HORIZON 2020

The EU Framework Programme for Research and Innovation

Horizon 2020 Expression of Interest

Informatics Institute

OUR UNIVERSITY

ISTANBUL TECHNICAL UNIVERSITY:

Founded in 1773 as the Imperial School of Naval Engineering during Ottoman Empire, Istanbul Technical University (ITU) is now one of the leading state universities in Turkey with approximately 32,000 students. The University offers 76 undergraduate and 140 graduate degree programs. ITU comprises 13 Faculties, 43 Departments, and 6 Graduate Institutes and Turkish Music Conservatory.

ITU is a very long-established higher education institution and presents a powerful research base for scientists and for prospective researchers with its highly-developed research infrastructure. Providing technical education within a modern educational environment and strong academic staff, ITU is strongly identified with architectural and engineering education in Turkey. ITU is one of the leading research-intensive technical universities in Turkey.

Research:

Being Turkey's first technical university, ITU aims to create a new generation of technology and innovation to drive economic growth by conducting value-added and industrially applicable research. ITU's researchers carry out research in the fields of engineering, core sciences, earth/planetary sciences, arts and social sciences. Particular research areas, in which the ITU researchers pursue discoveries and implement projects, are materials science, nanotechnology, aeronautics, mechatronics, biotechnology, renewable energy, sustainable building systems and design.

ITU is one of the leading research-intensive technical universities in Turkey. Regarding EU funded research; ITU currently has 22 projects from 6th Framework Programme, 47 projects from 7th Framework Programme, 4 projects from MEDA Programme, 2 projects from MINERVA Programme, 1 project from Leonardo Da Vinci Programme, 1 project from MATRA Programme, 1 project from Grundtvig Programme, 1 Project from Youth in Action Programme and 1 project from Black Sea Cross Border Cooperation Programme, 4 projects from Erasmus+, 7 projects from Horizon 2020 Programme. Besides, ITU is actively involved in wide range of national projects. In this respect, ITU has around 7600 projects funded by different national research programmes since 2003.

ITU has a world record by being accredited with 23 departments by Accreditation Board for Engineering and Technology (ABET), the world's foremost review organization in engineering education. ITU is the only university with the largest number of accredited departments worldwide.

ITU holds significant positions in a number of international institutions of academy. For instance, one of the three Turkish members of American Academy of Sciences, two of the three Turkish members of Russian Academy of Sciences and two of the three Turkish members of European Academy of Sciences are from ITU. Furthermore, the University has more than 130 international partnership agreements and is a member of various international networks such as European Association for International Education (EAIE), European University Association (EUA), International Association of Universities (IAU), Advanced Technology Higher Education Network (ATHENS), Black Sea University Network (BSUN), International Association of Universities (IAU), Community of Mediterranean Universities (CMU), and

Top Industrial Managers for Europe (TIME). ITU has around 900 Erasmus Agreement with renowned universities around Europe. 11 International Dual Diploma Programs are being conducted at ITU. ITU is the only university with the largest number of International Dual Diploma Programs in Turkey.

OUR DEPARTMENT

Description of the Unit

- *Informatics Institute, at Istanbul Technical University is an interdisciplinary research and development organization serving in all application areas of information technologies including applied research on mechanical infrastructure and thermal management of data centers. Supported by 14 full-time and numerous part-time faculty affiliated from other departments, Informatics Institute provides graduate-level education and research environment for the immediate and long term needs of the information technology (IT) industry partners in collaboration with industrial and academic partner organizations. Informatics Institute is initially founded to satisfy the requirements of various disciplines. Funded by the Turkish Government, the institute houses the first high performance computing laboratory in the country, which consists of powerful server systems. The lab aims to provide the infrastructure to gather industrial and academic partners that serve development of new computational techniques and execute computationally expensive simulations.*
- *Energy is an emerging field concerning the IT industry and data center sector due to the growth. The Institute is highly interested in the research and development of innovative ideas that can serve the growing needs of the IT industry as well as dissemination of the associated results to the broad public and industrial partners. The Informatics Institute emphasizes graduate level teaching and research programs in the general area of applications in modeling and optimization including but not limited to the energy efficiency, thermal management and reliability of data centers.*
- *Including the M.Sc. and Ph.D. students Informatics Institute has more than 25 researchers working on more than 25 national and international projects mostly in the wide areas of communications, network and vertical sectors and applications consisting of the critical infrastructure and high performance computing.*

1. Contact details

Country	TURKEY
Name of the organisation	Istanbul Technical University
Name of the contact	Hamza Salih Erden, Ph.D.
Phone	+902122856648
Email	erdenh@itu.edu.tr

2. Areas of Interest in H2020 Work Programme 2016-2017

FETHPC-02-2017: Transition to Exascale Computing

3. Specific skills related to the research topic

Thermal Systems
Energy
Thermodynamics
Fluid dynamics
Optimization

4. Proposed activities for the specific topic

FETHPC-02-2017:

- Innovative solutions to the design of mechanical infrastructure for data centers and optimization through physics-based reduced order multi-scale thermal models developed in-house (e.g. Matlab).
- Holistic energy-aware optimization and management of computing, power and cooling resources for exascale computing.
- Real-time model-based prediction of thermal environmental conditions in the exascale computing infrastructure.

