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AI exploration phase

P2 - Building Hypothesis on AI

AI and Exploration Topics. What are we exploring?

The INCLUSION gap: Why machine learning models can unintentionally exclude minority groups or individuals with disabilities.
SDG 10: Reducing inequalities by designing inclusive AI and robotics systems.
Practical approach: Understand by doing, testing accessibility-driven machine learning models.

Materials Needed and to Create. What must be prepared before the activity?

Pens / tablets / smartphones for note-taking
Whiteboard or projector for collective analysis



Exploration Steps and Description. What do participants actually do?

Step 1 – The Power of Inclusion: SDG 10 (Classroom – 60 minutes)
Key Question: Why is reducing inequality within and among countries essential for a just, functional, and sustainable society?

Suggested Facilitation Approach: Open with a discussion on "Invisible Barriers." Ask students to think about everyday technologies (like voice assistants or touchscreens) and consider who might be left behind when they are designed.

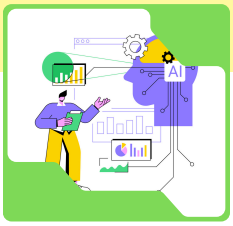
Introduce SDG 10 as a global mandate to ensure no one is excluded based on their identity or physical abilities.

Focus Areas:

- **Target 10.2 (Social & Economic Inclusion)**: Discuss the importance of empowering all individuals—irrespective of age, sex, disability, race, ethnicity, origin, religion, or economic status—to fully participate in society.
- **Target 10.3 (Equal Opportunity)**: Explore how eliminating discriminatory laws, practices, and systemic biases creates a level playing field, shifting the focus from equal input to equitable outcomes.
- **Target 10.4 (Policy & Protection)**: Look at how institutional policies (such as wage, fiscal, and social protections) act as safeguards to progressively achieve and maintain true equality.

Activity: The Accessibility Audit (20 min): Students work in pairs to evaluate a digital platform, public service, or local law through the lens of a specific marginalized group (e.g., individuals with hearing impairments or economic disadvantages).

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Exploration Steps and Description. What do participants actually do?

Goal: Identify one specific "exclusion gap" where a system fails to provide equal access or opportunity.
Fundamental Clarification: Inclusion isn't just a moral gesture; it must be hardcoded into our laws, economic policies, and technological infrastructure.

Step 2 – Meeting Otto: AI Takes Physical Shape (Classroom – 30 minutes)
Key Question: How can a Large Language Model (LLM) transform into a physical agent capable of moving and interacting in the real world? Suggested Facilitation

Approach: Introduce Otto, the lab's small bipedal robot. Explain its hardware and software architecture in a clear, accessible, and visual way:

- **The Brain**: An onboard Raspberry Pi that executes and processes instructions provided by a Large Language Model (LLM).
- **The Body**: The physical frame and servomotors that enable Otto to walk, move, and respond to commands.

Focus Areas:

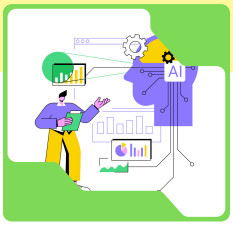
- **From Theory to Action**: How generative AI and language models do not merely produce text, but can translate concepts and natural language commands into physical movements and robotic behaviors.
- **Hardware/Software Integration**: The value of accessible, low-cost computing systems (such as the Raspberry Pi) in democratizing access to robotics and artificial intelligence.

Activity: **Live Demo of Otto (10 min)**: Facilitators demonstrate Otto in action as it walks and carries out commands driven by the LLM. Students observe how the robot interprets natural language input and converts it into physical movement or gestures. Goal: Understand the link between conceptual Artificial Intelligence (LLM) and embodied robotics (a physical body), laying the groundwork for subsequent accessibility applications.

Step 3 – Kahoot Challenge: The Inclusion & Tech Quiz (Classroom – 30 minutes)
Key Question: How deeply have we understood the core concepts of inclusion, SDG 10, and AI mechanics? Suggested Facilitation

Approach: Divide the class into teams or have students join individually using smartphones or tablets for an interactive Kahoot quiz. The goal is to review the concepts covered in Step 1 (SDG 10, invisible barriers, equity) and Step 2 (Otto's architecture, Raspberry Pi, LLMs) in an engaging, competitive format.

