



Inner Emotions of Individuals with Autism: A Systematic Literature Review

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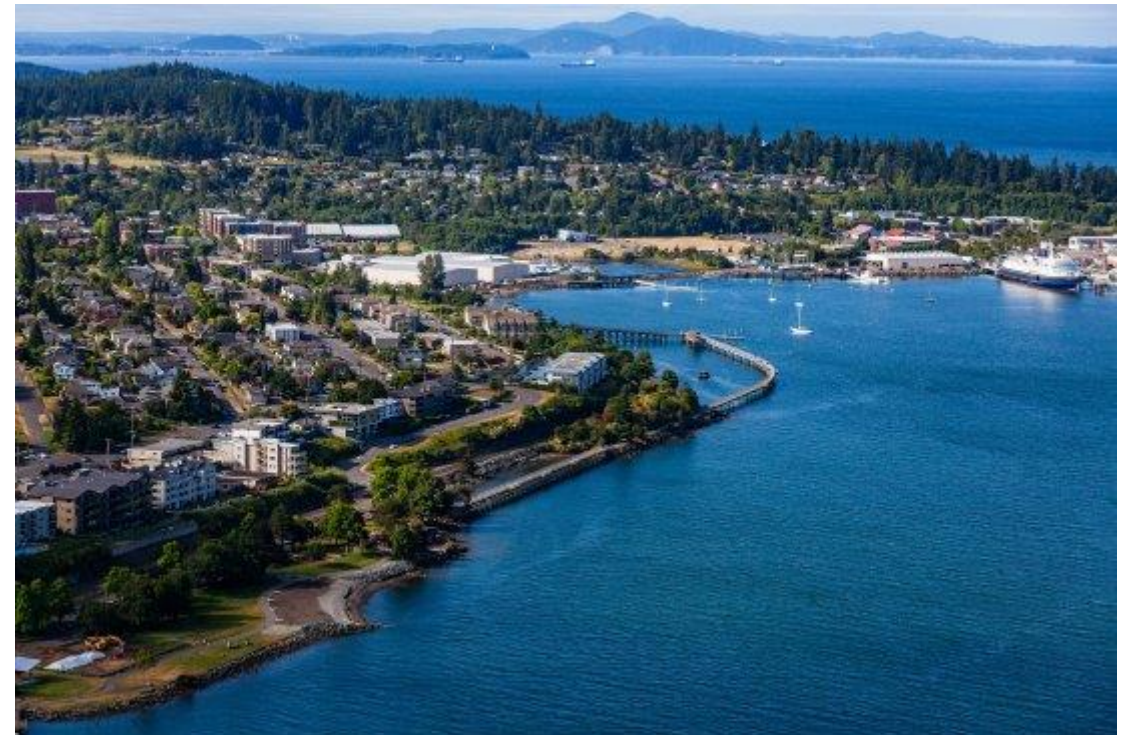
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Special Thanks to Zoe Wallin



How many of you are familiar with autism?



- 1970: 1 in 10,000 children identified with autism.
- 2020: 1 in **X** children identified with autism

What is X?

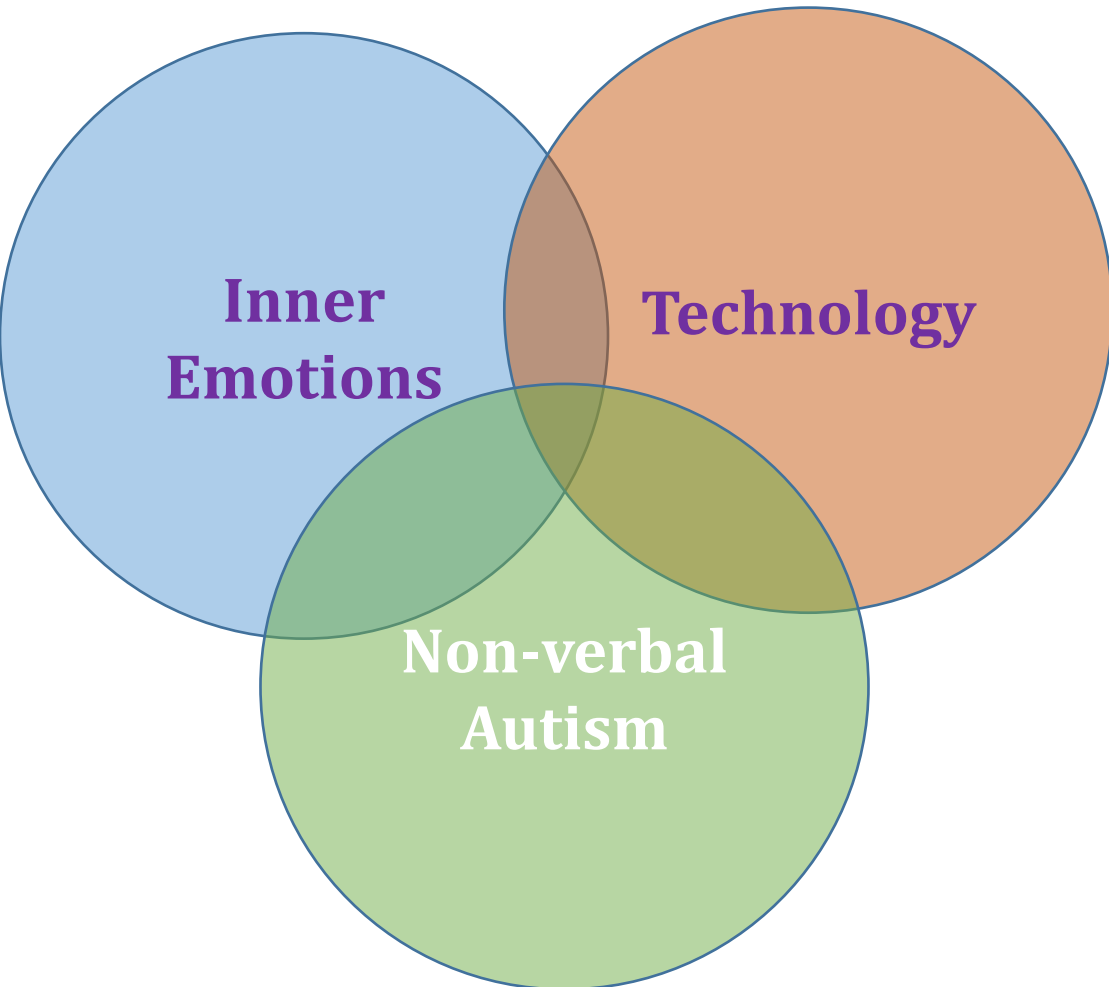
Y% of children with autism **do not speak.**

