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Blind & Low Vision

Challenge #1: Independent In-Person Shopping

Hackathon Challenge
How might we use wireless innovation to help blind and low-vision shoppers independently find aisles and product categories, identify and read packaging, and make informed purchasing decisions without relying on others

In Their Words
"Finding things when shopping is hard. There isn't a reliable way to shop independently as a disabled person.

As a blind person, I can't read packages or identify aisles to even begin to know where to find categories of products. For people with low vision, reading signs can be difficult because of lighting, and reading products can be difficult because of print size and contrast. Often we have to rely on assistance from others or are limited to delivery and online services, which prevents us from making our own informed decisions.

A story I use to illustrate this: I once purchased a coffee mug online that said *'When I have my cookies I think of you.'* What I didn't realize until later is that on the other side it said: *'…so I dunk them in my milk and hold them under until the bubbles stop.'* It was funny in hindsight, but also embarrassing. I didn't have a choice in this gag gift because I lacked access to the full information. If there were a way to interact with products fully in person, mistakes like this wouldn't happen."

Why It Matters
Independent shopping is about dignity and choice. Without equal access to product information, people risk embarrassment, reduced autonomy, and higher costs when forced to rely on delivery services or others.

What's Been Tried (and Falls Short)

- Going with friends, family, or caregivers — not always available, and not everyone wants to rely on others.
- Store-provided shopper assistants — often involve long waits, refusals, or poorly trained staff who describe products instead of reading exact labels.
- Remote interpretive apps like AIRA — require juggling headphones, phones, and navigation in crowded spaces, which isn't always safe or practical.

Challenge #2: Accessible Medication Measurement

Hackathon Challenge
How might we design a reliable, non-visual method for blind and low-vision people to accurately measure liquid medications (e.g., droppers, syringes, at-home injections) for themselves, their children, or service animals?

In Their Words
“As a blind person, there really isn’t a reliable way to measure liquid, such as medication into a dropper, whether for a baby, a service dog, or into a needle for an at-home injection. I’ve been lucky to have access to auto-injectors, but I know others are not so fortunate.”

Why It Matters
It is important for service dog handlers, blind parents, and blind people in general to be able to reliably measure medications delivered in liquid form. Blind parents are often under a lot of judgment for needing extra support with their children, and that kind of discrimination, just for needing help with proper dosage has even led to children being removed from parents.

What’s Been Tried (and Falls Short)
Some droppers click into place at different measurements, but they are overly sensitive to movement and can easily shift out of alignment, making them unreliable.

Challenge #3: Accessible Pill Planner

Hackathon Challenge
How might we design an accessible, travel-friendly pill planner that is practical, discreet, and easy to use for blind people and others with vision or dexterity challenges?

In Their Words
“As a blind person with other health conditions, I take several medications daily and as needed. I’ve struggled to find pill planners that are both accessible and usable. Some with Braille are huge, confusing, or in the wrong orientation. Others sacrifice style, leaving me with clunky, obvious containers that make my medications very public.”

Why It Matters
I want to manage my medications independently, efficiently, and without announcing that that is what I’m doing to everyone around me.

What’s Been Tried (and Falls Short)
- Using existing pill sorters with tactile markers like tape or stickers
- Oversized Braille planners (inconvenient but sometimes necessary)
- Stackable jars for travel (don’t indicate day/time clearly)
- Commercial “smart” pillboxes with apps (often expensive and accessibility uncertain)

None of these options provide a truly accessible, discreet, easy-to-open design that works both at home and on the go.

Challenge #4: Environment Recognition

Hackathon Challenge
How might we design a proof-of-concept tool that improves safe and independent mobility for people with retinitis pigmentosa and other vision conditions?

In Their Words
“My cane only gives me basic tactile feedback at the ground. Cane tips wear out, vibrate too much on rough sidewalks, and can get stuck. They can’t interpret the world around me. With only 10 degrees of central vision, I need better mobility tools to stay safe and independent.”

Why It Matters
People with retinitis pigmentosa face higher risks of falls and pedestrian accidents. Improving environmental recognition could reduce injuries and help users navigate safely in construction zones, dark environments, or crowded spaces.

What’s Been Tried (and Falls Short)

- Cane tips (lightweight → wear down, roller ball → heavy, vibrates excessively)
- No feedback above ground level
- Canes can’t provide real-time interpretation of the environment

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Challenge #5: Real-Time Child Tracking

Hackathon Challenge
How might we design a real-time, auditory tracking tool that helps blind parents keep their children safe in public spaces?

