WHAT IS ARTIFICIAL INTELLIGENCE?
OUTLINE

• What is AI?
• Current & Future Applications
• Ethics & Implications
• Careers in AI
• Getting Started & Resources
WHAT IS AI?

NO, REALLY...
WHAT IS AI?

A.I. aims to create technologies capable of learning, remembering, reasoning, planning, communicating, and interacting with its environment.
### WHAT IS AI?

**Thinking**

<table>
<thead>
<tr>
<th>Humanly</th>
<th>Rationally</th>
</tr>
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<tbody>
<tr>
<td>Cognitive modeling.</td>
<td>Logic.</td>
</tr>
<tr>
<td><em>Systems should solve the same way humans do.</em></td>
<td><em>Systems must somehow model uncertainty and deal with complexity.</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acting</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Turing Test approach.</td>
</tr>
<tr>
<td><em>Rational agents.</em></td>
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<tr>
<td><em>Maximize the expected outcome of their performance.</em></td>
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**Short answer:**

It depends on who you ask, **and when**.
LET’S BUILD SYMBOLIC AI
#oldschool

User Input:
- Hi
- Howdy
- Hey
- Sup?
- What’s up?
- What’s new?
- What’s going on?

Bot Response:
- Hey, you!
- Hi!
- Howdy!
- Hello
- Not much.
- Nothing.
- Pondering life.
- The usual.
- I’m well.
- I’m good.
- Great.
- Doing ok.

…is this intelligent?
AI AGENTS

Poncho
“symbolic AI”

IBM Watson
“expert system”

Microsoft Tay
“intelligent agent”
Types of Learning

Supervised

Unsupervised

category A
category B

Reinforcement

Attempt 1

Attempt 2

Attempt 3
SO...WHAT IS AI?

- Learning
- Reason
- Remember
- Plan
- Interact
- Communicate
- Automate Scheduling
- Data Analytics
- Big Data
- Language Processing
- Agents
- Robotics
THE FUTURE OF AI

How technology actually advances

How we tend to predict the future

Predicted Amount of Change

Time into the Future
Gartner Hype Cycle for Emerging Technologies, 2017

gartner.com/SmarterWithGartner

Source: Gartner (July 2017)
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WHAT CAN IT DO?

APPLICATIONS
FUN WITH AI

Artificial Intelligence Writes Bad Poems Just Like An Angsty Teen

Keep panicking.
AI FAILS

Puppy or muffin?
IT’S GETTING REAL...

ETHICS & IMPLICATIONS
IMPACT OF SOCIETY ON AI

PEOPLE IN THE SIXTIES:
I BETTER NOT SAY THAT OR THE GOVERNMENT WILL WIRETAP MY HOUSE

PEOPLE TODAY:
HEY WIRETAP, DO YOU HAVE A RECIPE FOR PANCAKES?
IMPACT OF AI ON SOCIETY

STARTING IN 2020, AI WILL BE A POSITIVE NET JOB CREATOR; ELIMINATING 1.8M JOBS WHILE CREATING 2.3M

Gartner PREDICTS

4th Industrial Revolution
(2nd Information Revolution)
Early 21st Century~

Artificial Intelligence
Information Technology

Intelligence
A.I. SW
Big Data
IoT
Cloud

3rd Industrial Revolution
(1st Information Revolution)
Late 20th Century

Computer and Internet-based Knowledge

2nd Industrial Revolution
19th~20th Century

Electrical Energy-based Mass Production

1st Industrial Revolution
18th Century

Steam-based Machines

OH...haven't you heard? -- the industrial revolution is over... we won...
..SO WE STILL NEED JOBS?

CAREERS IN AI
CAREERS IN AI

Software Engineer
AI Engineer
Developer/Integrator
CV Scientist
Data Analyst
Data Scientist
Research Scientist
R&D Engineer
HOW TO GET THERE

• Learn the theory and implementation ..more on this in a moment..

• Stay up-to-date ..you should be constantly learning, reading!

• Network ..share resources, ask questions, collaborate to build cool things!

• Apply what you know ..learn the business problems & optimize a solution
NETWORKING

• **On Campus:**
  • ACM, ACM-W meetings, talks

• **MeetUps:**
  • Growing with AI (SA)
  • SA Artificial Intelligence
  • *Data Science focused:*
    • DataKind volunteering
    • Kaggle competitions
SO YOU WANT TO BUILD AI?

