“Understanding Information-Energy Interactions”: Annual Report 2015

Existing Team: Yaoqing Yang, Majid Mahzoon, Praveen Venkatesh, Haewon Jeong, Karthik Ganesan, Pulkit Grover

New team: Yaoqing Yang, Sanghamitra Das, Praveen Venkatesh, Haewon Jeong, Karthik Ganesan, Pulkit Grover

Team interaction/meetings:

* Pulkit and Karthik met for discussions on JSAC submission in San Jose, CA, on the sidelines of Asilomar 2014.
* Haewon, Praveen, Yaoqing, and Karthik met and discussed ideas on information-energy interactions at the North American School on Information Theory at San Diego (NASIT, 2015).
* Haewon and Karthik discussed ideas on code design for energy-efficient communication regularly throughout the year over email and meetings.

Presentations/posters/papers:

* Haewon, Praveen, Yaoqing, and Karthik presented posters at NASIT.
* “Information Friction Limits on Computation,” Pooja Vyavahare, Majid Mahzoon, D. Manjunath, N. Limaye, Pulkit Grover, Allerton 2014.
* *Karthik Ganesan, Pulkit Grover, Andrea Goldsmith, Jan Rabaey, “Towards approaching total-power-capacity: transmit and decoding power minimization for LDPC codes,” Submitted to IEEE JSAC, 2015.*
* *Praveen Venkatesh and Pulkit Grover, “Is the direction of greater Granger causal influence same as the direction of information flow?”* *to be presented* at Allerton ’15 and Society for Neuroscience (SfN) annual meeting, 2015.

**Notable progress/outcomes**:



1. Experimental corroboration of Pulkit and Andrea’s earlier results on energy-efficient communication
2. With Praveen, we were able to concretely provide a counterexample on inferring information flow in the brain using Granger causality. We showed that the direction of Granger causal influence can be *opposite* to the direction of information flow, thus challenging a widespread technique used in modern neuroscientific studies.