What is Y?



“I wish I knew what was happening inside my daughter’s mind”

The BIG Picture

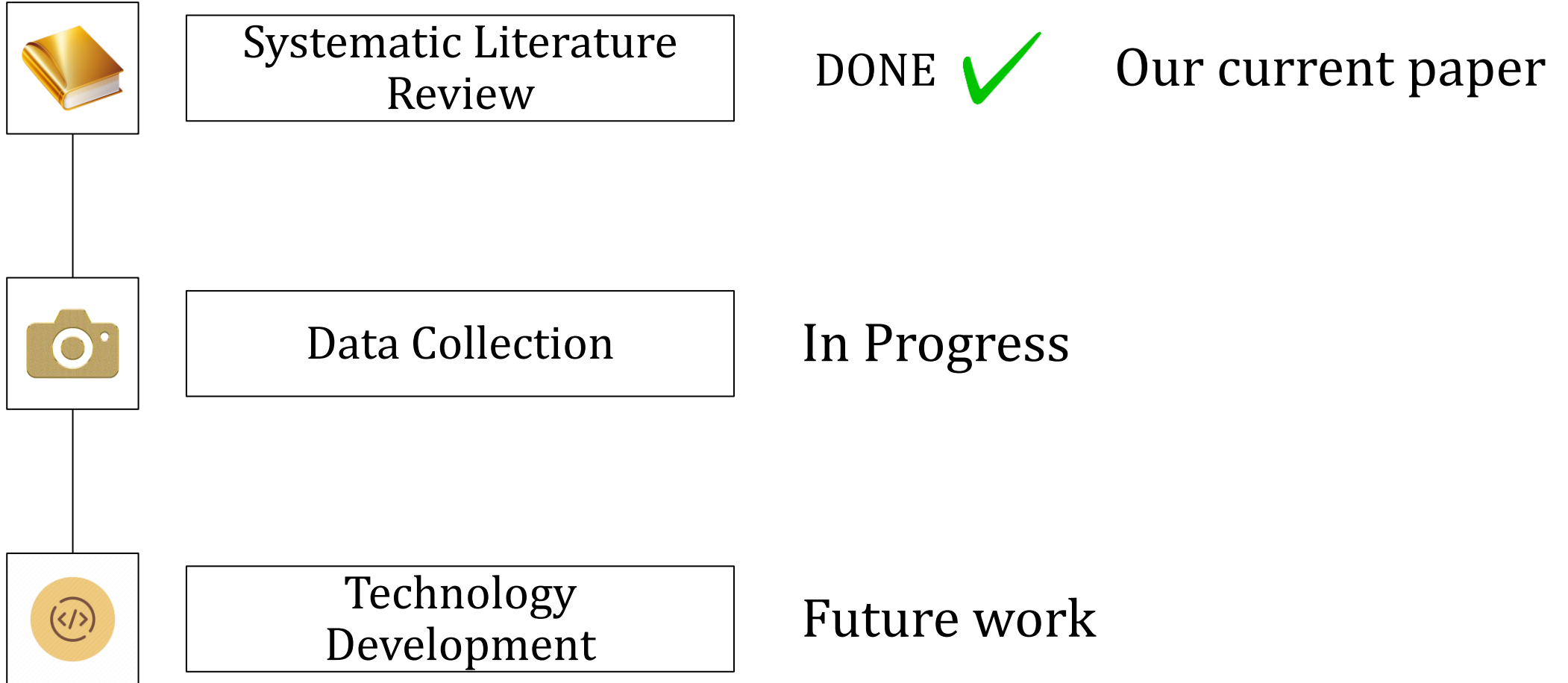


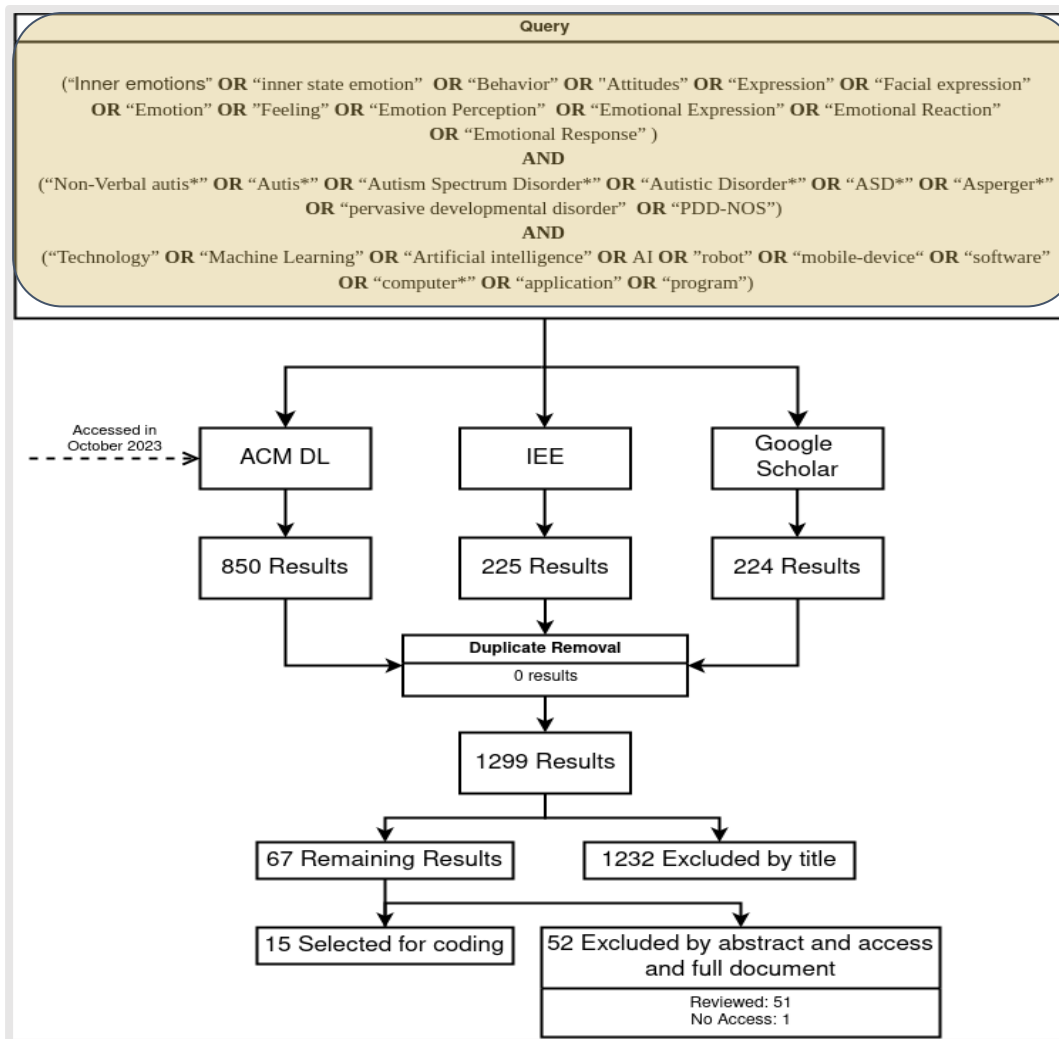
To develop a technology that allows non-verbal individuals with autism to express their inner emotions (e.g., joy, sadness, anxiety) and others to understand their emotions.

“It’s not a small potato”

