

IBM Watson Cognitive Cooking Fact Sheet

What do Indian Turmeric Paella, Baltic Apple Pie & Ecuadorian Strawberry Dessert have in common?

They were all dishes designed by IBM Watson's cognitive cooking system, in what is IBM's latest effort to expand the scope of cognitive computing systems by exploring if a machine can be creative.

IBM has demonstrated how a computer could use natural language understanding and powerful analytics to reason about *existing* information and provide evidence-based answers to questions during its triumph on Jeopardy!. It marked a major turning point in the evolution of computing and represented the beginning of a new era in computing. Since then Watson has been at work in healthcare, finance, and retailing, helping professionals make more informed decisions. Now we're on the verge of seeing if a cognitive computing system can make us more creative by coming up with *new* ideas and solutions.

The pinnacle of human intelligence is often said to be creativity. The promise of computational creativity is the ability to assist humans in thinking outside the box, explore new white spaces and transform customer experience. Going from making inferences about the world to generating *new* things the world has never seen before is a next step in cognitive computing. Researchers set out to explore this in the culinary field, collaborating with professional chefs at the Institute of Culinary Education (ICE) in New York, to develop strategies to implement computational creativity in the culinary arts, and they are now taking this into other domains where innovation, discovery and design are necessary.

This spring at IBM PULSE and SXSW, IBM is taking cognitive cooking on the road with the IBM Watson Food Truck that invents new kinds of recipes and an opportunity to let more people experience the power of cognitive computing; even taste it!

The ICE chefs will be cooking up new recipes with the help of IBM's cloud-based cognitive cooking system that understands why thousands of different recipes are appealing, what tastes people prefer, and how the chemistry of different ingredients interact.

Visitors to the IBM Watson Food Truck and the public will vote on different dishes they'd like to see made each day at the two events. Using the #IBMFoodTruck hashtag users can pick from a list of dishes and the ICE chefs and IBM researchers will tap into a mobile, cloud-based version of our cognitive cooking system, to turn the top-trending ideas into one-of-a-kind dishes that will be served the next day.

Why food? We tend to think of food and cooking as an art but in fact, there's a massive amount of chemical and neural science that underlies a great dish. IBM's cognitive cooking system can reason about flavor the same way a human uses his palate.

At the heart of this cognitive cooking system are a set of algorithms that draw upon a number of datasets, regional and cultural knowledge as well as statistical, molecular and foodpairing theories to come up with dishes that are high in surprise, pleasantness and pair well. The system begins by capturing and analyzing tens of thousands of existing recipes to understand ingredient pairings and dish composition, and which it rearranges and redesigns into new recipes. It then cross references these with data on the flavor compounds found in ingredients, and the psychology of people's likes and dislikes (hedonic perception theory) to model how the human palate might respond to different combinations of flavors.

What appears as a list of ingredients for a novel and flavorful meal is actually the result of a system that intelligently generates millions of ideas out of the quintillions of possibilities, and then predicts which ones are the most surprising and pleasant, applying big data in new ways.

Given the numerous different combinations of possible ingredients out there, it's impossible for a human to imagine and reason about them all. Because while we humans really are gifted with intuition, we have trouble thinking about large numbers of possibilities. Good chefs can think in pairs of ingredients, and even the very best can only juggle three ingredients successfully.

This is why cognitive computing can spur creativity. Because it's not the kind of computing we're used to today. In contrast to a search engine that simply sifts through data to serve up a list of already published recipes, cognitive cooking is not programmed to come up with a defined answer to a defined question, an "if, then" query. It understands, learns, and considers not just big data but also human perception to design highly creative recipe ideas.

Cognitive cooking has been at work over the past year, helping professional chefs reason about any number of ingredients and testing the limits of ingredient pairings. An important aspect of this collaboration is pairing human creativity with machine creativity to create the best possible outcomes and results. Cognitive cooking is essentially the "sous-chef" working alongside seasoned professional chefs.

While IBM is using the domain of food to explore and test its research, there's an opportunity to make a societal impact and tackle the challenges of obesity, malnutrition and hunger. Food manufacturers, school lunch providers and chefs all strive to create foods that satisfy people's various tastes and preferences, but it's a challenge to also make them healthy, rich in nutrients and adhere to different dietary standards. By using computational creativity technologies to analyze the chemical compounds and ingredients, food professionals can identify new recipes and pairings that are not only tasty and healthy, but also efficient to produce.

Beyond food, we are now applying this research in other industries. A system that can model human preferences and generate new ideas has many applications outside of food and the opportunity to transform customer experience. Truly superior customer experiences are based on perception—appealing taste, appearance and design, to name a few—and represent a major differentiator in a variety of industries, including retail, consumer goods, hospitality and travel. As companies race to bring new products to market, computational creativity can accelerate how quickly they can bring products to market, reduce the cost of R&D, while helping them design what differentiating features should be prioritized for competitive edge.

**The food truck will be serving dishes from 12-4pm, at the corner of Fourth Street and Red River Street in Austin, Texas from Friday March 7 through Tuesday March 11. For more info on the truck and dishes go to ibm.com/cognitivecooking

For more information:

A Smarter Planet Blog: [Food for Thought: IBM Watson Whips Up Some Creativity](#)

[IBM Cognitive Cooking site](#)

[Cognitive Cooking Flickr image set](#)

To learn more about this research and how it can transform your business, contact Anshul Sheopuri sheopuri@us.ibm.com