ReMI
Resilient Machine Learning Institute

AI/ML for critical applications in wireless communications

Effective communications is a foundation for rapid response.

The resiliency of our sophisticated communications networks, the stability of the increasingly smart infrastructure around us and our first responders' ability to communicate in a crisis situation are issues we rarely think about. Our overall safety and the ability to easily connect with others are aspects of daily life we often take for granted.

Networks which we all depend on to communicate are not impervious to national disaster or security threats. When this infrastructure is compromised, the ability to rapidly reconstitute it often means the difference between life or death.

Military forces abroad increasingly rely on sensor data and persistent cloud access to maintain real-time situational awareness in order to quickly identify and leverage tactical advantages before opponents do. For emergency first responders, public safety personnel and national guard, the lack of a stable communications network is a reality they must face when disaster occurs. Not only must they deal with food and water shortages, health hazards and protecting people from harm's way, but they must also deal with the reliability of a communications network which can rapidly degrade. Interoperability of communications equipment used by government agencies is a persistent challenge that is exacerbated in times of disaster when every minute counts. Future smart grids, robotic systems and intelligent transport solutions will also rely on communications networks and the need for stable and reliable communications will increase as these systems are deployed.

When networks fail and communications slows to a crawl, so do the critical services that are required to keep people safe. Effective communications and rapid response capabilities are essentially inter-dependent.

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Network resiliency using AI/ML technology. ReMI is making it happen.

With the growth of IoT, Big Data and user demand for bandwidth, smarter networks are essential. During a crisis, it's even more vital that networks function flawlessly. ReMI is working with operators on the frontline to maximize network efficiency by allowing devices to be prioritized, managed and configured intelligently and with minimal user interaction. The technologies we are developing at ReMI go beyond standard autonomous network management techniques and provide users the ability to analyze key network data, predict potential failures and apply preventative corrections to guarantee the productivity of all network elements. The artificial intelligence and machine learning technologies we develop allow networks to self-configure, self-optimize and self-heal and are only the beginning of what the future holds for this field. ReMI is passionately committed to making these capabilities a reality.

When the unexpected strikes, persistent communications and network uptime is a must have.

ReMI overview

ReMI is a transformational institute founded in Montreal, Canada focused on developing Artificial Intelligence and Machine Learning technology. ReMI stands for Resilient Machine Learning Institute and was founded by L'École de technologie supérieure (ÉTS) and Ultra in 2019. Since then, other organizations and schools have become involved. The ReMI team is a mix of international PhD, PostDoc, MSc and graduate level students, professors and Ultra engineers. The institute is a unique organization that is using applied science to tackle real-world problems by leveraging state-of-the-art programming techniques in the fields of AI and ML. ReMI will shape the future of how networks will operate.

ULTRA   ÉTS   *Le génie pour l'industrie*   CentraleSupélec   McGill UNIVERSITY   GERAD   POLYTECHNIQUE MONTRÉAL

The ReMI Mission

Bring together the best minds across industry and academia in order to develop Artificial Intelligence (AI) / Machine Learning (ML) technologies for mission critical networks.

When connections fail and parts of the network go down, it can take a long time for operators to diagnose problems and apply fixes. In some cases the issues are simply too complex for any single human to comprehend.

ReMI is tackling difficult communications challenges:

- Ensuring ad-hoc wireless networks in harsh conditions are self-configurable, self-organizing, self-optimizing and self-healing

- Reducing the OODA (observe–orient–decide–act) loop to minimize network planning and set-up to quickly respond to changing conditions or equipment failures

- Minimizing network congestion and providing options for contested situations

- Optimizing network traffic and prioritization

ReMI eases the technical burden on operators.

When disaster strikes, networks need to be as self-sustaining as possible so that operators:

- Can connect without issue

- Have sufficient bandwidth for the type of application they are using

- Receive intuitive indicators about how to fix issues quickly

- Have options when links go down or they need to pass on critical information to the right people

ReMI provides answers to critical questions in a timely manner.

Network awareness:
- How many devices are connected to the network?
- How stable are the communication links?
- Is there room for connection improvement?
- Is there interference?
- Which areas of the network are susceptible?

Automating Decisions:
- Which hub should traffic be redirected to?
- Which information needs to be prioritized?
- Who needs information now?