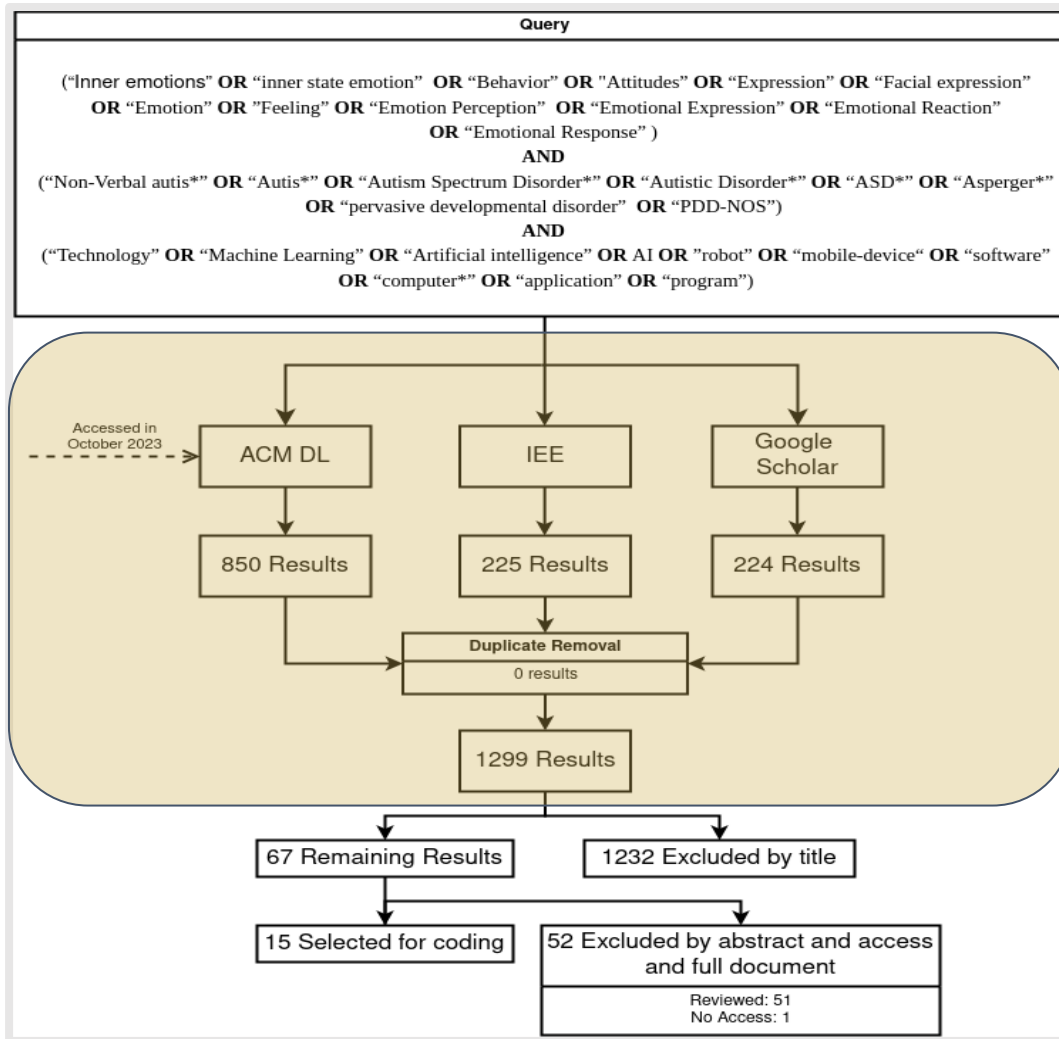


Methodology



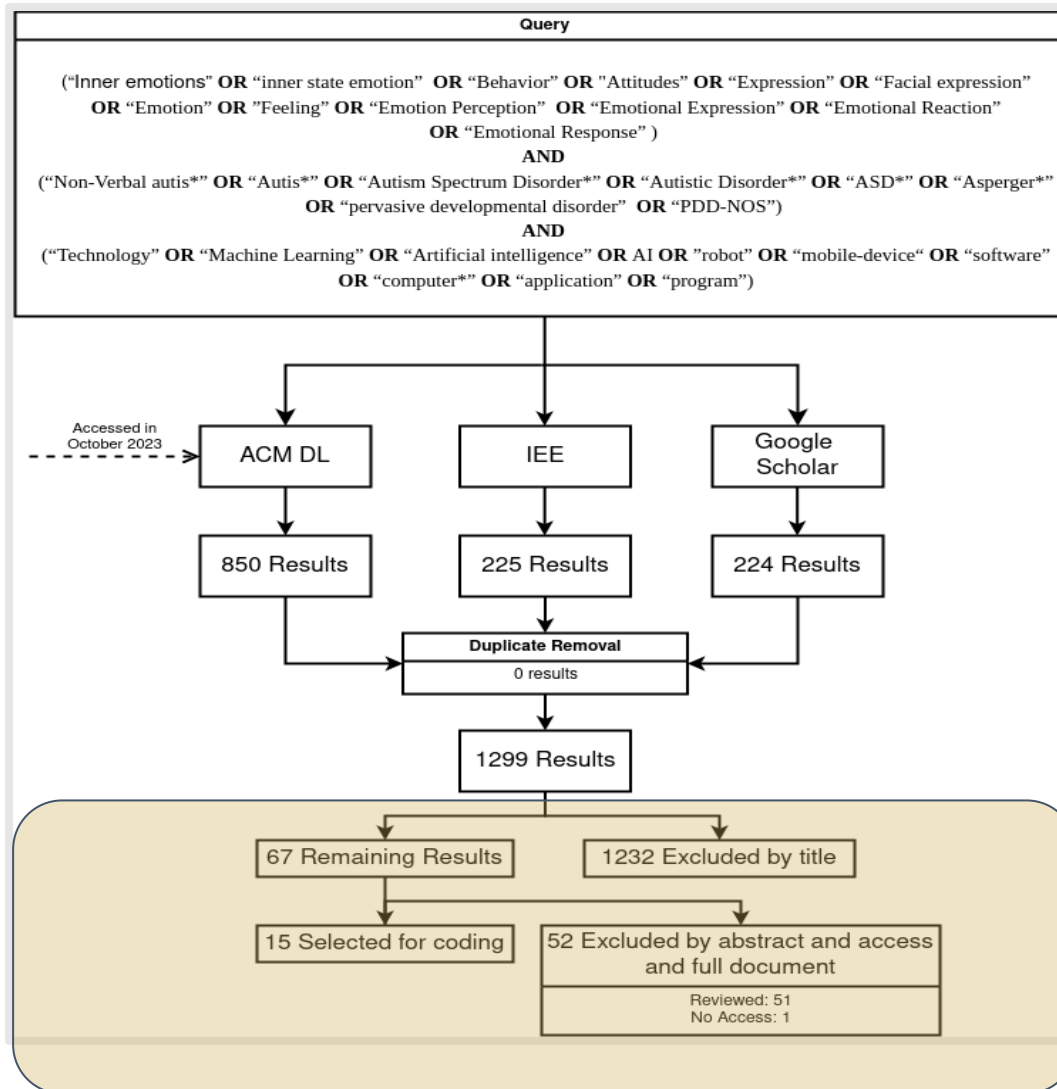


PRISMA(Preferred Reporting Items for Systematic reviews and Meta-Analyses)



