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Advances in Artificial Intelligence

University of Maine Artificial Intelligence Initiative

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Foundational AI Research – Advancing the Foundations of the Field

Session: 1

Advances in Artificial Intelligence

Date: April 29, 2020

Run Time: 00:27:32

<https://youtu.be/WHfI7c86HH0?t=1>

Moderator: Terry Yoo, Associate Professor of Computer Science, UMaine

Panelists: Roy Turner, Associate Professor of Computer Science, UMaine

Salimeh Yasaei Sekeh, Associate Professor of Computer Science, UMaine

Carla Brodley, Dean of Khoury College of Computer Sciences, Northeastern University

The University of Maine Artificial Intelligence Initiative (UMaine AI) is a unique Maine-based venture that brings together university, industry, government, and community collaborators from Maine and beyond to advance the field of artificial intelligence, and through development of innovative technologies and applications find transformative solutions to enhance human life and societal well-being in Maine and beyond.

Transcript is machine generated, unedited, in English.

00:00

thank you very much my name is Jerry

00:03

u.s. dr. Rivera said and I am an

00:06

associate professor in the School of

00:07

Computing and information science

00:10

they're very exciting panel to start off

00:12

this session today I'm joined by three

00:16

distinguished panelists right colonel

00:21

Salome yes I said it and Karla broadly

00:24

and I will be introducing each intern

00:29

there's no reason I have lost my screen

00:37
our first speaker is Roy Turner they'll
00:41
give us a brief a brief statement and
00:44
we'll then go through the other
00:46
panelists the four matters will go
00:48
through the other panelists each giving
00:50
a brief statement and they'll take
00:51
questions and answers well I will say
00:53
graduate he got his PhD at Georgia Tech
00:57
University and later was a visiting
01:00
research professor at the University of
01:02
New Hampshire in Northeastern University
01:04
before joining the faculty at the
01:07
University of Maine he is one of our he
01:10
has the most seniority one of professors
01:12
with the most seniority and our School
01:13
of Computing and information sciences he
01:16
is also the principal investigator for
01:18
major research initiative program
01:20
instrumentation program grant from the
01:22
National Science Foundation right to you
01:26
I've been asked to give a bit of an
01:28
overview of what artificial intelligence
01:30
is and kind of framed the discussion a
01:32
bit a is kind of misunderstood in many

01:35
ways but what it is is an area of
01:37
computer science whose goal is basically
01:38
to give computers so abilities they
01:41
currently don't have for example to
01:43
allow them to do things that require
01:45
intelligence so for example medical
01:47
diagnostic reasoning legal reasoning
01:49
planning fabrication of objects things
01:52
like that all of which can be done by
01:54
eye and to do the things that animals
01:56
and humans can do very easily but are
01:59
extremely difficult for for computers so
02:03
for example to examine an image and to
02:08
take things in an image - oops sorry
02:13
and to understand natural language the
02:17
things that we can do easily but
02:18
computers can't there's a huge number of
02:21
AI areas and techniques but I'm not
02:23
gonna go through all those obviously
02:25
automated reasoning being one which
02:26
includes things like they're improving
02:28
and planning and scheduling controlling
02:31
intelligence like Tesla cars things like
02:34
that or drones interpreting sensory

02:36
information so for example natural
02:38
language processing computer vision but
02:39
also that category knowledge-based or
02:42
expert systems you've probably all been
02:44
under the scrutiny of an expert system
02:45
at one time or another when you had
02:47
credit card transactions or you applied
02:48
for a loan or something like that and
02:51
then the most urgent area at the moment
02:52
machine learning that salome we'll talk
02:54
about in a bit so what can a I do
03:00
well web search is one thing that we
03:02
interact with on a daily basis in fact
03:03
Google is primarily an AI company one of
03:06
my colleagues is the chief of the
03:11
vice-president for search quality out
03:12
there and his he's got a PhD in AI for
03:15
example intelligent control exam
03:17
mentioned that for drones and
03:19
self-driving cars planning complex
03:21
operations like getting material where
03:23
it needs to be for wartime activities or
03:25
planning factory things medical
03:27
diagnosis car diagnosis things like that

