MedicBot: A New Virtual Assistance for the Children with Auditory Processing Disorder

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Overview

Introduction

- Auditory processing is defined as what we do with what we hear [1]
- Auditory Processing Disorder (APD) is a condition where someone has normal hearing, but the auditory system does not faithfully bring information to the brain [2]
- **Approximate 2-4% of school age children have APD** [3]

[1] Katz & Tillery, 2004
[2] https://www.sac-oac.ca
[3] http://www.ementalhealth.ca/

Objectives

Propose an AI model (virtual assitance) to assit in diagnosing, monitoring, and training of the children with APD problem

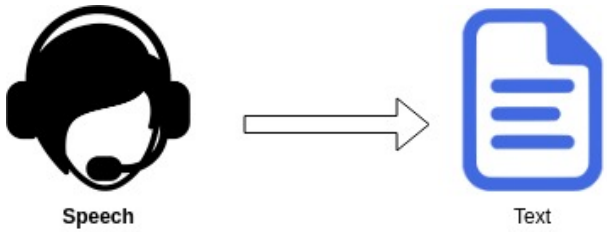
- Diagnose APD symptoms based on conversation with the considered children
- Create a Training Therapy Model Assitance (adaptable)
- Build the Reinforcement Learining (RL) Model to monitor the progress of APD treatment

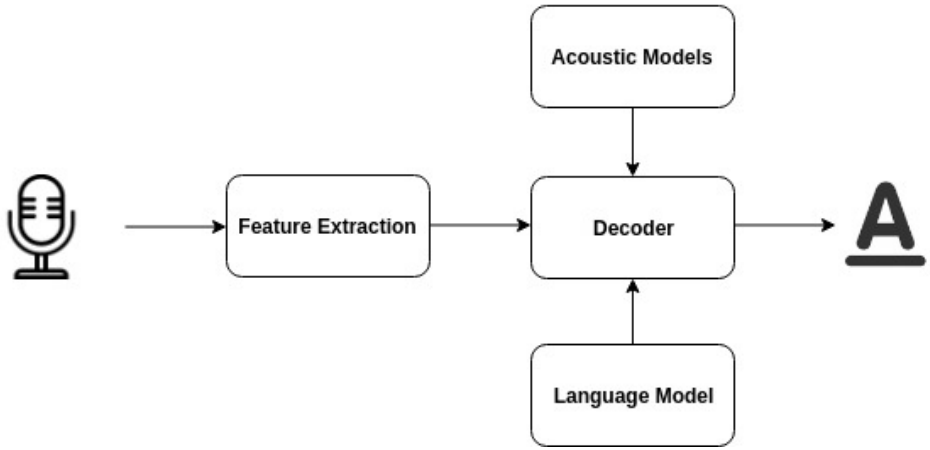
Methodology

- Analysis the given APD symptoms by speech recognition based on Deep learning
- Analysis the given APD therapy and recommend the treatment to the APD children. Apply a natural language processing (NLP) to generate sentences and exploit Deep learning to understand the context of the speech
- Monitoring the process of APD treatment by using speech analysis based on Deep
  learning