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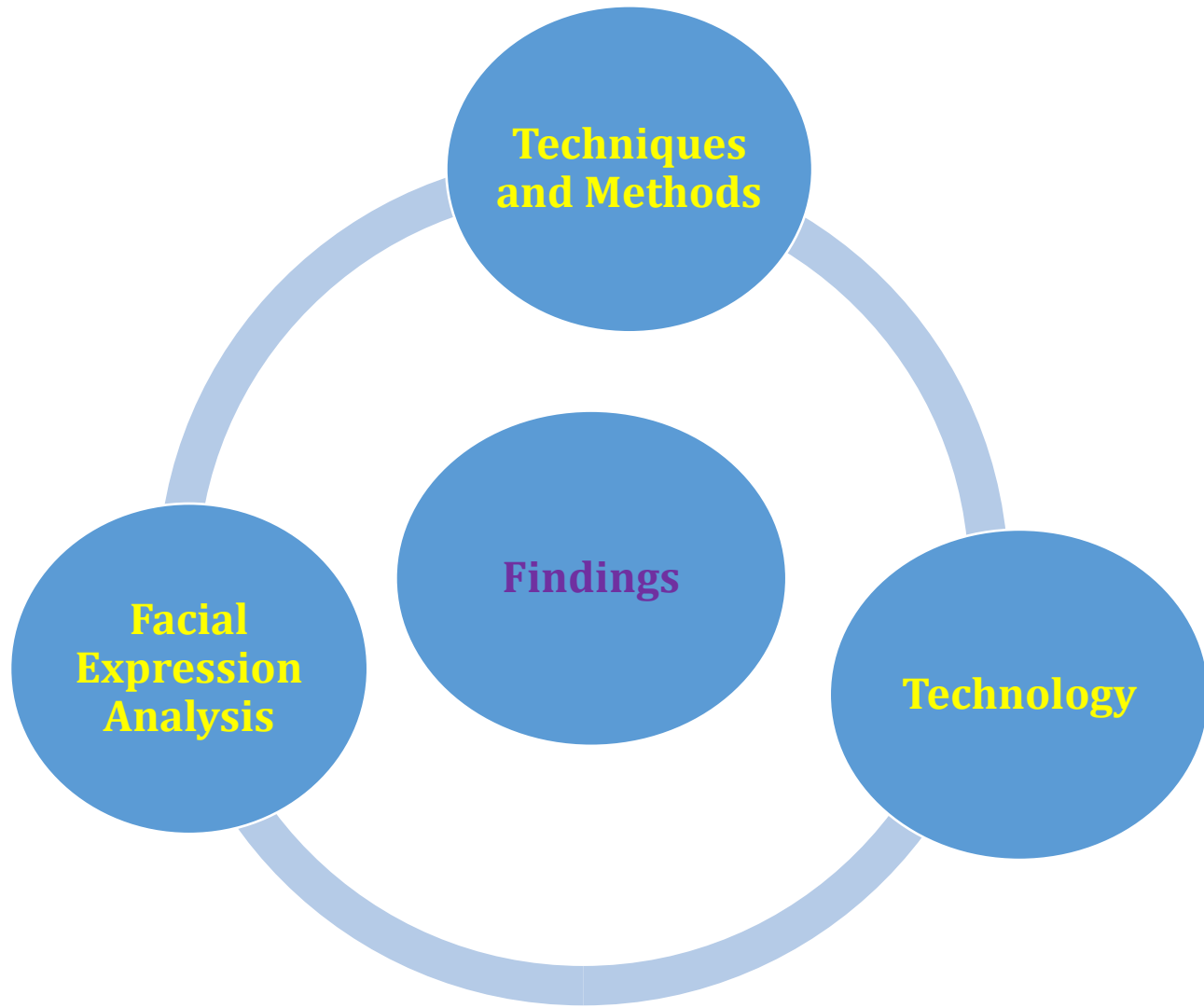