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Exploration Steps and Description. What do participants actually do?

Focus Areas:

- **Active Review**: Test comprehension of SDG Targets 10.2, 10.3, and 10.4, as well as the distinction between equality and equity.
- **Technical Connections**: Reinforce key concepts regarding Otto's mechanics (how the Raspberry Pi and LLM orchestrate physical movement).

Activity: **Interactive Quiz (20 min)**: Run a Kahoot session featuring multiple-choice and true/false questions. After key questions, the facilitator takes a moment to briefly unpack the answers to solidify understanding. Goal: Consolidate learning, promote teamwork, and keep energy high before transitioning to the hands-on machine learning activities in Step 4.

Step 4 – The Voice of the Silent: Sign Language Detection Using ML (Classroom – 60 minutes)

Key Question: How can we train machines to understand diverse forms of human communication and bridge the accessibility gap?

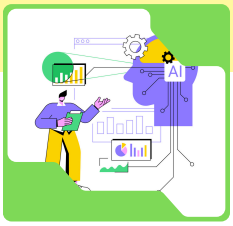
Non-Technical Explanation: Most human-robot interaction relies heavily on spoken language or standard text inputs. For the deaf and hard-of-hearing community, this creates a massive barrier. By training Machine Learning (ML) models on visual data, we can teach robots to recognize and interpret sign language gestures in real time.

Activity: The Sign Language Detection Demo & Stress Test (30 min): Students interact with a live Machine Learning demo designed to detect sign language gestures. They will analyze its performance and run a "bias and limitation check":

- **The Test**: Perform standard sign gestures. Does the model recognize them accurately?
- **The Variation:** Change the lighting conditions, skin tones, background environments, or speed of the gestures.
- **The Analysis**: Does the model perform equally well for everyone? What happens if the training dataset lacked diverse representation (e.g., different skin colors, hand shapes, or lighting)?

Goal: Understand that an ML model is only as fair as its training data. If we want robots to ensure equal rights to all when communicating, we must actively prevent algorithmic exclusion.

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Expected Output. What do participants create, produce or gain from the exploration?

- **Hands-on Experience with Computer Vision:** Direct interaction with a live machine learning model, gaining a clear understanding of how pixels are translated into semantic meaning (language).
- **An Engineering Mindset Shift:** Shifting from thinking of technology as "neutral" to realizing that inclusive design requires deliberate, conscious effort.

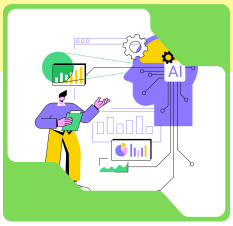
The Hook and the Playfulness. What makes this fun/exciting for young people?

- **Talking to a Robot with Your Hands**: Instead of typing or speaking, students get to use their physical body and gestures to control or communicate with a machine. It feels like unlocking a "superpower" or a secret language code.
- **Playing the "System Breaker":** Young people love to see where technology fails. The activity actively encourages them to try and "trick" or "break" the AI by changing lighting, hiding fingers, or using different angles, turning data analysis into a game of discovery.
- **The "Aha!" Moment of Invisible Barriers**: Realizing how a system they take for granted (like a video camera or an app) can completely fail someone else sparks an instant, engaging detective mindset.

Success indicators. How do we know it worked? What shows participants learned?

- **Critical Evaluation of Technology:** During the ML demo, students don't just say "Wow, cool robot!" Instead, they ask questions like: "Who did they train this model on? Why isn't it recognizing my classmate's gesture?"
- **Nuanced Understanding of SDG 10:** In discussions, participants move past vague ideas of "being nice to everyone" and start talking about concrete structural inclusion—like accessibility features, policy changes, and dataset diversity.
- **Actionable Redesign Ideas:** When asked how to fix the demo's errors, students suggest technical and social solutions (e.g., "We need to retrain the model with 500 more hands of different shapes and skin tones").

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Appendix - Example of material (duplicate if needed)

Appendix 1

Step 1 - The power of inclusion

Content of the appendix





Robot Camera



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