

# Research and Future Trends

Arvind Krishna

Senior Vice President, Hybrid Cloud  
and Director, Research

IBM  
Investor  
Briefing  
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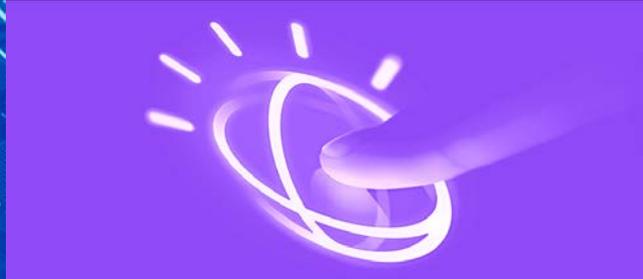


# IBM Research strategic imperatives

Reimagining computing



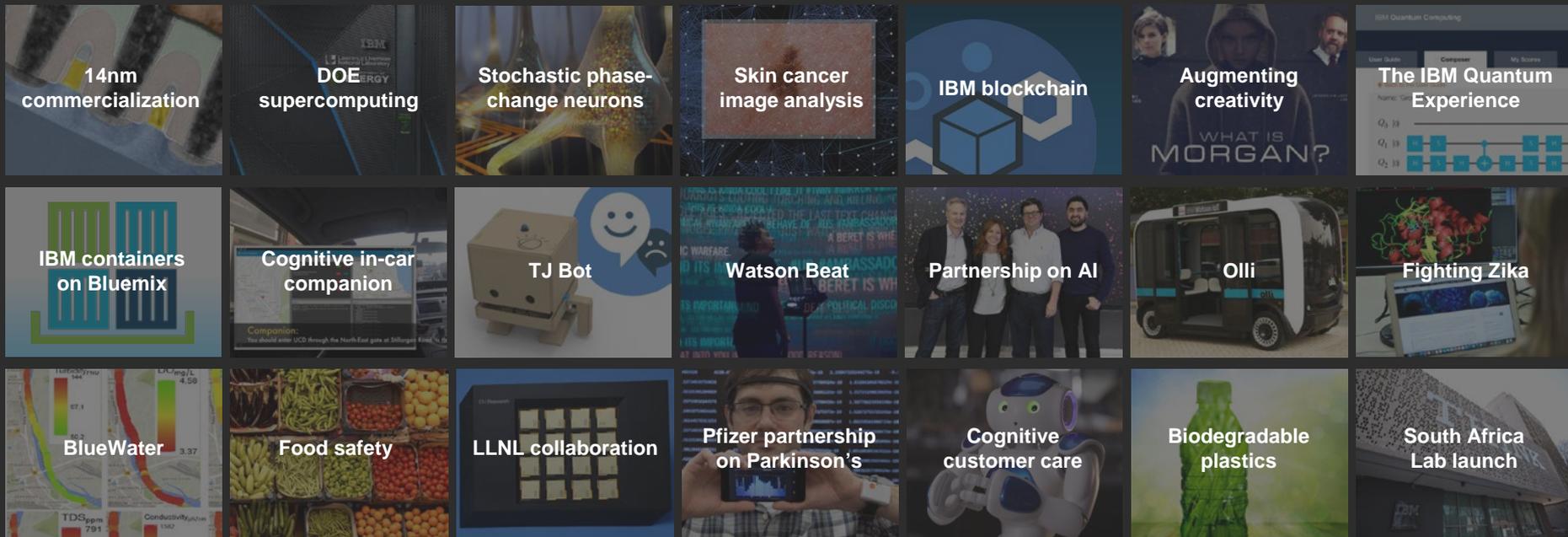
Developing core AI



Transforming industries through science and AI

Defining and optimizing blockchain

# Recent highlights



# Widen IBM's leadership in core AI

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- Now**
- Capable of ingesting **45 million articles** to learn essential vocabulary of over **100,000 topics**
  - Created **world's first cognitive movie trailer** using audio-visual emotional analysis
  - Watson for Genomics absorbs **10,000 new medical articles** and details from **100 clinical trials** every month
  - Achieved new milestone in speech recognition **with 5.5% word error rate** (a 20% improvement in 6 months)
  - IBM uses AI to train AI, finding the **best of hundreds of machine learning models** for a dataset, then **automatically training the model**
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**Soon**

