018 is organized by the Faculty of Computer Information Technologies (Ternopil National Economic University, Ukraine), the Institute of Applied Informatics (University of South Bohemia, Czech Republic) and the Institute of Applied Informatics (Deggendorf Institute of Technology, Germany) on the basis of higher education institution which is our partner, at the University of South Bohemia, Ceske Budejovice, Czech Republic. We express our gratitude to our partners for the opportunity to jointly hold this Conference.

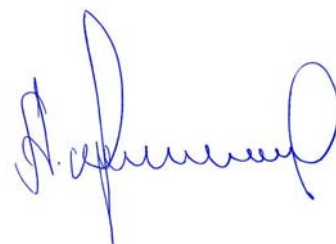
The practice shows that the International Conference “Advanced Computer Information Technologies” enables academics from various universities and IT companies to quickly establish contacts and conclude cooperation agreements.

I am convinced that during the Conference, lively discussions will take place, new ideas and approaches will emerge for solving current problems. I hope that such cooperation will be deepened and improved, gaining new meaning. This meeting of representatives of the scientific elite will become a solid ground for tight cooperation and integration of Ukraine into the world scientific community.

Welcoming the international scientific community, I would like to wish you good health, creative inspiration in conquering new heights of computer science, tireless search, interesting discoveries and implementation of intentions.

Sincerely,

Andriy Krysovatty
Rector of Ternopil National Economic University



Dear participants of the International Conference “Advanced Computer Information Technologies” ACIT 2018, it is a great pleasure for us to greet all of you at the Conference

The first annual All-Ukrainian School-Workshop for Young Scientists and Students “Advanced Computer Information Technologies” was held in May 2011. It was organized by the Faculty of Computer Information Technologies (Ternopil National Economic University, Ukraine), the Association of Computer Information Technologies Specialists and the Council of Young Scientists of Ternopil.

Last year, the VII-th ACIT 2017 has firstly become International Conference. Representatives from three countries took part in the Conference: Ukraine, Poland and Czech Republic. Participants from 23 higher education and scientific institutions of Ukraine were involved.

This year, the VIII-th ACIT 2018 International Conference is organized by the Faculty of Computer Information Technologies (Ternopil National Economic University, Ukraine), Institute of Applied Informatics (University of South Bohemia, Czech Republic) and Institute of Applied Informatics (Deggendorf Institute of Technology, Germany). It is held in the University of South Bohemia, Ceske Budejovice. The University of South Bohemia in Ceske Budejovice has been the center of education, research and science in the southern part of the Czech Republic for more than twenty five years.

We appreciate the great opportunity to jointly hold this International Conference. Eighty six papers were submitted to the Conference. A rigorous review was conducted. We would like to sincerely thank to all reviewers of submitted papers. Their names are listed in the Conference Proceedings. More than 20% of the papers were rejected, sixty eight papers were included in the Conference Program.

Dear participants of the ACIT 2018 International Conference, we wish all of you fruitful work, productive discussions, good inspiration and interesting cooperation in future.

With kind regards,
Mykola Dyvak, Libor Dostalek, Wolfgang Dorner

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