Innovative AI-driven Synthetic Data Solutions for Adversarial Activity Detection

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Arlington, VA
March 2022
IvySys provides innovative, high-quality synthetic data solutions and services that enable organizations to rapidly train AI models to discover threats hidden in big data to keep our nation safe.

AWS cloud-native application leveraging large-scale, generative deep learning models
Corporate Snapshot

- Founded by Dr. James A. DeBardelaben
- Headquartered in Arlington, VA
- Top Secret Facility Clearance
  - 75% of Technical Staff are TS/SCI Cleared
- Primary NAICS: 541715
  - Research and Development in the Physical, Engineering, and Life Sciences (Except Biotechnology)
  - Secondary NAICS: 541330, 541511, 541512, 541519, 541690, 541990
- Certified Small Disadvantaged Business (SDB)
- CAGE: 4CS09
- DUNS: 608730714
Trajectory Generation Problem

Generative Mobility Model $M$

- **Generate** $n$ synthetic trajectories $T_M = \{T_{a_1}, \ldots, T_{a_n}\}$,
  where $T_M$ specifies movements during a certain time period,
  for very large number of $n$ independent agents $a_1, \ldots, a_n$

- **Time-ordered sequence** $T_{a_i} = \{p_1, p_2, \ldots, p_k\}$
  Spatial-temporal points $p_i = (t, x, y)$ describe the $k$ locations visited by agent $a_i$
Leverage DARPA MAA Program

• Synthetic Transaction Data Generator (STDG) for DARPA Modeling Adversarial Activity Program
  • Generated unclassified temporal transaction graphs containing WMD threat and Background activities
  • Generated data sets with 1 million entities (nodes) and 1 billion transactions (edges)
  • Computed Signal-to-Noise ratio (SNR) metrics in real-time on generated data and make user configurable
  • Matched background data statistics to real-world data sets (e.g., geolocation, communications, financial, logistical)
  • Developed STDG in modules:
    • Synthetic Network Generator (SNG),
    • Synthetic Transaction Graph Generator (STGG)
    • Data Blender

• Relation to DARPA MAA Vision
  • The STDG provided synthetic transaction data to drive the development of mathematical techniques that integrate and analyze heterogeneous data sources to enable high confidence indications & warnings of WMD activities
    • Avoided the privacy and classification issues that can be associated with real-world data.
STDG Human Movement Simulator

- Actors in the movement simulator were provided locations for home, work, frequent shopping, family members, etc.
- Plan to expand with more detailed, patterns of life, mostly city-level movements.
- Individuals travel between cities via car, bus, train, or plane.
- Most individuals (agents) at their place of work during typical work periods of the work location.
- Model venues that serve as less frequent but highly attractive places to congregate, like sports stadiums or shopping malls.
- Given the actor’s location at any time, the simulator will be equipped to attach the account’s holder’s location to whichever transactions the user deems appropriate.
- Generate slight deviations of agent locations to represent roaming within a work campus or walking to nearby lunch locations.
- Location can dictate which accounts (e.g., financial, social media, etc.) are used for transactions at a given time.
Human Movement Model
Human Movement Model Demo
Contact Information

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