GETTING STARTED
START WITH THE BASICS

Teachable Machine

Step 1: What does this do??

TensorFlow Playground

Step 2: How does it work??
HOW TO GET STARTED

After the basics.

1. Machine Learning basics
2. Linear regression
3. Logistic regression
4. Neural networks
5. Deep learning basics

10. Profit (?)
NEURAL NETWORKS

A mostly complete chart of Neural Networks

- Backfed Input Cell
- Input Cell
- Noisy Input Cell
- Hidden Cell
- Probabilistic Hidden Cell
- Spiking Hidden Cell
- Output Cell
- Match Input Output Cell
- Recurrent Cell
- Memory Cell
- Different Memory Cell
- Kernel
- Convolution or Pool

Perceptron (P)
Feed Forward (FF)
Radial Basis Network (RBF)
Recurrent Neural Network (RNN)
Long / Short Term Memory (LSTM)
Gated Recurrent Unit (GRU)
Auto Encoder (AE)
Variational AE (VAE)
Denoising AE (DAE)
Sparse AE (SAE)

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REINFORCEMENT LEARNING

OpenAI

Discovering and enacting the path to safe artificial general intelligence.

Classical control
Control theory problems from the classic RL literature.

- Acrobat-v1: Swing up a two-link robot.
- CartPole-v1: Balance a pole on a cart.
- MountainCar-v0: Drive up a big hill.
LANGUAGES, TOOLS, ETC

AI is becoming democratized - there is an abundance of tools and languages available. Google Lowers the Artificial Intelligence Bar with Complete DIY Kits. Google Collaboratory is a powerful tool for AI development.
REFERENCES & RESOURCES

Choose learning methods that work for you.

- What is AI?
- My CS 3793 YouTube playlist
  - Because “TensorFlow in 5 Minutes” sounds like fun. ...Right?
- Podcasts:
  - Machine Learning Guide (by OCDevel)
  - List of 10 data science, AI, and ML podcasts
- Courses & resources from Coursera, Udacity, edX, MIT, etc.
- What’s new in AI (and tech in general):
  - Futurism, ImportAI, KurzweilAI
  - MIT News, ScienceDaily
  - Flipboard (app to collate news sources)

See also links embedded in images throughout these slides!
AI @ UTSA
Research with us!

UTSA professor wins $450,000 NSF grant to develop artificial intelligence that can detect computer system faults

Abdullah Muzahid, assistant professor of computer science at The University of Texas at San Antonio (UTSA), has received a $450,000 National Science Foundation (NSF) Faculty Early Career Development award to develop a hardware-based artificial intelligence system that can detect costly software bugs and security attacks in computer systems.

Businesses spend millions on cybersecurity and bug fixes each year. A 2016 report by the International Data Corporation estimated that more than $373 billion is spent worldwide in security-related hardware, software and service expenses. Muzahid and his collaborators hope to significantly decrease those expenditures by developing a new system that can catch bugs and attacks before they cause harm.

UTSA Open Cloud Institute supports artificial intelligence and cybersecurity cloud research and launches cloud computing certificate program

(April 16, 2018) - The University of Texas at San Antonio (UTSA) Open Cloud Institute (OCI) is awarding nearly $300,000 in funding through its Cloud Computing Endowment Grant program to kick start UTSA research projects in cloud computing and to provide scholarships to 40 UTSA graduate students in Computer Science, Computer Engineering, and Information Systems and Cyber Security (ISCY) departments, working toward cloud computing-related degrees.

"As we shape UTSA into an exemplary urban teaching-discovery enterprise, it’s vital that we support the development of new technologies," said UTSA President Taylor Eighmy. "The UTSA Open Cloud Institute is supporting collaborative R&D partnerships around innovative, cutting-edge research. It is also creating educational opportunities that will make a meaningful and lasting impact in a world that is increasingly reliant on cloud computing."

UTSA startup harnessing artificial intelligence, big data to optimize industrial building renewable energy use

CS 3793 - Intro to AI
CS 3753 - Intro to Data Science
CS 4233 - Intro to Comp Biology
CS 4593 - Machine Learning
MY RESEARCH

Deep “fakes”

Visual Saliency

(Erdem et al 2013)  (Rahtu et al 2010)  (Ideal result)

AI Teaching Assistant

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[Image: YouTube video link]

[Diagram: Encoder and Decoder for AI Teaching Assistant]
THANK YOU!

Q&A