IDSS

Integrated Defense & Security Solutions

Adaptive Algorithms

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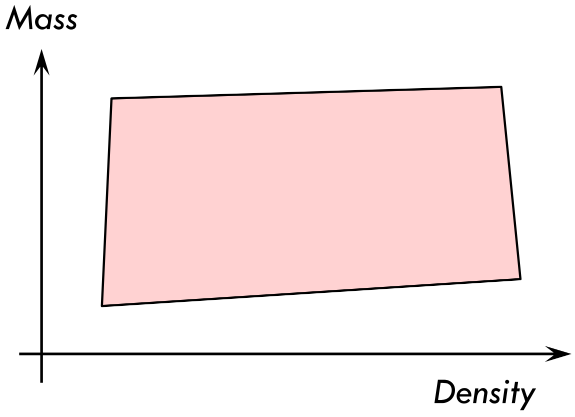
Adaptive Automatic Threat Recognition

Integrated Defense & Security Solutions

- Threats are Dynamic and Constantly Changing
  - Algorithms, too, must adapt
- Who Should Do it?
  - Vendors & 3rd party developers
- How Should we Do it?
  - TSA: provide data and incentives
  - Vendors: enable adaptive algorithm architecture
  - 3rd Parties: work closely with vendors

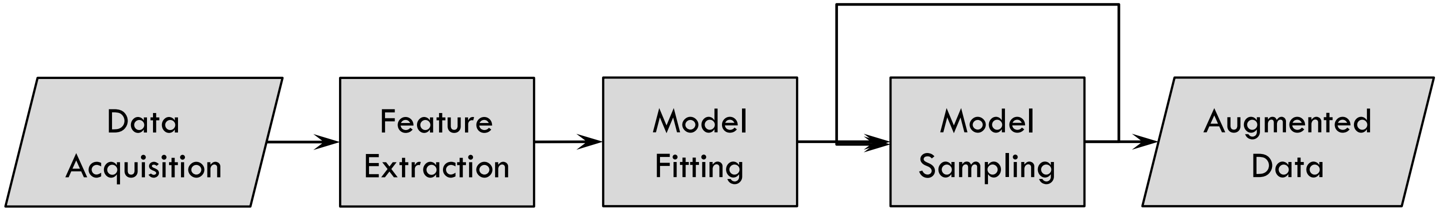
It All Starts with Data

- Classic RoR's are not Good Enough
  - Density, Mass and Zeff are insufficient to meeting Detection and False-Alarm requirements
  - Assume simple heuristic rules, do not apply to ML
- An RoR is scanner-specific
  - Measurement precision, bias and artifacts vary
- Features are threat and scanner-specific
  - Ex: Texture depends on resolution and contrast sensitivity
  - Ex: Threats in Laptops: thickness is a key feature
- How Much Data?
  - Few samples may be sufficient for Pd, but drive Pfa

