



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

## Wrapup

PI: Al Hero, Univ of Michigan





# Research program: Future directions

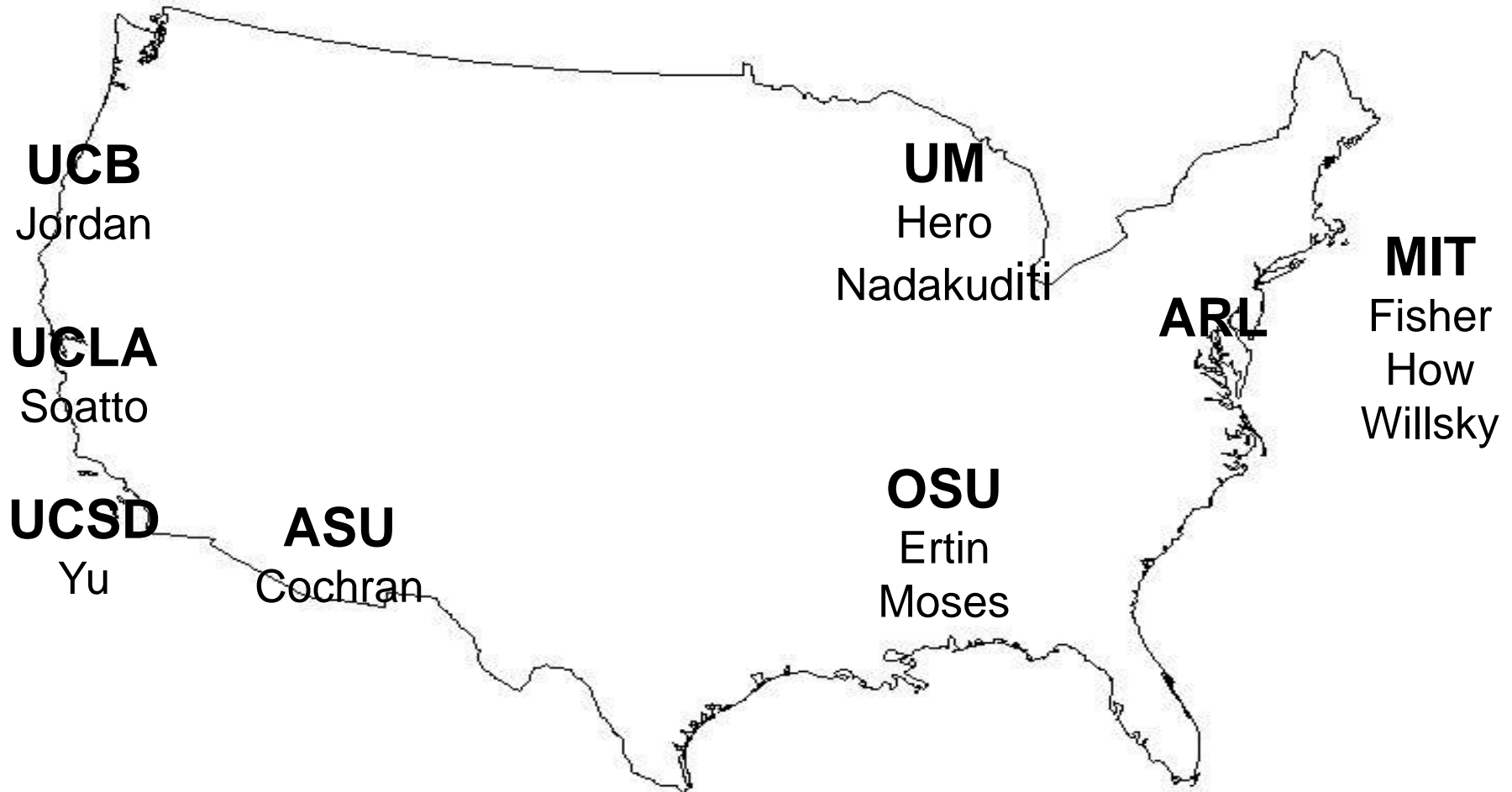


- Vol for heterogeneous sensor networks and modalities
  - Moses – adaptively censored sensor nets
  - Hero - human agents, sensor reliability
  - Fisher – heterogeneous resource constraints
- Vol for collection systems with human-interaction
  - Hero – MDP models for human feedback
  - Nadakuditi – eigenstructures in social network data
- Vol for spatio-temporal data sources
  - How - AVoIDS for multi-variance, dynamic estimation problems
  - Jordan – Vol for streaming data
- Vol in sensor management
  - Hero - OLFC for sparse signal tracking in managed sensors
  - Ertin – adversarial CLFC for surveillance networks
  - Cochran – practical application of information geometric SM
- Value of visual information
  - Soatto - Information-based classification architectures