03:29
natural language processing all sorts of
03:31
things that that are becoming important
03:33
sentiment analysis for example for
03:35
social media to pick up on hate speech
03:36
and that sort of thing data mining for
03:38
large pieces of data the question arises
03:41
why since AI has been around for
03:44
arguably a hundred years but really
03:46
since like 1956 why AI right now why an
03:50
AI initiative well it's a it's a
03:52
confluence of three things primarily
03:54
we've got great societal needs at the
03:56
moment many problems facing us that are
03:58
simply beyond what we can do without
04:01
some help from automation so for example
04:03
climate change even the Cova 19 pandemic
04:06
all sorts of things that are coming up
04:08
now that need significant amounts of
04:09
resources and analysis we also for the
04:14
first time have tremendous amounts of
04:15
data not only that needs to be processed
04:17
but that can be used in order to Train
04:20
artificial intelligence systems and
04:22
finally in the last decade or so people

04:24
have made tremendous advances in
04:27
algorithms behind machine learning in
04:29
addition there have been advances on
04:31
using the kinds of processors that we
04:33
have in our computers the GPUs which are
04:36
basically just super computers to use
04:38
those for our algorithms and so this has
04:41
all come together nicely in the last ten
04:42
years or so to see another reason why
04:45
this is the predicted economic impact of
04:47
AI and Mahon's of dollars we're right
04:49
about here if you can see my pointer if
04:51
not we're in 2020 and you can see it's
04:53
um expected to be an exponential growth
04:55
curve for the impact venture capital
04:58
which these people are not stupid they
05:00
put their money where they think you're
05:01
gonna get some reward again an
05:03
exponential increase so lastly why AI
05:06
why you main artificial intelligence
05:09
initiative well we've got active labs in
05:11
AI research for example the sky lab
05:16
saccades lab and the mainsail lab we
05:19
have very good collaborators most

05:22
recently the Roo Institute which dr.
05:24
broadly will talk about there's a host
05:26
of applications ongoing on campus
05:28
already these are all applications that
05:31
people are using AI for on campus
05:33
there's a plication 'aa cross the state
05:34
as well we have quite a bit of resources
05:37
as terry alluded to we have a major
05:38
research initiation grant initiative
05:40
grant that's gonna install a petaflop of
05:43
GPU cluster which that means basically
05:45
quadrillions of instructions per second
05:47
primarily for artificial intelligence
05:49
and finally as part of mains
05:52
outreach mission we're uniquely situated
05:53
to reach out to k12 to begin to educate
05:57
the workforce on on artificial
05:59
intelligence that's emerging technology
06:00
to help the industry in the state the
06:02
government and Fisheries etc all right
06:05
Thank You teri our next speaker our next
06:09
panelist is Salome yes a second of going
06:11
from our one of our most venerable
06:13
faculty to one of our newest hires in

06:16
fact she is our newest hire in in the
06:19
School of Computing information science
06:21
in the computer science program dr. yes
06:23
ii is a assistant professor of computer
06:25
science and prior to joining our faculty
06:28
at the university of maine she was
06:29
postdoctoral research fellow in the EECS
06:31
Department the University of Michigan
06:33
Ann Arbor she has also had appointments
06:35
in Brazil and Italy she is the director
06:37
of the second lab focusing her research
06:39
on designing and analyzing
06:41
learning algorithms deep learning
06:42
techniques net application of machine
06:44
learning techniques and real time
06:46
problems after just a second
06:59
okay good afternoon everyone I hope that
07:03
you can see my slides so I'm going to
07:05
talk about advances in AI from algorithm
07:09
design and machine learning perspective
07:11
how given and exponential rise of
07:15
interest in AI
07:16
experts have called and form angel
07:20
studies in developing AI approaches last

