Scilight

NEWS | JULY 09 2021

Exploiting random magnetic phenomena for computational applications FREE

Anashe Bandari

Scilight 2021, 281111 (2021)
https://doi.org/10.1063/10.0005666

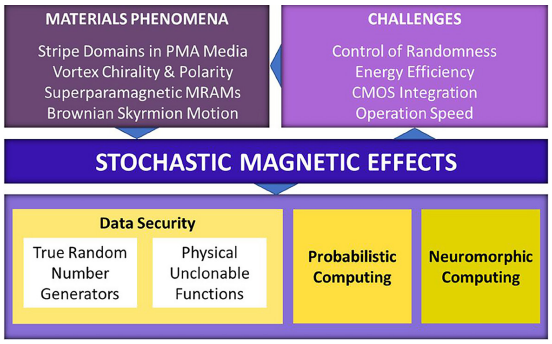
Scilight

8 July 2021

Exploiting random magnetic phenomena for computational applications

Anashe Bandari

A perspective presents the challenges and prospects of taking advantage of these typically unwanted effects for data security, probabilistic computing and neuromorphic computing.



As technologies shrink, random stochastic effects have a larger impact on their performance. Carles Navau and Jordi Sort discussed the prospects of exploiting stochastic phenomena in magnets for computational applications, where random patterns are needed.

“Materials and devices are becoming smaller and smaller. The level of the degree of computation is increasing day by day, week by week, because we have a lot, a lot of information,” said Navau. “When you go to such small pieces, randomness is more important.”

There are many examples of stochastic phenomena in magnetic materials, such as thermal effects on skyrmion trajectories. These effects are truly random and, therefore, more secure than any human attempts at generating random strings or passwords. By using engineering methods to control their randomness such that the probability of a certain behavior varies from exactly 50%, these materials can be made applicable for computation.

“There are some applications of stochastic effects or randomness, especially if you can control the randomness to some extent. If it’s not completely random, you can do some probabilistic computing,” said Sort.

These applications also include cybersecurity and neuromorphic computing, but the key challenge for achieving them is finding energy efficient ways to take advantage of these materials’ stochastic effects. Ultimately, the goal is to process as much information as possible with as little power consumption as possible.

“At the top of all of this is material development and different ways in which you can control or process or speed up all these computations. Everything goes in parallel,” Navau said.

“The perspective is focused on materials, but this has to be integrated with hardware and how to handle this huge amount of information,” said Sort.

Source: “Exploiting random phenomena in magnetic materials for data security, logics and neuromorphic computing: Challenges and prospects,” by C. Navau and J. Sort, *APL Materials* (2021). The article can be accessed at https://doi.org/10.1063/5.0055400.