### **Real-Time Communication System Powered by AI for Specially Abled**

# **Sign Language Recognition System for People with Disability using Machine Learning and Image Processing :**

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Communication plays a significant role in making the world a better place. Communication creates bonding and relations among the people, whether persona, social, or political views. Most people communicate efficiently without any issues, but many cannot due to disability. They cannot hear or speak, which makes Earth a problematic place to live for them. Even simple basic tasks become difficult for them. Disability is an emotive human condition. It limits the individual to a certain level of performance. Being deaf and dumb pushes the subject to oblivion, highly introverted. In a world of inequality, this society needs empowerment. Harnessing technology to improve their welfare is necessary. In a tech era, no one should be limited due to his or her inability. The application of technology should create a platform or a world of equality despite the natural state of humans. On the other hand, technology is the most innovative thing on Earth for every time the clock ticks, researchers, software engineers, programmers, and information technology specialists are always coming up with bright ideas to provide convenience to everyone. This paper shows how artificial intelligence is being used to help people who are unable to do what most people do in their everyday lives. Aligned with communication, D-talk is a system that allows people who are unable to talk and hear be fully understood and for them to learn their language easier and also for the people that would interact and communicate with them. This system provides detailed hand gestures that show the interpretation at the bottom so that everyone can understand them. This research allows the readers to learn the system and what it can do to people who are struggling with what they are not capable of and will provide the technical terms on how the system works.

# **AI enabled sign language recognition and VR space bidirectional communication using triboelectric smart glove :**

Authors :[**Feng Wen**](https://www.nature.com/articles/s41467-021-25637-w#auth-Feng-Wen)**,**[**Zixuan Zhang**](https://www.nature.com/articles/s41467-021-25637-w#auth-Zixuan-Zhang)**,**[**Tianyiyi He**](https://www.nature.com/articles/s41467-021-25637-w#auth-Tianyiyi-He)**,**[**Chengkuo Lee**](https://www.nature.com/articles/s41467-021-25637-w#auth-Chengkuo-Lee)

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Sign language recognition, especially the sentence recognition, is of great significance for lowering the communication barrier between the hearing/speech impaired and the non-signers. The general glove solutions, which are employed to detect motions of our dexterous hands, only achieve recognizing discrete single gestures (i.e., numbers, letters, or words) instead of sentences, far from satisfying the meet of the signers’ daily communication. Here, we propose an artificial intelligence enabled sign language recognition and communication system comprising sensing gloves, deep learning block, and virtual reality interface. Non-segmentation and segmentation assisted deep learning model achieve the recognition of 50 words and 20 sentences. Significantly, the segmentation approach splits entire sentence signals into word units. Then the deep learning model recognizes all word elements and reversely reconstructs and recognizes sentences. Furthermore, new/never-seen sentences created by new-order word elements recombination can be recognized with an average correct rate of 86.67%. Finally, the sign language recognition results are projected into virtual space and translated into text and audio, allowing the remote and bidirectional communication between signers and non-signers.

# **Imagining Artificial Intelligence Applications with People with Visual Disabilities :**

Authors : **Cecily Morrison,Edward Cutrell,Anupama Dhareshwar,Kevin Doherty,AnjaThieme,Alex Taylor**

Published in 2017

There has been a surge in artificial intelligence (AI) technologies co-opted by or designed for people with visual disabilities. Researchers and engineers have pushed technical boundaries in areas such as computer vision, natural language processing, location inference, and wearable computing. But what do people with visual disabilities imagine as their own technological future? To explore this question, we developed and carried out tactile ideation workshops with participants in the UK and India. Our participants generated a large and diverse set of ideas, most focusing on ways to meet needs related to social interaction. In some cases, this was a matter of recognizing people. In other cases, they wanted to be able to participate in social situations without foregrounding their disability. It was striking that this finding was consistent across UK and India despite substantial cultural and infrastructural differences. In this paper, we describe a new technique for working with people with visual disabilities to imagine new technologies that are tuned to their needs and aspirations. Based on our experience with these workshops, we provide a set of social dimensions to consider in the design of new AI technologies: social participation, social navigation, social maintenance, and social independence. We offer these social dimensions as a starting point to forefront users' social needs and desires as a more deliberate consideration for assistive technology design.

