

# How Artificial Intelligence (AI) is Transforming Healthcare

Jeffery Daigrepont, SVP Coker Group jdaigrepont@cokergroup.com 770-597-0590





# Q&A and Networking

While you're watching, please join us in the channel called "Live Session" in UC Chat.

You must register for <u>UC Chat</u> if you have not done so already.





#### **Discussions...**





# What is Intelligence?



- The ability to acquire and apply knowledge and skillsThe ability to interact
- The ability to interact (speech, vision, motion, manipulation)
- The ability to reason
- The ability to learn and adapt
- To think abstractly as measured by objective criteria (Ex: test taking)





# **Types of Artificial Intelligence**



- Artificial Intelligence An umbrella term for machines capable of perception, logic and learning
- Machine Learning Employs algorithms that learn from data to make predictions or decisions, whose performance improves when exposed to more data over time

• **Deep Learning -** Uses many-layered neural networks to build algorithms that find the best way to perform a task on their own based on vast sets of Data





# AI by the Numbers..

#### Start-ups developing AI grew by 14x since 2000







## Al by the Numbers

 There have been a 6X increase in the annual investment levels by venture capital (VC) investors into U.S.-based Ai startups since 2000







## Al by the Numbers

- Machine Learning, Deep Learning and Natural Language Processing (NLP) are the three most in-demand skills on Monster.com.
- Median starting salary is: \$127,000







# Al by the Numbers...

Global revenues from AI for enterprise applications is projected to grow from \$1.62B in 2018 to \$31.2B in 2025.

Image recognition and tagging, patient data processing, localization and mapping, predictive maintenance, use of algorithms and machine learning to predict and thwart security threats, intelligent recruitment, and HR systems are a few of the many enterprise application use cases predicted to fuel the projected rapid growth of AI in the enterprise.

Source: Statista.

UC 2020 Burlington, Vermont Enterprise artificial intelligence market revenue worldwide 2016-2025

#### Revenues from the artificial intelligence for enterprise applications market worldwide, from 2016 to 2025 (in million U.S. dollars)





#### **Prediction:** In 15 years, AI Could Replace 40% of all Jobs

(Repetitive Jobs Most at Risk)



AI Expert Says Automation Could Replace 40% of Jobs in 15 Years Fortune - Jan 10, 2019

Speaking to CBS News' Scott Pelley in an interview for 60 Minutes on Sunday, Kai Fu Lee said that he believes 40% of the world's jobs will be ...



Al could do 40% of the world's jobs in 15 years

Innovation Enterprise - Jan 11, 2019 "AI will increasingly replace repetitive jobs, not just for blue-collar work, but a lot of white-collar work," said Lee, a pioneer in AI and venture ...



The Future Of Recruiting In The Age of Automation And Artificial ... Forbes - Jan 4, 2019 So, the fear of job loss in the age of automation and Al is real. ... That reporting also revealed that 40% of mortgage specialists at a major ... Also, AI programs are already



20% of millennials in debt expect to die without paying it off Axios - Jan 9, 2019 40% of the world's jobs could be done by machines as soon as 15 ... What he's saying: "AI will increasingly replace repetitive jobs, not just for ...



Is Artificial Intelligence about Taking Human Jobs or Creating Them ... 1redDrop - Jan 13, 2019

Is Artificial Intelligence about Taking Human Jobs or Creating Them? ... CBS News that he thinks about 40% of all human jobs in existence today will be ... A light switch might cost you a few bucks to replace, but a smart switch ...





### **Timeline of Al**



#### TIMELINE OF AI MILESTONES

1956	The first Dartmouth College summer AI conference is organised by John McCarthy, Marvin Minsky, Nathan Rochester of IBM and Claude Shannon
1965	Joseph Weizenbaum (MIT) builds ELIZA, an interactive program that carries on a dialogue in English language on any topic
1978	Herbert A. Simon wins the Nobel Prize in Economics for his theory of bounded rationality, one of the cornerstones of Al known as "satisficing"
1993	Vernor Vinge publishes The Coming Technological Singularity, predicting that, within the next 30 years, humankind would have the ability to create "superhuman intelligence"
1997	The Deep Blue chess machine (IBM) defeats the (then) world chess champion, Garry Kasparov
2009	Google builds self-driving car
2011	IBM's Watson computer defeated television game show Jeopardy! champions Rutter and Jennings
2016	Google DeepMind's AlphaGo defeats 3x European Go champion Fan Hui by 5 games to 0
2017	Google's AlphaGo Zero – an improved version of AlphaGo – learns by playing only against itself and beat its predecessor 89:11 after only 40 days

