Explainer

AI Micromodels explained.

Micromodels are small, targeted artificial intelligence models made to understand and replicate aspects of the real world. Micromodels, as opposed to broad, general models, provide high-resolution insights for specific systems, processes, or locations.

How it works:

Real-world operations are made up of many processes interconnecting to deliver a result. In other words, most real-world operations are systems that can be modelled. These systems could be road networks, ports, supply chains, energy plantations etc. The process of modelling or trying to predict aspects of these operations is therefore complex as so many different aspects need to be considered.

AI micromodels is an approach that Entopy has developed to overcome these challenges. Instead of looking at the entire system as one, the AI micromodel approach breaks the system into multiple components. Individual AI models are then deployed to these components, predicting very specific aspects of the system or operation.

The result is smaller 'micromodels'. They have a purposely limited training dataset and are trained to deliver predictive outputs for very specific parts of the operation.

Entopy's technology then allows many AI micromodels to be orchestrated into an overall system. This means lots of small, independent AI micromodels work together to deliver an overall prediction. Each model forms a node and delivers a predictive output into the overall system. This architecture also allows deterministic data to be added. This is data that is not an output from a predictive AI model (which would be probabilistic) but instead is a data point that is fact and is normally delivered by an IoT system or sensor (such as a camera, a temperature monitor etc.). This means that the AI micromodels approach enables probabilistic and deterministic data to be combined to deliver dynamic and more effective intelligence across real-world environments.

A worked example:

Entopy's focus is critical infrastructure and ranges from ports, to roads, to renewable energy. But to help explain AI micromodels, we have put together two worked examples:

Predicting resource requirements for vessels arriving into ports: *The process of berthing container vessels into ports involves an ecosystem of partners working together to provide necessary resources. This includes maritime pilots, tugboats and crews to assist with manoeuvring, terminal resources and berth availability and is also heavily dependent on fair weather and tide. Each of these aspects needs to be available for a vessel to berth safely and on time.*

AI Micromodels allows us to deploy small, focused AI models to predict each aspect of the operation, for example what time the vessel is going to arrive ready for pilotage, how long the pilotage movement will take and therefore how long the pilots and tugboats are required, how many tugboats are required to assist, the likely availability of the berth, the likely productivity of the berth and so on. These models then interact into an overall system to identify challenges across the process.

AI micromodels allows much greater resolution on each part of the problem, in turn enabling much better models to be deployed and much greater performance. Each part of the process can be looked at in detail and tweaked. When issues arise, users can look across the network of AI micromodels to understand where and why alerts are being raised.

Predicting traffic flows to a specific location: *Traffic flows to a specific location (such as a port entrance or stadium) are notoriously hard to predict. Traffic will travel to the target location from multiple locations across a complex road network (therefore comprising multiple potential routes). There will be various things that affect general traffic flow volumes such as time of day, day of year, weather, etc. and things that affect traffic flow rate such as car accidents, road works and other things that cause restrictions on the road network. Some of those things are predictable, some aren't.*

Instead of trying to predict traffic flows just to the specific location, the AI micromodels approach involves deploying many AI models across the entire road network. Using data from local sensors, traffic flows are predicted at specific locations and integrated into an overall network which ultimately informs the traffic flow to the target location. Real-time incident data (road works, traffic accidents etc.) are not predicted. Instead, they are captured from sensors, news feeds and so on and added into the network as deterministic nodes.

The advantage of AI micromodels in this scenario is to be able to combine probabilistic data (predicted traffic flow volume) with deterministic data (incidents that affect flow rates) to deliver much better predictions to the target location, factoring both predictable and random activities on the road network.