# **AI fairness for people with disabilities :**

Authors : **Shari Trewin,Sara Basson,Michael Mulle,Stacy Branham**

Published in 2019

In society today, people experiencing disability can face discrimination. As artificial intelligence solutions take on increasingly important roles in decision-making and interaction, they have the potential to impact fair treatment of people with disabilities in society both positively and negatively. We describe some of the opportunities and risks across four emerging AI application areas: employment, education, public safety, and healthcare, identified in a workshop with participants experiencing a range of disabilities. In many existing situations, non-AI solutions are already discriminatory, and introducing AI runs the risk of simply perpetuating and replicating these flaws. We next discuss strategies for supporting fairness in the context of disability throughout the AI development lifecycle. AI systems should be reviewed for potential impact on the user in their broader context of use. They should offer opportunities to redress errors, and for users and those impacted to raise fairness concerns. People with disabilities should be included when sourcing data to build models, and in testing, to create a more inclusive and robust system. Finally, we offer pointers into an established body of literature on human-centred design processes and philosophies that may assist AI and ML engineers in innovating algorithms that reduce harm and ultimately enhance the lives of people with disabilities.

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# **Comparative study on emotions analysis from facial expressions in children with and without learning disabilities in virtual learning environment :**

Author : [**Nihal Ouherrou**](https://link.springer.com/article/10.1007/s10639-018-09852-5#auth-Nihal-Ouherrou)**,**[**Oussama Elhammoumi**](https://link.springer.com/article/10.1007/s10639-018-09852-5#auth-Oussama-Elhammoumi)**,**[**Fatimaezzahra Benmarrakchi**](https://link.springer.com/article/10.1007/s10639-018-09852-5#auth-Fatimaezzahra-Benmarrakchi)**,**[**Jamal El Kafi**](https://link.springer.com/article/10.1007/s10639-018-09852-5#auth-Jamal-El_Kafi)

Published in 2019

Children with Learning Disabilities (LDs) show some emotional difficulties and behavioural problems in the classroom compared with their peers without LDs. Emotions constitute an important part of the learning process. Recent evidence suggests that the use of Information and Communication Technology (ICT) in special education permits to remove barriers in learning for the target children. Besides, it offers a learning environment for a diversity of emotional experiences. In this present study, we explored the benefits of ICT use to identify the ways in which emotions are involved during the learning process in Virtual Learning Environments (VLE). We conducted a user study with 42 children divided into two groups; experimental group (*n* = 14) and age matched control group (*n* = 28) to compare their emotional experiences in VLE. We used advances in Artificial Intelligence (AI) to detect children’s emotions through their facial expressions by analysing seven basic facial emotion expressions (angry, disgust, fear, happy, sad, surprise and neutral) while playing an educational game. The initial results indicate that emotions are present in VLE and they appear to suggest that children with LDs experience the same emotions as their peers without LDs in VLE. Besides, they show that children with LDs experience less negative emotions compared to literature evidence about the presence of a higher level of negative emotions in the classroom.

# **Binary particle swarm optimization (BPSO) based channel selection in the EEG signals and its application to speller systems :**