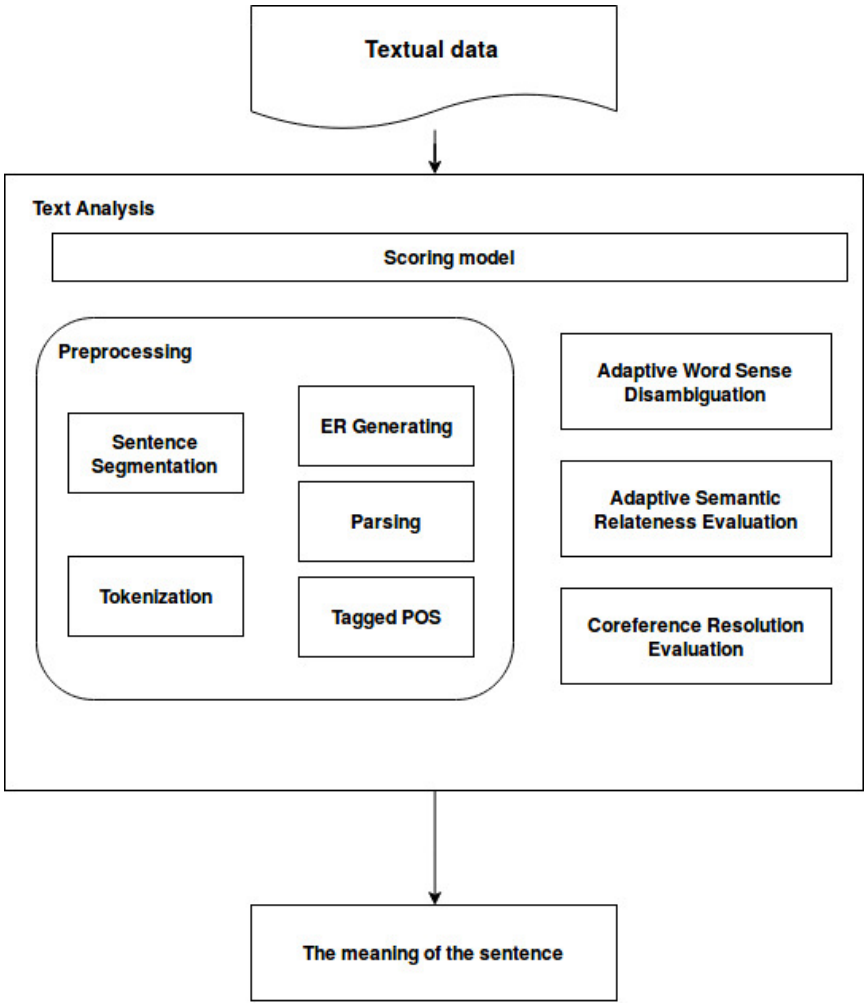
Techniques

Convert speech to text





Proposal for the objective 1 solution

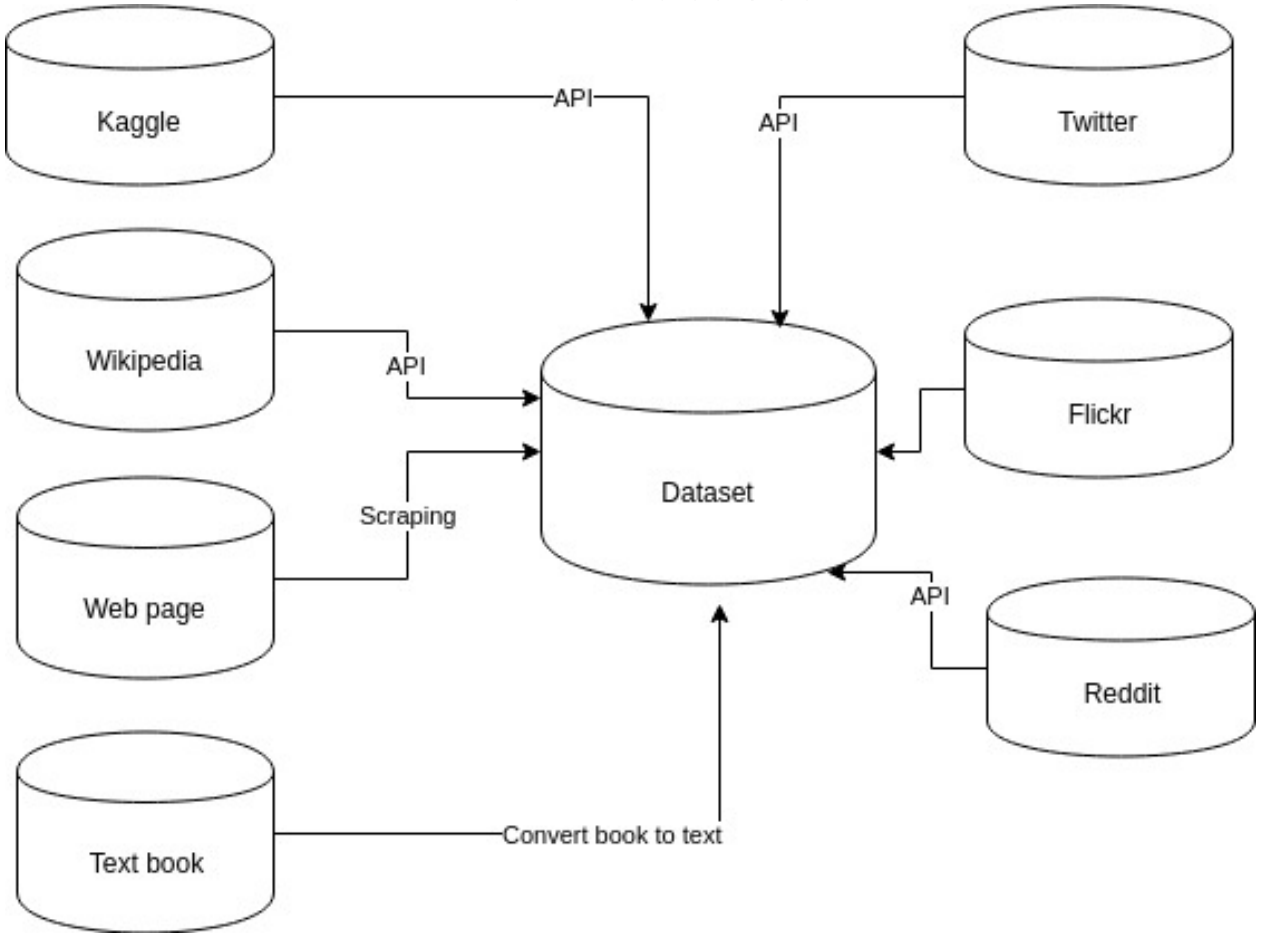


- Step 1: Get the raw text data from the user conversation
- Step 2: Process text go extract and compute the score of features based
- Step 3: Adapt word sense disambiguation
- Step 4: Evalue the semantic relateness and coreference resolution
- Step 5: Get the meaning of the sentence

Open Dataset

- (NLVR) A Corpus of Natural Language for Visual Reasoning, 2017
- (MS MARCO) MS MARCO: A Human Generated MAchine Reading COmprehension Dataset, 2016
- (NewsQA) NewsQA: A Machine Comprehension Dataset, 2016
- (SQuAD) SQuAD: 100,000+ Questions for Machine Comprehension of Text, 2016
- (GraphQuestions) On Generating Characteristic-rich Question Sets for QA Evaluation, 2016
- (Story Cloze) A Corpus and Cloze Evaluation for Deeper Understanding of Commonsense Stories, 2016
- (Children's Book Test) The Goldilocks Principle: Reading Children's Books with Explicit Memory Representations, 2015
- (SimpleQuestions) Large-scale Simple Question Answering with Memory Networks, 2015
- (WikiQA) WikiQA: A Challenge Dataset for Open-Domain Question Answering, 2015
- (CNN-DailyMail) Teaching Machines to Read and Comprehend, 2015
- (QuizBowl) A Neural Network for Factoid Question Answering over

