Value-centered Information Theory for Adaptive Learning, Inference, Tracking, and Exploitation

Wrapup

PI: Al Hero, Univ of Michigan
Opportunities for future investment?

Some opportunities and directions for future investment

- Hierarchical/multiscale situational awareness
- Task-aware learning and inference
- Privacy-aware learning
- Resource-aware learning (computation, energy, bw)
- Timeliness-aware learning
- Just-in-time push-pull of information
- Decisionmaking that integrates nontraditional datatypes
  - Primary sensor data (Imaging, radar, acoust, LIDAR, etc)
  - Secondary behavioral data (text/microtext/emoticon data)
  - Geo data (GPS, DEM, blueprints, etc)
  - Event-tagged data (heavy-tailed spatio-temporal)
- Learning and exploitation with small sample sizes
Cumulative education activities 2012-2015

- Education of students for next generation
  - Over 60 graduate student research assistantships
  - Over half a dozen undergraduate student appointments
  - Over a dozen Postdoctoral appointments

- Degrees awarded to students supported on MURI
  - Over a dozen PhD, MS and BS/BA degrees

- Summer student internships at federal and associated labs
  - Over a dozen student internships at ARL
  - Over half a dozen student internships at AFRL
  - Several student internships at Lincoln Laboratory
Tech transfer (2012-2015)

- Co-PI Soatto working with China Lake to transition DSP SIFT (POC: Matthew Kirchner)
- Co-PI Cochran ARL-ASU CRADA in process (POC: Brian Sadler)
- Co-PI Hero and post-doc Hye Won Chung are working to transition human-in-the-loop query models at ARL in 2014 (POC: B. Sadler)
- Co-PI Hero and student Mark Hsiao transitioned Pareto web image search engine to ARL in 2013 for evaluation and adaptation into an in-house interface (ARL POC: Brian Sadler).
- Co-PI Fisher transferred in 2013 implementations of information planning algorithms to DARPA sub-contractor (*Systems Technology Research*) under the All Source Positioning and Navigation (ASPN) program. The method is being adapted to sensor planning and anomaly detection. (STR POC: Joel Douglas).
Synergistic activities (2012-2015)

• Service on National/International Advisory Boards
  • How serves on Air Force Scientific Advisory Board
  • Hero serves on NAS Committee on Applied and Theoretical Statistics (CATS).
  • Jordan chaired NAS Committee on Frontiers in Massive Data Analysis
  • Jordan runs Big Data program at Simons Institute
  • Moses serves on NAS Committee on Science and Technology for Defense Warning.
  • Moses serves on NRC ARL TAB for CISD
  • Hero is member of Strategic Advisory Group (SAG) of University Defence Research Collaboration (URDC), U. Edinburgh and Heriot-Watt U. (UK).

• Workshop/session organization on MURI-related topics
  • Fisher and Hero co-organized special session at Fusion meeting in 2015
  • Hero and Zelnio co-organized special session on VoI at 2013 SPIE DSS Conference
  • Fisher and Sadler co-organized 2 sessions on VoI at 2012 IEEE SSP
  • Moses chaired Government Panel at 2012 IEEE SSP
  • Hero and Nadakuditi co-chaired 2012 ARO SIEEE Workshop
Other cumulative statistics (2012-2015)

- Technical progress under MURI is reported in over 160 peer reviewed publications (https://wiki.eecs.umich.edu/voimuri)

- Over a dozen papers co-authored with ARL collaborators

- Quality of MURI team’s research has been recognized by
  - Several best paper awards
  - Several major career awards to co-PIs
  - Over 40 invited talks and distinguished lectures
  - Over 30 keynote and plenary talks