07:24
recent decades researchers have been
07:27
working on designing and analyzing
07:31
metals that are capable of beating human
07:36
experts in different fields however the
07:42
the coming era of AI brings prominent
07:45
allinger's of smart methods with low
07:49
risk and computational complexity this
07:53
is because digital life demands
07:56
acceleration and accuracy in processing
07:59
this algorithm in circular we actually
08:03
address these type of challenges so
08:06
machine learning specifically deep
08:08
learning has become a massively
08:11
important thing in recent decade and
08:15
this is because of its application its
08:18
fascinating applications in many modern
08:21
real world problems
08:22
so in speaker lab we advanced deep
08:25
learning techniques we improve them and
08:29
we actually try to extend deep learning
08:35
architectures as the networks are
08:39
extremely intensive in terms of both
08:42
computations and actually memory usage
08:47
we explore their applications in various

08:50
domains and disciplines like computer
08:54
vision climate change
08:56
forest science and so on in addition in
09:00
Sekulow at university of maine we
09:02
develop AI techniques that makes
09:05
computers creative like adversarial
09:08
attacks in machine learning but this is
09:10
not only
09:11
in secular in secular well we actually
09:17
rely on AI an online machine learning
09:23
approaches we design time series methods
09:28
that actually analyze the big and
09:33
massive streaming a million award of
09:36
streaming massive data and time series
09:42
algorithm and prediction play an
09:45
important role in the future of AI the
09:49
for in secular we design online
09:53
streaming feature selection techniques
09:56
that are applicable and problems alike
10:00
autonomous car or in video streaming or
10:04
in movie streaming companies and in
10:10
addition we actually focus I'm a time
10:13
series deep learning as new technology
10:16
that supports large-scale streaming data

10:19
and save human lives we leverage time
10:23
series deep architectures and explore
10:26
the applications in many real world
10:28
problems as a side project actually here
10:33
at University of Maine in circular with
10:37
my machine learning team we are working
10:39
on COBE 219 forecasting locally and
10:42
globally by using this time series deep
10:45
learning architectures and with the hope
10:48
that we will be able to help humans and
10:54
save some lives
10:56
Thank You charity and I'm happy to take
10:58
the questions later
11:01
Thank You Solomon the University of
11:04
Maine is also both grateful and and
11:08
happy to to have Karla broadly the Dean
11:12
of the quarry School of Computer
11:14
Sciences at Northeastern University join
11:15
us this afternoon
11:16
prior to joining northeastern as dean
11:19
she was professor in the department of
11:20
computer science at Tufts University and
11:23
before house she was on the fact
11:25
school of electrical engineering at

11:27

Purdue she's a fellow of the ACM and the

11:31

fellow of the Association for the

11:32

Advancement of artificial intelligence

11:34

she is co-chaired been program co-chair

11:36

for triple AI as well as the information

11:40

international conference on machine

11:41

learning she is currently a board member

11:43

of the CRA the computing Research

11:45

Association and she's been a member of

11:49

the Advisory Committee for the National

11:50

Science Foundation's director of

11:52

computer and information science and

11:54

engineering

11:55

please welcome Karla broadly Thank You

12:01

Terri first of all I'm very honored to

12:03

participate in this webinar today and in

12:07

particular my background of research is

12:11

in Applied AI and one of the things I

12:15

love about the directions that you're

12:17

speaking about and of course the the

12:20

Reis the really incredible research that

12:23

we just heard about is the fact that

12:25

when you do applied AI you have the

12:28

ability to make a huge scientific impact

12:31
in the field that you're applying
12:33
artificial intelligence and you also
12:35
have the ability that through that
12:38
application you uncover areas where AI
12:42
has not progressed far enough to solve
12:45
that particular problem
12:46
I want to ground that with two examples
12:49
from my own research the first was with
12:52
New York University's epilepsy Center
12:55
where we were trying to find the lesions
12:57
in treatment resistant epilepsy patients
13:01
that were causing their seizures a
13:03
treatment resistant epilepsy patient is
13:06
one where the drugs don't work now I
13:08
didn't know this prior to the
13:10
collaboration but it turns out that the
13:13
only way that you can solve this problem
13:15
is through a process called surgical
13:19
resection which is where you scoop out
13:21
the bit of the brain that causes the
13:23
seizure of course you have to check that
13:25
it's not a place that you really need
13:27
and although I was invited multiple
13:30
times to watch the operation I have

