# Major technological revolution underway:
## the era of robotics, automated systems, virtual reality, artificial intelligence

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# Note

- This presentation and the companion paper is part of a book on the subject by Frank Owarish, Ph.D., Computer Science, MIEEE and his brother Sam Owarish, Ph.D., Mechanical Engineering, scheduled to be published in the fall of 2018

# Technological revolution

- Technologies are constantly moving, evolving all the time but at time something big happens, for example the IOT, now RASVRAI* is happening big time, a real revolution because they are happening at the same time often impacting each other; the interrelationships are quite significant; recall Alvin Toffler's First Wave (agricultural), Second wave (industrial), Third Wave (informational); would have qualified the current one as a mega-wave
- *R=robotics; AS=automated systems; VR=virtual reality; AI=artificial intelligence

# Elements of the Mega Wave

- Automated system {AS}
- Robotic {R}
- Virtual reality {VR}, added reality/ augmented reality {AR}, mixed realty {MR}
- Artificial intelligence {AI}

# Basic automated *system*

- This is typically a computer-based system which takes a series of steps and convert them into an algorithm which can run itself with minimal human intervention

# Basic robotic

- Basically a machine which runs an automated system with minimal to no human intervention

# Basic virtual reality

- This is a replication of reality, real or created, which runs on a computer system

# Basic artificial intelligence

- This is a state where a computerized system is able to make decisions, for example a thermostat set at a specific temperature makes adjustment by increasing or decreasing heat generated by the system so that the constant temperaure is maintained; similarly for a car in a cruise-control mode

# Complex automated systems

- Have been going on for decades
- What's different now is that current day automation can be said to be intelligent not just mechanical
- Often working in tandem with robotics, VR and AI

# Complex robotics

- Have also been going on for years but today increasingly relating to AI; often called smart robotics albeit robots that make decision

# Complex virtual reality

- The smart phone revolution ushered in a whole new world of virtual reality
- You can visit a vacation resort online and see what it is like before making a decision (beware misrepresentation)
- Associated terms are added reality, augmented reality, mixed reality

# Complex artificial intelligence

- Again AI has been happening for years, as a matter of fact started with the Turing Machine and 'enigma'
- Today AI is coming of age

# Case study methodology at Harvard University

- When the MBA first started decades ago the field of business administration was partly known and partly in the making; the Harvard philosophy is that in context the material is best studied through existing and generall accepted concepts and also through case studies bringing light to the multifaceted aspects of the field; this methodology is warranted for the new field emerging, shaping up

# Case study is key to knowledge acquisition

- Real life 'cases' albeit stories
- At times, with an attempt to conceptualize
- Collection makes up new body of knowledge, of course evolving in nature
- In the following slides, we review typical applications

# AS: Commercial flights

- Commercial aviation is already heavily automated. Modern aircraft are generally flown by a computer autopilot that tracks its position using motion sensors and dead reckoning, corrected as necessary by GPS. Software systems are also used to land commercial aircraft
  - (Source: https://www.nytimes.com/2015/04/07/science/planes-without-pilots.html)

Advances in sensor technology, computing and artificial intelligence are making human pilots less necessary than ever in the cockpit. Already, government agencies are experimenting with replacing the co-pilot, perhaps even both pilots on cargo planes, with robots or remote operators. "The industry is starting to come out and say we are willing to put our R&D money into that," said Parimal Kopardekar, manager of the safe autonomous system operations project at NASA's Ames Research Center.

# R: Robotic surgery

- Robotically-assisted heart surgery, also called **closed-chest heart surgery**, is a type of minimally invasive heart surgery performed by a cardiac surgeon. The surgeon uses a specially-designed computer console to control surgical instruments on thin robotic arms.
  - (Source: https://my.clevelandclinic.org/health/treatments/17438-robotically-assisted-heart-surgery)

# VR: Virtual reality LAMPIX VR platform

- [https://www.kickstarter.com/projects/868083461/lampix-intelligent-interactive-tabletop-ar-is-here](https://www.kickstarter.com/projects/868083461/lampix-intelligent-interactive-tabletop-ar-is-here)?

# Augmented reality rocket launch

- https://www.usatoday.com/story/tech/nation-now/2018/03/29/augmented-reality-rocket-launch-app-shows-you-spacex-launch-like-never-before/461696002/

# Mixed reality

- Nature as it truly is; nature captured and rendered via music videos:

www.natureappreciation.org

Pick Spring site and sound as an example

# How is AI shaping up: Five predictions 2018 by Daniel Newman, Forbes

## 1. Data driven machines

It's what most companies will be focusing on … With the steady growth of data produced by the Internet of Things (IoT), businesses will be turning to machine learning to process, trend, and analyze the information. Machine learning AI is a *must-have.* It's the only way companies can make valuable sense of the flow of data—both structured and unstructured—coming in (simply be too much for any human to manage). (If you don't yet have an AI strategy in place, don't worry. Forrester predicts up to 80% of firms will rely on "insights-as-a-Service" in at least some capacity in 2018.)

# 2. More Human-like Help

- More and more businesses are moving toward harnessing the power of conversational AI chatbots and other virtual assistants to manage the day-to-day flow of work. It is estimated that some 85% of customer interactions will be managed by AI by 2020. In the near-term, we'll likely see an increased focus on bot sensitivity training, which will allow humans to offload even more work on chatbot shoulders. And I'm not just talking about business. Amazon's Alexa recently began syncing with Outlook and Google to help families keep up with their hectic schedules. Meanwhile, a new virtual assistant from X.ai called "Amy" can be trusted to respond to messages regarding meetings, meals, and calls without ever alerting the sender she's a bot. We may not be ready for the *Jetsons'* Rosie, but we're getting closer.

# 3. Siri—And Other Tech—Will Hear You Better

Ugh, the pain of voice-texting a message, only to find you need to edit nearly every word because Siri didn't get it. My guess is we'll finally get a handle on conversational technology in 2018, including not just emotional sensitivity, but translational technology that allows us to communicate seamlessly between languages. This is big for both business and personal life, as I recently discussed in The Many Benefits of Conversational AI. Amazon is already training Alexa to recognize speech patterns that may be indicative of suicide. Eventually, bots may be able to perform psychiatric counseling or serve as a support network for those who are isolated.

# 4. Smart Automation Continues

Have you noticed Amazon's subscription order services? When you purchase day-to-day products, it actually auto-populates your order to schedule regular delivery of these items—whether it's paper towels, laundry, detergent, or dog food—on a weekly or monthly basis. Talk about locking you in to future sales. Just as AI has already shaken up the marketing industry with its ability to personalize marketing campaigns—and even tweak them in real-time—we'll continue to see AI bringing smart automation to an even wider range of industries—from retail product delivery to machine maintenance, energy conservation, and more.

# 5. AI Adoption Will Continue To Grow

OK, this may not warrant its own bullet, but I just wanted to emphasize the fact that AI isn't going anywhere. In fact, as the technology continues to refine itself, engineers are finding even greater—and more granular—uses for it, in all aspects of our lives. Yes, robots and self-flying delivery drones are cool. But the things we're seeing now—and into 2018—are perhaps just as amazing. They have the power to take much of the drudgery out of our daily work and personal lives—something pretty much all of us can rally behind as we close another active year of tech advancement.

# Conclusion

- Blending all the elements together creates a mega revolution transforming the way business operates

- The impact will also be felt in government and non profit organizations