

Sensing Insights

Technology Trends Report #4 | August 2023

Trends to track

The potential role of AI-powered technology in human trafficking mitigation

As the presence of human trafficking has increased worldwide, there is potential for government agencies to adopt AI-powered solutions to aid in mitigation efforts. Romanian startup Humans.ai harnesses AI avatar technology to help maintain anonymity of victims during human trafficking investigation interviews with an entirely new AI-generated face and voice. An additional technique that can help address human trafficking is the usage of AI-powered analytics guided by computer vision in processing identification documents at the border. In October 2021, four European countries reported an increase in the number of Cuban citizens attempting to enter Europe with false documentation, which prompted Europol to issue a joint intelligence statement earlier this year. These individuals using counterfeit passports were eventually revealed to have been trafficking victims. To address this, recent advancements in computer vision from Massachusetts Institute of Technology (MIT) researchers offer potential promise to identify anomalies in false identification faster than human-based tracking. This MIT research development enables improved simulation of parts of the human brain within neural networks when analysing data, allowing for more nuanced insights. These new innovations in AI-powered solutions can mitigate human trafficking through novel approaches.

Why this matters: The growth of human trafficking requires innovative technologies to address the evolving threat posed to the EU's international security. While the use of AI for border surveillance brings operational efficiencies, risks such as AI bias when utilising computer vision technology for processing identification documents cannot be overlooked. By monitoring the evolving landscape of trafficking, Frontex has the opportunity to identify how emerging technologies such as computer vision detect future trafficking mitigation tactic circumventions.

Identified with SensingBridge events: Current and future applications of advanced computing methodologies

New developments in advanced computing methodologies across the technology readiness spectrum introduce the potential for border security innovations through digital twins, computer vision, and autonomous systems. In the near-term, the field of digital twins has the capability to provide greater insight into complex infrastructure problems. An example of the application of digital twins in border security is their use in managing the operations of the port of Barcelona. The port's digital twin serves as a one-to-one replica of all port activities taking place and provides advanced insights into logistical challenges such as how to optimise maritime traffic flow at the port. University of California Berkeley has recently released a research development known as MoTok, which is a new framework that allows computer vision systems to better identify moving objects with less machine learning required. Enhanced computer vision frameworks have the potential to significantly improve surveillance accuracy and decrease mission deployment time. Researchers at NVIDIA recently revealed a long-term technology development called AnyTeleop, a computer vision-based teleoperation system that enables individuals to more easily train robotic arms to operate more hyper-realistically. This innovation has the potential to be utilised in conjunction with autonomous systems trained with advanced objection recognition to assist in high-risk operations such as neutralising explosive devices and reconnaissance. Advanced computing innovations bring efficiencies that can support Frontex's long and short-term technology mission to improve surveillance measures to drive autonomous monitoring.

Why this matters: As advanced computing innovations come to higher technology readiness levels, preparedness for applications of these emerging technologies is an important consideration. In addition to simulating ports, digital twins of land border crossings have the potential to bring advanced insights into surveillance procedures and their effectiveness. Robotic appendages utilised on drones may be able to perform tasks standing corps officers normally would reducing the need for manpower. These technologies offer the potential to enhance insights into complex infrastructural challenges, optimise operational efficiency, and enable more precise surveillance, ultimately contributing to safer and more effective security measures.

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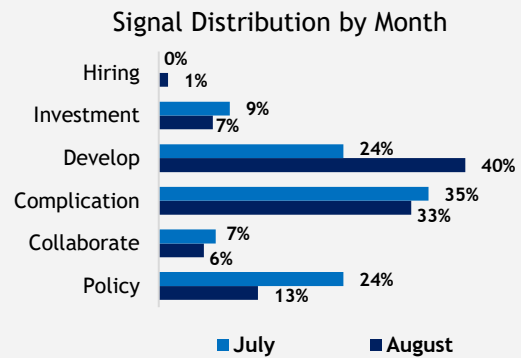
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What's trending?

Signals Snapshot: Developments Take a Leap Forward in Prevalence

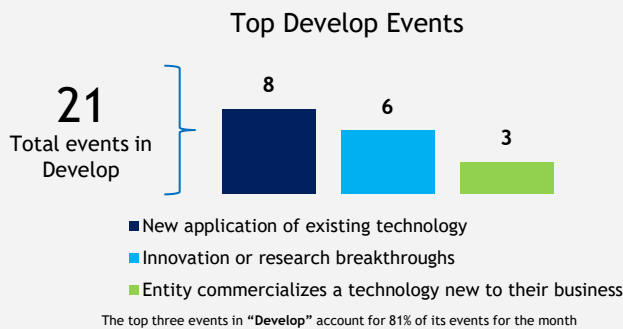
The signals tracked in Frontex monthly data between 10 July and 11 August are displayed in the chart to the right and compared with the previous period. Signals are categorical groupings of actions across the data. This month captured a major increase in the signal develop, reflecting an increase in innovation from the previous month. Note, signals are shown as a percent of the whole to normalize for comparison between July and August reporting.

