



پژوهشگاه دانش‌های بنیادی  
پژوهشکده علوم کامپیوتر

## سخنرانی علمی

# Thermal Management in Safety-Critical Systems

سپیده صفری

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### Abstract

A major requirement of safety-critical systems is high reliability at low power consumption. Dynamic voltage and frequency (v/f) scaling (DVFS) techniques are widely exploited to reduce power consumption. However, DVFS through downscaling v/f levels has a negative impact on the reliability of the tasks running on the cores, and through upscaling v/f levels has circuit level aging effects. The availability of multiple cores on a single chip provides opportunities to employ fault-tolerant techniques to ensure the reliability constraints of safety-critical systems. However, applying fault-tolerant techniques will increase the power consumption on the chip, and thereby on-chip temperatures might increase beyond safe limits. To achieve high reliability in multicore safety-critical systems, task replication as a well-known fault-tolerant technique which is an established way to deal with the negative effect of downscaling v/f levels, but it may accelerate aging effects due to elevating the on-chip temperatures. In this talk, we will discuss our proposed aging-aware task replication (called ATLAS) method that solves the problem of satisfying the desired reliability target for a set of periodic hard real-time tasks which are executed on a multicore system. The proposed method satisfies the reliability target of the tasks through updating the required number of replicas for each task at different years. Moreover, to verify the schedulability of real-time tasks under considered constraints, we have developed a unified demand bound function (DBF) analysis.

### Biography

[Sepideh Safari](#) received the M.Sc. and Ph.D. degrees in computer engineering from Sharif University of Technology, Tehran, Iran, in 2016 and 2021, respectively. She was a visiting researcher in the [Chair for Embedded Systems \(CES\), Karlsruhe Institute of Technology \(KIT\)](#), Karlsruhe, Germany, from 2019 to 2021. She is now the postdoctoral researcher at the [Institute of Research for Fundamental Sciences \(IPM\)](#), Tehran, Iran, from 2021-Present. Her research interests include: scheduling of real-time mixed-criticality systems, low-power design of embedded and cyber physical systems, energy management in fault-tolerant mixed-criticality systems, and multicore systems with a focus on dependability/reliability. She is the associate editor of Elsevier Microprocessors and Microsystems (MICPRO) journal from May 2022-present. She was a technical program committee (TPC) member of the Euromicro Conference on Digital System Design (DSD), 2022, and 2023.

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