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# Making the leap from machine learning to machine intelligence

## Using machine intelligence to improve operations and customers' experiences

There is a lot of excitement about the potential for machine intelligence (MI) and machine learning (ML) to make service platforms smart. Despite the hype, there is no consensus about what these approaches mean or even what the delineation is between the two concepts. The intent of this piece is to provide some perspective on how MI is adding value to communication service providers (CSPs) today.

### MACHINE LEARNING VS MACHINE INTELLIGENCE

Machine learning is a branch of analytics in which machines continuously improve their ability to recognise patterns as they are trained with more examples. This approach relies on creating and updating a knowledge base, which can be used to systematically map new data into responses to questions, insights or prescriptions for action. It creates specific models to compute answers to specific problems based on supplied examples of the answers. Practitioners of ML choose the best algorithms to apply to their problem domain and then compute the parameters for the mathematical algorithms to create the model.

In this piece, we assume the colloquial notion of "intelligence" without attempting to define it. Intelligent systems extrapolate from raw, disparate, data to develop new, valid information, which is not a direct consequence of the available data or knowledge. One characteristic of intelligence is the ability to create associations between entities without such maps being directly derivable from supplied data through a previously established model. When this phenomenon is manifested in artificial devices we call it artificial intelligence (AI). We define MI to be that subset of AI wherein the machine receives and provides all data directly from and to another machine even if those data represent interactions with the natural world (its environment). An MI device does not directly interact with the natural world.

To summarise, MI creates valid information which cannot be derived or retrieved by an ML model even when both are using the same machine supplied data.

### ANALOGIES IN NATURE: ANTS VS RAVENS

Some animals map the characteristics of detected pheromones to reflexive behaviours; for example, red harvester ants use this model to follow trails to food. This is a natural analogy of ML. Other animals apply what they have learned in one context to solve problems in completely different contexts; for example, ravens have been observed to drop objects into containers of water to raise the level of floating food to reachable heights. This is a natural analogy of AI. Disparate pieces of data or models are combined to formulate a solution to a problem in a different context.

### APPLYING MI TO CSP OPERATIONS AND CUSTOMER EXPERIENCE

Customer experience has become the key point of differentiation for CSPs as customers expect flawless delivery and personalised experiences. CSPs are leveraging automation to enable networks to contextually analyse big data in order to gain the operational intelligence needed to optimise those experiences.

Putting data into context enables the network to predict and prescribe actions. By leveraging ML and MI, CSPs can enable customer support teams to personalise and assist in customer interactions. For example, using ML and MI, CSP networks can automatically identify the risk for any customer to require service support and provide a scoring mechanism that ranks the likely technical reasons driving the inquiry. Armed with that predictive information, the customer support team can personalise their customers' interactions both online, with interactivity and automated workflows, and directly with a representative for faster and more efficient problem resolution.

### BEYOND PROACTIVE NETWORK OPERATIONS: NETWORK REASONING

The CSP domain deals with event driven systems. Generally, both MI and ML may predict what is likely to happen next and prescribe new actions such as what steps should be taken to achieve a desired outcome. In the network operations realm, both MI and ML are used to detect anomalous activity and classify the behaviours of network elements or users based on observed events. With supervised ML, the network can learn to predict labelled outcomes using regression models to deduce business-impacting incidents. MI, on the other hand, uses reasoning to analyse data over time to deliver new insights that would otherwise be disconnected in the ML models. Thus, MI takes proactive network operations to the next level, predicting service incidents and resolutions which were not learned and correlating them with the detected issues. More generally, MI can look at new situations and understand how they relate to operational dissonance and suggest what action should be taken to optimise the experience of the end user. In effect, an MI equipped network reasons.

> *"Ravens have been observed to drop objects into containers of water to raise the level of floating food to reachable heights. This is a natural analogy of artificial intelligence."*

The next step is enabling the network elements themselves to reason in order to take proactive steps. Eventually leveraging MI will mean using virtual interactions and personal assistants (like Siri or Amazon Echo) to help solve potential service issues. The ecosystem itself will become self-optimising, diagnosing and prescribing solutions even before its users are aware of them.