Author : **Murat Arican,Kemal Polat,Kemal Polat**

Published in 2020

Social participation of people with disabilities has increased with state-supported projects recently. However, even in neuromuscular diseases such as Motor Neurone Disease (MND), Full Sliding Status (TSD), even the communication skills of individuals are interrupted. Brain-Computer Interfaces (BBA), which have a few decades of history and an increasing number of studies with exponential momentum, are being developed to enable individuals with such disorders to communicate with their environment. Spelling systems are BBA systems that detect the letters that the person focuses on the matrix of letters and numbers on a screen and convert them into text through the application. In this context, with the random flashing of the letters on the screen, it aims to detect the electrical changes occurring in the brain as a result of the stimulus given to the person. Research reveals that the stimulus that the individual encounters causes an amplitude in the EEG signal called P300, between 250 and 500 ms. Brain-computer interfaces are used through EEG signals to provide environmental interactions for individuals with restricted movements due to stroke or neurodegenerative diseases. The multi-channel structure of EEG signals both increases system cost and reduces processing speed. For this reason, reducing the system cost by detecting more active electrodes during the process increases the accessibility of people. In this context, the use of optimization techniques in electrode selection is used to determine the most effective channels by a random selection method. In the study, the particle herd optimization algorithm, one of the herd-based optimization techniques, was used with two classifiers, SVM and Boosted Tree, and the eight most frequently selected channels were determined to improve system performance in terms of speed and accuracy.

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# **AI Fairness for People with Disabilities: Point of View :**

Author : [Shari Trewin](https://arxiv.org/search/cs?searchtype=author&query=Trewin%2C+S)

Published in 2018

We consider how fair treatment in society for people with disabilities might be impacted by the rise in the use of artificial intelligence, and especially machine learning methods. We argue that fairness for people with disabilities is different to fairness for other protected attributes such as age, gender or race. One major difference is the extreme diversity of ways disabilities manifest, and people adapt. Secondly, disability information is highly sensitive and not always shared, precisely because of the potential for discrimination. Given these differences, we explore definitions of fairness and how well they work in the disability space. Finally, we suggest ways of approaching fairness for people with disabilities in AI applications.

# **Wheelchair simulator game for training people with severe disabilities :**

Author : [**Oberdan R. Pinheiro**](https://ieeexplore.ieee.org/author/37086067077)**;** [**Lynn R. G. Alves**](https://ieeexplore.ieee.org/author/37086062072)**;** [**M. F. M. Romero**](https://ieeexplore.ieee.org/author/37086060919)**;** [**Josemar R. de Souza**](https://ieeexplore.ieee.org/author/37086065812)

Published in 2016

People with motor and neurological impairments have little control over parts of their bodies, so they have great difficulty in walking. The development of solutions based on assistive technology dedicated to people with severe motor disabilities can provide accessibility and mobility, the intelligent wheelchair is an example of this type of technology. However, its use without proper training can be dangerous, a wheelchair simulator game can be a good tool for training people with severe disabilities. The EEG signals can be used as a source of information that allows communication between the brain and an intelligent wheelchair. This research aimed to develop a computer model to categorise electroencephalogram signals and control a virtual wheelchair using motor imagery of the left and right wrists, both wrists and both feet. Signs of electroencephalogram were acquired through the eegmmidb database - EEG Motor Movement/Imagery Dataset, captured by the BCI2000 system, and electroencephalogram signal samples from 10 individuals were used to validate the model. The techniques used are promising, making possible its use in three-dimensional simulation environments for intelligent wheelchairs controlled by a brain-computer interface.

**Artificial intelligence, machine learning and health systems :**

Author : [**Trishan Panch**](https://pubmed.ncbi.nlm.nih.gov/?term=Panch%20T%5BAuthor%5D)**,** [**Peter Szolovits**](https://pubmed.ncbi.nlm.nih.gov/?term=Szolovits%20P%5BAuthor%5D)**,** [**Rifat Atun**](https://pubmed.ncbi.nlm.nih.gov/?term=Atun%20R%5BAuthor%5D)

Published in 2018

Globally, health systems face multiple challenges: rising burden of illness, multimorbidity and disability driven by ageing and epidemiological transition, greater demand for health services, higher societal expectations and increasing health expenditures . A further challenge relates to inefficiency, with poor productivity . These health system challenges exist against a background of fiscal conservatism, with misplaced economic austerity policies that are constraining investment in health systems.Fundamental transformation of health systems is critical to overcome these challenges and to achieve universal health coverage (UHC) by 2030. Machine learning, the most tangible manifestation of artificial intelligence (AI) – and the newest growth area in digital technology – holds the promise of achieving more with less, and could be the catalyst for such a transformation. But the nature and extent of this promise has not been systematically assessed.To date, the impact of digital technology on health systems has been equivocal. Is AI the ingredient for such a transformation, or will it face the same fate as earlier attempts at introducing digital technology? In this paper, we explore potential applications of AI in health systems and the ways in which AI could transform health systems to achieve UHC by improving efficiency, effectiveness, equity and responsiveness of public health and health care services.

