AI TRAINING PROGRAM WORKSHOP FOR STUDENTS

ABOUT ARTIFICIAL INTELLIGENCE REVOLUTION

We are in the midst of a revolution in our society's relationship with the bot we create. In a high-touch, high-tech environment, you have an unprecedented opportunity to engage with real robots, witness their astonishing skills and ponder their life-like qualities. *Artificial intelligence* transforms the way you think about models as well as encouraging and empowering you to envision your own role in creating and using this technology positively as the future unfolds.

As you get your hands and mind involved in the world of robots, you'll see the rich possibilities the future holds for those with the spirit of innovation. This exhibition is designed to increase awareness and appreciation of robots as well as interest and involvement in science, technology, engineering and math (STEM) topics, particularly the field of robotics.

The exhibit is divided into different zones that highlight the distinct attributes of robots, including:

- Cooperation: AI solutions can collaborate with us, as well as with other systems.
- Smarts: The programming of AI systems enables them to sense, plan and act to meet a goal.
- Skills: There are a variety of ways that robots can grasp, grip and interact physically with their environment.

The exhibit zones contain functional robots, hands-on interactives, videos and graphics designed to help you explore further. Complementing and supporting these zones is a stage that offers scheduled demonstrations of robots; a robot garage where technicians repair robots in real time in front of guests; and a build a-bot area, where you can build a simple robot.

EXHIBIT GOALS AND MESSAGES

This course is designed to:

- Encourage personal understanding of and connection with this new tech
- Showcase diverse examples of its applications in daily and future life.
- Offer opportunities for hands-on interaction with real solutions.
- Highlight the innovative spirit and evolving nature of AI
- Encourage students in 21st Century skills and STEM content.

The key messages of *AI studies* are:

- The revolution is happening now.
- AI will transform how we live, work and play.
- AI solutions, no matter their function, capabilities or design, operate in similar ways: they SENSE, PLAN and ACT
- Models serve as a mirror through which we see ourselves.
- Robotics is a creative field in a continuous state of development and discovery.
- No matter your age or experience, you can be involved in this tech

NEXT GENERATION SCIENCE STANDARDS CONNECTIONS

AI is aligned with the following Next Generation Science Standards:

Science and Engineering Practices:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Constructing explanations and designing solutions• Obtaining, evaluating and communicating information

Crosscutting Concepts:

- Cause and effect
- Systems and system models
- Structure and function

Disciplinary Core Ideas:

- PS4: Waves and their applications in technologies for information transfer • ETS1: Engineering design

CLASSROOM LESSONS

What is AI? Students unveil their personal interactions with robots and understand how AI assist with real life scenarios.

AI Brains: Explore the intricacies of AI programming through an activity where students act and program.

AI Bodies: Discover how “hands” are shaped in different ways depending on their intended function.

AI Senses: Explore how sensors can either mimic human sensors or do things that humans can’t do.

AI and Society: Learn about how different peoples’ values and perspectives shape how AI applications are developed and used.

OBJECTIVES

Students will:

- Create a definition of AI.
- Discover different categories of AI and how they interact with their surroundings.
- Illustrate AI's build (form) based upon a specific set of parameters (function).

KEY VOCABULARY

AI, Programmer, Code

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Asking questions and defining problems
- Developing and using models
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Obtaining, evaluating, and communicating information

CROSSCUTTING CONCEPTS:

- Patterns
- Systems and system models
- Structure and function

DISCIPLINARY CORE IDEAS:

- MS-PS4: Waves and their applications in technologies for information transfer
- MS-ETS1: Engineering design

PACE YOURSELF

- 45 minutes each day

WHAT YOU NEED TO KNOW

When you hear the word AI, the first visual that might come to mind is something that looks like you. As the industry continues to evolve and grow, this stereotypical image and misconception starts to dissolve. If not this image, then what exactly is AI? To complete their tasks, **AI applications** have to sense, plan and act. They use different kinds of sensors to collect the information they need. Software processes this information so the robot can plan a response. Then they act to get the job done. The person that instructs or programs a robot is called a **programmer**. Programmers use a specific "language" called code to interact with a variety of robots through a computer or software system.

AI applications come be developed in different shapes and sizes depending on the activities the applications are intended to carry out. During the design process, engineers consider functionality when creating the form and build of the AI.