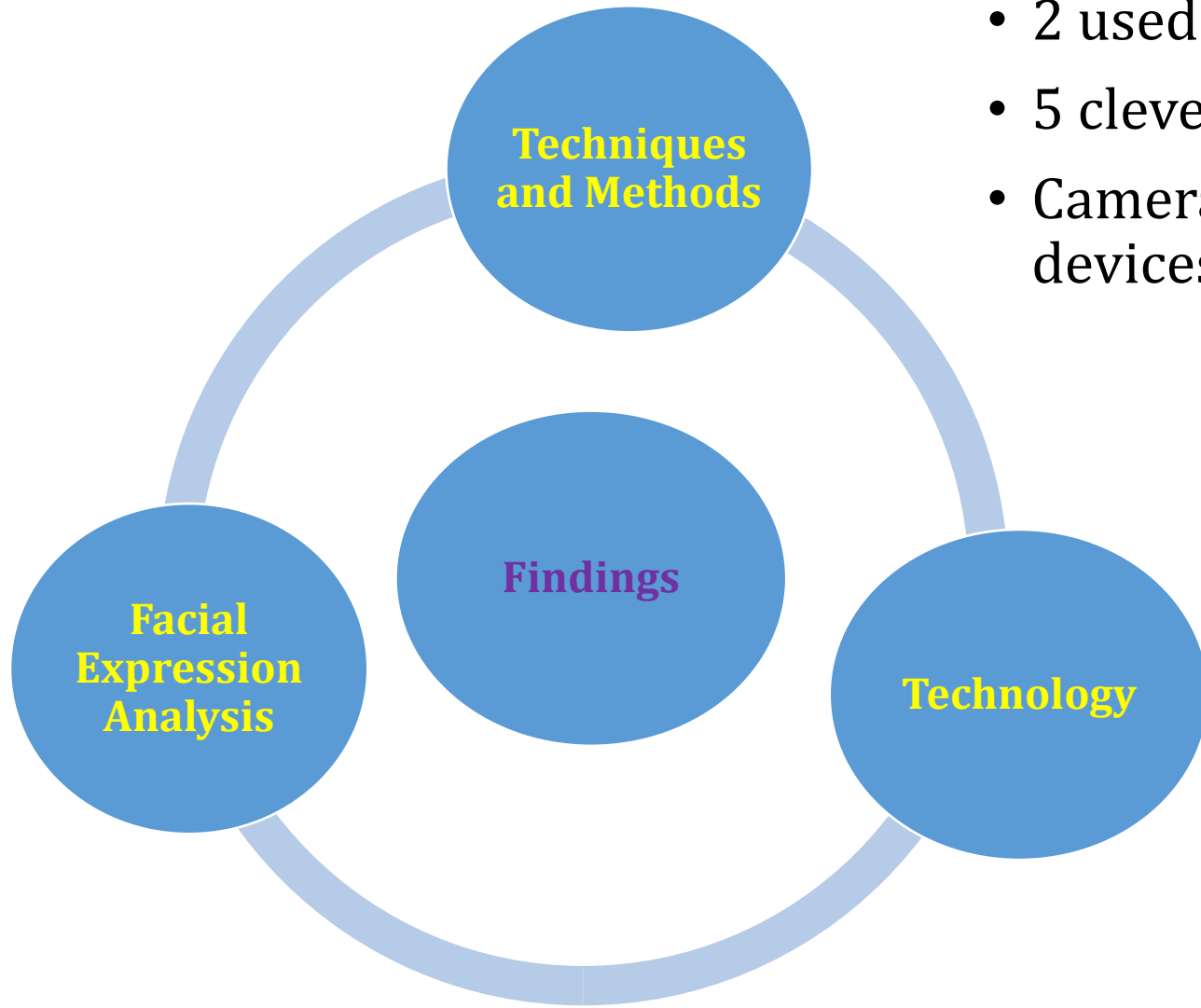
Atlas.ti

PRISMA(Preferred Reporting Items for Systematic reviews and Meta-Analyses)

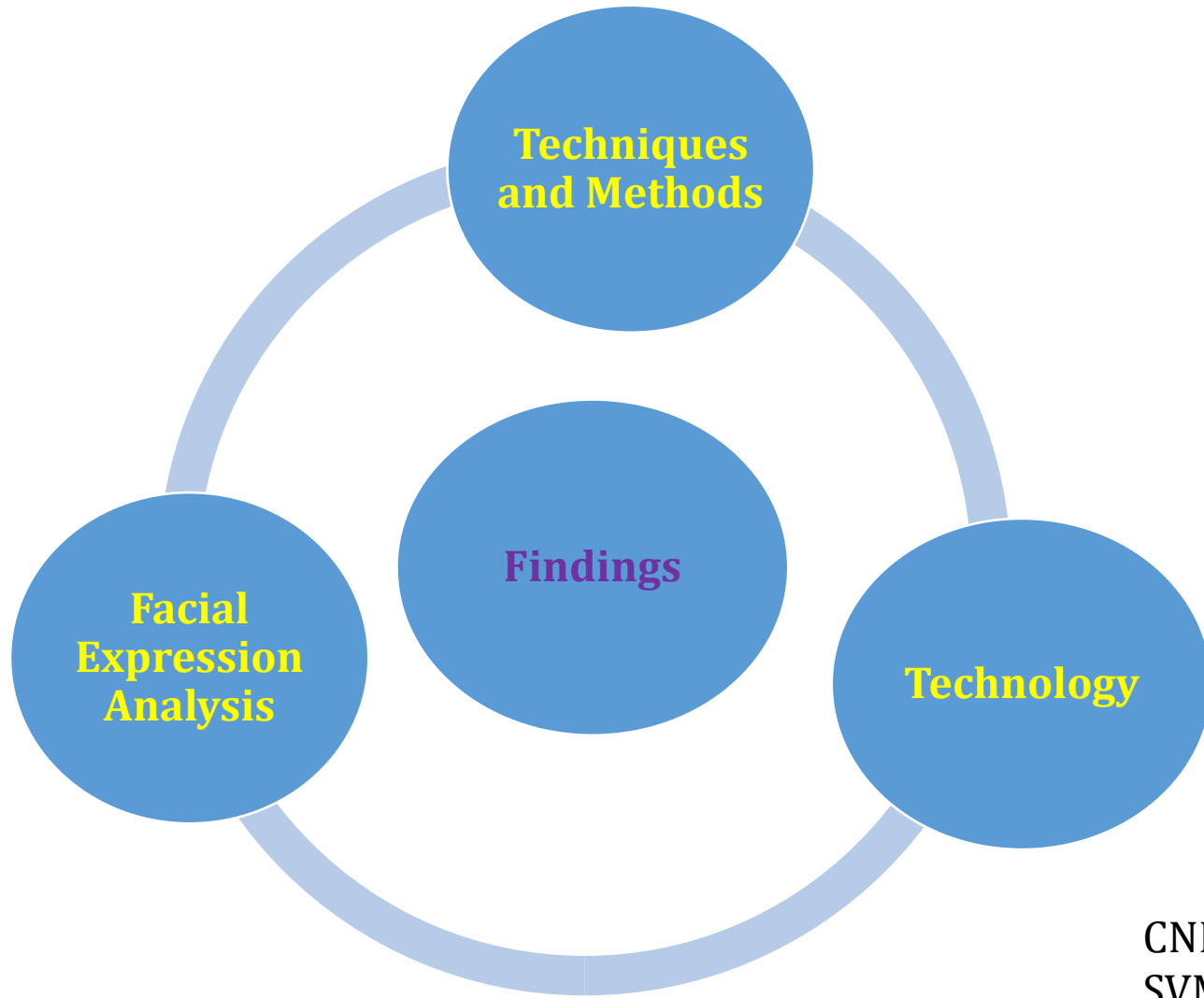
Grounded Theory

Coding Phase	Sample Codes
Open Coding	Facial Expressions, Emotion Data Gathering, Emotional Recognition, Tools for Understanding Facial Expressions, Differences in Facial Expression, Machine Learning Techniques
Axial Coding	ASD Facial Expression, Methodology, Motive, Technology
Selective Coding	ASD Facial Expression, Methodology, Technology