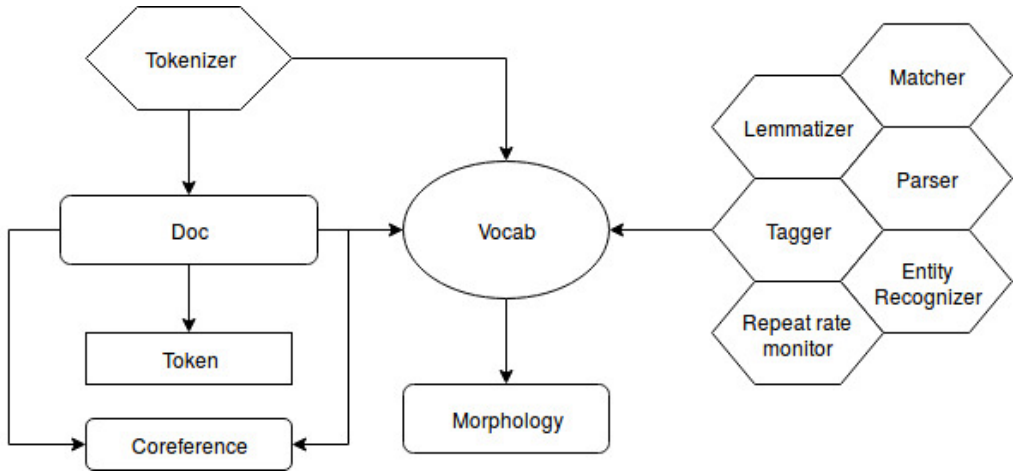
Crawl dataset



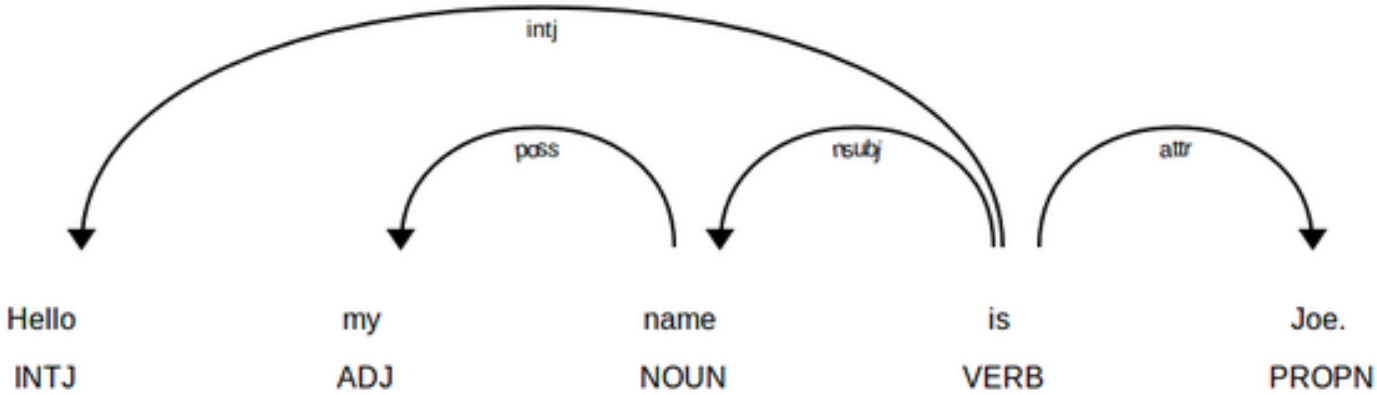
Techniques

Preprocessing

- Recognize the subject, verb, object in a given sentence
- Recoginze noun, adj, adv, preposition of a sentence
- Recognize the entities in a sentence
- Recognize the coreference of a sentence



Unit tests of the system

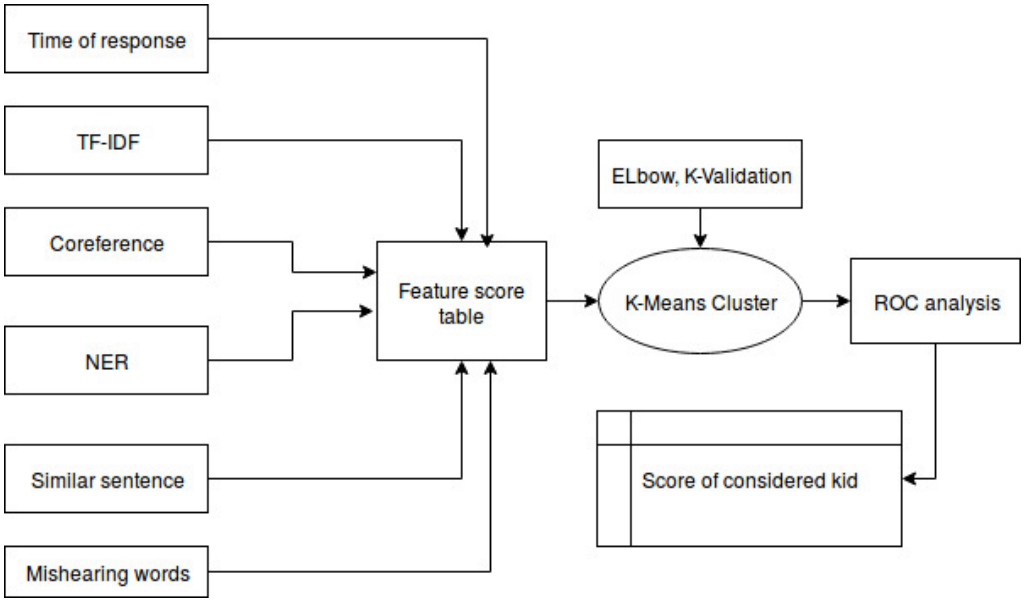


But Google ORG is starting from behind. The company made a late push GPE into hardware, and Apple ORG 's Siri, available on iPhones PRODUCT , and Amazon ORG 's Alexa ORG software, which runs on its Echo GPE and Dot ORG devices, have clear leads in GPE consumer adoption.

```
text 1: My sister has a dog.
text 2:  She loves him
0.016491954893255212  a dog loves him
0.9719385606143631  my sister loves him
0.011569484492381571  she loves him
```