Enable **multi-step reasoning** capabilities

Capable of **persuasion**, not just answers

Train in a new domain in **minutes**

# IBM systems leadership is unmatched

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## Now

- World's fastest commercial processor capable of handling **2.5 billion transactions/day**
- POWER8 has **4x more cache, memory bandwidth and threads per core** than competition
- 14nm IBM processor chips contain **~8 billion transistors** operating at industry-leading **5.3 GHz**
- Industry-leading Extreme Ultraviolet Lithography enables **3x reduction in complexity** and extends chip scaling
- IBM-led alliance introduced **industry's first functional 7nm node** test chips

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## Soon

Deliver  
**100x** AI workload  
performance

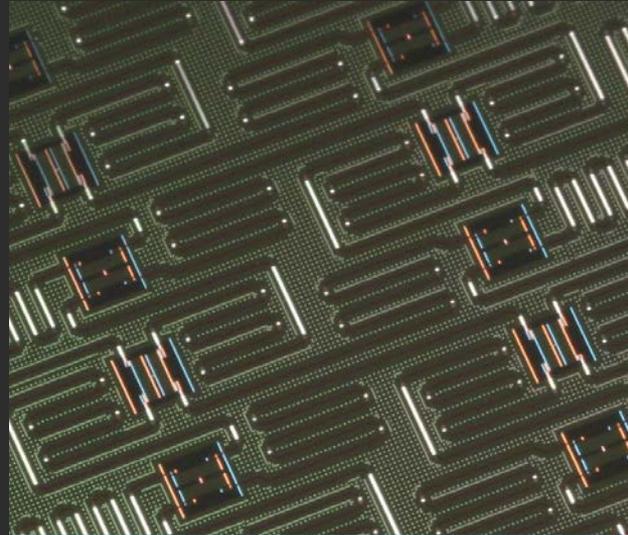
IBM storage enables  
**fastest cognitive data**  
ingestion