Sources: Wikipedia, Old Mutual Investment Group





## **Other Stats**

- 75% of all things recommended on Netflix comes from collaboration sourcing. (Source: Statwolf)
- By 2020, 85% of customer interactions will be handled without a human. (Source: Gartner)
- The Washington Post's Al writer (Heliograf) wrote more than 850 stories during the Rio Olympics and the 2016 US presidential election. (Source: Washington Post)
- By 2020, AI will eliminate 1.8 million jobs and create 2.3 million. (Source: Gartner)
- Execs expect AI personal assistants (31%) and data analysis (29%) to make the biggest impact on their businesses. (Source: PWC)
- 44% of consumers don't even realize they're already using AI platforms. (Source: Pega)
- By 2020, 90% of cars will be connected to the internet. (Source: LinkLab)
- Investment in AI will increase more than 300% over the next year. (Source: Forbes)
- 40% of adults now use voice search at least once per day. (Source: Location World)
- 4 billion devices will carry AI-powered voice assistants this year. (Source: HIS Markit)
- Al could prevent 86% of cyber attacks and security threats
- Smart speakers are the world's fastest-growing technology segment (Source: TechCrunch)







## **AI IN HEALTH CARE**

# Al in Health Care

Technological developments are a key driver in changing the face of healthcare. But how far are patients prepared to take this. For example, can robots really be used to deliver procedures and how do patients feel about this?









# **Reducing Infections**

Fighting Infections:

Duke University Hospital, in Durham, N.C., is officially launching Sepsis Watch, an AI-based system that identifies incipient sepsis cases and raises the alarm

#### How it Works:

Sepsis Watch was trained via deep learning to identify cases based on dozens of variables, including vital signs, lab test results, and medical histories; its training data consisted of 50,000 patient records including more than 32 million data points. In operation, it pulls information from patients' medical records every 5 minutes to evaluate their conditions, offering intensive real-time analysis that human doctors can't provide. If the AI system determines that a patient meets its criteria for someone with the early signs of sepsis, it alerts the nurses on the hospital's rapid response team.

Over 200,000 patients die every year from sepsis Cost to our system: 27 Billion!





# AI Enforced Hygiene

A CDC-funded study underway at Emory University Hospital Midtown (EUHM) and Emory Johns Creek Hospital (EJCH), are testing an AI monitoring system to measure hand hygiene compliance.

How it works:

Data is collected by electronic sensors attached to alcohol hand-rub and soap dispensers in patient rooms and hallways. These sensors know when a caregiver entered into a patient care area and will alarm if they exit the area without washing their hands and/or if the enter an area not having washed hands from leave the prior area.





## Virtual Health Assistants

The idea of a robotic chat agent isn't new. Eliza, the world's first chatbot, was created by MIT scientists 50 years ago as a Rogerian psychotherapist that could reflect and provide feedback on what patients said. Current examples of virtual health assistants include:

<u>Florence</u> acts as a virtual nurse helping patients with medication adherence and maintaining healthcare regimens. It also can help locate specialists and schedule appointments.

Eva helps women track their menstrual cycles and pregnancies. Molly — an avatar-based virtual nurse assistant — connects patients with clinical advice to assess their condition and suggest appropriate follow-up.

HealthTap allows people to chat with a doctor and send pictures and copies of lab results to see if a problem requires additional care.

Your.MD asks users about symptoms and offers medically approved potential conditions and then makes referrals and schedules appointments.

Ada is an AI-powered technology, asking people how they're feeling and guiding them on next steps.

From an efficiency standpoint, chatbots offer a real opportunity to relieve staff of repetitive tasks. They also could help organizations deal with staff and budget constraints.