Scoring model

- Create the features for the scoring model
- Compute the score for these ones
- Using the K-Mean Clustering algorithm to cluter the kid
- Apply the Elbow and K-validation algorithm to optimize the K-value of K-Mean Clustering algorithm
- Make the score table of considered kids



time of response	$\sum_{t=0}^{T}(t_i)$, t_i the duration of one sentence
tf-idf(k,d,D)	$tf(k,d) \times idf(k,D)$, k: term k d: document d; and $d \in D$
coreference	coreference resolution evaluation
ner	name entity recognization
similar sentence	similarity evaluation
mishearing word	spelling and grammar checking evaluation
elbow algorithm	choose a small value of k that still has a low SSE
ROC analysis	Receiver Operating Characteristic analysis

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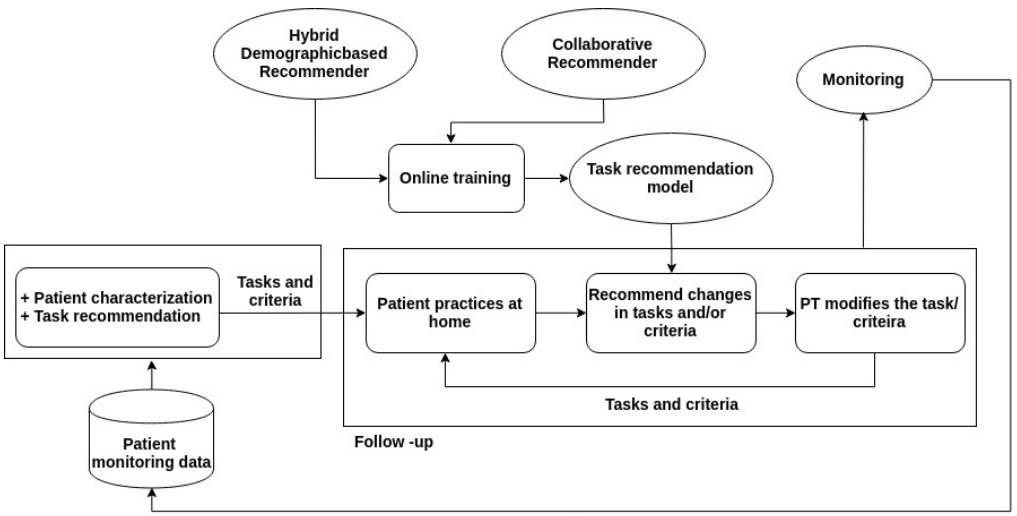
Proposal for the objective 2 solution



- Propose a training therapy to the APD kid based on the diagnosing report and Task recommendation model
- Monnitor the progress of therapy
- Update the monitoring data
- Suggest the fit training therapy by using reinforcement learning based on recommendation system

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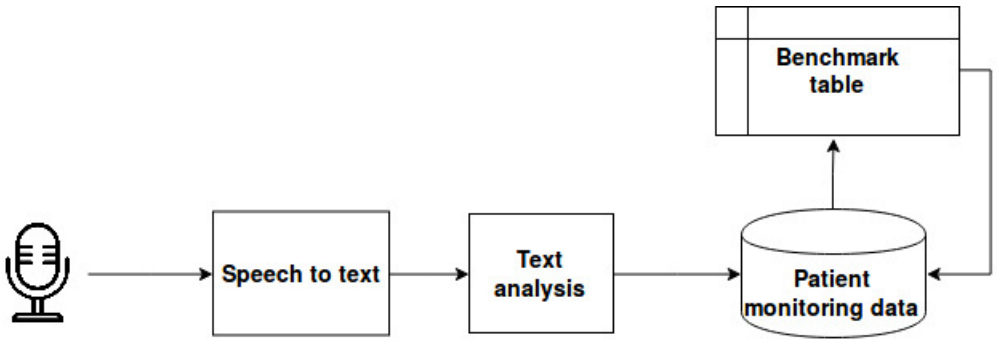
Proposal for the objective 3 solution



- Convert the APD speech to text
- Analysis the meaning of the text
- Compute the score of the benchmark A