Detection of strong mine presence indicators using intelligent algorithms

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Introduction

- In Mine Action reduction of Suspected Hazardous Area (SHA) extend is an important goal.

- The airborne and spaceborne imagery can provide valuable evidence about the indicators of mine presence and indicators of mine absence.

Introduction

- Strong indicators of mine presence (IMP) are proven to be more significant than other indicators.

- Detection of the strong indicators of mine presence is highly demanding.

Proposed Concept

- Deep Neural Networks may be used for detection of strong mine presence indicators.

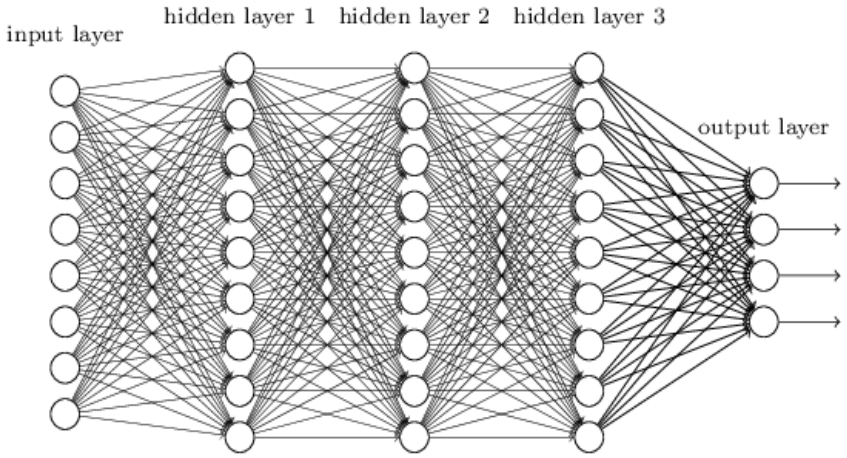
- Rule-based reasoning engine will be employed in construction of mine danger maps.

Detection of strong mine presence indicators

- Artificial neural networks (ANNs)
  - Have been very successful in content-based image recognition.
  - Can be used as classifiers and for clustering.
  - The major issues:
    - The training dataset must be diverse,
    - Excess computing time.

Detection of strong mine presence indicators

- Deep Neural Networks (DNNs)
  - Are typically feedforward networks.
  - Have multiple hidden layers between the input and output layers.



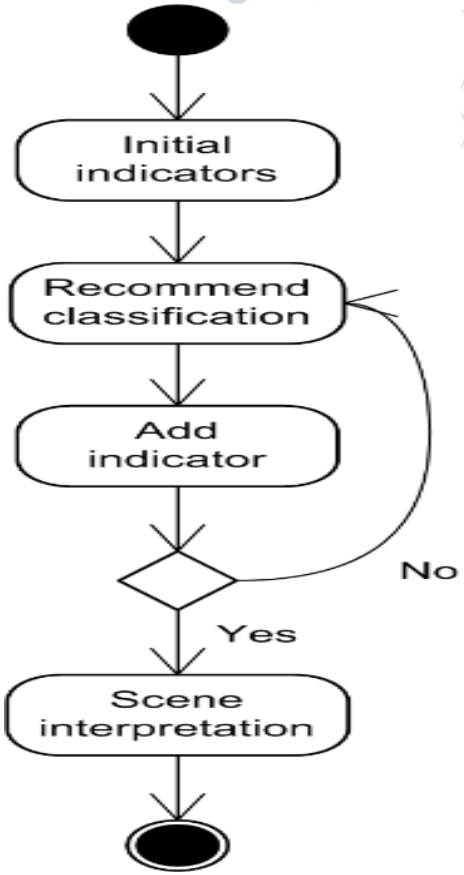
Detection of strong mine presence indicators

- Deep Neural Networks (DNNs)
  - Can model complex non-linear relationships.
  - The most promising approach for strong mine presence indicators detection
    - if multiple representatives of indicators are available.

Detection of strong mine presence indicators

- Detection Process

1. Setting up an initial feature “ground truth” database for network training
    - Photo interpreter.
2. Using a recommender system with feedback loop to facilitate the database development.



Detection of strong mine presence indicators

- Rule Based System
  - implementation of the human expert logic for categorization and classification of indicators

    - Enables:
      - Interactive management of the system.
      - Separation of data and logic.
      - Building knowledge database.

Detection of strong mine presence indicators

- Expert Systems based on Rule engine
  - Will generate confidence and danger maps of mine suspected area with several risks and confidence categories.

Conclusion

- An experienced terrain interpreter is crucial for a successful aided detection of strong mine presence indicators with artificial intelligence algorithms.

- The aim of this approach is to help domain experts.

Conclusion

- DNNs - the most promising approach for detection of strong IMP
  - due to the possibility to modeling complex non-linear relationships
- Rule Based System will be used:
  - In implementation and application of the human expert logic for categorization and classification of indicators after detection.

Feature work

- Initial design development of the proposed system
  - tested with the key use cases to prove the technology's design and applicability in realistic scenarios.

Thanks!

Any questions?