13:31
declined in all cases so what did we do
13:36
well it turns out that the lesions that
13:38
cause
13:38
this that are typically on the cortical
13:41
surface and expert neuroradiologists
13:44
can't see these lesions so we took a
13:46
machine learning approach to this and we
13:49
were able to get the efficacy of our
13:51
ability to find the lesions up to eighty
13:53
percent whereas before it had been
13:55
twenty percent now if you can find the
13:58
actual lesion then the efficacy of the
14:03
surgical resection goes from twenty nine
14:06
percent to sixty-six percent and I can
14:09
tell you if you're telling me that I
14:10
should have an operation on my brain 66
14:13
percent sounds a lot better than not
14:16
sixty-six percent obviously a hundred
14:18
percent would be better but in creating
14:20
this in employing machine learning we
14:24
had to develop new machine learning
14:26
methods that were then published in the
14:28
AI literature that were applicable to
14:30
other problems a second example and one

14:34
that I think will resonate with Maine in
14:36
particular is we looked at how do we use
14:40
machine learning to create maps of
14:42
global land cover from satellite data so
14:44
what's on the Earth's surface this is a
14:48
very challenging problem because you
14:49
only have a feature a set of data to
14:54
work with the satellite can produce and
14:56
we were able through our application to
14:59
figure out that the 17 land cover
15:01
classes that have been dictated by the
15:04
whole community were not actually as
15:08
representative of what's going on in
15:10
terms of what could be distinguished by
15:12
the data so for example agriculture
15:15
really needed some finer distinctions
15:17
for the different types of agriculture
15:19
and the distinction between mixed
15:22
forests versus coniferous forests was
15:25
not able to be ascertained from the
15:29
spectral data so and again we invented a
15:32
new machine learning method that looked
15:34
at how do we use both the raw data and
15:38
then the data that have been labeled to

15:41
come up with a new definition of land
15:43
cover classes so I love this applied
15:46
focus it's going to lead to wonderful
15:48
inventions in basic and basic machine
15:51
learning and
15:52
now on behalf of Northeastern University
15:55
I want to say that we're extremely
15:57
excited to join the Maine ecosystem with
16:00
the brew Institute the focus of the root
16:02
Institute is applied human-in-the-loop
16:05
artificial intelligence and in
16:07
particular we are really excited to
16:10
build partnerships with AI faculty and
16:13
then faculty from the areas of
16:15
excellence in Maine and I apologize if I
16:18
if I leave any out but such as forestry
16:21
the climate change Institute composite
16:24
materials pulp and paper and then of
16:26
course all of the many initiatives
16:28
around marine science that the
16:30
University of Maine is so well known for
16:32
we're really excited to create joint
16:35
government industry funded research and
16:38
as part of this beginning of our

16:40
collaboration we are hoping that we
16:42
build up the synergy where Maine faculty
16:44
might spend sabbaticals that through
16:46
institute and vice-versa that we have
16:48
visiting fellowships for PhD students in
16:51
both directions and that we really work
16:52
collaboratively with you and of course
16:56
it's our hope and that the University of
16:59
Maine will hire a lot of AI faculty to
17:02
collaborate with us in these new
17:03
initiatives and and in particular we're
17:06
really excited about applied AI for the
17:08
earth and climate initiatives that
17:10
you're so well known for thank you
17:15
Thank You Carla we have a so we like to
17:18
open the panel for questions if the
17:21
panelists would please start their
17:24
videos again and unmute the microphones
17:26
I'd appreciate it we have a question
17:30
right now on online this one from Arthur
17:33
Fink and from Portland the question that
17:37
stated granted that AI can be useful and
17:39
powerful but how does it earn the name
17:41
intelligence as in artificial

17:43
intelligence and does that naming invite
17:45
unneded fear and concern
17:47
I'll give this question first to our
17:49
guest our honored guest Carla broadly I
17:53
was actually gonna say I thought Roy
17:55
should answer that question better than
17:56
I why I'm passing it to you
17:58
Thank You Carla first of all I'm sorry
18:01
about the slides I didn't notice they
18:02
weren't moving
18:04
it's called intelligence I think are
18:07
originally maybe with a little bit of
18:10
hyperbole like the you know the but
18:13
digital brains back in the 40s when
18:15
people talk about computers but it was
18:18
the term was coined because we hope to
18:20
do some things that seem to require
18:22
intelligence when people do them as I
18:24
mentioned things like medical diagnosis
18:26
or protein folding and things like that
18:28
so some folks yes are working on full
18:31
fledge trying to create intelligent
18:33
machines but not many most of us are
18:35
concerned with with adding intelligence

