

# Technology: Addressing Bias and Health Disparities in Children

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# Disclosure

In the past 12 months, I have relevant financial relationships with:

Cognoa, Inc.

DotCom Therapy

Happiest Baby

SOBI

I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.



Topics:  
Learners will  
Recognize

Technology and its potential  
Demystifying AI (Artificial  
Intelligence) and (ML)  
Machine Learning  
Current Examples  
Guardrails and the Need for  
Continued Advocacy



# Global Tech Adoption in Fast Forward



**E-Commerce**

**10 Years in 8 Weeks**

*Increase in e-commerce deliveries*



**Telemedicine**

**10x in 15 Days**

*Increase in virtual appointments*



**Streaming Video**

**7 Years in 5 Months**

*Netflix vs. Disney+ to hit 50M subscribers*



**Remote Learning**

**250 Million in 2 Weeks**

*Students who went to online learning*



## Gap #1: Diagnostic Services

- Developmental Disabilities
- Autism Spectrum Disorders
- Learning Disabilities
- Behavioral Health



## Gap #2: Treatment Services

- Speech Therapy
- Counseling and Behavioral Health
- Dyslexia treatment
- Occupational Therapy
- Family Coaching





## Gap #3: Self-management tools

# Demystifying AI/ML





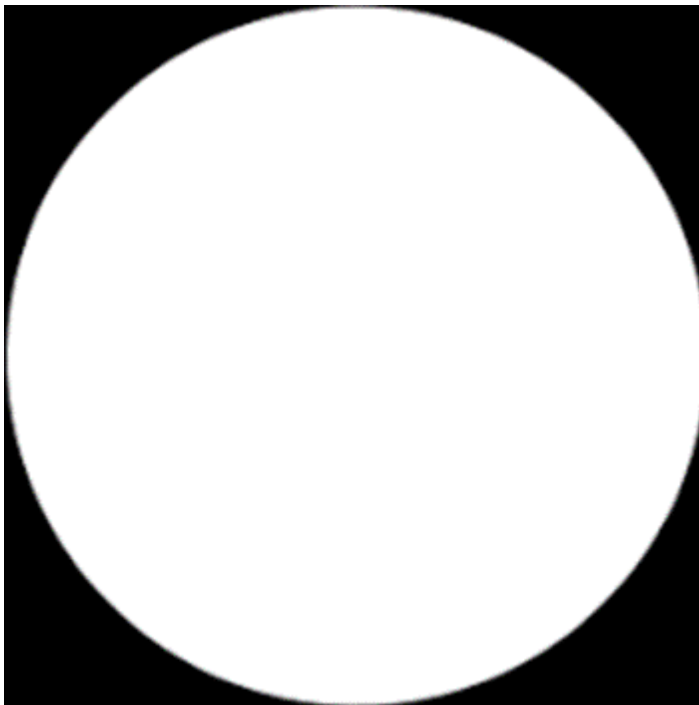
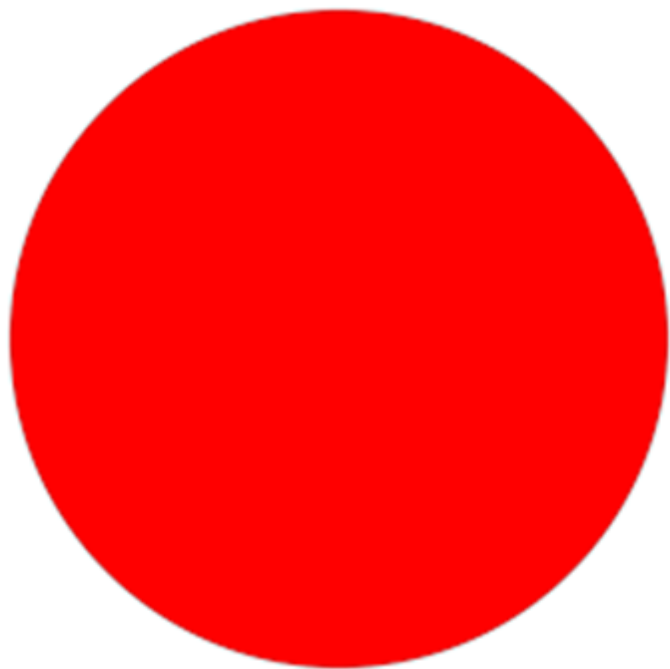
# What is Artificial Intelligence? (AI)

Using computers/statistics to:

- Solve problems
- Make predictions
- Make automated decisions
- For tasks when done by humans typically requires intelligence



# It starts with an Algorithm...a Decision Tree















# More data





## Training the Algorithm

# What is Machine Learning?



Pattern based



Algorithms find patterns in data and infer “rules” based on this



These patterns can be used for automation or prediction



ML is the most predominant form of AI today

# Machine Learning

- Made with Algorithms
- Knowledgeable ONLY about what is taught
- Control ONLY data that is given
- Aware of nuances and can continue to learn more
- Do very boring work
- Often make more consistent decisions than humans
- No fatigue



## Supervised

- Labeled data

## Unsupervised

- Unlabeled data

## Deep Learning

- Neural networks consisting of layered sets of algorithms designed to recognize patterns in data
- Can modify algorithms independent of human programming

## Reinforcement

- Interaction with output informs input



# Supervised Learning Processes



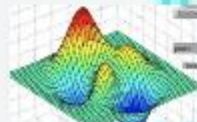
## Prepare Data

Data preparation is crucial for any data analysis. If your data is messy, there's no way you can make sense of it.