Develop was the most frequently occurring signal, with a 16% increase in total share of signal tags from the previous month, illustrating a renewed push towards technological innovation. **Complication** saw a 1% increase in total share of signal tags from the previous month, showing sustained concerns around emerging technologies, especially those leveraging AI and mass data. **Policy** saw a 12% decrease in total share of signal tags from the previous month, which reflects a slight shift in focus as privacy violations and fines against corporations were previously introduced by EU regulators.

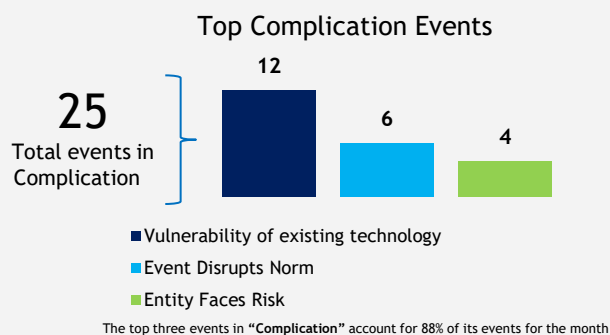


Events Snapshot: Complications Arise and Policy Takes Center Stage After Technology Races Ahead

The volume of **events** can further describe the specific actions occurring within a signal. **Events** are set categories to further describe the specific actions occurring in the data.



This month tracked a total increase in technological developments and innovations. The top event "**new application of existing technology**" accounted for 40% of the total events tagged for the signal develop. These developments surrounded new uses of AI in human trafficking and new computer vision developments mimicking brain functionality. Additional developments surrounding "Innovation and research breakthroughs" were also tracked, relating to leveraging advanced AI tools and imagery datasets to improve maritime domain awareness and bolstering coast guard capabilities to plan naval missions and automate analysis.



The top event, **vulnerability of existing technology**, accounted for 47% of the total events tagged for the signal complication. Several complications surrounding "**vulnerability of existing technology**" relate to challenges of cybersecurity and risks to agencies' critical infrastructures. Events reflecting AI technologies being used in countries outside of the EU are disrupting norms by heightening surveillance of citizens and leveraging monitoring-related technologies to solve criminal cases more efficiently.

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Analytics Snapshot: Use Case Deep Dive

Roots are the broadest level of categorisation for keywords and include the following three categories for Frontex: Technology, Use Cases, and Challenges. There were 115 Use Case tags over the course of the month, a 20% decrease in the total share of tags for this month. Use Case refers to mission-relevant applications of Key Enabling Technologies. The prominence of Use Cases reflects a continued focus on recognition and situational awareness, the emergence of operational response relating to irregular migration, and the use of emerging technologies for increased operational efficiency.

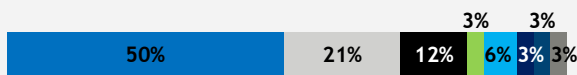
Recognition



*Due to rounding, percentages may not add up to 100%

- Facial Recognition
- Biometrics
- Object Recognition
- Digital Recognition

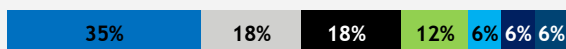
Situational Awareness



*Due to rounding, percentages may not add up to 100%

- Monitoring
- Risk Management
- Border Surveillance
- Situation Assessment
- Risk Analysis
- Intelligence Analysis
- Geospatial Imaging
- Behaviour Prediction

Operational Response



- Operational Efficiency
- Field Operations
- Logistics Support
- Rapid Border Interventions
- Join Operations
- Improved Operational Awareness
- Tactical Intelligence

Count of Tags by Category



The continued prominence of the keywords **facial recognition** and **biometrics** relates to deployments of facial recognition cameras, complaints over the technology, and potential privacy infringements with its use. These terms are also commonly tied to the use of monitoring for improved law enforcement surveillance. The use of object recognition has been applied to understanding real-world scenes for autonomous driving and improved human-machine interactions using computer vision.

The prominence of **Monitoring** within **Situational Awareness** refers to both monitoring across law enforcement as well as internal monitoring of organisational infrastructure. Notable examples include law enforcement agencies leveraging facial recognition for public safety and companies monitoring critical infrastructure to manage risk of cyber attacks. **Border surveillance** is another theme within situational awareness that relates to managing migration flows actively with AI and law enforcement addressing challenges pertaining to illegal goods smuggling and human trafficking around EU borders.

The prominence of **Operational Efficiency** within **Operational Response** relates to the use of emerging technologies to benefit agencies' operations like coordination, process automation, and border interventions. One example includes the use of augmented reality to train staff and form greater sense of cohesion amongst distributed teams.