18:37
to the computers but I do understand
18:39
your concern about unneeded fear
18:42
and concern that certainly is part and
18:45
parcel AI has been since the beginning
18:47
but but I think we're beginning to earn
18:49
at least a little bit of the the
18:52
sobriquet of intelligence and some of
18:54
the algorithms were using now yeah so
18:57
I'm gonna put mispronounced the question
19:00
or the person asked and the questions
19:01
that Illya and I'm not gonna try the
19:04
last name has asked how can current
19:05
humane students get involved with humane
19:08
AI and in particular
19:10
Salameh the second lab I think it's very
19:18
easy just email me and I try my
19:23
my best and I usually don't miss my
19:25
email so I get back to you as soon as
19:28
possible just email me if you are
19:29
interested and then we retake from there
19:32
sure I think this question is also for
19:38
salivate but I'll a bite after her
19:40
invite the other panelists to respond
19:43
this question from Lois and how is

19:47

AI being applied to our current pandemic

19:49

and I refer this one to you Salome

19:51

partly because one of your site's

19:53

mentioned Co bit on on it yeah so weird

19:57

my animal team we actually put together

19:59

it explained here at the University of

20:02

Maine and we started to see what are out

20:05

there and some why it's a oh and

20:09

especially deep learning techniques that

20:11

we could apply here in this type of

20:14

pandemics there are some non machine

20:16

learning techniques that many people

20:18

from a very well-known universities are

20:21

working on them including seers and we

20:25

started also from from those techniques

20:28

but in specific we are trying to

20:31

implement recurring your networks deep

20:35

learning architectures to implement on

20:38

this type of time series data of course

20:41

it's very challenging and we have

20:43

challenges but we have also very

20:46

interesting results so this is very

20:47

ongoing process and hopefully the result

20:50

will be ours very soon thank you anybody

20:54
else have their support whoop stop sorry
20:59
I believe there is some work being done
21:01
elsewhere as sound indicated on looking
21:04
at finding drugs for treatment of corona
21:08
and also some antibodies that might fit
21:10
the the virus a lot of a lot of works
21:12
being done on that in general and I
21:14
think people are applying that to to the
21:15
köppen a question also from from that
21:21
the internet I'll start this one with
21:25
you Roy but perhaps the other panelists
21:28
can address it if you wish to pass it
21:30
off can you address the issue of bias in
21:32
AI coming from the fact that people make
21:35
algorithms and each person
21:37
has their own biases I'll I will quickly
21:41
address this and pass it to Carlo
21:42
because she's got way broader experience
21:44
in this than i Naughton biased but in
21:46
May I the one of the things with the
21:51
old-style AI or the traditional AI yes
21:54
the algorithms do have a bit of bias in
21:56
the miming everything does but it's not
21:57
most of the things we're doing is not