In Their Words
“As a blind single mom, I used to put a bell on my toddler’s shoe so I could locate him instantly. Now that he’s older, I wish I had a device I could use with one AirPod in my ear that would ping his location in real time. Current GPS apps are too slow, even a 30-second delay can be dangerous.”

Why It Matters
Keeping kids safe is urgent, especially for blind parents in busy environments like playgrounds, sporting fields, or airports. Faster, more intuitive tools would reduce stress and keep families safe.

What’s Been Tried (and Falls Short)

- Bells on shoes → worked well, but only practical for toddlers
- Apple AirTags → too much delay, not real-time
- GPS apps → don’t provide quick enough auditory cues to localize in crowds

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Mobility

Challenge #6: Independent Play (Cornhole Catapult)

Hackathon Challenge
How might we design a smartphone-controlled cornhole catapult that allows people with limited hand function (e.g., spinal cord injury, ALS, arthritis) to independently launch beanbags and play cornhole with friends and family?

In Their Words
“Because of a spinal cord injury resulting in the inability to grasp, I haven’t been able to play yard games such as cornhole with friends and family at events like picnics and tailgates.”

Why It Matters
Recreational activities aren’t just fun; they support inclusion, community belonging, and quality of life. Research shows participation in recreation can have equal or greater impact on life satisfaction than employment, health, or financial resources.

What’s Been Tried (and Falls Short)
A prototype cornhole catapult using stretchable tubes and a lever has been built. However, it still requires cranking by hand, which excludes players with limited grasp strength. A smartphone-controlled motorized version could remove this barrier and make play accessible to more people.

Challenge #7: Wheelchair Obstacle Alert

Hackathon Challenge
How might we create a universal, wireless-enabled obstacle alert system that helps powered wheelchair users avoid collisions and navigate more safely?

In Their Words
“My Permobil wheelchair is large compared to my small frame, and due to my muscle disease I lack the range of motion to turn my head, shoulders, or upper body. I often run into door frames, furniture, or descend ramps at awkward angles. Sometimes I even bump into people’s feet!

I think it would be advantageous to add an obstacle alert feature to the chair — something that signals me with a beep or warning. Even better, add a back-up camera like cars have. Our chairs aren’t just transportation, they’re our legs and an extension of us.”

Why It Matters
Wheelchairs can weigh 400 lbs or more, not including the user. Collisions can cause injury,

damage, and loss of confidence in mobility. An obstacle alert would increase safety, independence, and peace of mind for users and those around them.

What's Been Tried (and Falls Short)
Some obstacle detection systems for wheelchairs do exist, but they are often expensive, tied to specific models, or limited in availability. What's missing is a universal, affordable solution that can be adapted across different chairs and designed with real users' needs in mind.

Challenge #8: Calorie Tracking for Wheelchair Users

Hackathon Challenge
How might we prototype a system that more accurately tracks daily energy expenditure for power wheelchair users and others with limited mobility?

In Their Words
I've lived with a C5 incomplete spinal cord injury for over 20 years and use a power wheelchair. Because I don't or can't move much, my caloric output is much lower than the general population. I can track what I eat using apps like MyFitnessPal, but there is no reliable way for me to track what I burn.

Fitness trackers don't account for wheelchair use or limited mobility, as they're built for walkers and runners. That leaves me relying on outdated calorie estimates from old studies, which don't reflect my injury level, metabolism, or daily effort. Without knowing my true expenditure, I can't balance intake and output. That puts me at higher risk for obesity, diabetes, and other secondary complications.

A customized, intelligent wearable that understands my actual energy burn would be a game-changer, not just for me, but for thousands of others who use power wheelchairs."

Why It Matters
Managing caloric balance is critical for independence and long-term health in SCI. Current tools are built for walkers and runners, leaving wheelchair users behind.

What's Been Tried (and Falls Short)
- Fitness apps (e.g., MyFitnessPal) track intake but not accurate expenditure
- Wearables use walking-based algorithms → not relevant for wheelchair movement
- Reliance on outdated calorie-burn tables from academic studies
- Early AI research exists, but no widely available, accessible tools

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Challenge #9: Accessible Rides

Hackathon Challenge
How might we design an app that helps wheelchair users quickly find accessible transportation options nearby?

In Their Words
“As a person with severe spastic quadriplegia cerebral palsy who uses a motorized wheelchair, I know how hard it is to find accessible transportation. You have to do hours of research, make phone calls, send emails, and wait for responses. Sometimes companies don’t even exist anymore.

