

# What to Do and Not to Do With Smart Machine Technology, AI and Cognitive Computing

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Update Information Management 2017

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# What to Do and Not to Do With Smart Machine Technology, AI and Cognitive Computing

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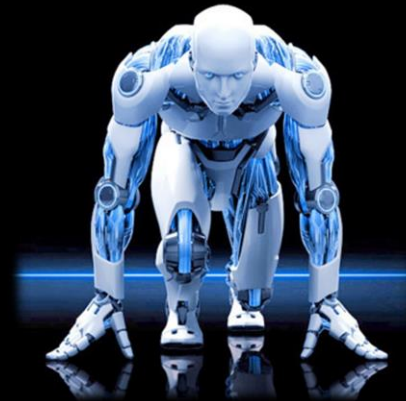
# The Smart Machine Age

From the 2012 Big Bang through most of the century

Special Applied Analytics

Trained With Data

Pervasive in New Products  
by 2020



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## What to Do

1. Characterize It Properly
2. Prepare for Massive Turbulence
3. There Is a New Platform Paradigm Emerging
4. Invest in AI-Rich Applications
5. Attend to the Bigger Issues

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## Smartness Rooted for Now In

- Deep Learning (Deep Neural Networks):  
Programming with models and data instead of code
  1. Develop a many-layered analytical model
  2. Force-feed it lots of data
  3. Certify performance with a test dataset to rule out anticipatable errors
- Natural Language Processing

Published definition: *Smart machine technologies adapt their behavior based on experience, are not totally dependent on instructions from people (they learn on their own) and are able to come up with unanticipated results.*

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## Expectation Reset

### Machines:

- Do not think, have common sense, understand or set their own goals.
- Do not learn, they're force-fed data.
- Are not self-aware, not conscious.

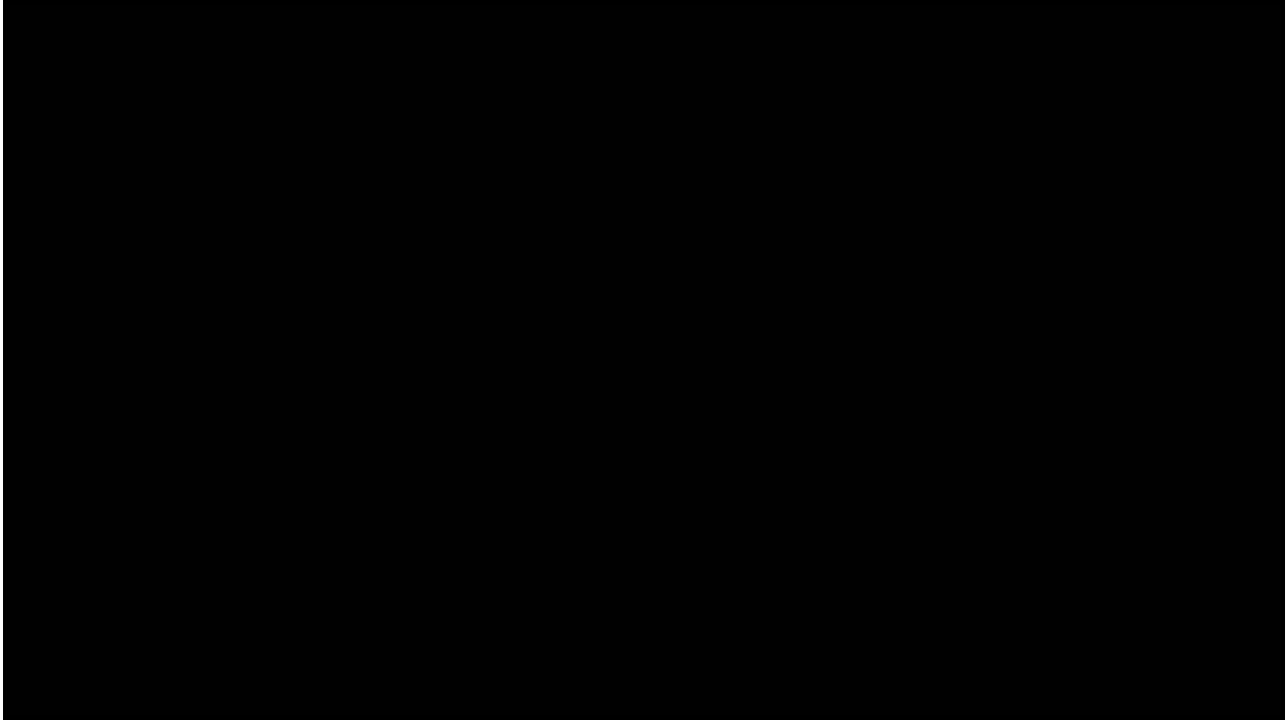
### Consistently Mis-Setting Expectations Since 1955:

- AI, cognitive processing, machine learning, smart machines and other anthropomorphisms
- Promoters weave seductive tales, obscure the innards, talk about successes and hide failures.