## **Reception & Bedside Bots**

Belgian hospitals: Friendly droid is being used to greet patients at reception

Pepper robots are being tested at Belgian hospitals in Ostend and Liege

The humanoid robot uses cameras and sensors to detect human emotions

It will act as a greeter and interact with visitors entering the hospital





# Al Diagnostics

- For the first time, the US Food and Drug Administration has approved an artificial intelligence diagnostic device that doesn't need a specialized doctor to interpret the results. The software program, called IDx-DR, can detect a form of eye disease by looking at photos of the retina.
- It works like this: A nurse or doctor uploads photos of the patient's retina taken with a special retinal camera. The IDx-DR software algorithm first indicates whether the image uploaded is high-quality enough to get a result. Then, it analyzes the images to determine whether the patient does or does not have diabetic retinopathy, a form of eye disease where too much blood sugar damages the blood vessels in the back of the eye. Diabetic retinopathy is the most common vision complication for people with diabetes, but is still fairly rare there are about 200,00 cases per year.





#### **Robot-Assisted Surgery**

Popularity in robot-assisted surgery is skyrocketing. Hospitals are using robots to help with everything from minimally-invasive procedures to open heart surgery. According to the Mayo Clinic, robots help doctors perform complex procedures with a precision, flexibility and control that goes beyond human capabilities.

#### How Does it Work:

Robots equipped with cameras, mechanical arms and surgical instruments augment the experience, skill and knowledge of doctors to create a new kind of surgery. Surgeons control the mechanical arms while seated at a computer console while the robot gives the doctor a three-dimensional, magnified view of the surgical site that surgeons could not get from relying on their eyes alone. The surgeon then leads other team members who work closely with the robot through the entire operation.







#### AI Powered EHRs

EHR have utilized AI for years, we just never called it AI. Programed triggers, defaults and rules are examples of EHRs using AI. The original concept was called "Charting by Exception", which would auto navigate the documentation based on the previously text. For example, if user enters 47-year-old female, the system would filter out anything that could be applicable to only males, children, infants, etc... If the next entry was "non-smoking" they system would remove the part of the examine applicable to someone who is a smoker. Most have also seen or used smart text, which can drop in entire paragraphs with an entry of just a few initials. And finally, speech recognition has been around for years and is now evolving beyond just voice to text.





## **AI Powered Collections**

HighRadius Corporation launches the FIRST Artificial Intelligence-based machine learning platform to power their Integrated Receivables solution offerings for credit, collections, cash application, deductions, billing and payments.

Other examples include LexisNexis, providing powerful consumer data enabling practice to identify who is at risk for not paying and/or being slow to pay.

Text to pay alerts is also very common today.



# Chat Bot

#### AI Powered Help Desk Support

Using Chat Bots to manage tier one IT support calls and to perform self healing transactions. Improves customer support by providing a means for self-help.

Stat: 80% of clinicians report being "impeded" by inadequate tech support, and that most help desks are falling short of the needs of healthcare systems. Source: Black Book Report

How it works: See next slide





#### Illustration of Chat Bot Logic...



2020 rlington, Vermont



# **Facial Recognition**

- Detection of non-employees interacting with PHI or entering into secure areas
- Advanced knowledge of patients entering the building who may require special services (Wheelchair, translator)
- Triggers check in processes
- Alerting the campus of a hostile/threating patient
- Active shooter/terrorist in the area









# AI Legal and Ethical Concerns...

- When AI shows bias or acts racist (see: Microsoft Tay)
- Inequality How do we distribute the wealth created by machines?
- Evil AI (Cures cancer by killing all humans)
- Al Rights (Can non-humans have rights? A: See Corporations)
- Humanity (How do machines affect our behavior and interaction?)
- IP developed by AI (Who owns it?)
- Causing harm (Who is at fault)
- Privacy and Consent (Facial recognition, tagging)
- Al can now predict the propensity to pay (Are these patients treated differently?)
- Al can now predict the propensity to commit crimes (Should it be for employment screening?)
- Security How do we keep AI safe from adversaries?
- Limitation Requires access to the cloud and to an enormous amounts of data



https://www.researchgate.net/publication/320826467\_Exploring\_Legal\_Ethical\_and\_Policy\_Implications\_of\_Artificial\_Intelligence



# **AI Implementation and Adoption**

Al is beginning to play a role in transforming health care, in and out of the clinical setting. The opportunities and limitations is just being explored. However, there are significant challenges in this field that include:

- The acceptance of AI at the point of care
- The availability of quality data from which to build and maintain AI applications.
- The missing data streams.
- The limitations of AI methods in health and health care software applications.







#### Top Barriers to Implementing AI

While AI technology has improved significantly in recent years, it doesn't always live up to the hype.