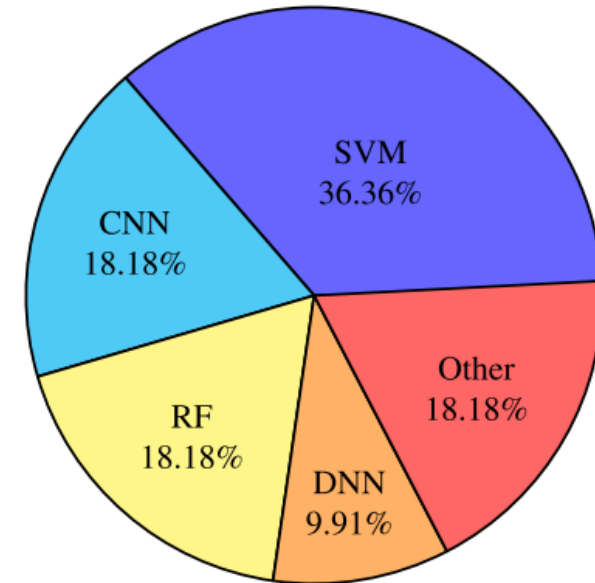


- 13 used facial expression data
- 2 used physiological and brainwave data
- 5 cleverly used games to involve subjects
- Cameras, pre-existing images/videos, IOT devices, humanoid robot with camera

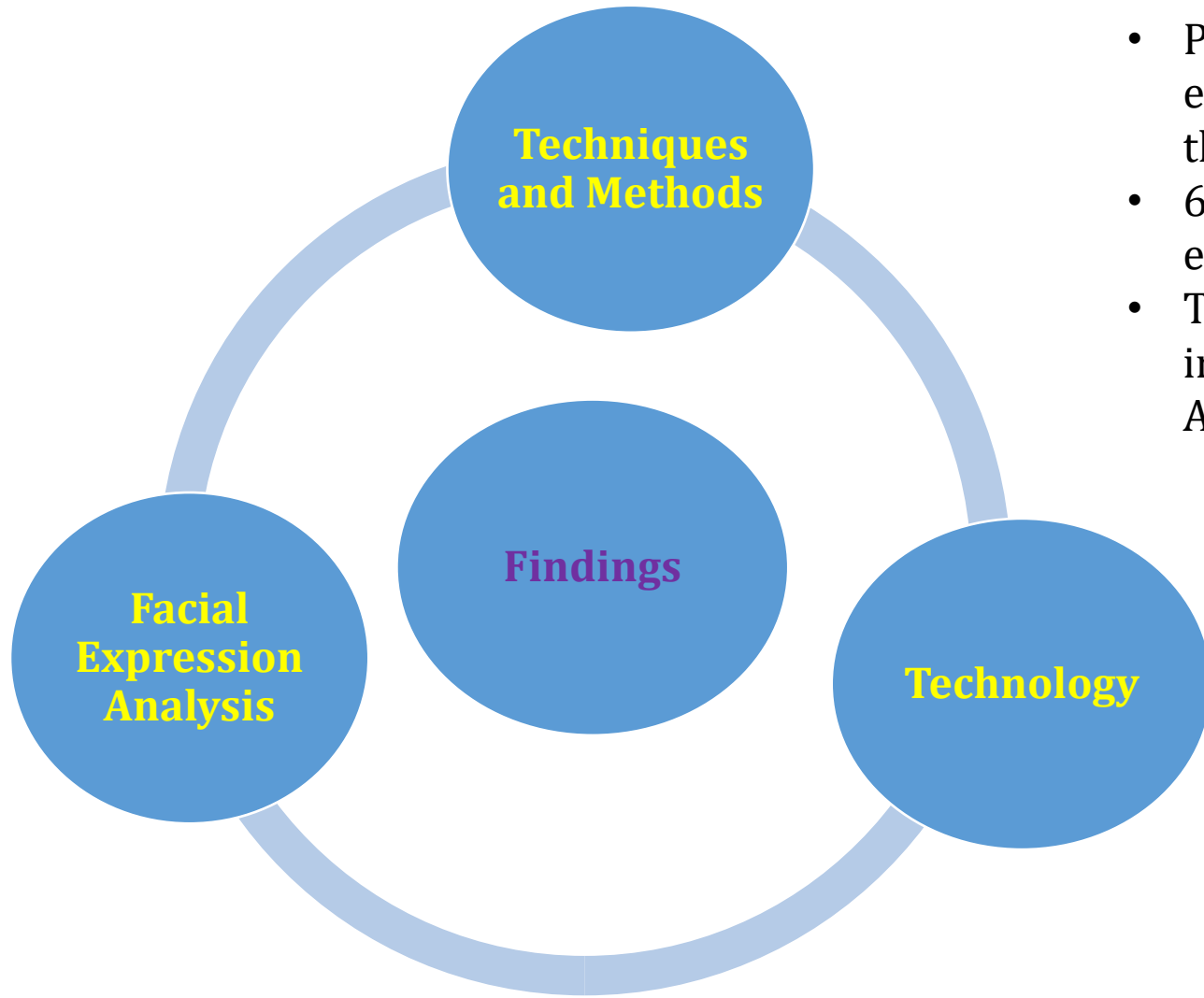


- Collect Data (sensors, cameras)
- Preprocess Data
- Train and Evaluate Machine Learning Model