Industrial Applications

Robotic companies, such as FANUC, are the largest makers of industrial robots in the world. Many robots, including the M-1iA Delta Robot, work in assembly lines to increase the production time of a product. As human beings, we use hand-eye coordination in order to complete tasks on an assembly line. Robots are very precise and their vision, powerful motors
(actuators) and lightweight arms can work more efficiently than a human. Today it is more likely for a worker to be trained how to program and function a robot to work on an assembly line rather than completing the task themselves.

Social Applications

Scientists have been studying human facial expressions for many years. With the dozens of muscles found in our faces we are able to communicate emotional cues such as joy, anger, or shock. Social robots like EMYS have the ability to detect emotional cues from human beings. Social robots can also be used as a comfort mechanism. Paro is a baby seal used for therapeutic purposes and can have a calming effect on a person in a nursing home or hospital. This idea is much like live Animal-Assisted Therapy. Even though emotional cues

can be detected, these robots do not feel or experience emotions themselves.

ACTIVITY

Introduction to artificial intelligence
- Course structure and policies
- History of AI
- Proposing and evaluating AI applications
- Case study: Google Duplex

CHECK FOR UNDERSTANDING

- How do you know if something is an AI system?
- What is the purpose of an AI system?
- What should an engineer take into consideration before building an AI solution?
- Is a dishwasher An AI application? Why or why not?
- Is a cellphone an AI application? Why or why not?

DIFFERENTIATED INSTRUCTION

Student is expected to select two AI applications and the different jobs they assist with and/or perform. Students create a small presentation about their work, explaining the research they discovered to back up their personal conclusions.

SCENARIO 1

The local hospital wants to make children feel more comfortable after they come out of surgery. Unfortunately, they cannot bring live animals like a dog or a cat to help relax the young patients, but they can bring in AI solutions and different types of it. What type of AI application would you offer to the hospital?

- How does the application work?
- How does your application benefit the young patients in the hospital?
- Why is this application the best choice compared to the other options?

SCENARIO 2

A new electric car company has just been funded and they are starting to put together their facility where the cars will be produced. The company has hired several employees but they are quickly learning that some of the car parts are too heavy for one person to lift. What type of application would you offer to assist the electric car company?

- How does the AI application work?
- How does your application benefit the company?
- Why is this application the best choice compared to the other options?

AI BRAINS: PROGRAMMING AN AI SYSTEM

SCENARIO 3

Scientists are interested in researching rock formations at the Grand Canyon. As they are exploring, they discover a cave and have come to a point where humans can no longer fit through the opening. They are curious about the depth of the cave, and if there are any living plant life or insects present. What type of AI application would you offer to the scientists to enhance their research?

- How does the application work?
- How does your AI application benefit the scientist researching the Grand Canyon?
- Why is this application the best choice compared to the other options?

SCENARIO 4

Ghana is interested in reducing crimes and kidnapping cases. Law enforcement agencies discovered that data about the missing children is often the problem. A mission attempted before and has not yield any significant results. What type of AI application would you offer the police specially to deal with this problem?

- How does the application work?
- How does your AI application benefit the police and the citizenry?
- Why is this application the best choice compared to the other options?

AT A GLANCE Students will explore the intricacies of AI programming through an activity where they act as robots and programmers.

OBJECTIVES

Students will:

- Understand how robots complete simple tasks.
- Learn the basics of how programming works.
- Explore how difficult it can be to create a robot that mimics a human.

KEY VOCABULARY

Programming, Computational Thinking

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information

Crosscutting Concepts:

- Patterns
- Cause and effect

Disciplinary Core Ideas:

- PS4: Waves and their applications in technologies for information transfer
- ETS1: Engineering design

PACE YOURSELF

- 45 minutes

WHAT YOU NEED TO KNOW

To complete their tasks, AI have to sense, plan and act. AI applications use different kinds of sensors to collect the information they need. Software processes this information so the application can plan a response. Then they act to get the job done.

The AI application need to have someone tell them what to do. This process is referred to as **programming**: the way that we can make computers follow instructions. Any action the application is going to do needs to be specifically programmed for it to complete the task. AI "thinks" and learns by processing data and then uses this information to plan its actions.

Programming is the source of instructions for the AI. AI's program is a set of instructions that tells it what to do, how to do it and when to do it. In order for the robot to complete a task it must be programmed to do so. Programming requires defining AI's task as a series of logically based step-by-step instructions that can be followed sequentially in order to reach a goal.