21:59

something that would be biased one way

22:01

or another we're coming with general

22:02

techniques some of the newer things and

22:05

Salome can't also address this that

22:07

they're not biased so much in their

22:08

algorithms as much as they're in the

22:10

data that gets fed to the algorithms

22:11

well-known problem with Microsoft's

22:15

online chat BOTS that became

22:17

anti-semitic because people were feeding

22:19

at data from the web that was that was

22:22

anti-semitic so I'm not sure the best

22:25

answer to address that but I'm sure

22:26

Carla knows actually answer the pop was

22:35

not the algorithm the problem is the

22:38

data and data has two problems with it

22:42

the first is what are the features that

22:44

you use to define each data point and if

22:48

you don't have features that are able to

22:51

fully represent your data in a quick

22:55

example of this would be if you're

22:57

trying to predict you has heart disease

22:59

and all you have is age and hand-sized

23:04

you will correctly predict that older

23:08
people with large hands will die of
23:11
heart disease and younger people with
23:14
small hands won't but that's not what
23:15
you're looking for and if you don't have
23:17
a good representative sample of the data
23:20
you might not even be able to do that so
23:25
it's the features that represent each
23:27
data point and then it's also the data
23:30
points that you collect a classic
23:32
example of this is sentencing software
23:34
that was used to predict recidivism rate
23:38
that predicted that african-americans
23:43
should not be paroled because they were
23:45
just going to recommit crimes and that
23:48
was based on data
23:49
that was completely the distribution was
23:52
completely off because of who's
23:53
incarcerated in this country so these
23:56
types of issues they now have their own
23:58
conference it's very important the first
24:02
principle of applying machine learning
24:04
is that you have a representative data
24:07
set from which to train your models that
24:10
is the same as which you will apply your

24:12
models and if it's biased in some way in
24:15
making those decisions and and was
24:18
particularly egregious about the example
24:20
that I gave is that the company that
24:22
created this algorithm didn't explain
24:26
why it was making these decisions so
24:29
just using machine learning as a box
24:33
that you can't see into is a mistake and
24:36
that research also needs to happen on
24:39
the explained ability of the decisions
24:41
that you're making I think we're we have
24:48
another question but I think we're gonna
24:50
have to push on I have one question for
24:53
our distinguished guests from
24:55
Northeastern University in the time that
24:58
we have remaining coming from the
24:59
outside in particular what are them
25:03
we've already mentioned the roux
25:04
Institute is a new resource in Portland
25:06
you obviously have faculty and
25:09
laboratories here at the University man
25:10
you mentioned some of our other work and
25:12
you're particularly interested in
25:14
applied AI I'm curious what are the

25:17
resources needed to take to expand
25:19
Maine's participation in research
25:21
development in this area we appear to
25:24
have a good start what what that more is
25:27
needed so we write analyze this there's
25:32
so many different areas look at all of
25:45
the areas the research areas where you
25:47
think AI could be applied to see do you
25:51
need computer vision researchers do you
25:53
need machine learning researchers do you
25:55
need natural language understanding my
25:57
guess is is that your number one
25:59
priority will be machine learning
26:00
because even because machine learning
26:03
can be applied to compute computer
26:05
vision problems but I would do an
26:07
analysis to see where do you really need
26:11
the most collaborators and then go after
26:15
those areas first because you'll be able
26:17
to write the joint grant proposals and
26:19
also interface with industry and of
26:22
course I can say from just well not
26:25
quite done with hiring season still
26:27
fighting really hard to get a couple

26:29
more people on it's quite an interesting
26:31
hiring year I have to say machine
26:34
learning people are really really really
26:36
hard to hire but a lot of people who are
26:40
hired into industry are working on how
26:42
to better serve you ads and kind of
26:45
we're sick of this as a field so the
26:47
fact that you have these built-in
26:49
collaborations will really help you with
26:51
your recruiting because if you're
26:53
recruiting me if I was still research
26:55
active and not an administrator I'd be
26:57
extremely excited if on my interview I
27:00
could meet with the people that I would
27:02
be collaborating with and these really
27:03
critical and important domains that are
27:05
particularly germane in terms of global
27:08
warming all right thank you very much we
27:14
are running out of time in our panel and
27:16
we do need some time to transition to
27:17
the next panel thank you the panelists
27:20
dr. Turner first of course dr. yes I
27:24
take it and of course to our honored
27:26
guests

27:26

Carla broadly thank you for having me

The University of Maine in Orono is the flagship campus of the University of Maine System, where efforts toward racial equity are ongoing, as is the commitment to facing a complicated and not always just institutional history. The University recognizes that it is located on Marsh Island in the homeland of the Penobscot nation, where issues of water and its territorial rights, and encroachment upon sacred sites, are ongoing. Penobscot homeland is connected to the other Wabanaki Tribal Nations — the Passamaquoddy, Maliseet, and Micmac — through kinship, alliances, and diplomacy. The university also recognizes that the Penobscot Nation and the other Wabanaki Tribal Nations are distinct, sovereign, legal and political entities with their own powers of self-governance and self-determination.