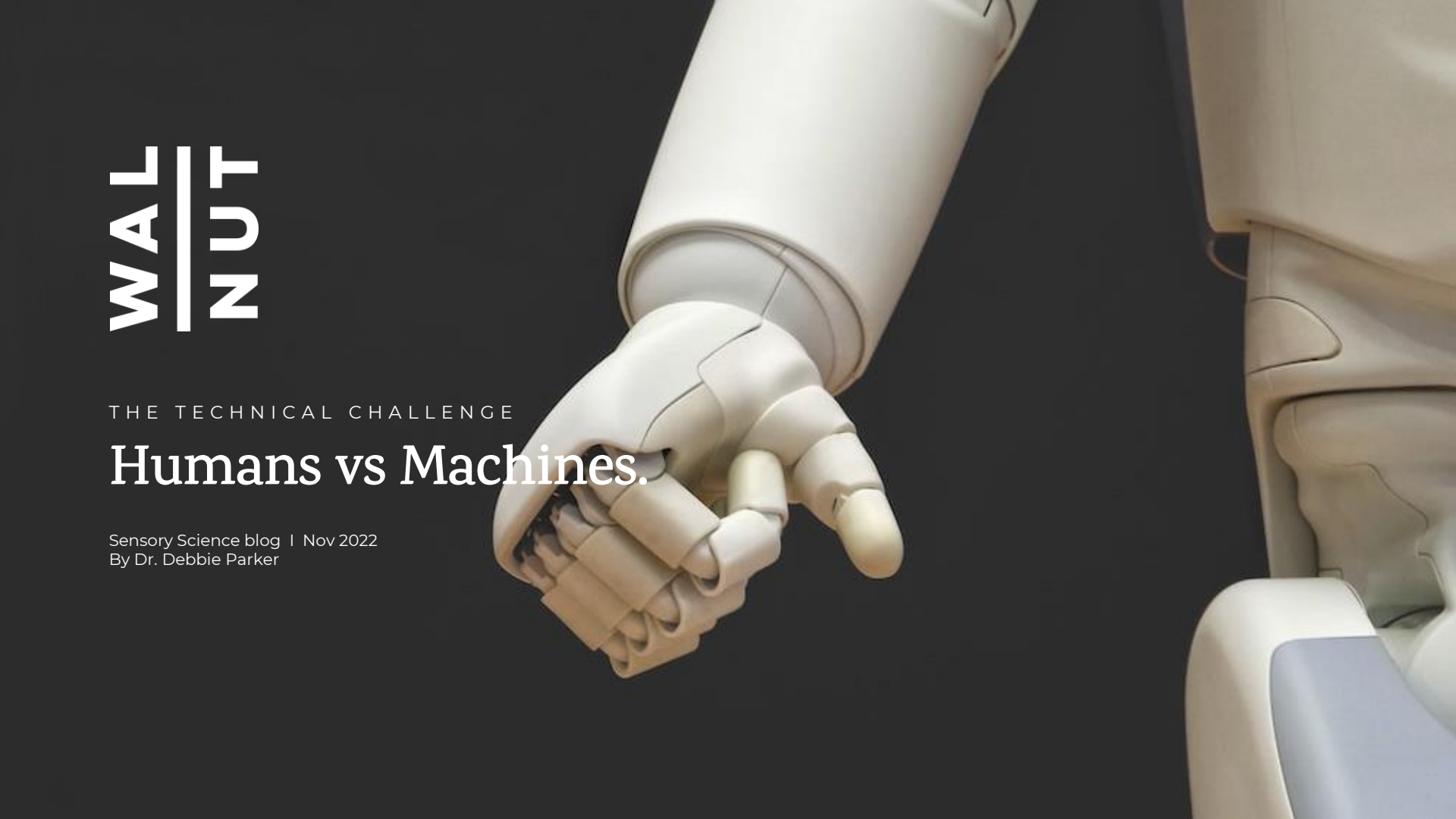

WALNUT

THE TECHNICAL CHALLENGE

Humans vs Machines.

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By Dr. Debbie Parker

Watching Bake Off last week, a friend posed the question about the dreaded technical challenge.... “If they’ve all got the same ingredients, and in theory the same instructions and same equipment, how come they turn out so differently?” Now there is a difference between Bake Off and ‘real life’. As you may know, in Bake Off the instructions are vague to say the least, so it’s little wonder there are very different results from the varying interpretations by the contestants. However, it got me thinking about how you can often easily tell the difference between the results of two different people following the same recipe, or even if one person makes the same recipe, but a week apart. Small differences can add up to one big one in the final product.

When talking about amateur cooks, or even professional chefs, we can often delve into the inputs to help to explain the different outcomes. For example, perhaps it was a different batch of cheese used in the recipe, or the temperature in one oven is not as easily controlled as another oven... there can be a myriad of other explanations meaning that there is a noticeable difference in two food or drink items that, in theory, should be identical. But what about when differences are detected in products produced in controlled conditions? purpose-built factories, for example, with minimal interventions from humans? How can things taste or smell different when the exact same ingredients have gone into them, and the human element reduced as much as possible? What about when these products are analysed by machines and found to contain the same ingredients, in the same quantities? How is it that we humans can STILL detect differences between such seemingly identical products?

Well... lets delve into some of the science behind this fascinating insight...

The sciencey bit...

The manufacturing of foods and drinks is a complex mix of ingredients, composition, equipment, processes and technologies. The use of instrumental analysis as a quality control tool is very useful in checking that the finished product consistently lies within set specifications for key parameters for composition, such as salt, sugar and fat content, and physical factors, such as colour and density. However, it is a fact that products can be analytically within specifications yet can still look and taste very different, which is why sensory evaluation using trained sensory panels is so essential for assessing product consistency. Although instrumental measurement offers the advantages of being faster and more cost-effective, there is not yet an instrument that can replicate the complex interaction between specialised human sensory organs of sight, smell, touch, mouthfeel and taste and then interpret the whole flavour and texture experience caused by potentially hundreds of volatile and non-volatile compounds that contribute to a food or drink.

Flavour is just too complex to be compressed into an analytical table of specifications. There is a role for analytical measurement, for example, to compare different recipe formulations in NPD, checking manufacturing consistency or detecting taint compounds in an automated production environment, all of which would be too fatiguing for human senses; however, the machines themselves are only as good as the level of detection and accuracy of the sensors used to identify the specific compounds and the sample set used to calibrate them. In many cases, human sensory organs are far more sensitive than the level at which instruments can detect compounds. There are also many flavour compounds which are present at minute levels in food and drink and are at levels too low to be detected by machines, but which have a disproportionate impact on aroma and taste perceived by humans. Similarly, although equipment used to manufacture food and drink may seem identical, it only requires small changes across temperature and density profiles, in mixing procedures and ingredient composition to dramatically affect the chemical reactions occurring during manufacturing and produce a different spectrum of flavour and texture compounds. Therefore, it is just not possible for instruments, which distil quality into a single numeric number, to measure the deliciousness of food which is produced either within a standard manufacturing operation or with the individuality of a chef. I would still prefer and trust the output of a sensory panel than a machine when it came to evaluating the smell and taste of food.

So, there we have it. As humans’ we have evolved to be especially sensitive to food and drink. All part of keeping us alive! We all experience food and drink differently and are unique in this respect. And this means that there is no machine yet built that can truly tell us what something will really taste or smell like...and more importantly, whether we will like it!

If you found this interesting and would like more information, please contact:

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