An AI's program will also contain a library of simple commands that allow a programmer to describe things in the same way every time. Applications cannot interpret variability in commands the way humans do. For example, an application will not be able to differentiate between a command to "sit down" versus "please sit."

Emphasizing the specificity of the command is important. At times, the application's environment may be strewn with obstacles or unexpected events. Programmers need to think through the possibilities of these various scenarios and plan accordingly so they can communicate in any situation.

The tasks an AI application completes must be defined up front. For example, if the application does not know how to respond to a command to "sit", then giving the application that command will result in no action from the robot. An AI application will have a library of available actions. Without that action being in its library, the AI is not capable of understanding. One way to think about this is to imagine a programming language that does not have the addition (+) operator

that is used in math. In this example, the programmer can never give the computer any math operation that includes addition. Similarly, if the AI does not have a library of actions that says “lift feet,” then a programming step that includes “lift feet” will result in the robot doing nothing.

AI software is the collection of coded commands that tell the robot what tasks to perform. AI software is used to determine what tasks should be performed and to carry out that action. Programming AI can be an intricate task. Many software systems and frameworks have been proposed to make programming robots easier.

Programming involves computational thinking: a way to analyze and solve problems. **Computational thinking** requires deconstructing the entire decision-making process, the variables involved and all possible solutions, ensuring the right decision is made based on the corresponding parameters and limitations of the problem. Computational thinking can be useful in almost any situation that requires solving a challenge.

ACTIVITY

1. ○ Problem spaces and search
2. ○ Knowledge and rationality
3. ○ Heuristic search strategies
4. ○ Search and optimization (gradient descent)
5. ○ Adversarial search
6. ○ Planning and scheduling
7. ○ Case studies: Playing chess, Manufacturing scheduling

CHECK FOR UNDERSTANDING

- Throughout the lesson discuss the detailed nature of instructions needed for an AI application to perform any task.
- share a time when a computer or other programmed system didn’t do what they wanted it to. What are some of the reasons why?
- Students to discuss the various things they utilize that have to be programmed.

DIFFERENTIATED INSTRUCTION

Free online programming language that makes it easy to create interactive art, stories, simulations and games

http://scratch.mit.edu/

Online chatbots

http://www.elbot.com/

http://www.cleverbot.com/

IN THE EXHIBIT

- Google Self Driving Car

AI BODIES: BUILDING AN AI SYSTEM HAND

AT A GLANCE Students will learn how much of the knowledge in Artificial Intelligence is acquired and represented.

OBJECTIVES

Students will:

- Construct a mechanical end effector ("hand") and test it with a variety of tasks.
- Design a new end effector for a task.

KEY VOCABULARY

Logic and Inference

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information

Crosscutting Concepts:

- Structure and function
- Systems and system models

Disciplinary Core Ideas:

- ETS1: Engineering design

PACE YOURSELF

- 60 minutes

ACTIVITY

Knowledge Representation and Reasoning

- Topics
  - Logic and inference
    - Ontologies
  - Bayesian reasoning
  - Temporal reasoning
  - Case study: Medical diagnosis

DIFFERENTIATED INSTRUCTION

More advanced student may have time to do a representation of whatever he has learnt and test them at various tasks.

DIGITAL RESOURCES

- "Chapters 3: Solving Problems by Searching," "Chapter 5: Adversarial search", "Chapter 10.2-10.5: Planning", "Chapter 11: Planning and Acting in the Real World" in Russell & Norvig, Artificial Intelligence: A Modern Approach, 2010

AI AND MACHINE

AT A GLANCE Students will learn that AI sensors can either mimic human sensors or do things that humans cannot. They will use their knowledge to move through an obstacle course, then design a robot to complete a specific task.

MATERIALS

OBJECTIVES

Students will:

- Describe the difference between supervised and uns.
- Identify the learning needs of machines
- Explain similarities and differences between the different algorithms
- Choose an appropriate to a task and function.
- Make predictions based on observations using tools and their own senses.