Open interfaces  
**revolutionize**  
**cost-performance** gains

# IBM Quantum Experience



Quantum computer at IBM Research



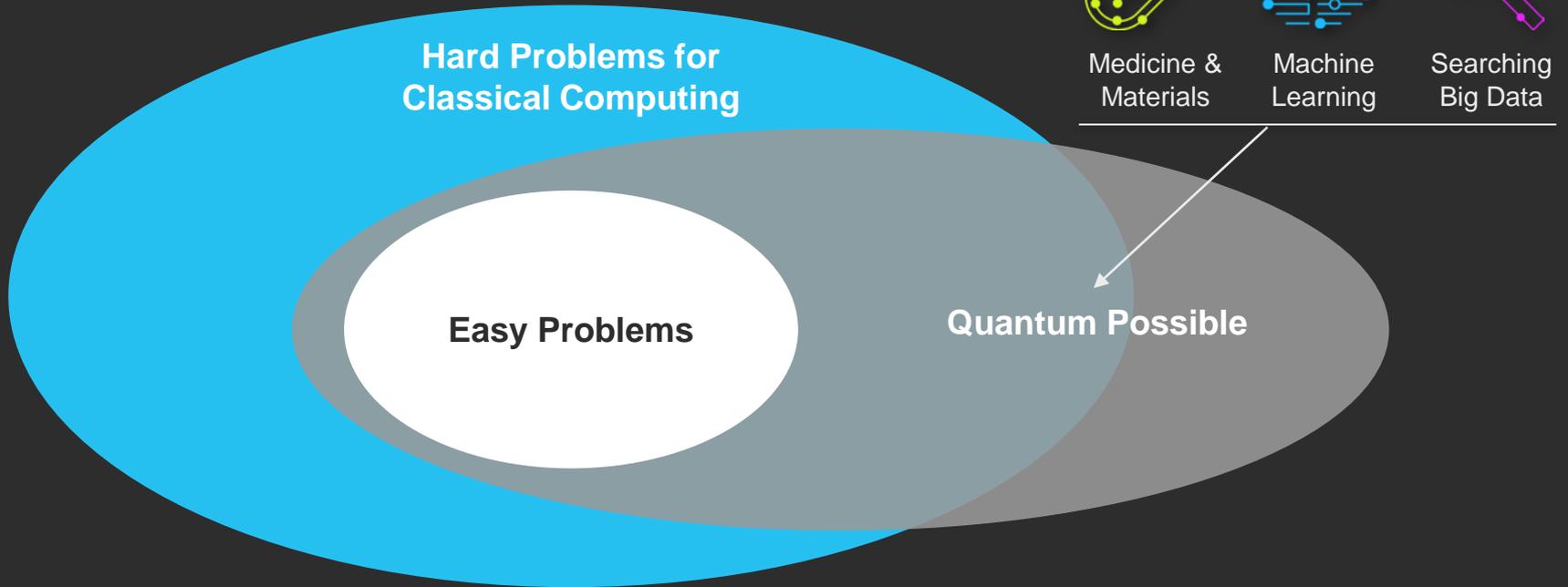
IBM quantum bit device



IBM Quantum Experience

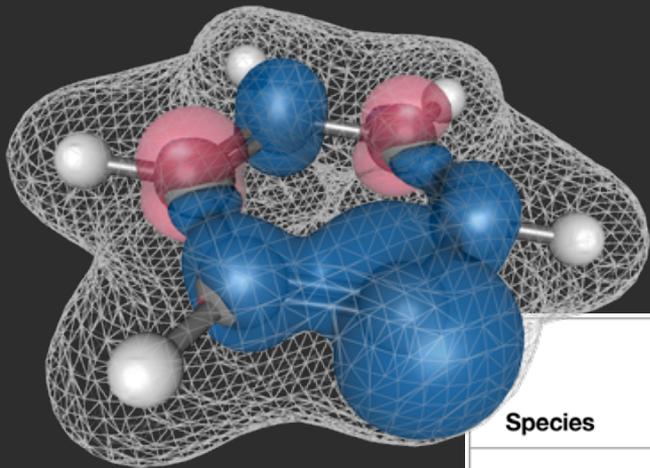
In May 2016, IBM made a quantum computing platform available via the IBM Cloud, giving students, scientists and enthusiasts hands-on access to run algorithms and experiments

# Why quantum computing matters



Quantum computing will enable us to perform some computations that would take more than the age of the universe to do on a classical computer

# Classical systems cannot accurately solve certain categories of problems



A laptop can simulate a molecule with 25 electrons, but to simulate one with 43 electrons, we'd need to use the most powerful supercomputer in the world

No classical computer we could ever build could simulate a 50-electron system exactly...we need a quantum computer

Species	Name	Bond Length (Å)		
		Experimental	Calculated	Difference
<b>CaF</b>	<b>Calcium monofluoride</b>	<b>1.967</b>	<b>4.079</b>	<b>2.112</b>
<b>Na<sub>2</sub></b>	<b>Sodium diatomic</b>	<b>3.079</b>	<b>2.379</b>	<b>-0.700</b>

Today's classical systems can only do approximate calculations of how molecules behave, and sometimes those calculations are inaccurate, as the table shows

# IBM building first universal quantum computers for business and science

On March 6, 2017, IBM announced industry-first initiative to build commercially available universal quantum computing systems

Leveraging IBM's quantum research breakthroughs, IBM plans to deliver "IBM Q" quantum systems and services via the IBM Cloud platform

Also releasing a new application program interface for the IBM Quantum Experience for developers and programmers



IBM