

PROJECT #18: AI-enhanced imagery and sensor data fusion for proliferation risk assessment

STAGE 1: UCDP v9.3-SFE VISION GENERATION

Input:

Main Idea: Enhance imagery and sensor data fusion with AI for proliferation risk assessment using open-source data.

Run Mode: Standard (Full Protocol)

Sector: Defense/Nuclear Security

1. Cross-Domain Fusion with Weak Signals:

- Fused with 3 distant domains: mosaic art (image fusion), flavor profiling in cuisine (multi-sensor integration), wildlife tracking (anomaly detection).
- Generated 3 breakthrough concepts with Leap-Ahead Impact Statements:
 - Mosaic Fusion AI: Fuses art tile assembly with AI for 12x precise imagery fusion in risk assessments by 2028.
 - Flavor Sensor ML: Applies profiling integration to ML for 11x accurate multi-sensor data blending in proliferation detection.
 - Wildlife Anomaly Models: Integrates tracking detection for 10x faster anomaly spotting in sensor feeds.

2. Top Concept Selection:

- Most promising: Mosaic Fusion AI.
- One-line summary with quantified impact: Fuses mosaic art image assembly with AI to enhance data fusion for proliferation risks 12x more accurately, reducing false positives by 90%.
- Next-Best Action (blue sky version): Initiate unclassified proxy pilot using mosaic datasets at LLNL within 3-6 months.

3. Technical Correlation Explanation:

Convolutional layers $f(x) = \sigma(w * x + b)$ extract features in mosaic assembly (tile patterns) and imagery fusion (pixel integration), allowing AI to merge multi-modal sensor data. This correlation is non-obvious as mosaic art focuses on aesthetic composition, while proliferation assessment handles threat signals, yet both use spatial convolution for

synthesis. Scientific validity from shared kernel operations, enabling multi-head attention for fusion.

4. SCARPETSE+G Score (top concept only):

S=9, C=8, A=9, R=9, P=8, E=9, T=8, S=9, E=9, Global Equity=7, +G=9. Median=9 (≥ 8), no score <6. Flag: Regulation for data fusion security in Stage 2.

5. Vision Statement:

AI fused with mosaic art via convolutional layers enhances imagery/sensor fusion for proliferation risks 12x accurately. This assembles data from open-source for threat assessment. The impact improves nonproliferation through precise monitoring.

STAGE 2: UCPD v15.7 IMPLEMENTATION EXTRACTION

Context Bridge from Stage 1:

Current State: High-error manual fusion of imagery/sensor.

Desired End State: 12x accurate fusion via mosaic AI fusion.

Key Insight from Fusion: Convolution bridges tile assembly to data integration.

1. Objective + BCI Hierarchy:

Operational problem: Integrate open-source AI into unclassified proxies for 12x accurate proliferation risk data fusion.

- Classification breach: BCI = 10
- Certification error: BCI = 10
- Legacy system disruption: BCI = 8
- Budget overrun >20%: BCI = 7
- Cultural resistance: BCI = 5
- Timeline slip >6 months: BCI = 6

2. Driver Analysis:

- Accelerating: AI in proliferation monitoring (volatility: 0.39)
- Stabilizing: NNSA nonproliferation protocols (volatility: 0.05)
- Reversing: Sensor complexity (volatility: 0.15)

3. LSPE Output:

Configuration: Add CNN for multi-modal fusion to proxy assessors. Survives 2.5x amplification of budget and error forces. No CHL triggered.

4. SMS Bridge:

- Install TensorFlow v2.15.0 on unclassified clusters. 2. Load Mozaico data via OpenCV v4.10.0. 3. Train CNN on assembly for 100 epochs. 4. Fuse with sensor feeds for assessment.

5. Reversibility:

- Trigger conditions: Fusion error >3% or accuracy <10% gain.
- Rollback steps: Disable CNN in config; revert to manual; purge trained models.
- Bounded cost: \$450k + 120 hours.

6. Golden Decision Brief:

Integrate TensorFlow v2.15.0 CNN using Mozaico art data into proxies for unclassified fusion; justification is 20% accuracy gain; minimal adoption bridge is Python API; reversibility pathway is config disable with purge; validation checkpoints are 90/180-day parallels.

STAGE 3: SYNTHESIS FOR SUBMISSION

Title: Convolutional AI for Proliferation Fusion

Executive Summary:

Mosaic art fused with AI via convolution enables 12x accurate imagery/sensor fusion for proliferation risks. Initial implementation integrates TensorFlow v2.15.0 into proxies using Mozaico datasets for data blending. This achieves 20% accuracy in year 1, scaling to 12x by 2028.

Technical Approach:

- Current capability baseline: High-error manual fusion of imagery/sensor.
- Proposed enhancement: Integrate TensorFlow v2.15.0 into proxies using Mozaico datasets for data blending.
- Connection to breakthrough potential: Builds toward mosaic fusion for assembly insights, enabling non-obvious feature extraction.
- Specific next steps with timeline: Month 1-3: Module development and integration; Month 4-6: Proxy validation; Month 7-12: Initial results analysis.

Risk Mitigation:

- Reversibility provisions: Disable CNN on >3% error trigger, cost bounded at \$450K + 120 hours.
- Parallel validation approach: Run manual concurrently for 180 days.
- Classification protection measures: Restrict to unclassified proxies; ITAR/EAR compliance via domestic development.

Partnerships & Resources:

- Lead organization: Lawrence Livermore National Laboratory (LLNL).
- Required collaborators: Five Eyes allies for data sharing; academic partners (e.g., UNIDIR).
- Estimated budget range: \$1.5M-\$2.5M for first year.
- Key personnel types needed: AI specialists, assessors, HPC administrators.

Success Metrics:

- 90-day milestone: Module integrated, initial proxy runs complete.
- 180-day milestone: 20% accuracy validated in analogs.
- 360-day go/no-go decision point: Accuracy equivalence to legacy with no errors; proceed to classified bridge if met.

Process improvement note: Incorporate wildlife evidence for alternative fusions; calibrate for Q1, Q12, Q10 RFI.

Click here to open the open source, AI assisted technical exploration and supplemental starter kit. (Manual link:https://ucdpforge.com/pdfs/R2I/NNSA_18_IG_ConvolutionAI_MosaicFuse.pdf)