## Choose an algorithm

Choosing the most appropriate algorithm for specific problem is the most crucial task here



AILabPage

## Fit a Model

Model fitting is a procedure that takes three steps- Function, Error Function and Parameter to minimise the difference.



## Choose a validation method

Depending on the nature of data, choosing a validation set can be the most important step.



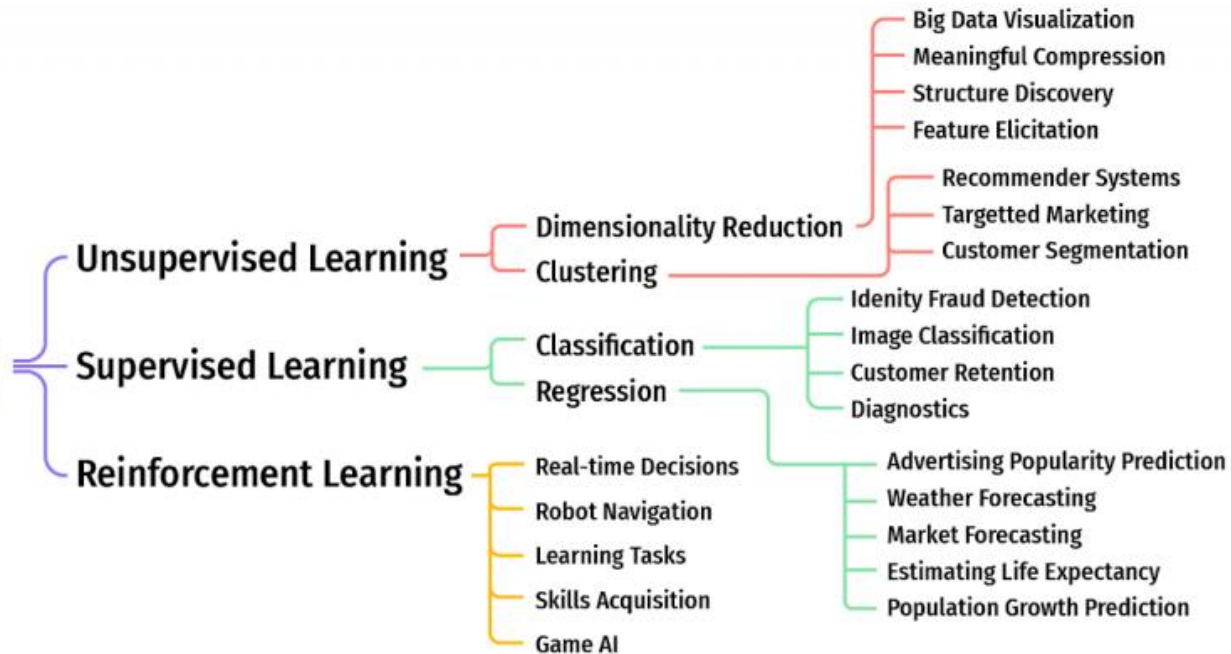
## TUUM – Test Update Use Model

Examine fit and update until satisfied. Use fitted model for prediction



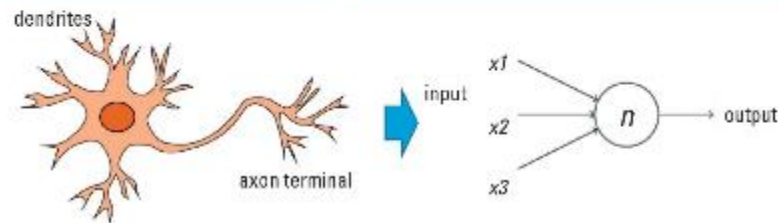
## Output

Every output that the model provides, along with the new data that facilitated the output, becomes the new input-output combination that is fed as training data into the model for learning.

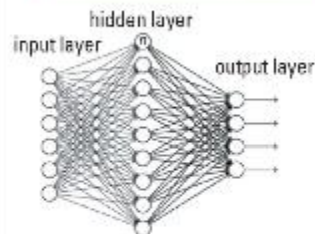


## FIGURE 2 DEEP LEARNING: ARTIFICIAL NEURAL NETWORK

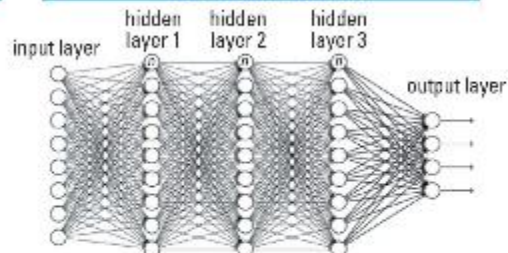
### The neurobiological basis for neural networks



### Basic artificial neural network



### Deep neural network



Abbreviation: n, neuron/node.

