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RESEARCH NEWS

Hannover Messe 2019: Machine learning dialog systems for business

Smart voice assistant answers your questions

Voice assistants are becoming more and more prevalent in every area of our lives. At this year's Hannover Messe, researchers from the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS are teaming up with automaker Volkswagen to showcase a new voice interaction system that caters to domain-specific knowledge. Drawing on the techniques of "informed" machine learning, the system goes far beyond the capabilities of most Alexa, Siri & co. skills – and has been specifically designed for use in industry. The smart vehicle voice assistant is an example of how companies can use dialog systems to enable users to interact intuitively with technology and to develop new business models. The system will be on display – in a VW Tiguan – from April 1 to 5 at the Fraunhofer Booth C22 in Hall 2.

Many people use Alexa, Siri and other similar voice assistants on a daily basis, dipping in to access the latest news, make use of voice navigation or simply stream their favorite songs. Voice assistants are an intuitive way to interact with technology, an effective way of delivering services and imparting information. They are not just handy everyday helpers, however; they present companies and business with a huge opportunity to simplify human-machine interaction and offer entirely new services to their industry customers.

Focus on companies

Researchers at Fraunhofer IAIS in Sankt Augustin develop just these sorts of voice interaction systems for use in a wide variety of applications, including manufacturing and the automotive and medical sectors. While Alexa, Siri and the like are aimed at individual consumers, the research team at Fraunhofer IAIS uses the latest techniques in machine learning, question answering and knowledge graphs to address the specific needs and challenges of business. "In manufacturing, for instance, we are seeing more and more robots equipped with voice assistants, which the worker can then operate and train using voice and gestures," says Prof. Dr. Jens Lehmann, Lead Scientist at Fraunhofer IAIS.

Prof. Lehmann and his team at Fraunhofer IAIS specialize in dialog systems catering to domain-specific knowledge and trained for specific applications. At the Hannover Messe, they will be showcasing a voice assistant integrated into a VW Tiguan. Wearing a headset and virtual reality glasses, drivers will be taken on a virtual tour of Berlin while the interactive system answers questions about the surroundings such as: What's

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that building on the left-hand side? What's it known for? When was it built? Who built it? The system also supports supplementary questions such as "Where does the architect come from?" or "Tell me more about him!"

Domain-specific knowledge answering complex questions

The Hannover Messe showcase is a collaboration between the Fraunhofer Cluster of Excellence Cognitive Internet Technologies (www.cit.fraunhofer.de), Volkswagen and the Fraunhofer Institute for Integrated Circuits IIS. "Knowledge related to Berlin has been collated into a knowledge graph, where each building represents a point on the graph and forms connections with other points. As a result, we can gather progressively more information and constantly expand the knowledge base. This is what allows answering complex questions instead of restricting inquiries to a limited number of prescribed questions," explains Lehmann. In a manufacturing context, this sort of knowledge graph could report on the status of machines, for example, or answer questions about components produced in the last hour. The knowledge graphs used for the trade show exhibition draw on a variety of data sources including Dbpedia (http://dbedia.org) and OpenStreetMap. A special feature of the voice assistant is that it is also able to harness unstructured knowledge, such as text documents on museums, for instance.

With these systems, you have not only the physical machine in the production hall, but also a virtual counterpart that is fed with real data. This data can be interrogated using dialog or question answering systems. "While question answering systems directly answer a single question, dialogue systems support multiple interaction steps with sequences of questions and answers. A dialog system will also respond to sequences of inquiries and small talk, just like the exhibit we will have on display," says Lehmann.

The more training data, the smarter the voice assistant

"It is the domain-specific knowledge that makes a voice assistant smart. The technical challenge from our side lies in developing a system that can understand users' queries and respond appropriately using the knowledge contained in the knowledge graph," the researcher concludes. Developing such a system calls for the application of the latest techniques in machine learning, techniques that the researchers at Fraunhofer IAIS are constantly developing and refining. The expertise they have assembled in machine learning and domain-specific knowledge puts them at the top of their field internationally. Tailored to the respective domains, the experts select the appropriate machine learning algorithms and train them using sample dialogs and question-answer pairs. The intelligence of the voice assistant grows with the amount of training data it amasses. The voice assistants developed by Fraunhofer IAIS offer their users the ultimate digital experience and are all GDPR-compliant. Visitors can try out the exhibition demonstrator live at the Hannover Messe from April 1 to 5 at the Fraunhofer Booth C22 in Hall 2.

Fraunhofer IAIS's new dialog system can answer complex questions – including queries from drivers about their surroundings. The voice assistant can be used in a wide variety of applications, including manufacturing and the medical sector.

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