# **Artificial intelligence and ambient intelligence :**

Author : [**Gams, Matjaz**](https://content.iospress.com/search?q=author%3A%28%22Gams,%20Matjaz%22%29)**,**[**Gu, Irene Yu-Hua**](https://content.iospress.com/search?q=author%3A%28%22Gu,%20Irene%20Yu-Hua%22%29)

Published in 2019

Ambient intelligence (AmI) is intrinsically and thoroughly connected with artificial intelligence (AI). Some even say that it is, in essence, AI in the environment. AI, on the other hand, owes its success to the phenomenal development of the information and communication technologies (ICTs), based on principles such as Moore’s law. In this paper we give an overview of the progress in AI and AmI interconnected with ICT through information-society laws, superintelligence, and several related disciplines, such as multi-agent systems and the Semantic Web, ambient assisted living and e-healthcare, AmI for assisting medical diagnosis, ambient intelligence for e-learning and ambient intelligence for smart cities. Besides a short history and a description of the current state, the frontiers and the future of AmI and AI are also considered in the paper.Intelligence refers to the ability to learn and apply knowledge in new situations . Artificial is something made by human beings and ambience is something that surrounds us. We also tend to consider ambient intelligence (AmI) to be something artificial; the phenomena in natural AmI are the subjects of biology and sociology. The scope of this paper is in human-centric technologies, which require a close alignment of both humans and artificial intelligence (AI) interacting with the environment. Many AI technologies generated by computers originate from the idea of emulating neurological functions and human intelligence.depicts some of the application areas of AmI; it shows some smart and intelligent systems surrounding the user deploying the AI technologies. In this sense AmI is not a particular technology, but essentially an experience of the user with respect to the service provided by those systems. The cost functions for optimising the AmI solutions are usually related to improving the subjective human experience, which is only indirectly measurable. Therefore, a successful application of AI and AmI requires us to select the best objective/cost functions that meet the subjective human experience in AmI.

**Triboelectric nanogenerator based self-powered sensor for artificial intelligence :**

Author : **Catherine Holloway**

Published in 2019

[Triboelectric nanogenerator](https://www.sciencedirect.com/topics/engineering/triboelectric-nanogenerators) based sensors have excellent material compatibility, low cost, and flexibility, which is a unique candidate technology for artificial intelligence. Triboelectric nanogenerators effectively provide critical infrastructure for a new generation of sensing systems that collect information by large amounts of self-powered sensors. This review mainly discusses capability and prospect of triboelectric nanogenerators being applied to intelligent sports, security, touch control, and document management systems. The above fields have paid increasing attention in artificial intelligence technologies, such as machine learning, big data processing and cloud computing, demanding huge amount of sensors and complicated sensors network.The review introduces the application capabilities and prospects of triboelectric nanogenerators (TENG) in intelligent sports, safety, touch control and document management systems. TENG based self-powered sensors are perfect for artificial intelligence (AI) applications in the future.

**Exclusion by design: intersections of social, digital and data exclusion :**

Author : [**Justine Humphry**](https://www.tandfonline.com/author/Humphry%2C+Justine)

Published in 2019

As smart technologies such as artificial intelligence (AI), automation and Internet of Things (IoT) are increasingly embedded into commercial and government services, we are faced with new challenges in digital inclusion to ensure that existing inequalities are not reinforced and new gaps that are created can be addressed. Digital exclusion is often compounded by existing social disadvantage, and new systems run the risk of creating new barriers and harms. Adopting a case study approach, this paper examines the exclusionary practices embedded in the design and implementation of social welfare services in Australia. We examined Centrelink’s automated Online Compliance Intervention system (‘Robodebt’) and the National Disability Insurance Agency’s intelligent avatar interface ‘Nadia’. The two cases show how the introduction of automated systems can reinforce the punitive policies of an existing service regime at the design stage and how innovative AI systems that have the potential to enhance user participation and inclusion can be hindered at implementation so that digital benefits are left unrealised.