KEY VOCABULARY

Machine learning, Supervised, Unsupervised, Model, Context, Electro-Algorithms, predictions

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Constructing explanations and designing solutions
- Engaging in argument from evidence

Crosscutting Concepts:

- Cause and effect
- Scale, proportion and quantity
- Systems and system models

Disciplinary Core Ideas:

- LS1: From molecules to organisms: structures and processes
- PS1: Matter and its interactions
- ETS1: Engineering design
- ETS2: Links among engineering, technology, science and society

PACE YOURSELF

- 45-60 minutes per lesson over two days

ACTIVITY

Part I:

- Machine learning: Supervised methods
- ● Topics
- ○ What is machine learning?
- ○ Supervised vs. unsupervised learning
- ○ Regression -- linear, logistic, ridge
- ○ Classification – decision trees, SVM, random forests
- ○ Model performance evaluation – MSE, lift, AUC, Type 1 vs 2 errors
- ○ Case study: Bank failure prediction Ask the class to predict how their sound cues will affect the robot's performance.

Part II:

Unsupervised Methods

● Topics

○ Dimensionality reduction: PCA

○ Clustering – k-means, hierarchical clustering

○ Semi-supervised methods

○ Reinforcement learning

○ Choosing among machine learning techniques

○ Case study: Public health outcome clustering

CHECK FOR UNDERSTANDING:

Throughout the activities, ask the following questions:

- When you walked through the course the first time, did you recognize objects when you touched them? How did you know the chair was a chair?
- When you had the hula hoop, did you know what an object was when the hoop touched it? AI applications can detect obstacles, but do not add context the way humans do.
- When talking about constraints: Was it easier or harder to get through the course when we added the hula hoop? When we added sound? Too many sensors could confuse a robot or make it inefficient, or just be

- DIGITAL RESOURCES

Readings

○ Chapter 5.8: "Unsupervised Machine Learning," in Goodfellow, I., Bengio, Y. and Courville A., Deep Learning, 2016. ○ Honeycutt, J., "An introduction to clustering algorithms in Python", May 29, 2018, https://towardsdatascience.com/an-introduction-toclusteringalgorithms-in-python-12343857409 7

○ Russell & Norvig, Chapter 21 "Reinforcement Learning" in Artificial Intelligence: A Modern Approach, 2010

○ **Booz Allen Hamilton "Guide to Analytic Selection," p. 65-83 in The Field Guide to Data Science, 2nd Edition 2015, available online at https://www.boozallen.com/content/dam/boozallen_site/sig/pdf/publications/2015 -field-guide-to-data-science.pdf NASA animation of how GPS works**

NASA space and robotics activities
http://spaceplace.nasa.gov/gps/en/

Discovery lessons on human senses for younger grades http://www.discoveryeducation.com/teachers/free-lesson-plans/the-incredible-human-body-the-five-senses.cfm

AI AND DEEP LEARNING, CV AND NLP

AT A GLANCE This lesson will have students thinking like engineers and learning about how the neurons work through the Artificial Neural Networks

OBJECTIVES

Students will:

- Discover how technology and society influence each other.
- Utilize engineering design practices to develop a robot that solves a societal issue.

KEY VOCABULARY

Neural nets, CNN and RNN, deep learning, Sensor, Mechanism

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Asking questions and defining problems
- Constructing explanations and designing solutions
- Obtaining, evaluating and communicating information

PACE YOURSELF

- 60 minutes

WARM UP ACTIVITY

1. Deep Learning
2. ● Topics
3. ○ Neural networks and back-propagation
4. ○ Convolutional neural networks
5. ○ Recurrent neural networks and LSTMs

Image Processing

● Topics

○ Introduction to computer vision

○ Image segmentation

○ Object and motion detection

○Object classification

○ Use of pre-trained models (VGG16, Inception)

Natural Language Understanding

● Topics

○ Intro to natural language understanding

○ Case study: Machine translation

○ Sentiment analysis

○ Application of deep learning to NLP

CHECK FOR UNDERSTANDING:

- How might who we are or where we live influence what AI are made in the future?

DIGITAL RESOURCES

Videos and articles about robotics, including their impact on society.
http://www.ted.com/topics/robots

Lesson plans on nanoscience, which is related to robots
http://www.nisenet.org/search/product_category/k-lesson-plans-15

Readings

○ Chapter 24 “Perception” in Russell and Norvig, Artificial Intelligence: A Modern Approach, 2010

○ Karpathy, A. “Convolutional Neural Networks for Visual Recognition,” 2018, available at http://cs231n.github.io/convolutional-networks/

○ Visualizing CNNs, http://scs.ryerson.ca/~aharley/vis/conv/flat.html

○ PyTorch Dataloader video: https://www.youtube.com/watch?v=zN49HdDxHi8

○ TensorFlow, “Image Recognition”, July 30 2018, https://www.tensorflow.org/tutorials/images/image_recognition