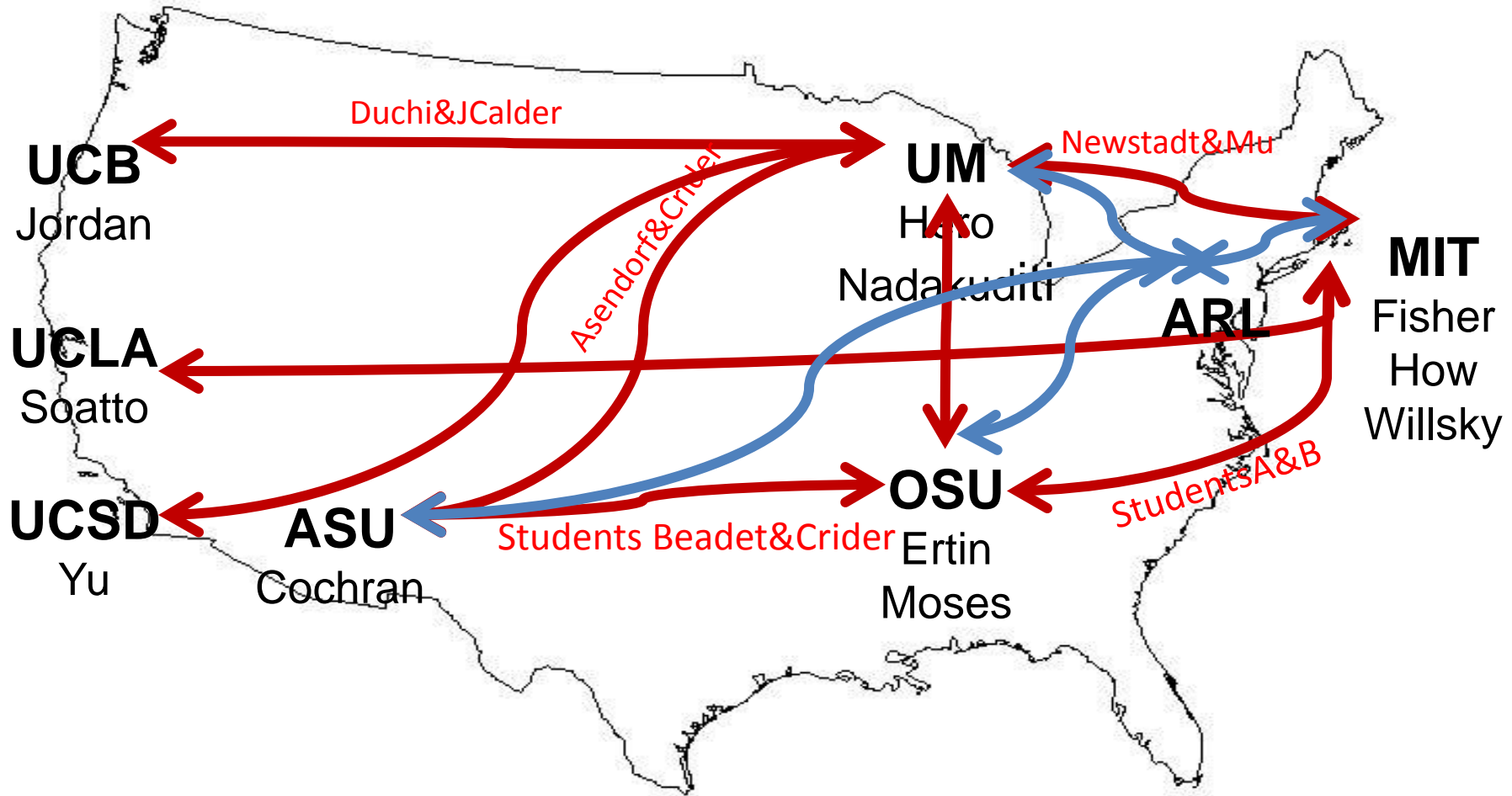


# Our MURI Leverages Collaborations (2013)





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# Our Vol MURI leverages collaborations (2013)