# **Smartphone-Based Gaze Gesture Communication for People with Motor Disabilities :**

Author : **Xiaoyi Zhang,Harish Kulkarni,Meredith Ringel Morris**

**Published in 2018**

Current eye-tracking input systems for people with ALS or other motor impairments are expensive, not robust under sunlight, and require frequent recalibration and substantial, relatively immobile setups. Eye-gaze transfer (e-tran) boards, a low-tech alternative, are challenging to master and offer slow communication rates. To mitigate the drawbacks of these two status quo approaches, we created GazeSpeak, an eye gesture communication system that runs on a smartphone, and is designed to be low-cost, robust, portable, and easy-to-learn, with a higher communication bandwidth than an e-tran board. GazeSpeak can interpret eye gestures in real time, decode these gestures into predicted utterances, and facilitate communication, with different user interfaces for speakers and interpreters. Our evaluations demonstrate that GazeSpeak is robust, has good user satisfaction, and provides a speed improvement with respect to an e-tran board; we also identify avenues for further improvement to low-cost, low-effort gaze-based communication technologies.

**Robots and ICT to support play in children with severe physical disabilities :**

Author : [**Monique A. S. Lexis**](https://www.tandfonline.com/author/Lexis%2C+Monique+A+S)**,**[**Gert Jan Gelderblom**](https://www.tandfonline.com/author/Gelderblom%2C+Gert+Jan)**,**[**Rianne M. L. Janssens**](https://www.tandfonline.com/author/Jansens%2C+Rianne+M+L) **&**[**Luc P. de Witt**](https://www.tandfonline.com/author/de+Witte%2C+Luc+P)**e**

Published in 2015

Children with physical disabilities experience difficulties in play, especially those with severe physical disabilities. With the progress of innovative technology, the possibilities to support play are increasing. The purpose of this literature study is to gain insight into the aims, control options and commercial availability of information and communication technology (ICT) and robots to support play (especially play for the sake of play) in children with severe physical disabilities. *Methods*: A systematic literature search in the databases PubMed, CINAHL, IEEE and ERIC was carried out. Titles and abstracts were assessed independently by three reviewers. In addition, studies were selected using Google Scholar, conference proceedings and reference lists. *Results*: Three main groups of technology for play could be distinguished: robots (*n* = 8), virtual reality systems (*n* = 15) and computer systems (*n* = 4). Besides ICT and robots developed for specific therapy or educational goals using play-like activities, five of the in total 27 technologies in this study described the aim of “play for play’s sake”. *Conclusions*: Many ICT systems and robots to support play in children with physical disabilities were found. Numerous technologies use play-like activities to achieve therapeutic or educational goals. Robots especially are used for “play for play’s sake”.

# **Behaviour prediction using an improved Hidden Markov Model to support people with disabilities in smart homes :**

Author : [**Eying Wu**](https://ieeexplore.ieee.org/author/37085865199)**;** [**Peng Zhang**](https://ieeexplore.ieee.org/author/37085873314)**;** [**Tun Lu**](https://ieeexplore.ieee.org/author/37403550200)**;** [**Hansu Gu**](https://ieeexplore.ieee.org/author/37574486000)**;** [**Ning G**](https://ieeexplore.ieee.org/author/37267636800)**u**

Published in 2017

Smart environment has evolved as a hot research topic with the development of machine learning algorithms and wireless communication technologies. Existing smart home solutions usually need inhabitants to operate device controllers directly. However, for people with disabilities, it is inconvenient and difficult to perform such manual operations. Therefore, it is important to develop automatic and intelligent services to reduce operation inconvenience and improve comfort level. In this paper, an Improved Hidden Markov Model (IHMM) is presented to support personalised behaviour prediction for people with disabilities. The model can learn behaviour patterns of users and provide services to inhabitants automatically. Moreover, by breaking the time invariant hypothesis in Hidden Markov Model, we incorporate time information as positions of states, and develop a temporal state transition matrix to replace the fixed state transition matrix to demonstrate the probabilities of state transitions. As a result, different values of daily temperature sections are characterised and identified as hidden variables, which guide user activities. Evaluation of proposed work has shown that IHMM improves the prediction accuracy by at least 10% compared to the traditional HMM.