Faster response through learning:
- What diagnostics should be sent to operators?
- Can the time to connectivity be shortened?
- Can re-routing be done faster?
- Can manual network tasks be more automated?

Who benefits from the results of ReMI?

- ■ Network operators
- ■ First responders including fire, police, and ambulance
- ■ Disaster relief personnel
- ■ Military personnel
- ■ Homeland security and National Guard
- ■ Communities needing help during a disaster or crisis

ReMI makes resilient, inter-service, mission-critical communications possible.
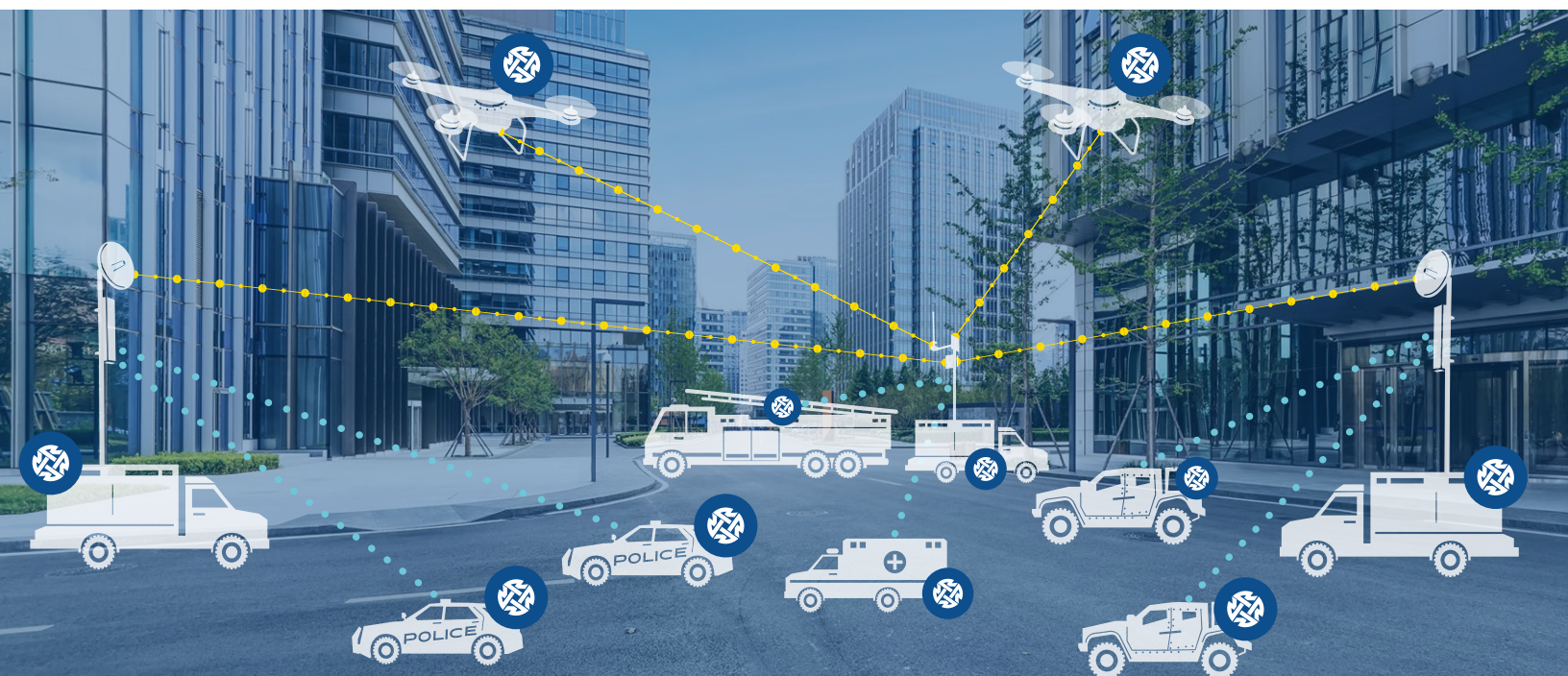
ReMI is in the heart of Montreal, one of the leading cities in North America for AI/ML development.

$1 billion+

funding dedicated to university research.

300+

researchers and doctoral students in fields related to Artificial Intelligence.

11,000+

university students enrolled in Artificial Intelligence and data-related programs.

For Students: Work in Montreal, ranked the best student city in North America!

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