

# Differently Enabled. Study and Methods of Augmentative Human Computer Interfaces that can detect, assist and include differently abled people into day to day life

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One billion people, or 15% of the world's population, experience some form of disability. Persons with disabilities, on average as a group, are more likely to experience adverse socioeconomic outcomes than persons without disabilities.

-- The World Bank on Disability, Oct 2020

<https://www.worldbank.org/en/topic/disability>

## Summary

Accessibility guidelines, policies and mandates are increasing in importance and criticality, rightly so. Not being sensitive to individual's abilities to learn, adapt and cope is a form of exclusion in itself. Certain conditions are degenerative and could worsen on repeated (ab)use of improper interaction patterns. For instance, constant use of mouse and QWERTY keyboards has been the biggest contributors to Repetitive Stress Injury (RSI), yet we do not have mainstream success in alternative methods. On the other hands, kids with learning disabilities are only now beginning to see some assistive tools to augment their learning.

But several accessibility guidelines are an afterthought designed to assist knowledge capture and/or dissipation (or in general, an interaction) for *already* differently abled people. While it is an inclusive approach, it is inefficient in curbing the alarming rate of increase in disabilities.

In this research, I hope to document issues, possible methods to detect indicators of an early onslaught of disabilities and methods that can arrest degeneration, augment learning and interaction into a series of Augmentative Interaction Patterns & Systems powered by Artificial Intelligence.

## Specific Aims

The primary goal of this research is to

- Identify and catalogue known traits and warnings that indicate disabilities which would be the foundation of an AI powered monitoring system, that continuously monitor for early indicators.
- Develop a model for self learning interaction system that can trained and tailored to every individuals need. To build and scale such a system requires a fundamentally strong automated and augmentative Artificial Intelligence system.
- Future research can be built upon these methods that specializes such a system with Industry specific assistive systems. For example, A Math visualization assistant for Primary school kids, Voice and Visual programming for Software Engineers, Tailor made work-break-work recommender system for employees under high risk for musculoskeletal disorders.

According to the Occupational Safety and Health Administration (OSHA), RSI affects some 1.8 million workers per year. One government study puts the cost of RSI between \$17 billion and \$20 billion a year.

-- Healthday Report, Dec 2019

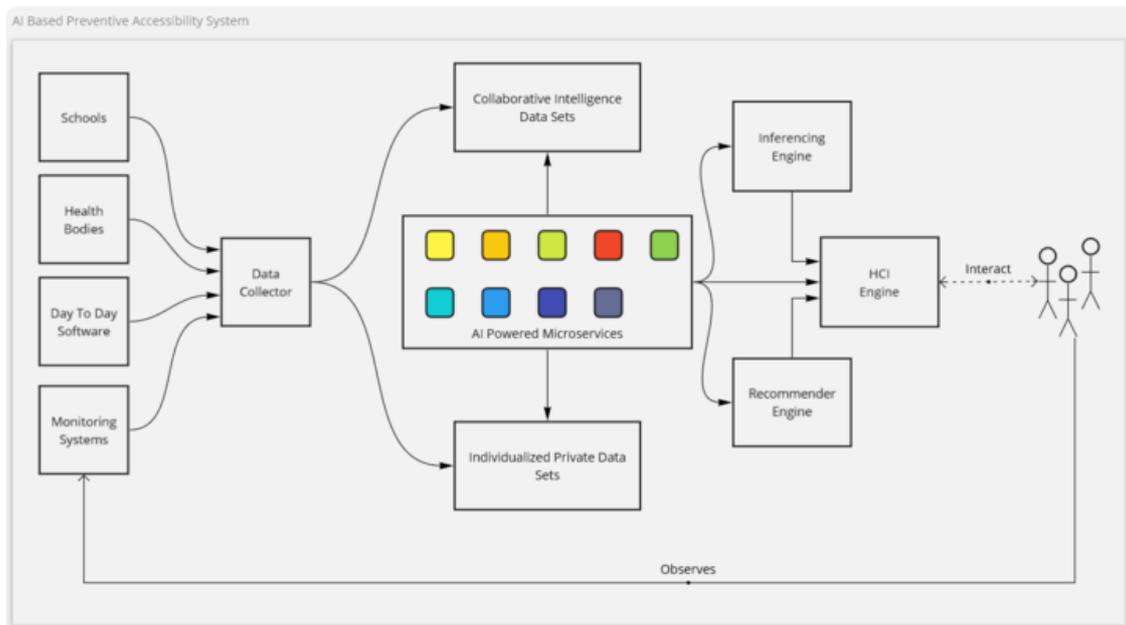
<https://consumer.healthday.com/encyclopedia/pain-management-30/pain-health-news-520/repetitive-stress-injury-rsi-646236.html>

## Background and Significance

### Experimental Design and Methods

In order to build a coherent pipeline for a self-learning system that is oriented towards preventive accessibility, we must adopt and establish open data initiatives in a common protocol to capture and interpret data. The data could be grouped into Anonymized collaborative intelligence data sets, access controlled individualized assessment data sets and a pattern catalogue. A series of AI assisted microservices could operate on the data sets to identify, enrich and derive a recommendation. Once a series of recommendations are derived, a multi-modal interaction paradigm that could use, Voice, Video, Augmented Reality, Virtual Reality, Mixed Reality, Touch-screen and other immersive interaction models that could be adopted in a preventive or prescriptive manner.

The last decade has seen a resurgence in voice assisted systems like Alexa, Google Mini. The key takeaway is its affordability which has made them very pervasive from miniaturized home devices to built into speaker and phones. Their applications are, however, still in very early stages and more general purposes or entertainment oriented. Special purpose systems or extensions to the same can be adopted to make these services pervasive to consumers.



## References

1. World Bank - <https://www.worldbank.org/en/topic/disability>
2. Healthday - Health Journal - Repetitive Stress Injury (RSI)
3. Software Engineer with Disabilities - <https://medium.com/@jcalderaio/started-coding-at-30-with-a-disability-6f9b81fff049>