Use outcome-or result-specific terms: What do they do?

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## Self-Driving Models That Have Created Turbulence

2004: Levy & Murnane: Driving too complex for machines alone  
2005: Stanford team wins DARPA Grand Challenge<sup>1</sup>  
2006: First V2V demonstrations by General Motors<sup>1</sup>  
2008: Rio Tinto collaboration with Komatsu America for self-driving trucks, limited environment<sup>1</sup>  
2009: Launch of Google Self-Driving Car Research  
2012: First public discussions of Google Cars, submillimeter resolution roadmaps, LIDAR sensors<sup>1</sup>  
2015: Tesla Motors and Mobileye: End-to-end deep network algorithms for sensing and control  
2016: Reinforcement Learning for end-to-end training of a car<sup>2</sup>

**The rate of change is not increasing linearly or exponentially.**

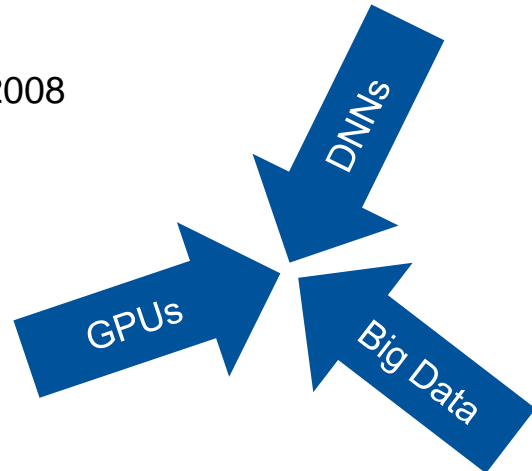
**Progress is lumpy, with hard turns, reversals and dead ends.**

<sup>1</sup> — brute force algorithmic vehicle control <sup>2</sup> — clear use of deep learning for vehicle control

## The Big Bang of 2012

### Graphics Processing Units — GPUs

- A million-fold improvement between 2008 and 2016
- Accept bigger DNN models
- Ingest more data

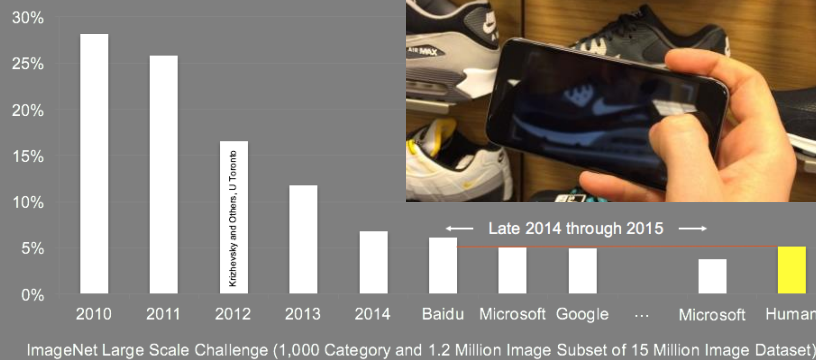


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## Why Now, After 65 Years of AI Disappointments?

### ImageNet Visual Recognition Challenge Best Error Rates



Classification error rate now better than humans in some cases

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## More Disruptive Changes

- 2014: Baidu Deep Speech
- 2014: Google Knowledge Vault
- 2015: DeepMind Atari Games
- 2016: DeepMind AlphaGo

Many of today's noted leaders are based on obsolete (or soon to be obsolete) technology

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## Disruptive History of Decadal Platform Paradigm Shifts

- Mainframe systems: 1960s
- Minicomputer systems: 1970s
- PCs and file-sharing LANs: 1980s
- Client/Server and GUIs: 1990s
- Internet and intranets: Mid-1990s to mid-2000s
- Mobile and cloud: Late 2000s to now
- What's next?

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## Platforms

- **TenCent** launches WeChat bot economy: 2011
- **IBM** launches first broad, general purpose AI platform, Watson: 2014
- **Amazon** introduces Alexa Skills: 2015
- **Baidu** releases Duer: 2015
- **Microsoft** launches Cortana Intelligence Suite: March 2016
- **Facebook** introduces Messenger (bot ecosystem): April 2016
- **Google** does SyntaxNet and more, new AI services: May 2016
- **Amazon** does too with Amazon ML
- **Salesforce** buying AI services to integrate into Force platform
- ...