# **Brain Computer Interface for Synthesised Speech Communication for the Physically Disabled :**

Author :[**SumitSoman,B.K.Murthy**](https://www.sciencedirect.com/science/article/pii/S1877050915000873#!)

Published in 2019

Brain Computer Interface (BCI) systems have been widely used to develop viable assistive technology for physically disabled persons. In this paper, we present the design and development of a BCI-based system for generation of synthesised speech, which works on eye-blinks detected from the Electroencephalogram (EEG) signals of the user. Such a system is particularly useful for patients suffering from locomotive disorders such as locked-in syndrome, who can use this interface to communicate with their caretakers. This system enables patients to communicate by selecting the desired options from a configured list by performing eye-blinks, which is then converted to synthesised speech by the computer system. The key advantages of our system are that it uses the portable and easy-to-wear Emotiv headset, is built on using an open-source application stack and also does not require training for individual users. The system has been tested on patients who have been able to use it conveniently to communicate with their caretakers in a medical facility.

# **Communication Services and Supports for Individuals With Severe Disabilities :**

Author : **Susan Bruce; Amy Goldman; Karen Erickson; Beth Mineo**

Published in 2018

The National Joint Committee for the Communication Needs of People With Severe Disabilities (NJC) reviewed literature regarding practices for people with severe disabilities in order to update guidance provided in documents originally published in 1992. Changes in laws, definitions, and policies that affect communication attainments by persons with severe disabilities are presented, along with guidance regarding assessment and intervention practices. A revised version of the Communication Bill of Rights, a powerful document that describes the communication rights of all individuals, including those with severe disabilities is included in this article. The information contained within this article is intended to be used by professionals, family members, and individuals with severe disabilities to inform and advocate for effective communication services and opportunities.

# **Solar Powered Multi-Controlled Smart Wheelchair for Disabled: Development and Features :**

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Published in 2020

As per the report presented by the World Health Organization, it is well aware that 15% of the total world’s population is physically challenged. Accessibility of health care services is limited to people with physical disabilities. The utilisation of battery powered wheelchairs with excellent navigational capabilities is one of the extraordinary strides towards the incorporation of severely physically and mentally challenged people. Motion, movement and localization are significant issues for the blind, paraplegic and handicapped people who are accompanied by eminent tiresome work. There exist different systems to override the problems described, allowing the end-user to perform safe movements and complete certain daily life tasks. Considering the said issues as a motivation, this work presents the design and development of Solar Powered Multi-Controller Smart Wheelchair. The developed smart wheelchair using eye blink sensor to steer the wheelchair for quadriplegia patient along with Joystick and Keypad module for several kinds of disabilities. In addition, more liberty is provided to the disabled person by using additional sensors such as heartbeat sensor and a temperature sensor which continuously monitors the health condition of the patient. Additionally, a urine level indicator is also used to avoid inconvenience to the patient. If the patient falls down along with a wheelchair, a fall detection system in the wheelchair detects the same. All the detail can be shared with hospital staff and the patient’s guardian during a contingency condition, so that the staffs and guardians can take immediate actions. The safety of the patient and the wheelchair with respect to the incorporation of solar power is highly given priority during this system design.

# **Service robot system with integration of wearable Myo armband for specialised hand gesture human–computer interfaces for people with disabilities with mobility problems :**

Author : [**Ing-J,rDing,Rui-ZhiLin,Zong-YiLin**](https://www.sciencedirect.com/science/article/abs/pii/S0045790617329920#!)

