



**Machine Learning /
Artificial Intelligence
Services**

Autonomous Spectrum Management is a key area of focus for Consunet. As demand for telecommunications has rapidly increased, the once-plentiful resource of electromagnetic spectrum has become congested, limiting the capacity and speed by which we can communicate. Consunet, particularly through the *Distributed aUtonomous Spectrum management* (DUST) project, has been using innovative Machine Learning (ML) and Artificial Intelligence (AI) techniques to shift towards a future with a more dynamic and efficient spectrum management environment.

Asset Usage



Applicable for Forecasting and Planning management of any finite resource.

Resource Forecasting

A core component of Consunet's autonomous management strategy is to forecast the future to inform future plans. To achieve this, Consunet implements the following approaches:

- ✓ **Advanced spatiotemporal forecasting** capable of determining complex relationships in both space and time.
- ✓ **Uncertainty estimation** to better inform planners as to the confidence of any forecasts, giving them a clearer picture.
- ✓ **Anomaly detection** to inform users and algorithms about unusual activity.
- ✓ **Conceptual understanding** in ML, one solution does not fit all cases. Consunet's conceptual knowledge in ML means the most suitable models can be applied to your unique product/application.
- ✓ **Compute awareness** to adapt forecasting approaches to the compute infrastructure.





Resource Planning

Consunet has innovative AI Planning and Scheduling techniques that exploit vacant spectrum. These techniques enable:

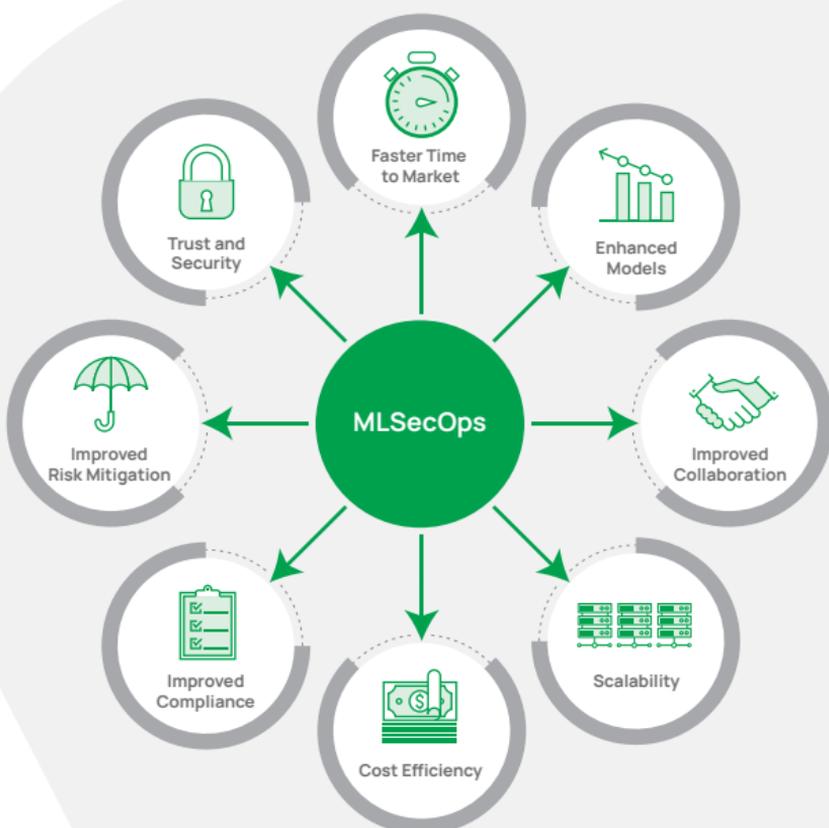
- ✓ **Efficient dynamic allocation** for substantial improvements over decades-old unsustainable static allocation techniques that have led to congestion problems.
- ✓ **Fairness as a priority** for Consunet's allocation approach, prioritising and balancing fairness ensures that all users can access the resources to meet their needs.
- ✓ **Minimal resource damage** occurs as planners are informed by state-of-the-art forecasters, assuring that licensed resource owners are minimally affected.
- ✓ **Near-real-time adaptation** allows planners to adapt to changes in the environment, assuring that they will continue to function effectively in the face of dynamic environments.
- ✓ **Leveraging the decentralised approach** as a key component to planning, using a hierarchical approach well-suited to applications with latency-sensitive, yet compute-constrained environments.

MLSecOps

Consunet has been developing a new Machine Learning, Security and Operations (MLSecOps) pipeline to accelerate deployment of AI and ML systems. This enables:

- ✓ **Greater collaboration** between data scientists, developers, software engineers, and stakeholders.
- ✓ **Rapid iteration and improvement** to ensure that new models can be deployed quickly in the face of newer approaches, shifting project requirements, or changing data.
- ✓ **Enhanced security** through formalising and automating Data and model management, testing, and deployment processes, ensuring more secure models and data.

MLSecOps is a game-changer for the future of ML and AI applications. MLSecOps accelerates development and deployment processes, bringing Consunet closer to realising its goal of autonomous, dynamic resource management.



Data Simulation

Consunet has developed detailed, agent-based simulations to help train forecasters, providing the realistic data required without the regulatory complexities that go into recording real-world data on large scales. In addition to ML and AI training, our data can be used to create realistic usage data for third party simulation and emulation systems.

Visualisations

Consunet excels in making complex analyses accessible through intuitive visualisations. It recognises that visualisation methods are not only about presenting data; they are about storytelling, enabling stakeholders to grasp the narrative within the data, and help to make informed decisions through these data-driven insights.



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