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# The new platform paradigm

## Smart User Experience

Conversational UX, Bot Control, More

## Application Layer

Bots, Apps and Other Applications

## Smart, General-Purpose Platform

AI Services and Other (IoT, System of Record ...)

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## ... Pervasive and Proactive General-Purpose Platforms

- Conversational User Interfaces:
  - Text, speech and other modalities
  - Improves machine precision
  - Reduces human cognitive loading for novel situations
  - Well-learned, highly repetitive task performance hindered
  - Conversational learning essential for full exploitation
- Chatbots
  - Interfaces, vetting, management, governance, personal bots, ...

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## Smart Machines

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**Business Impact (in Billions):**  
**\$10 in 2015, \$30 in 2020, \$2,000 in 2040\***



**The Value Chain**

Technology (Handful)  
 Product Categories (100s)  
 Applications (1000s)  
 Use Cases (Thousands)  
 Business Results (Millions)

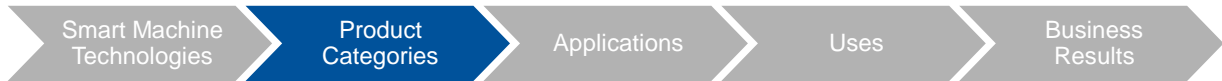


\* Unofficial amalgamation of third-party forecasts

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## Multidimensional Product Categories (Illustrative)



- **Agents:** Professional, personal, and customer assistants, advisors and coaches
- **Robots** and related autonomous transport — air, ground, sea and industrial
- **Enterprise Applications:** Security/fraud, human resources/recruiting, sales, marketing, customer support, internal intelligence, market intelligence, ...
- **Platforms and Services:** General-purpose or narrow —deep learning, industrial IoT, vision, audio-seismic vibration, natural language processing, data enrichment, bot economies
- **End User and Developer Tooling:** For example, data science, machine learning, NLP including open source
- **Industries:** Ad tech, agriculture, government, retail finance, legal, materials and manufacturing, healthcare, education, transport and logistics ...

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## Application Examples From Banking Clients



### Product Category

### Applications (Sample)

Smart Vision Systems	Authentication, access, ATM security, interpersonal recognition, advisors for tellers and wealth managers
Virtual Customer Assistants	Roboadvisors; assistants for ultra high net worth clients
Virtual Personal Assistants	Career advisors, exercise trainer (health and wellness)
Smart Advisors	Ingesting large bodies of information and debating issues for users, examining contract compliance.
Other NLP Applications	Monitoring internal person-to-person communication traffic to identify risks
Smart Facility and Campus Infrastructure (IoT)	Reducing operating cost and risk

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## Reverse the Flow



### Focus on

- Business results
- Time-to-value: Stepwise business value delivery
- Production reference alignment with your use cases and desired results
- Transparency
- Open versus walled garden
- Platform breadth and generality

### Trade-offs

- Applications or platforms?
- How smart to start?
- Simple versus complex
- How custom? (buy and build)
- Example: Bootstrap a virtual customer assistant strategy

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**Bigger Issues**

- ~~The End of Human Life as We Know It~~
- ~~More Dangerous Than Nuclear Weapons~~
- ~~Further Concentrations of Economic Power~~
- ~~Widespread Unemployment and Social Unrest~~

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- Legal, Regulatory, Social and Ethical Issues
- Conundrum: Replace or Upskill People?
- Performance of People Plus Smart Machines
- Privacy, Trust, Intimacy and Fallibility Issues

**Bigger Issues**

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## Recommendations



- ✓ Engage the business:
  - Explore the relevant knock-on consequences of smart machines in your business.
  - Define how application of specific elements in the sample smart machine spectrum will disrupt your industry.
  - Identify at least three separate smart machine business initiatives to fund in 2017-2018.
- ✓ Manage the impact on people:
  - The impact of software and robots on employment, work and careers of people will be profound.

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## Recommended Gartner Research

- ▶ [How to Define and Use Smart Machine Terms Effectively](#)  
Tom Austin, Alexander Linden and Martin Reynolds (G00301283)
- ▶ [Entering the Smart-Machine Age](#)  
Tom Austin, Bettina Tratz-Ryan and Others (G00290997)
- ▶ [Smart Machines See Major Breakthroughs After Decades of Failure](#)  
Tom Austin (G00291251)
- ▶ [Where Banks Can Use Smart Machines](#)  
Tom Austin and David Furlonger (G00290560)
- ▶ [Cool Vendors in Smart Machines, 2016](#)  
Tom Austin, Frances Karamouzis and Others (G00302010)
- ▶ [Hype Cycle for Smart Machines, 2016](#)  
Kenneth F. Brant and Tom Austin (G00290496)
- ▶ [The IT Role in Helping High Impact Performers Thrive](#)  
Tom Austin (G00259381)

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