Readings

○ Lewis-Krause, G. “The Great AI Awakening” , The New York Times,, December 14, 2016, https://www.nytimes.com/2016/12/14/magazine/thegreat-ai-awakening.html

○ Russell & Norvig, “Chapter 22: Natural Language Processing” in Artificial Intelligence: A Modern Approach, 2010

○ Collobert et al. “Natural Language Processing (Almost) from Scratch,” Journal of Machine Learning Research, 2011 available at https://arxiv.org/pdf/1103.0398.pdf

○ (Optional) G Golderg, Y. Neural Network Methods for Natural Language Processing Synthesis Lectures on Human Language Technologies, April 2017, freely available monograph at https://doi.org/10.2200/S00762ED1V01Y201703HLT037

○ (Optional) Feldman, R, “Sentiment Analysis Tutorial, IJCAI-13, 2013, http://ijcai13.org/files/tutorial_slides/tf4.pdf

A large corporation sells and ships items all over the world. They sell items as small as a ring to as big as a car. They can get many items to their customers in as quickly as 24 hours, but would like have packages delivered in less than 12 hours. These packages sometimes need to get across oceans or mountains and must be delivered directly to people's homes or businesses.

A small country is constantly threatened by earthquakes. Recently a 7.8 magnitude earthquake hit the country, killing hundreds of people and destroying many homes and businesses. The country's leaders would like a robot or robots that can search through rubble to find survivors, help with the clean up and rebuild structures to get the country back on its feet.

Farms all over the world are attacked by bugs, small mammals and birds that feed on the crops. Many farmers don't want to kill these animals, but would prefer if they found their food somewhere else. They would like a robot or robots to help; these robots can be any size, but cannot interfere with the farmers when they are harvesting their crops.

An elderly woman with no children is starting to have trouble getting around her house. She is starting to forget to take her medicine and needs help preparing her meals. She wants to be able to stay living at home, but is going to need help. The robot needs to be able to easily move around her house, help with everyday chores and give her reminders.

● Readings

○ Jerome, J, “Why AI may be the next big privacy trend,” https://iapp.org/news/a/why-artificial-intelligence-may-be-the-next-bigprivacytrend/, 2016
○ Burt, A. “How will the GDPR impact machine learning?”, May 16, 2018, “https://www.oreilly.com/ideas/how-will-the-gdpr-impact-machinelearning
○ Vanian, J “Unmasking A.I.'s Bias Problem,” Fortune, June 25, 2018, http://fortune.com/longform/ai-bias-problem/
○ NSTC, “Preparing for the Future of AI,” October 2016
○ Brynjolfsson, E and Mitchell, T. “What can machine learning do? Workforce implications,” Science 22 Dec 2017: Vol. 358, Issue 6370, pp. 1530- 1534 DOI: 10.1126/science. aap8062
○ Courtland, R. “Bias detectives: the researchers striving to make algorithms fair,” Nature, June 2018, https://www.nature.com/magazineassets/d41586-018-05469-3/d41586-01805469-3.pdf
○ (optional) Abadi, M. et. al “Deep Learning with Differential Privacy, “ https://arxiv.org/pdf/1607.00133.pdf

● Readings
○ National Science and Technology Council, “Preparing for the future of AI,” October 2016, https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/microsi tes/ostp/NSTC/preparing_for_the_future_of_ai.pdf

ROBOTICIST DESIGN WORKSHEET

NAME: _____ **DATE:** _____

Write the problem you are trying to solve from your group's Societal Scenario Card.

_____

_____

_____

_____

_____

_____

Work together to describe the size of your solution:

_____

_____

_____

_____ Work together to describe how you will power your solution:

_____

_____

_____

_____

_____

_____

_____ List mechanisms the solution will have (there are no limits to the number of mechanisms):

_____

_____

_____

_____

_____

_____

Draw your model in the box below and label all the mechanisms.

STUDENT WORKSHEET

NAME: _____ **DATE:**

_____ List four mechanisms you would want in a model for yourself and explain why you chose them.

MECHANISM 1:	**WHY:**
MECHANISM 2:	**WHY:**
MECHANISM 3:	**WHY:**
MECHANISM 4:	**WHY:**

Do you think your choices are the same as your classmates? Why or why not?