## Human-in-the-loop

Hero, Jordan, Yu (Sadler)

## Geometry of information

Cochran, Ertin, Hero, Soatto (Sadler)

## Analyze-fuse for subspace tracking

Cochran, Nadakuditi

## Kronecker product matrix reductions

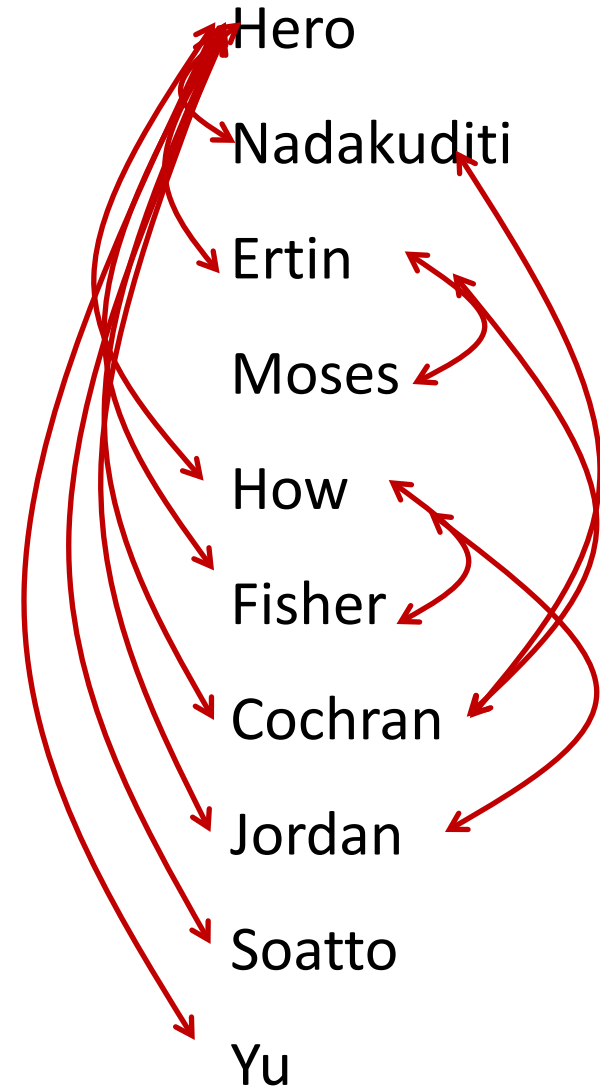
Hero, Ertin, Nadakuditi

## Convex surrogates for planning

Hero, How

## Software defined radar DURIP

Ertin, Moses. Cochran, Fisher, Hero, How





# Education and training in years 1 and 2



- Over 20 Graduate students
- 2 Undergraduate students
- 5 Postdoctoral students
  
- Summer student internships at federal and associated labs
  - 5 students at ARL
  - 3 students at AFRL
  - 1 student at DSTO (Australia)
  
- Dissemination to broader community
  - SIEEE Workshop in 2012
  - Special sessions at 2012 IEEE SSP and 2013 SPIE DSS





# Tech transfer in years 1 and 2



- Cochran, Ertin, Fisher and Hero visited ARL in 2012 and 2013
- Co-PI Hero and student Mark Hsiao have 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 has 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.
- Co-PI Hero and student Kristjan Greenwald have worked on transitioning Kronecker sum decompositions to video sources at **AFRL** over the summer 2013.





# Synergistic activities in year 1 and 2



- Service on National/International Advisory Boards
  - Hero serves on NAS Committee on Applied and Theoretical Statistics (CATS).
  - Jordan chaired NAS Committee on Frontiers in Massive Data Analysis
  - 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
  - Hero chaired special session on VoI at 2013 SPIE DSS Conference
  - Hero and Nadakuditi co-chaired 2012 ARO SIEEE Workshop
  - Hero chaired 2012 IEEE Statistical Signal Processing Workshop
  - Moses chaired Government Panel at SSP 2012







# Statistics



- Technical progress under MURI is reported in over 70 peer reviewed publications (<https://wiki.eecs.umich.edu/voimuri>)
- 10 faculty supported by MURI
- 27 PhD, MS and BS students supported by MURI
- 6 postdoctoral students supported by MURI
- Quality of MURI team's research has been recognized by
  - 1 notable paper award
  - 19 invited talks and distinguished lectures
  - 14 keynote and plenary talks

