A Fresh Look at AI

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So What? Who Cares?

- Space: CBP possible use of AI

- Problem: AI (machine learning) has it place: that is, good for some problems by not all. How to know when to apply AI?

- Solution: Share insights from creating a method for early detection of Parkinson's disease using a linguistics model, which utilizes neural networks and large language models. ChatGBT utilized for language processing and to write Python code.

- Results:
  - Positive: Rapid time to market, impressive initial results
  - Negatives: Data availability, robustness of solution
  - AI may not cause paradigm shifts. For example, feeding x-ray transmission images into a neural network will not cause the invention of x-ray back-scatter imaging.

Parkinson's Disease Detection

- Hypothesis: Parkinson's Disease (PD) leads to linguistic changes in spontaneous speech.
  - Examples: verb tenses, morphemes (number of verbs/nouns)
- Hypothesis testing
  - EU database spontaneous speech with and without PD
  - Voice to text with (*wave2vec*)
  - Linguistics extracted using ChatGPT
  - Neural network
  - Implementation (Python using ChatGPT generated code)
- Results: 90% accuracy
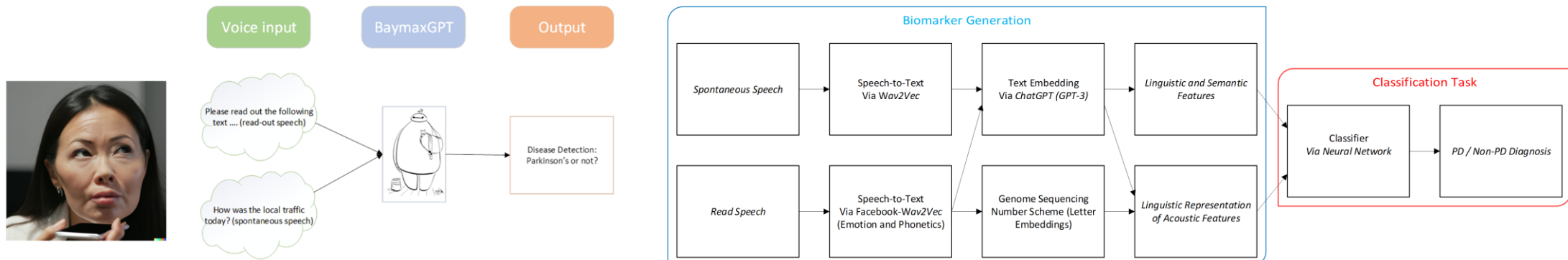
AI Lessons Learned

Positive

- Generative AI models learn the patterns and structure of their input training data by applying neural network machine learning techniques, and then generate new data that has similar characteristics.
- Examples:
  - Large language models
    - ChatGPT, computer coding
  - AlphaFold (protein structure)
  - Natural language processing (speech-to-text, text-to-speech, deep fakes)
- Extremely powerful when operating in a bubble (training, test, operational data)
- Rapid development

Negatives & Misconceptions

- Sentient / thinks for itself or like a human
- The word "AI" is a solution to every problem
- Every problem can be solved with AI
- Robustness (performance on training data v. real-world situation)
- Accuracy may be meaningless for rare events (prevalence scaling)
- AI research becomes a game to improve accuracy on classification tasks with algorithms never deployed
- Research with AI cannot induce paradigm shifts