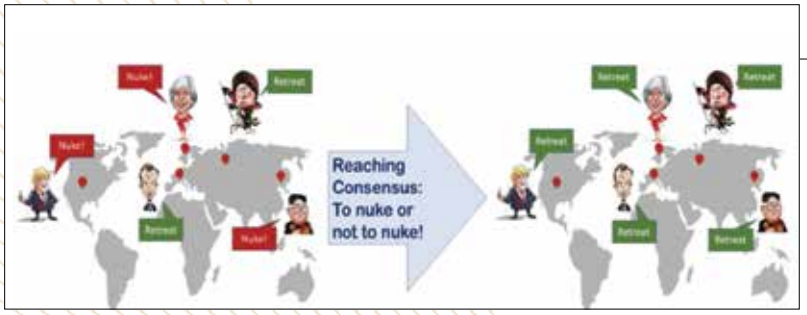
DIVISION OF

Electrical Sciences

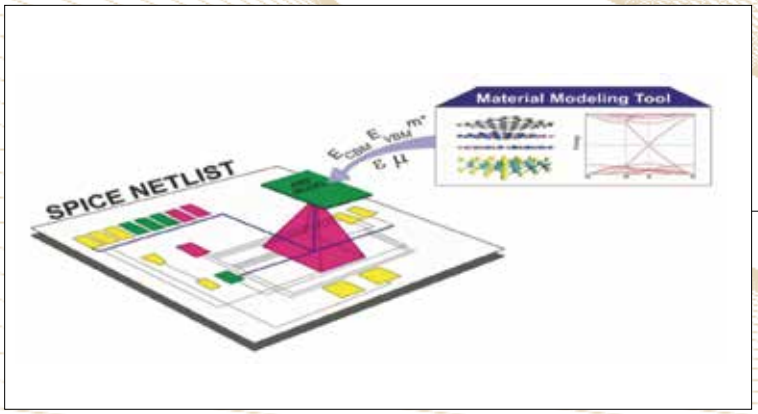
RESEARCH SNAPSHOTS 2018



ARPITA PATRA (CSA)

The problem of Byzantine Agreement (BA) is of interest to both distributed computing and cryptography community. Following well-known results from the distributed computing literature, BA in the asynchronous network setting encounters inevitable non-termination issues. The impasse is overcome via randomization that allows construction of BA protocols in two flavors of termination guarantee – with overwhelming probability and with probability one. The latter type termed as almost-surely terminating BAs are the focus of this work. An eluding problem in the domain of almost-surely terminating BAs is achieving a constant expected running time. Our work makes progress in this direction.

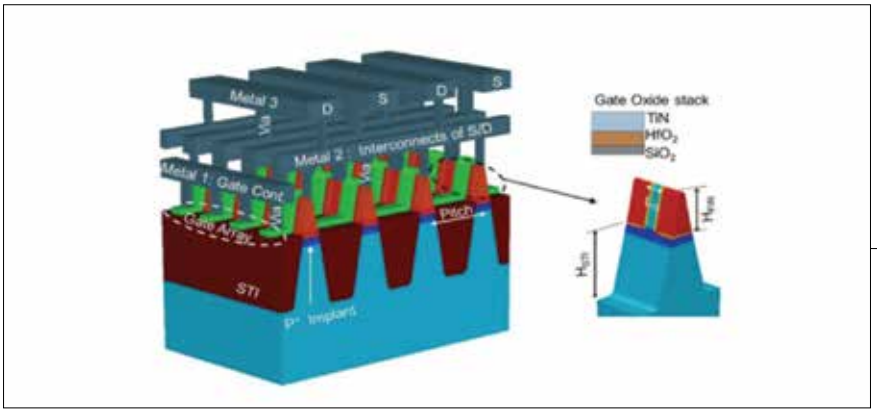
Reference: https://eprint.iacr.org/2018/394



SANTANU MAHAPATRA (DESE)

In the semiconductor industry, there is demand for a modeling framework that enables systematic performance evaluation of new materials at device and circuit levels. We propose an 'atom-to-circuit' modeling framework for all-2D MISFET (Metal-Insulator-Semiconductor Field-Effect Transistor). It bridges between first-principle based material modeling tools and industry standard circuit simulators and facilitates seamless design flow from 2D materials to integrated circuits.

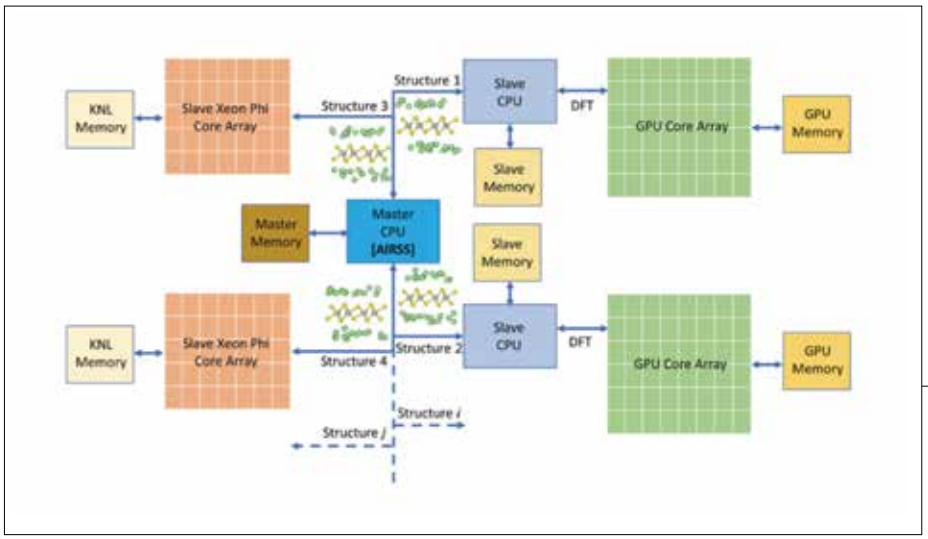
Reference: Biswapriyo Das and Santanu Mahapatra, "An Atom-to-Circuit modeling approach to all-2D Metal-Insulator Semiconductor Field-Effect Transistors", npj 2D Materials and Applications, Nature publication group, 2018, DOI:10.1038/s41699-018-0073-3



MAYANK SHRIVASTAVA (DESE)

Improved non-planar transistor device designs like Fin Field Effect transistors (FinFETs) are the most promising candidates for ultra large scale integration. In this work, the researchers studied the mechanisms behind electrostatic discharge (ESD), Latch-Up and Hot Carrier reliability in FinFET devices, which led to invention of special ESD protection techniques and high voltage concepts enhancing the reliability limits of FinFET technology. They proposed a hybrid contact and junction engineered scheme, enabling ESD robust protection devices as well as reliable core functional devices in FinFET technology.

Reference: http://msdlab.dese.iisc.ac.in/



SANTANU MAHAPATRA (DESE)

Two dimensional materials are being explored extensively for possible applications in next-generation lithium-ion battery anode due to their large surface-to-mass ratio. We investigate lithium ion binding on rhenium disulphide (ReS2) by first-principles based calculations. The unique atomistic modeling technique proposed in this work is generalized enough for the realistic estimation of reversible lithium ion storage capacity of any new material.

Reference: Arnab Kabiraj and Santanu Mahapatra,"High-throughput first-principles-calculations based estimation of lithium ion storage in monolayer rhenium disulfide", Communications Chemistry, Nature publishing group, 2018. DOI:10.1038/s42004-018-0082-3