Organizations continue to face technological, cultural, and organizational challenges to their Al initiatives.







#### What are the top three barriers to AI adoption in your organization?

## Where to Start...

#### <u>10 Step Plan</u>

- 1. Learn and research AI (See Resource Slide)
- 2. Create awareness
- 3. Change mindset based on reaction from awareness campaigns
- 4. Educate leadership
- 5. Start off setting low expectations
- 6. Identify easy wins (Most Critical)
- 7. Embrace cloud computing
- 8. Form a workgroup
- 9. Identify gaps in data / capabilities
- 10. Consider enlisting a third-party expert to transfer knowledge







#### Working with Al Vendors

License or Co-development Who owns the IP rights Royalty Agreements Scope of Work Acceptance Agreements Payment Terms Late Fees Documentation of programing and ERD Price Escalation / Caps Cyber Security Patient Safety / Liabilities Warranty Termination Data Ownership Data Migrations Version Venue / Governing Law for Disputes







- <u>Short-term</u>: Focus on current digital capabilities and proven technology solutions already available on the market. Avoid the temptation to build an AI solution or co-development. The key is to get an early win.
- <u>Medium-term</u>: Test the waters with emerging but still relatively immature AI to prove its value in key business use cases before scaling. (Ex: deep learning AI Chatbots and service bots)
- <u>Long-term</u>: Work with a third party to solve a high-impact use case with bleedingedge AI technology to potentially capture a sizable first-mover advantage.
- Consider working with experts or peers who have already started





### **Real World Examples of AI in Use**



ğ

Flagler Hospital uses Al to create clinical pathways that enhance care and slash costs, lowered length of stay by two days and significantly reduced readmission rate. Al tools points to 2300 data elements within the EHR looking for common patterns.



Mayo Clinic teamed up with Tempus, a health tech startup focused on developing personalized cancer care using a machine learning platform. The partnership involves Tempus conducting "molecular sequencing and analysis for 1.000 Mavo Clinic patients participating in studies relating to immunotherapy" for a number of cancer types including "lung cancer, melanoma, bladder cancer, breast cancer and lymphoma."

<u>Cleveland Clinic</u> and Microsoft announced a collaboration to help the medical center "identify potential at-risk patients under ICU care." Researchers used Cortana, Microsoft's Al digital assistant, to tap into predictive and advanced analytics. <u>Massachusetts General</u> <u>Hospital</u> is currently in the early stages of its Al strategy with NVIDIA. The hospital aims to serve as a hub for Al applications in healthcare for the "detection, diagnosis, treatment and management of diseases.

**Johns Hopkins Hospital** announced the launch of a hospital command center that uses predictive analytics to support a more efficient operational flow. The **Command Center which** receives "500 messages per minute" and integrates data from "14 different Johns Hopkins IT systems" across 22 high-resolution, touchscreen enabled computer monitors.



# Final Thought...

### THE BLACK SWAN



The Impact of the HIGHLY IMPROBABLE

Nassim Nicholas Taleb





#### Life Span









#### **AI Learning Resources...**

The following are a number of online resources (free and paid) that you can use to get started:

- Udacity's Intro to AI course and Artificial Intelligence Nanodegree Program
- Stanford University's online lectures: Artificial Intelligence: Principles and Techniques
- edX's online AI course, offered through Columbia University
- Microsoft's open-source <u>Cognitive Toolkit</u> (previously known as CNTK) to help developers master deep-learning algorithms
- Google's open-source (OS) <u>TensorFlow</u> software library for machine intelligence
- <u>Al Resources</u>, an open-source code directory from the Al Access Foundation
- The Association for the Advancement of Artificial Intelligence (AAAI)'s <u>Resources Page</u>
- MonkeyLearn's <u>Gentle Guide to Machine Learning</u>
- Stephen Hawking and Elon Musk's Future of Life Institute
- **OpenAl**, an open industry and academia-wide deep-learning initiative





# **Thank You!**

Jeffery Daigrepont, SVP Coker Group jdaigrepont@cokergroup.com 770-597-0590





# What Questions Do You Have?

Questions posted in the <u>Live Session channel of UC Chat</u> will be read aloud by moderator for presenter to answer. Please post your questions in Live Session.





# Later Viewing

This and all other UC2020 course recordings will be available for later viewing on <u>PCC's UC 2020</u> <u>YouTube Channel</u>