_____
_____

_____
_____

_____
_____

_____
_____

STUDENT WORKSHEET

NAME: _____ **DATE:**

_____ What changes did you make to your design after your presentation?

Do you think it was good to make changes? Why or why not?

How might a model designed in another country be different than a model designed in Ghana?

List three other problems you think your model might be able to help solve and explain how.

1) _____

_____

_____

_____

2) _____

_____

_____

_____

_____

3) _____

_____

_____

_____

_____

» FOCUSING YOUR FIELD TRIP

AT A GLANCE Students will record their observations and experiences in the exhibit and complete a follow-up writing exercise in the classroom. development. and learning about societal impacts on AI application development.

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OBJECTIVES

Students will:

- Have a meaningful museum experience.
- Connect their museum experience to the classroom.
- Learn what AI applications are and what they can do.

KEY VOCABULARY

Observation

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices:

- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating and Communicating Information

PACE YOURSELF

- 30 minutes in the classroom before your field trip
- 30 minutes in the exhibit during your field trip
- 30 minutes in the classroom after your field trip

ACTIVITY

In the classroom before your field trip

1. Tell students they will record their observations, experiences and thoughts while they explore. They will make observations in the exhibit to better understand what robots are. They will then use their observations to design their own robot after their field trip.

2. Show them an example of an assembled Exhibit Guide. Briefly read each page and discuss what they will do in the exhibit.

3. Pass out materials and give them time to assemble their exhibit guides. Cut on the dotted lines and staple the pages together with two staples, like a book. Be sure to staple the pages together in numerical order.

In the exhibit during your field trip

1. Ensure each student has their Exhibit Guide and a pencil. Consider giving each chaperone an Exhibit Guide and having them fill it out as well.

2. Walk around with students as they explore the exhibit. Make sure they are recording their observations and experiences on each page. If they need more room, they can use the back of each page.

Encourage students to not only record what they see and learn, but to also what they feel and experience.

3. When everyone has explored the exhibit, collect their pencils and Exhibit Guides to make sure they are not lost or dropped in the museum.

In the classroom after your field trip

1. Each student their Guide and the worksheet.

2. Students to use their observations noted in their Exhibit Guide to design their own solution on the My Model worksheet. They will first determine what their model will be used for, i.e., its purpose. Encourage them to create a model that performs a specific job which improves the way they live, work, or play. For example, have them think of an AI system that could help them get ready for school faster.

3. Have students fill out the My Model worksheet, drawing their models and answering questions to determine how it works. They can even color their drawing.

CHECK FOR UNDERSTANDING

- What is the purpose of this model?
- It what ways is this AI system similar to or different than humans? What can it do that humans cannot?
- How does this robot sense, plan, and act?
- How can this system make our lives better?

WHAT'S HAPPENING?

Making **observations** is a central component of science and the scientific method. It involves receiving information from the outside world through the senses and recording information using scientific instruments.

DIFFERENTIATED INSTRUCTION

Students should know the purpose of their system before they create it. For example, they must create a system that can deliver food and water to people after a natural disaster.

Have students describe their finished model or system to each other and to the class.

EXHIBIT GUIDE

NAME: _____

Instructions: Cut pages, assemble in numerical order and staple to form a booklet.

1

COOPERATION

AI applications work with humans and others to make our lives better.

2

Find an application and describe what it is doing.

_____

_____

_____

How could it work with humans to make our lives better?

_____

_____

_____

3

SMARTS

Robots are “smart” because they process internal and external information that guide their actions.

Draw and describe a model that seems to be “smart.”

4

SENSE

All AI applications gather information with, such as microphones, lights and cameras.

Draw a model and label its **sensors**

Some applications have different “hands” depending on what they are designed to do.

5

Find an application “hand” and draw it.

How is it different than your hand?

All AI application process information to **plan** their actions.

6

Experiment with an application that **plans** and draw it.

What is the application’s job or purpose?

_____

LOCOMOTION

7

Draw and explain one way an AI application can move around.

AI powered applications move in different ways, and they can go places humans can't.

8

ACT

All AI applications **act**, such as move or speak.

Make a model **act**. What is its job or purpose?

What can it do that humans cannot do?

MY MODEL

NAME:

_____

Use the information you gathered in the exhibit to create your own model.

Here is a picture of MY MODEL:

The purpose of MY MODEL is to. . .

MY MODEL has sensors that can. . .

MY MODEL is "smart" because it can. . .

MY MODEL can do things humans can't do: