

A hand is shown in silhouette, pointing towards a medical scan. The scan displays various anatomical structures, including what appears to be a brain cross-section. Technical data is overlaid on the scan, including 'FoV 199*24', '295*512s', 'Tra>Cor(6.1)>Sag(1.5)', 'W 128', 'C 667', 'AF', 'Chilom 1170', 'Harmony 20000', '4VA128', 'HFS', '+LPH STUDY 1', '10.11.19', '18.11.19', and '2 MA 10'.

Artificial Intelligence in Healthcare

BASICS AND APPLICATIONS

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CO-FOUNDER & CO-DIRECTOR, AI IN MEDICAL SYSTEMS SOCIETY

STEERING COMMITTEE MEMBER, PHYSICIAN INNOVATOR

Agenda

- Basics of AI and Medical AI
- Applications of AI in Healthcare
- Health AI Initiatives
- Success Stories and Lessons Learned from AIMSS
- The Future is Bright! (or is it?)

Artificial Intelligence

- Development of computer systems/machines capable of performing tasks that typically require human intelligence
- Multiple subcategories of AI exist
 - Machine Learning
 - Supervised Learning
 - Unsupervised Learning
 - Reinforcement Learning
 - Deep Learning
 - Neural Networks
 - Convolutional Neural Networks
 - Generative Adversarial Networks
 - Natural Language Processing
 - Expert Systems
 - ...

Medicine and AI

- Prevention
- Research
- Diagnosis
- Treatment

“To be a competent doctor, an AI system does not have to be the best doctor in the world. AI has to be better than only the worst graduating student in your class. Further, assuming a standard distribution curve, if AI is better than your average student, it is better than 50% of all doctors. Moreover, as seen from the references above, there are already systems that can perform several tasks better than some of the best, so AI is on track to achieve this.” - Masters (2019)



ELECTRONIC
MEDICAL/HEALTH
RECORDS (EMR/EHR)



MEDICAL IMAGES &
VIDEOS (X-RAY, MRI, CT,
PET)



MEDICAL SIGNALS (EEG,
EMG, ECG, MEG)



GENETICS, OMICS
(GENOMICS, PROTEOMICS,
METABOLOMICS)

But you need data!

Considerations of using AI in healthcare

- Confidentiality/Patient Privacy
- Accuracy & Safety
- Mitigation of Bias
- Interpretability & Explainability
- Building Trust in the Healthcare Team & Patients
- Clinical Significance
- Cost-effectiveness & Scalability
- Responsibility



But there are lots of benefits!

- More personalized patient care
- More time spent caring for the patient rather than paperwork
- Early detection of pathology
- Detection of potential errors
- More efficient analysis of big datasets (omics, population data, outbreak management, etc.)
- Prediction of physical exams, lab tests, and interventions that are most helpful
- Remote monitoring & remote health
- Health sciences research

Actual Applications



Pneumothorax



Diabetic Retinopathy



Drug Discovery

EMR/EHR



AI input

Voice
Image
Video
Sensor Data



AI transformations

Speech-to-Text
NLP/NLU
Text-to-Speech
Image Recognition
Skeletal Tracking



Cerner knowledge management

Knowledge Graphs
Medical Terminologies



AI applications

Chart Assist
Virtual Scribe
Voice Enabled EMR
...and more

Diagnosis Support

Email ●●○○○ 2:47 PM buoyhealth.com

buoy

1674 in consideration 23

headache

Remove

How long has your headache been going on?

1 minutes

2 hours

3 days

4 weeks

5 months

6 years

How would you describe your headache?

Feels like one I have had in the past

This is a new type of headache

Unsure

How severe is your headache?

Email ●●○○○ 2:47 PM buoyhealth.com

buoy

1674 in consideration 23

4 weeks

5 months

6 years

How would you describe your headache?

Feels like one I have had in the past

This is a new type of headache

Unsure

How severe is your headache?

Mild

Moderate

Severe

Submit

Diagnosis Support

The screenshot displays the DXplain Case Analysis interface. At the top, it shows the user's profile: "Adult, Young (18 to 40 yrs)", "Male", and "> 4 weeks". The main navigation bar includes "New Case", "Save Case", and "Retrieve Case". The interface is divided into several sections:

- Finding Lookup:** A search box containing "weight loss" with a dropdown menu showing "weight loss", "weight loss, severe", and "weight loss, slight".
- Case Findings:** A list of selected findings: "weight loss", "Mexican", and "hip pain". Below this list are controls: "Remove finding from case findings list", "Change findings 'Present/Absent'", and "Focus ON/OFF".
- Common Diseases:** A list of diseases including "Diabetes mellitus type 2", "Diabetes mellitus type 1", "Adverse effects of medication", "Fluorine and compounds poisoning, chronic", "Non-alcoholic fatty liver disease", "Osteoporosis", "Tuberculosis, pulmonary", "Endogenous depression", "Neuropathy, diabetic", and "Emphysema, pulmonary".
- Rare Diseases:** A list of diseases including "Amebiasis", "Malaria", "Trichloroethylene poisoning", "Blastomycosis, North American", "Chagas disease", "Coccidioidomycosis", "Aseptic necrosis of hip", "Larva migrans, visceral", "Leishmaniasis, American cutaneous", and "Pinta".
- Legend:** A section at the bottom right explaining the evidence levels: "++ sufficient evidence to strongly support this DX", "+ sufficient evidence to support this DX", "sufficient evidence to suggest this DX", and "-- minimal evidence to suggest this DX".

Blue arrows point from the "weight loss" finding in the "Case Findings" window to the "Finding Lookup" window and to the "Common Diseases" list. Another blue arrow points from the "Common Diseases" list to the "Rare Diseases" list.

As findings are selected, they appear in the Case Findings Window.

DXplain displays lists of Common and Rare diseases that are associated with some or all of the case findings. These lists are dynamically refreshed each time a new case finding is entered.

Deciphering Discharge Summaries

Original Note in Discharge Summary

Doppler of her carotid which showed 99% right internal carotid artery stenosis.

MedLEE Output

```
<problem v = "stenosis"
code = "UMLS:C1261287_stenosis" >
<bodyloc v = "internal carotid artery" code =
"UMLS:C0007276_internal carotid artery struc-
ture!UMLS:C1305387_entire internal carotid artery">
<region v = "right"></region>
<code v = "UMLS:C0226156_structure of right internal ca-
rotid artery" ></code>
<code v = "UMLS:C1278588_entire right internal carotid
artery"></code></bodyloc>
<certainty v = "high certainty"></certainty>
<measure v = "99 %"></measure></problem>
```

Transcription

The screenshot shows the settings window for the Nuance Dragon Medical One Desktop Application. The window has a teal background with a blue border. In the top left, the text reads "Nuance® Dragon Medical One". In the top right, there is a cloud icon and the text "Desktop Application". The settings are organized into three sections: "Microphone:" with a dropdown menu set to "Nuance PowerMic Mobile"; "Language:" with a dropdown menu set to "English (United States)"; and "Specialty:" with a dropdown menu set to "General Medicine". Below these is a checkbox labeled "Always use when logging on" which is currently unchecked. At the bottom of the settings area are two buttons: "OK" and "Exit". In the bottom right corner of the window is the Nuance logo. At the very bottom of the image, there is a dark blue bar containing the copyright notice "© 2011-2020 Nuance Communications, Inc. All rights reserved." on the left and the version number "2020.4 (20.3.36.0)" on the right.

Nuance®
**Dragon Medical
One**

Desktop
Application

Microphone:
Nuance PowerMic Mobile

Language:
English (United States)

Specialty:
General Medicine

Always use when logging on

OK Exit

NUANCE

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Insert AIMSS



2019

- AIMSS UAlberta Established

2020

- 1st Annual Symposium, In-Person
 - 10 speakers, 15 booths, 110+ attendees

2021

- AI in Medicine Introductory Curriculum
- North American Expansion
- 2nd Annual Symposium, Virtual
 - 9 speakers, 15 booths, 150+ attendees

2022

- 3rd Annual Symposium
 - Hybrid 3-day event featuring networking, workshops, student talks, industry booths and speaker series from world-renowned speakers
- AI in Medicine Course
- AI in Healthcare Hackathon
- AI-Generated Art Show
- AI in Healthcare Community Project

2023

- 4th AI in Healthcare Conference
 - Hybrid 3-day event featuring networking, workshops, student talks, industry booths and speaker series from world-renowned speakers
- Dually-accredited AI & ML in Medicine Course
- AI-Generated Art Show

2023

**ARTIFICIAL INTELLIGENCE
X
MACHINE LEARNING**

IN

MEDICINE

COURSE



SECTION A

**THE BASICS OF
ARTIFICIAL
INTELLIGENCE AND
MACHINE LEARNING
TOOLS**

SECTION B

**INTRODUCTION TO
PYTHON AND
LIBRARIES**

SECTION C

**ARTIFICIAL
INTELLIGENCE IN
MEDICAL
SPECIALTIES I**

SECTION D

**ARTIFICIAL
INTELLIGENCE IN
MEDICAL
SPECIALTIES II**



Artificial
Intelligence in
Medicine Student
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[2023](#)

[2022](#)

[2021](#)

D.3. Case-based Learning and Wrap-Up

Learning Objectives (Students should be able to):

1. Describe how AI has been applied to the given study
2. Provide examples of how AI might transform the future of this discipline
3. Develop the ability to evaluate a medical AI paper

LECTURE SLIDES

ML in Medicine Course
AI & ML in Medicine Course (Session 12 - Case-bas...
Case-based Learning in Medical AI and Wrap-up
April 5, 2023
Ehsan Misaghi (he/him), MSc
MD/PhD Student
Co-Director and Co-Founder, AI in Medical Systems Society

The image shows a YouTube video player interface. The video title is "Case-based Learning in Medical AI and Wrap-up" from the "AI & ML in Medicine Course (Session 12 - Case-bas...". The video is dated "April 5, 2023" and is presented by "Ehsan Misaghi (he/him), MSc, MD/PhD Student, Co-Director and Co-Founder, AI in Medical Systems Society". The thumbnail features a stylized illustration of a hand holding a tablet with various medical and AI icons like a stethoscope, a clipboard, a heart, and gears.



Artificial
Intelligence in
Medicine Student
Society

CERTIFICATE OF COMPLETION

To recognize the successful completion of the
Artificial Intelligence in Medicine Course
January - April 2023

Ehsan Misaghi
President
UAlberta AIMSS

Certific

2023

ARTIFICIAL INTELLIGENCE IN HEALTHCARE CONFERENCE

ITINERARY

BROUGHT TO YOU BY



MARCH

10-12

ARTIFICIAL INTELLIGENCE IN HEALTHCARE

2023

CONFERENCE ITINERARY

Locations

- Alberta Machine Intelligence Institute
10065 Jasper Ave NW, Edmonton, AB
- Quartz Ballroom, Matrix Hotel
10640 100 Ave NW, Edmonton, AB
- Foyer, Matrix Hotel
- Amber Room, Matrix Hotel

Friday, March 10 Mixer Night

- 17:00 ● Introductions
- 17:30 ● AI in Medicine Primer
- 18:00 ● Facilitated Networking
- 18:30 ● Dinner

Be sure not to miss our
KEYNOTE
speaker



DR. PATRICK PILARSKI

**SATURDAY
MARCH 11
11:00**

Saturday, March 11

- 08:15 ● Registration & Breakfast
- 09:00 ● Opening Ceremony
- 09:30 ● ONLINE: Dr. Pheidas Diamandis
AI in Neuropathology
- 10:00 ● IN-PERSON: Dr. Nazila Ameli
Two Applications of Machine Learning in Dentistry
- 10:30 ● Coffee Break
Posters & Booths
- 11:00 ● KEYNOTE: Dr. Patrick Pilarski
Subverting the Relationship Between Humans and Their Assistive Technologies
- 12:00 ● Lunch
Posters & Booths
- 13:00 ● ONLINE: Dr. Bo Wang
Opportunities & Challenges of AI for Organ Transplantation
- 13:30 ● IN-PERSON: Dr. Yan Yuan
A Brief Overview of Machine Learning in Clinical Cancer Care
- 14:00 ● IN-PERSON: Dr. Eytan Wine
AI in GI: Using AI in Inflammatory Bowel Disease Research
- 14:30 ● Coffee Break
Posters & Booths
- 15:00 ● IN-PERSON: Dr. Jihyun Yun
AI for the most accurate radiology of multiple tumors
- 15:30 ● ONLINE: Dr. Peter Campbell
AI in Pathology of Prostate
- 16:00 ● Industry Panel
Dr. Robert Poproski (Santaris), Tim Tran (Druglogix), Randy Gagnay (Health Canada)
- 17:00 ● Closing Remarks

Sunday, March 12

- 09:00 ● Registration & Breakfast
- 09:45 ● Opening Remarks
- 10:00 ● AI Ethics in Practice: Strategies for Governance and Deployment - Part I
- 12:00 ● Lunch
- 13:00 ● AI Ethics in Practice: Strategies for Governance and Deployment - Part II
- 14:00 ● Health Law, Ethics, Privacy and Fairness Panel discussion
Dr. Michael van Marrewijk, Dr. Gillian Lerner, Dr. Nabil Haggag
- 15:00 ● Closing Ceremony

See you next year!





#AIHC2023
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AIMSS is growing!



Challenges still apply!



Lots of new avenues now that we have breakthroughs!



Regulatory landscape is about to change!



We need to equip the next generation of healthcare providers and AI practitioners with tools that support them in building/using better AI!

AI in the Future of Healthcare

Stay in touch!



<https://www.aimss.ca>



ehsan@aimss.ca

