

## Fundamental &amp; Computational Sciences

## Advanced Computing, Mathematics and Data Division Staff Awards & Honors

April 2015

### They've Got 'Game'

*PNNL staff awarded Cyber Security Track Best Paper honors by IEEE HST*

As part of this year's IEEE Symposium on Technologies for Homeland Security (HST '15), the leading science and technology symposium devoted to homeland security, scientists from PNNL and Virginia Tech were honored with the Cyber Security Track Best Paper Award for their work, "Quantifying Mixed Uncertainties in Cyber Attacker Payoffs." The paper employs game theory to mathematically address cyber-system security and resilience challenges in the context of added uncertainties. The authors received their award during the initial HST '15 Plenary Session on April 14, 2015.

The team from PNNL's National Security and Fundamental & Computational Sciences directorates who collaborated on the award-winning paper included: **Samrat Chatterjee** (NSD's Operations Research Team), **Mahantesh Halappanavar** (Data Sciences, ACMD Division), **Ramkrishna Tipireddy** (Computational Mathematics, ACMD Division), and **Matthew Oster** (NSD's Operations Research Team). Sudip Saha, from Virginia Tech, also was a contributor. The work was supported by PNNL's **Asymmetric Resilient Cybersecurity** initiative.



PNNL authors Chatterjee, Halappanavar, Tipireddy, and Oster (clockwise top left) with their award from IEEE HST. [Enlarge Image.](#)

Using game theoretic applications and terminology in their mathematical analysis of cyber-system security, the researchers proposed ideas for quantification of adversary payoff uncertainty—*payoffs* being penalties (negative values) and rewards (positive values) associated with the actions of a cyber-system defender and attacker. Their work presents new ideas for development of a probabilistic framework to reason about attacker payoff uncertainties and uncertainty quantification methods to address sources of uncertainties in the attacker payoffs. Moreover, it is a step toward improving models of an intelligent adversary and defender in response to or anticipation of a cyber-system attack.

PNNL researchers have had past success at the IEEE HST symposiums, which includes a top-five "Best Papers" nod from *Homeland Security Affairs* to a team that included Halappanavar for work featured in HST '13, "Towards a Theory of Autonomous Reconstitution of Compromised Cyber-Systems."

#### Reference:

Chatterjee S, M Halappanavar, R Tipireddy, M Oster, and S Saha. 2015. "Quantifying Mixed Uncertainties in Cyber Attacker Payoffs." Presented at *2015 IEEE Symposium on Technologies for Homeland Security (HST '15)*. April 14-16, 2015, Waltham, Massachusetts.

#### Related:

- PNNL Team Included Among IEEE Technologies for Homeland Security Best Papers
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