Michigan Tech Research Institute

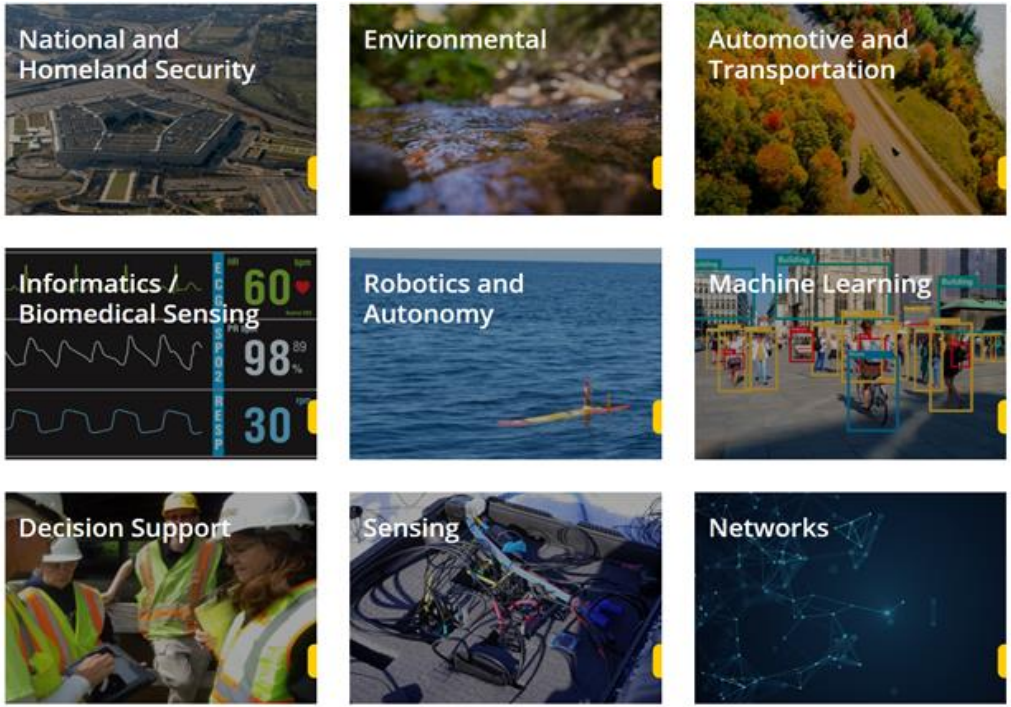
Proposers Day: Video LINCS

02/07/2024

Michigan Tech
Research Institute

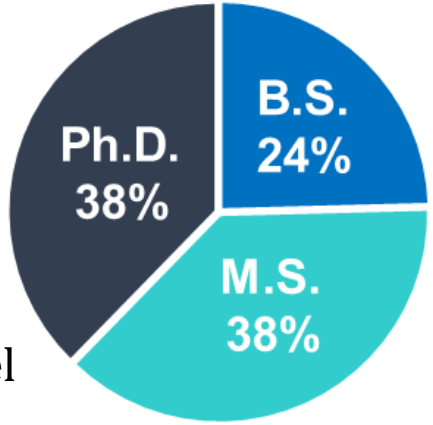
MTRI Vision

- **Michigan Tech Research Institute** focuses on *multidisciplinary technology development and research to sense and understand natural and human-made environments*. Through innovation, education, and collaboration, we support meaningful solutions to critical global issues, from infrastructure to invasive species, national security to public health.

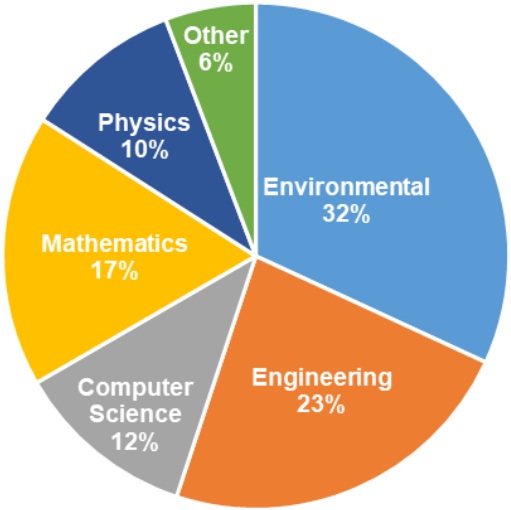


Who we are

- Research Institute reporting to the vice president of research at Michigan Tech
  - ~100 Staff
  - Supporting ~ $12 Million in research contracts
- We are PI driven and focused on 6.2-6.3 level applied research
  - Remote Sensing – Image Classification
  - Multi-Modal Sensor Fusion
  - Advanced Optical Systems
  - Resource Allocation for Sensor Platforms
- Major Sponsors: DARPA, NASA, AFRL, NGA, DOT,