Published in 2017

Hand gestures will become a mainstream method of manipulating [human computer interfaces](https://www.sciencedirect.com/topics/computer-science/human-computer-interfaces) (HCIs). For disabled people with mobility problems, hand gesture-based HCIs should be specifically designed. To achieve effective hand gesture HCIs, this study integrated a mobile service robot platform, three-dimensional (3D) [imaging sensors](https://www.sciencedirect.com/topics/computer-science/imaging-sensor), and wearable Myo armband device. Four kernel techniques are presented: (1) Myo armband [software development kit](https://www.sciencedirect.com/topics/computer-science/software-development-kit) hand [gesture recognition](https://www.sciencedirect.com/topics/computer-science/gesture-recognition) using a two-layer hierarchy scheme to significantly increase hand gesture command numbers, (2) identity recognition of users using clustering-based [support vector machine](https://www.sciencedirect.com/topics/computer-science/support-vector-machine) [classifiers](https://www.sciencedirect.com/topics/computer-science/classification-machine-learning) with a designed [root mean square](https://www.sciencedirect.com/topics/engineering/root-mean-square) surface [electromyography](https://www.sciencedirect.com/topics/computer-science/electromyography) (RMS-sEMG) feature, (3) robot vehicle navigation with effective obstacle avoidance using a conceptually simple and computationally fast approach, and (4) efficient vehicle positioning based on the face-detection information of the user provided from the 3D imaging sensor to receive the hand gestures commands of the user with disabilities.Artificial intelligence (AI) has been paid substantial attention, and prototype systems have been fabricated for AI system developers to use for constructing applications , AI development prototypes for three-dimensional RGB-depth (3D RGBD) sensors , wearable devices and mobile platformsBecause of improvements in AI, a revolution in human–computer interfaces (HCIs) is likely to occur, which will include (1) biometric recognition using a person's active hand gesture data for controlling a targeted system and (2) mobile-based service robots with 3D sensor navigation. These hand gesture recognition HCIs will represent an alternative to mature voice control-based speech recognition. Instead of conventional navigation strategies for robotic movement, including person movement tracking or colored track deployment, navigation using 3D sensors will be applied on mobile robots in the near future.

# **Disability digital divide: the use of the internet, smartphones, computers and tablets among people with disabilities in Sweden :**

Author : [**Stefan Johansson**](https://link.springer.com/article/10.1007/s10209-020-00714-x#auth-Stefan-Johansson)**,**[**Jan Gulliksen**](https://link.springer.com/article/10.1007/s10209-020-00714-x#auth-Jan-Gulliksen)**,**[**Catharina Gustavsson**](https://link.springer.com/article/10.1007/s10209-020-00714-x#auth-Catharina-Gustavsson)

Published in 2020

Although Sweden is one of the most digitised countries and the Swedish population’s use of the internet is among the most studied in the world, little is known about how Swedes with disabilities use the internet. The purpose of this study is to describe use of and perceived difficulties in use of the internet among people with disabilities and to explore digital divides in-between and within disability groups, and in comparison with the general population. This is a cross-sectional survey targeting the same issues as other nationwide surveys but adapted for people with cognitive disabilities. Participants were recruited from May to October 2017 by adaptive snowball sampling. The survey comprised questions on access to and use of devices, and use of and perceived difficulties in use of the internet. A total of 771 people responded to the survey, representing 35 diagnoses/impairments. Larger proportions of people with autism, ADHD and bipolar disorder reported using the internet than other disability groups. Women with autism used the internet more than any other disability group, and women with aphasia used the internet the least. People with disabilities related to language and understanding reported more difficulties using the internet than other disability groups. Larger proportions of participants than the general Swedish population reported not feeling digitally included. In many but not all disability groups, larger proportions of men than women reported not feeling digitally included. Our findings show that there are differences in digital inclusion between sub-groups of diagnoses/impairments. Thus, disability digital divides are preferably investigated by sub-grouping disabilities, rather than studied as one homogeneous group.