I imagine an app that works with Google Maps to pinpoint my location and show the closest transportation companies with wheelchair vans, lifts, tie-downs, and seat belts — plus details like their hours, fees, and how much notice they require. That would save me time and stress.”

Why It Matters
It currently takes hours of searching to find the right transportation, often with outdated or missing info. A centralized, up-to-date resource would help wheelchair users get where they need to go more quickly and with less frustration.

What’s Been Tried (and Falls Short)
- Saving company contacts in a phone → quickly becomes outdated
- Repeated phone calls and emails → slow and inefficient
- No centralized or reliable database exists today for accessible transportation options

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Challenge #10: Accessible Medical Supply Tracking

Hackathon Challenge
How might we design a proof-of-concept system that helps wheelchair users and others with limited mobility track, access, and manage essential medical supplies reliably and independently?

In Their Words
“Because of my spinal cord injury, I often have to keep supplies like catheters, wound dressings, and medications in places I can’t reach. I can’t easily see what I have, track what I’ve used, or know when I’m running low. Caregivers fetch items and are supposed to log usage, but often forget. Mistakes happen, and I risk running out of critical supplies.”

Why It Matters
Running out of or missing expired medical supplies can quickly become a health emergency. Reliable, accessible tracking isn’t just convenient — it’s essential for independence and safety.

What's Been Tried (and Falls Short)

- Inventory apps (e.g., Sortly) → not designed for accessibility (tiny fonts, cluttered screens, no voice input).
- Smart cameras → require manual checks, no integration with reminders.
- Caregiver logging → inconsistent and often forgotten.

Communication & Voice

Challenge #11: Clearer Voice in Noise

Hackathon Challenge
How might we design a proof-of-concept system that helps people with weak or unclear voices be better understood in noisy environments?

In Their Words
"In 2022, I developed a left vocal cord paralysis. My voice became high-pitched, breathless, and difficult to understand. After surgery, I improved somewhat, but I still struggle in noisy places. At a recent conference poster session, when I tried to ask questions, no one understood me. Talking on the phone is unpredictable too, sometimes fine, sometimes not.

When people can't understand my speech, they sometimes assume I also can't think clearly. Add to that being elderly and female, and it becomes socially and professionally limiting. Today, I wouldn't submit a paper to a conference or accept a speaking engagement. My appearance I can manage, but I cannot change my voice. Could there be a microphone-like device that makes my voice louder and clearer?"

Why It Matters
Many people live with vocal cord disorders from surgery complications, accidents, or conditions present at birth. Current options are limited to surgery, therapy, or "learning to live with it." A new solution could restore independence, participation, and dignity.

What's Been Tried (and Falls Short)

- Lifestyle changes: scheduling Zoom instead of phone calls, preferring online groups to in-person meetings
- Avoidance: limiting noisy environments and public speaking opportunities
- Additional surgery is an option, but not a preferred path

Challenge #12: Universal Voice Access

Hackathon Challenge
How might we design a proof-of-concept universal voice control system that fills the gaps

left by current tools like iPhone Voice Control, Alexa, or Roku? The goal isn't to build a perfect solution, but to show how voice could reliably:

- Complete actions that currently get "stuck" (e.g., pressing **Send** in a health app, clicking **Buy Now** on a website).
- Work consistently across different apps and devices.
- Avoid false triggers (e.g., when the TV says a number).
- Respond to the user's voice, even at low volume.

In Their Words

My husband has progressive multiple sclerosis and no use of his hands or legs. He relies completely on voice for independence. While he can use his iPhone, Echo Show, and Roku by voice, there are big gaps. For example, he can search for items online but can't activate the purchase button. He can type a message to his doctor in the app, but can't press send. If the wifi goes down, he can't restart it. On the iPhone, voice commands are numbered, but if he's watching TV and a number is spoken, his phone accidentally activates it. We need a universal voice system that works across devices and apps, only responds to his voice, and can hear him even when he speaks softly.

Why It Matters

When voice commands are a person's only form of independence, they must work reliably. A more consistent, affordable voice system could dramatically improve quality of life, ensure safety in emergencies, and reduce caregiver burden.

What's Been Tried (and Falls Short)

- iPhone and Echo Show → limited by what commands each app supports.
- Dragon dictation → works for text but not app control.
- Smart home devices (Ecobee, Ring, Alexa-enabled shades) → useful but siloed, not universal.