5. References

A. Previous EC funded projects

Project acronym / starting date	Main objectives	Main activities	Role in the project

B. Ongoing EC funded projects

Project acronym / starting date	Main objectives	Main activities	Role in the project

C. Forthcoming EC funded projects

Project acronym / starting date	Main objectives	Main activities	Role in the project

D. Some of the recent publications

Selected Publications

- Pardey, Z., Demetriou, D.W., Erden, H.S., VanGilder, J., Khalifa, H.E., Schmidt, R., (2015). "Proposal for Standard Compact Server Model for Transient Data Center Simulations," ASHRAE Transactions, Vol. 121(1).
- Erden, H. S., Khalifa, H.E. and Schmidt, R., (2014). "A Hybrid Lumped Capacitance – CFD Model for the Simulation of Data Center Transients", HVAC&R Research, Vol. 20(6), pp. 688-702.
- Erden, H. S., Khalifa, H.E. and Schmidt, R., (2014). "Determination of the Lumped-Capacitance Parameters of Air-Cooled Servers Through Air Temperature Measurements", ASME J. Electron. Packaging, 136(3), p. 031005.
- Erden, H.S. and Khalifa, H.E. (2012). "Energy and environmental assessment of on-site power and cooling for data centers," HVAC&R Research, Vol. 18(1-2), pp. 51-66.
- Koz, M., Erden, H.S. and Khalifa, H.E., (2016). "Numerical Investigation of the Melting of a Phase Change Material in a Thermal Storage Device with Embedded Air Flow Channels", Proceedings of the ASME 2016 Summer Heat Transfer Conference, Washington, DC, July 10-14, 2016.
- Erden, H. S., Yildirim, M.T., Koz, M. and Khalifa, H.E., (2016). "Energy Assessment of CRAH Bypass for Enclosed Aisle Data Centers", Proceedings of the IEEE ITHERM 2016, Las Vegas, NV, May 31-June 3, 2016.
- Erden, H. S., Khalifa, H.E. and Schmidt, R., (2013). "Room-Level Transient CFD Modeling of Rack Shutdown", Proceedings of the ASME InterPACK, Burlingame, CA, July 16-18, 2013.
- Ringham, D.C., Rice, D.J., Granetz, B.S., Erden, H. S., Khalifa, H.E. and Schmidt, R., (2013). "Assessment of the Energy Performance of Cogeneration Systems for Powering and Cooling Data Centers", Proceedings of the ASME InterPACK, Burlingame, CA, July 16-18, 2013.

6. Other

Recent Academic Awards

- 2015 Willis H. Carrier Award, ASHRAE, June 2016
- 2015 Technical Paper Award, ASHRAE, June 2016

Research Project Experience

- 2016-2018: (Principal Investigator), Energy Savings and Economic Potential Evaluation of Economizer Use for Data Center Cooling in Turkish Climate Zones, The Scientific and Technological Research Council of Turkey (TÜBİTAK).
- 2015-2015: (Researcher), Micro-Environmental Control System, Advanced Research Projects Agency-Energy (ARPA-E) - U.S. Department of Energy

- 2014-2016: (Researcher), Cooling Unit Bypass Fans for Air Conditioning Management in Enclosed-Aisle Data Centers, New York State Energy Research and Development Authority (NYSERDA)
- 2013-2014: (Researcher), Energy Saving Potential of Low Temperature Cooling of Computers, Syracuse Center of Excellence & Advanced Manufacturing For Thermal & Environmental Controls (AMTEC)
- 2008-2013: (Researcher), Transient Thermal Response of Air-Cooled Data Centers, Thermodynamics Modeling of Data Centers, SU-IBM Data Center Research Program

Professional Activities

Society Memberships

- ASHRAE (2008-present)
- ASME (2008-present)

Journal Reviewer

- ASME Journal of Electronics Packaging
- International Journal of Heat and Mass Transfer
- IEEE Transactions on Components, Packaging and Manufacturing Technology
- Journal of Thermal Science and Engineering Applications

Conference Reviewer & Session Chair

- IEEE ITHERM 2014 / 16
- ASME InterPACK/ICNMM 2015