From *Oncology*, February 2019; 47. Used with permission.

# A Complex Algorithm



# A Complex Algorithm



1. What are the facial features (phenotype) of a child with Down Syndrome—what goes into the decision tree?
  - a. Epicanthic folds
  - b. Upslanting palpebral fissures
  - c. Brachycephaly (small, flattened head)
  - d. Flattened nasal bridge
  - e. Low set, smaller ears, which fold at the top
  - f. Small mouth
  - g. Large, Protruding Tongue



# What we see



# What the Algorithm sees





# What we see



# What the Algorithm sees



# What we see



# What the Algorithm sees



# What we see



# What the Algorithm sees



# What we see



# What the Algorithm sees





## Deep Learning and Computer Vision

Deep learning algorithms build syndrome-specific computational-based classifiers (syndrome gestalts). Proprietary technology converts a patient photo into de-identified mathematical facial descriptors (facial descriptors). The patient's facial descriptor is compared to syndrome gestalts to quantify similarity (gestalt scores) resulting in a prioritized list of syndromes with similar morphology. Artificial intelligence suggests likely phenotypic traits and genes to assist in feature annotation and syndrome prioritization. Please read more [in this Nature Medicine publication](#).



## Real World Phenotype Data

# Vision Screeners

## GoCheckKids



## iScreen



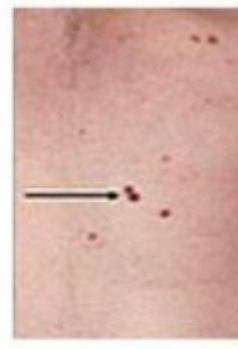




- Pediatric Physical Therapy and Rehabilitation
- Monitoring for Children with Medical Complexity
- Real Time Notification during health emergencies



Pediatric Robotic Surgery

**A****B****C****D****E****B  
E  
N  
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A  
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T**

x

[All](#)[Acne](#)[Allergy](#)[Eczema](#)[Genital & STD](#)[Kids](#)[Mole](#)[Rash](#)[Skin Cancer](#)[Other](#)

Abscess



Acne Vulgaris (Zits)



Actinic Keratosis (AK)



Angioma



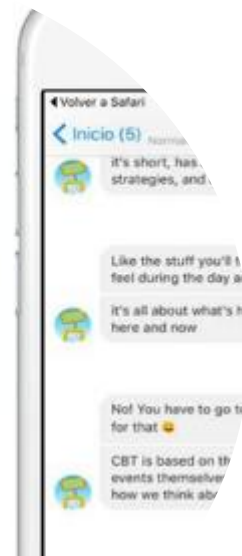
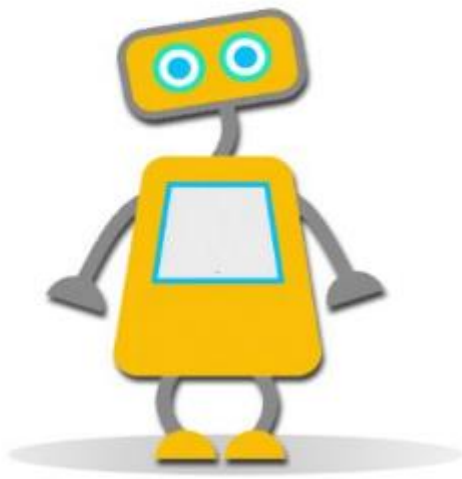
Balanitis (Foreskin Problem)

[Support](#)



# Self- Management Tools

**CALM  
DOWN**  
FREE high quality emotional  
thermometer printable included



# Guardrails



# Continued Advocacy

Infrastructure necessary for  
technology to work

Poverty

Caring Adult

Medical Home





# Ahmed

- Has ADHD and Anxiety Disorder
- Is the class clown at school
- Worries about what his friends think about him
- Worries about his grades



# Ahmed

- Attends school virtually
- Can focus on school work without distractions
- Can spend time with friends as life opens up
- Grades are as good as they have ever been





- Good student
- Lots of friends at school
- Has several close friends
- Involved in basketball and band

Kesha



# Kesha during COVID-19

- Attends On-line school
- Her grandmother was hospitalized with COVID-19 for 3 weeks
- Grades are dropping
- Having episodes of chest pain, has been to the emergency department twice
- She has had difficulty sleeping and hasn't wanted to virtually meet with her friends



# Genesis and Grace

- Good students
- In fourth and fifth grade
- Live in a 2-bedroom apartment with their parents, aunt and uncle
- Close knit family
- Free breakfast and lunch at school



# Structural Disparities

- Father and Uncle died from COVID-19
- Mother and Aunt became very ill but recovered; they are now doing domestic work for money
- Genesis and Grace had mild symptoms. They spend their days at home alone. School has not opened up
- Broadband access is poor
- Food is scarce and their school doesn't have the resources to





Goal:  
Improved  
Health for All





# What Questions Do You Have?

Questions posted in the Socio will be read aloud by moderator for the presenter to answer. Please post your questions in Socio now.



# Later Viewing

This and all other UC2020 course recordings will be available for later viewing on [PCC's YouTube Channel](#)