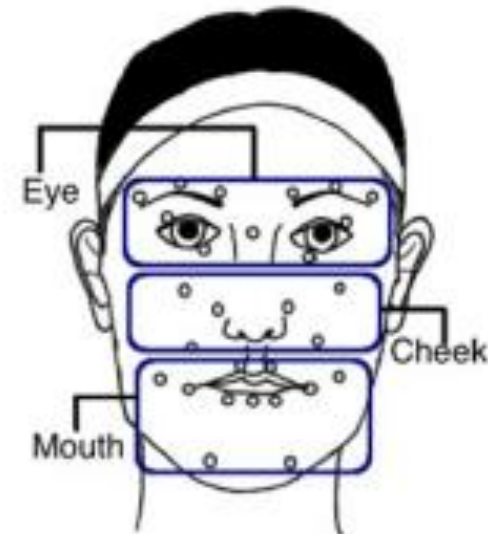
40%  99.0062%



CNN = Convolutional Neural Network, RF = Random Forest, SVM = Support Vector Machine, DNN = Deep Neural Networks



- People with autism tend to have very neutral facial expressions, which can make it difficult to pick up on their emotions.
- 6 articles mention of certain facial traits to identify emotion of people with Autism.
- The lower region of the face (e.g., mouth, cheek) is important for recognizing the emotions of people with Autism.



Things to Ponder

Should We Solely Rely on Facial Expression?



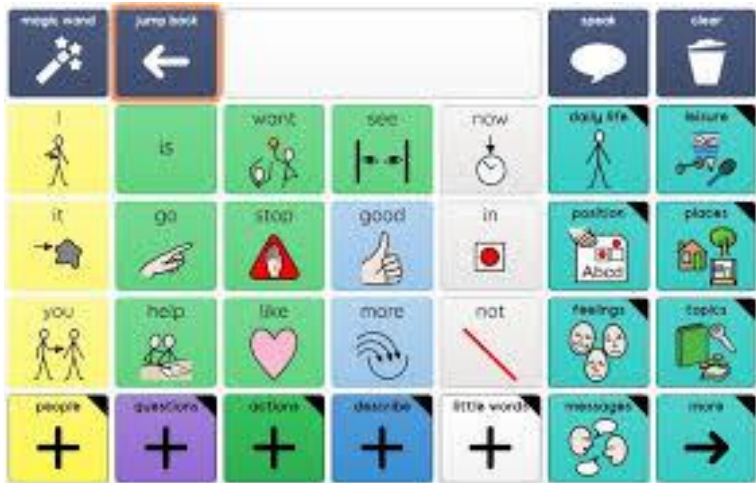
- Sound Data
- Physiological Data
- Environmental Data

Should We Trust Online Data Set for Autism?

- Quality of the data?
- Authenticity of the data source?
- Ethical concerns during data collection?

99.0062% Accuracy?

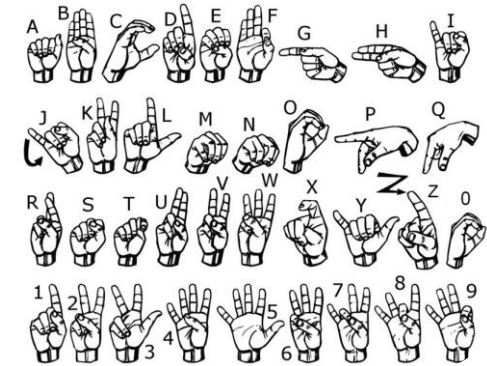
- None of the results validated by actual subjects



Augmentative and Alternative Communication (AAC)



Letter board



Medical Model

I need to be "fixed" to fit in with society.

Can't go to the cinemas because they are Deaf

Can't go to a cafe by themselves because they are blind

Can't work here because they can't go upstairs

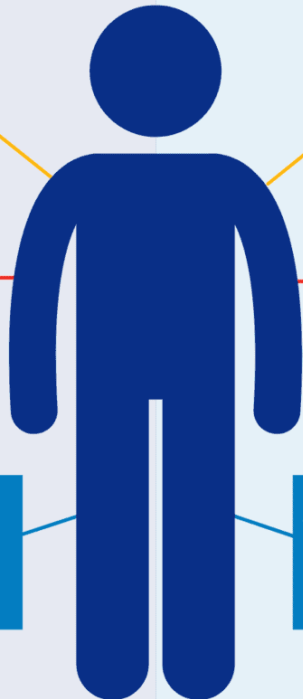
Social Model

Society needs to change so I can fit in.

Cinema hasn't provided closed captions

Cafe hasn't provided braille or electronic menu options

The building doesn't have a lift or a ramp



- Autism is not a disease or sickness that need to be cured
- Many papers still consider it as medical model

Take-Way Messages

- Inner Emotions of Individuals with Autism

- Very under researched area.
- A very challenging thing to identify even a mother isn't completely sure.

- Technology has the potential to help

- Facial Expression
- Sound
- Physiological Data



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