

SOFA2020 Special Session

Rebooting Reliability – From Maths to Circuits

Early on, both *communications* and *computations* were in dire need of practical designs for enhancing their reliability. That is why John von Neumann proposed the first gate-level method (using redundancy to build reliable systems from unreliable components), while Edward F. Moore and Claude E. Shannon followed suit with the first device-level scheme (where the nodes of the network were considered to be perfectly reliable, while the edges could fail independently with a certain probability). Moore and Shannon scheme required estimating the probability that two nodes are connected, establishing the well-known reliability polynomial. This concept has been heavily used for *communications*, while for *computations* the research community converged on the gate-level method proposed by von Neumann, and the device-level scheme crafted by Moore and Shannon—although very practical and detailed—did not inspire circuit designers and went under the radar for half a century.

Moore and Shannon scheme was built on a thought-provoking network called *hammock*, exhibiting regular brick-wall near-neighbor connections. ***This session aims to do justice to computing networks in general, and to hammocks in particular, by targeting the reliability of networks when intended for computations.*** To our knowledge, ranking networks with respect to their computing reliability has never been properly discussed before, and we believe that ***a rethinking of how we should design reliable computing systems – immediately applicable to arrays of devices like FinFET transistors and qubits – is both very timely and needed.***



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Rebooting Reliability – From Maths to Circuits

Keynote **Why Reliability Is Such a Nemesis – Rethinking Computing Reliability**
V. Beiu

List of papers	Title and authors	Topic/area
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2.	Consecutive Systems Asymptotic Threshold Behaviors V.-F. Dragoi, and V. Beiu https://scholar.google.com/citations?user=X4uzwBUAAAAJ https://scholar.google.com/citations?user=u_PrdFwAAAAJ	Maths/CS
3.	3D Hammocks and 2.5D Consecutive – Biology Fine Balancing R.-M. Beiu, V.-F. Dragoi, and V. Beiu https://scholar.google.com/citations?user=gzmO7wEAAAAJ https://scholar.google.com/citations?user=X4uzwBUAAAAJ https://scholar.google.com/citations?user=u_PrdFwAAAAJ	CS/Bio
4.	Where Reliability Gets Ugly – The Devil is in the Details M. Tache, V.-F. Dragoi, and V. Beiu https://www.semanticscholar.org/author/Mihai-Tache/2568633 https://scholar.google.com/citations?user=X4uzwBUAAAAJ https://scholar.google.com/citations?user=u_PrdFwAAAAJ	CS/CE
5.	And Now This: Hammocks for Quantum and Photonics R.-M. Beiu, S. Hoara, and V. Beiu https://scholar.google.com/citations?user=gzmO7wEAAAAJ https://www.researchgate.net/profile/Sorin_Hoara https://scholar.google.com/citations?user=u_PrdFwAAAAJ	CE/EE

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