

Leveraging Vision AI to Produce over 1 Million Meals



apetito is the leading food producer for the health and social care sector, supplying to the elderly and some of the most vulnerable in society, via the NHS, care homes, meals on wheels, and to individuals in their own homes. Great quality food, meeting various nutritional requirements and dietary needs is at the heart of what they do. Ensuring that the customer receives the right meal, with all elements in the right proportions is crucial – hence the focus on working with AI.

Speeding Every Ingredient to Mealtimes

For people already in need of support, such as residents of care homes, hospital patients, or elderly at home unable to cook for themselves, the comfort of a delicious meal delivers so much more than just nutrition. And on the flip side, a disappointing meal can be upsetting. Imagine your grandmother awaiting her Christmas dinner in her care home, only to find out her tray is missing one of her favorites, like mashed potatoes or Yorkshire pudding.

While working to feed over a million people each week, apetito was fielding a number of complaints regarding missing meal components. To mitigate the chances of incomplete trays going out, each tray is weighed when coming off the line; but this wasn't a satisfactory solution, if one component was a little heavier than usual, it could falsely account for what was missing.

At the same time, improving efficiency was a key priority for apetito. For example, one of the company's desserts required an employee to ensure each lid was properly crimped and secure, a time consuming and costly process.

apetito needed a solution that could efficiently detect errors in the products coming off the line, without compromising efficiency or cost – better yet, improving both.

CHALLENGES

- Producing in excess of **1 million meals each week** via 14 production lines
- Ensuring each tray meets expectations and is packed properly

SOLUTIONS

- Installed Vision Inspection Automation (VIA) – Neurala's easy-to-use vision AI that can detect inconsistencies and defects before products leave the factory
- Collaborated with Neurala to consistently innovate with the software to ensure apetito is at the forefront of delivering the highest quality to its customers

BENEFITS

- Developed a model that can flag missing components with **100% accuracy**
- Laid the groundwork to easily expand to additional production lines, with the ability to **build new AI brains in 10-20 minutes** and immediately begin testing
- Saved costs and solved for workforce shortage, while **increasing product quality**

Introducing AI with a Raspberry Pi

apetito recognized the power of AI even before working with Neurala. To begin optimizing performance and automating visual inspections, apetito employed a graduate student to develop a Raspberry Pi-based solution to monitor one production lane. Photos of good and unacceptable products informed models connected to an output signal that could blow rejects off the lane. As a result, apetito no longer needed to allocate an individual to this function, enabling them to be redirected into more productive areas, effectively saving over £15,000 in labour per year.

However, the above had one major drawback: the Raspberry Pi solution required hundreds of pictures of the products that were then uploaded onto a USB, transferred to a computer where they would then retrain the brain for 3-4 hours, then later transferred back to the line. What's more, apetito frequently changes up the meals in production to maintain appropriate stock levels across a wide product range. Unfortunately, this meant that the new brains could not even make an impact until weeks after they were developed.

Due to the Raspberry Pi's slow-moving process, apetito never fully productionized it. After realizing the technology was not scalable, the team used it as a successful case study of how AI could save on costs while quickly detecting anomalies. The next step was finding AI technology that could achieve the same benefits to scale across apetito's site.

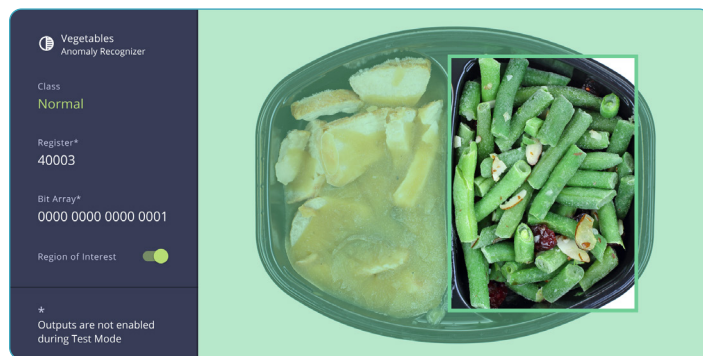
Productionizing AI to Catch Missing Components

After vetting several vendors, apetito began working with Neurala to detect cases of the five most reported missing components from meal trays. Upon reviewing photos of the production line, Neurala determined their Vision Inspection Automation (VIA) software, an integrated solution that helps manufacturers improve quality inspection on the factory floor, would suit apetito's needs.

VIA consists of two software programs, Inspector and Brain Builder, which could work with apetito's existing equipment. The graduate student who initially designed the Raspberry Pi applications worked with Neurala and the user-friendly VIA to build new, anomaly-detecting brains in 10-20 minutes and immediately begin testing. Throughout the testing process

“Throughout this AI-building journey, we've spoken with other companies in similar situations, and are yet to find anybody in the food industry that is leveraging AI like we are with Neurala. We're very much breaking new ground together.”

– Kevin McDonagh, Operations Manager, apetito



Input	Behaviors	Total Class Outputs	Regions of Interest	Total Inspection Count			
Line 1	1	2	1	345			
Behavior	Lasagna	Class Outputs	Normal	Anomaly			
	Lasagna Anomaly Recognizer	2	317	28			
Line 2	2	8	2	606			
Behavior	Chicken	Class Outputs	Acceptable	Low Chicken	No Gray	Empty	Nothing I Know
	Chicken Learning Classifier	6	274	11	7	5	6
Behavior	Vegetables	Class Outputs	Normal	Anomaly			
	Vegetables Anomaly Recognizer	2	259	14			

Neurala's Vision Inspection Automation (VIA) software helped apetito quickly build new, anomaly-detecting brains in as little as 10 minutes. As a result, apetito can discover what is missing from unique meal-trays and identify trends in missing components to avoid them in the future.

apetito was able to provide specific points of feedback to the Neurala team, and the two companies worked collaboratively on the implementation.

During testing, VIA's ability to inspect multiple regions of interest (ROIs) during surface inspection proved incredibly valuable. With their previous weight-based inspection system, apetito could only flag an incomplete tray, without understanding what was missing. With Multi-ROI, apetito can discover which components are missing and identify trends in missing components to avoid them in the future.

“I see the brain able to detect anomaly as being equivalent to the bronze medal in the Olympics. The classification brain is the silver. The Multi-ROI brain is the gold standard,” said Kevin McDonagh, Operations Manager at apetito. “It's delivering so much more accuracy, as opposed to a human taking the time to look and identify a missing component.”

Together, Neurala and apetito built 30 brains across the plant. The brain developed to detect missing Yorkshire pudding achieved 100% accuracy at the end of testing, assuring apetito could now detect their most frequent missing component without fail. At the same time, the speed with which VIA can build new brains and inspect production lines is projected to significantly increase efficiency, while saving on labor costs. With the support of the right AI technology and a collaborative vendor, apetito not only positioned themselves for speedy, successful production, but to also meet their customers' expectations.