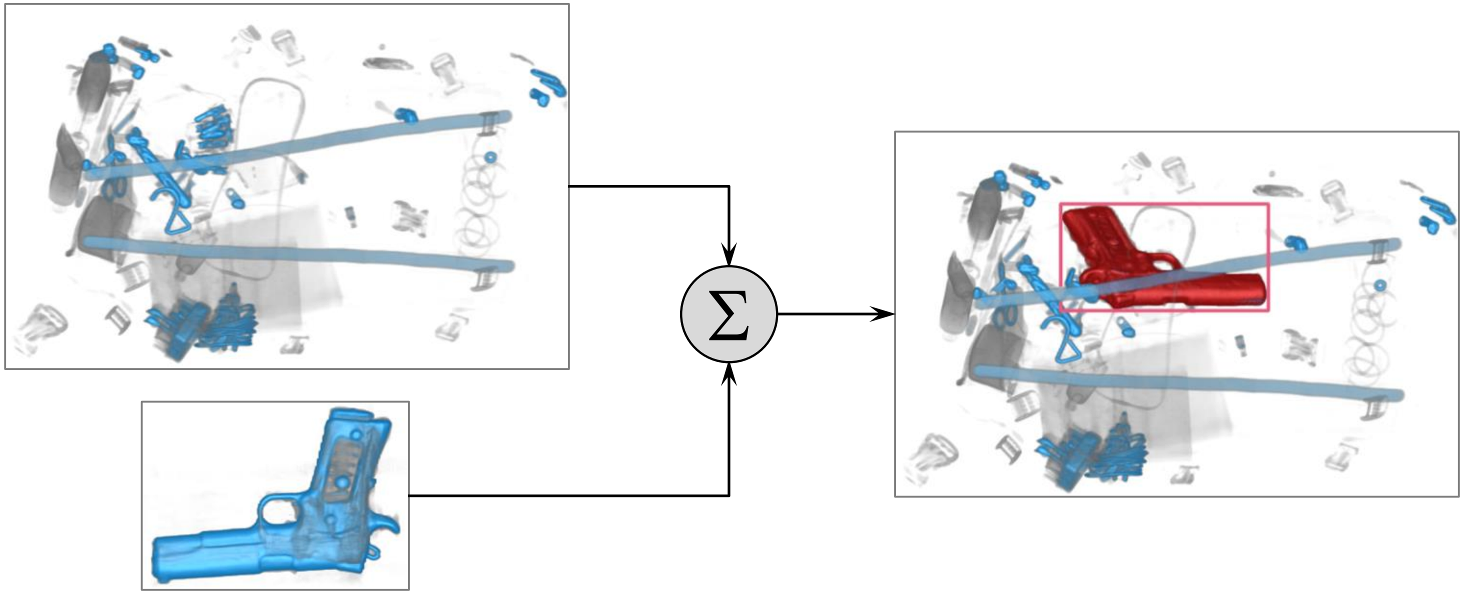


Data Augmentation

- □ Data Augmentation in Feature and Image Spaces



Feature-space data augmentation. Not applicable for Deep CNNs

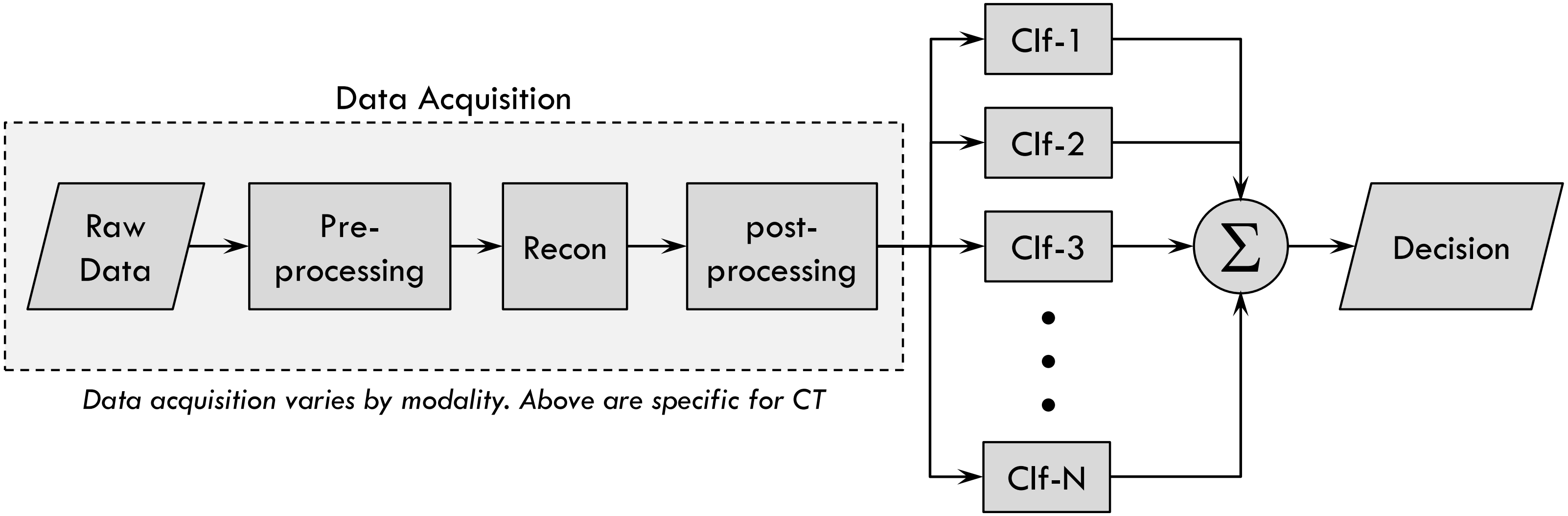


Who Should do it

- Vendors Have the Domain-Based Knowledge
  - Algorithms are generally scanner-specific
  - Scanner-agnostic algorithms are great, but do not exist
- 3rd Party Community provides wider skillset and bandwidth
- TSA: Provide Framework
  - Incentive structure
  - Ownership. When something breaks, call vendor or developer?
  - …

AATR Development Process

- Step 1. Vendor: Adaptive ATR architecture; E.g., Classifier Bank
- Step 2. TSA: Data, scanner images, not RoR.
- Step 3. Vendor and/or 3rd Party: Develop New ATR
- Step 4. Vendor Integration
  - *Risk*: New ATR added into a certified algorithm; integration testing required
  - Efficiency: New ATR may reuse existing pipeline elements; E.g., recon, segmentation, feature extraction



Data acquisition varies by modality. Above are specific for CT