Staff Degree Types



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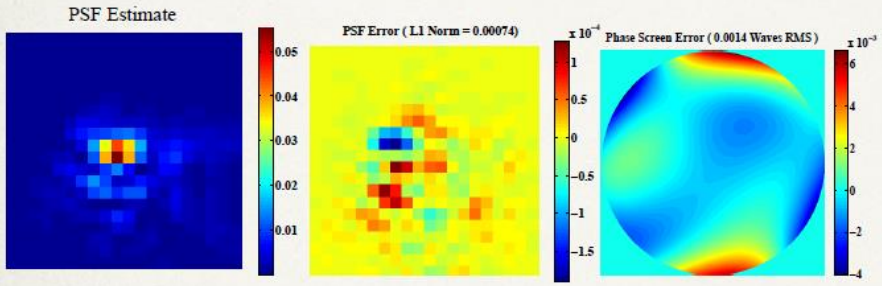
Relevant Related Work: Optical System Characterization

Sensor Characterization:



Information Theoretic Bounds:

Estimators Approach Information-Theoretic Limits

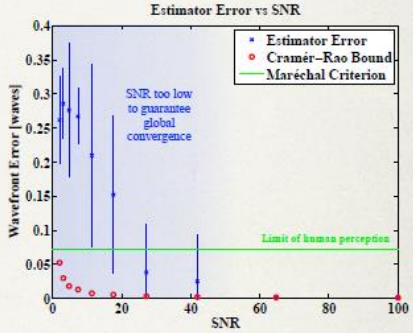
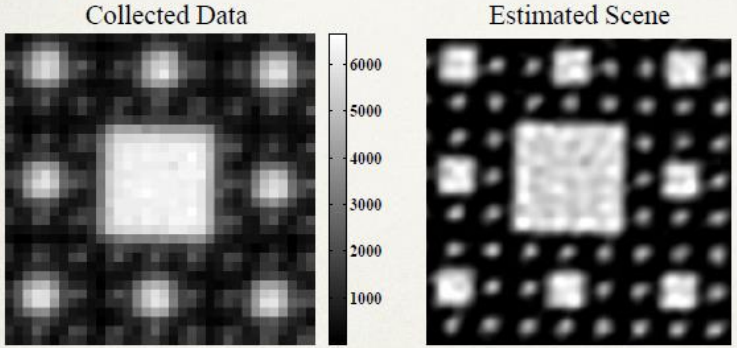
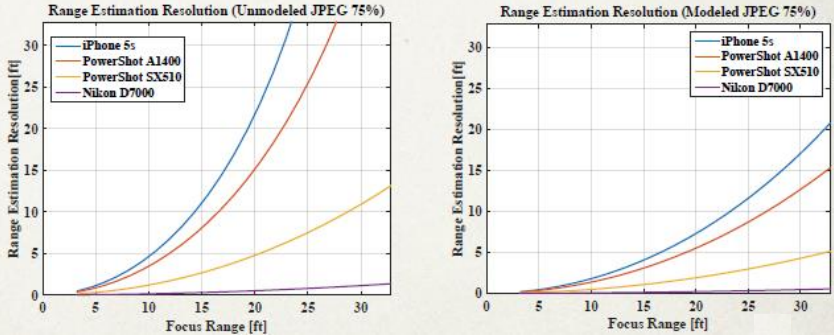


Image Restoration:



Depth from Defocus:



Related Work

- **RAIILS**: Automated Trespasser Detection from UAVs
  - VideoLINCS Relevance: Real time target tracking from moving platform
- **DARPA OFFSET**: Visual odometry and target tracking for UAV SWARM Autonomy
  - VideoLINCS Relevance: Real time image processing and target tracking
- **DARPA Subterranean Challenge:** Automatic detection and localization of specified objects from autonomous platforms
  - VideoLINCS Relevance: Object recognition and localization from moving cameras
- **AFRL SMAX:** Sensor fusion for tracking long time-scale behaviors of targets
  - VideoLINCS Relevance: Long-time scale target characterization

Forward Model

$$d = c_3 \mathscr{P}\left\{\text{diag}\left(\{\boldsymbol{TSB}(\alpha)\boldsymbol{W}(v_j)\}_{j=1}^{J}\right)\left(\boldsymbol{K}(\lambda)\otimes \boldsymbol{I}_{n_f}\right)(c_1\boldsymbol{f}+c_2)\right\} + c_4 + \varepsilon_r(\sigma_r)$$

Poisson Process; Truncation, Sampling, Blur; Warp; Frame Index; Sensor Gain; Spectral Effects; Object in Photons @ λ_{ref}; Sensor Offset; Read Noise