**ChiMP: Children Interacting with Machines Project**

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### Research Goals
- **Long-term:** Examine and model how children interact with machines using natural communication modalities
- Develop new algorithms and interfaces that:
  - Understand child intent
  - Foster a positive and successful child-machine interaction

### Role in IMSC
- Development of the natural human–machine communication systems based on spoken interactions.
- Provide an information theoretic model of child speech to explain age-dependent effects in ASR performance due to fundamental limitations in feature extraction.

### Accomplishments
- **Results:** Information contained in cepstral features about phonetic classes increases as bandwidth increases.
- Cepstral features of adult speech convey more information compared to that of children speech.
- Recognition accuracy increases as bandwidth increases. This is consistent with the (phonetic class dependent) information increase contained in the cepstral features as bandwidth increases.

- **Papers:**

### 5-Year Plan
- Data collection for investigating multimodal interactions in preschool children.
- Gesture Analysis of child-computer interaction.
- Creation of new models and theory of child-machine interactions
- Implementation and demonstration of an educational prototype.

**Research Approach**
- **Specific Goal:** Determine effects of age and signal bandwidth on speech signal features
- Relative information is calculated between cepstral features and the vowel phonetic class for different age groups and signal bandwidths.

\[
\text{Relative Information} = \frac{H(X) - H(X|Y)}{H(Y)}
\]

- HMM-based recognizer is implemented using same cepstral features to determine effects of age and signal bandwidth on ASR.

**Uniqueness & Related Work**
- Information theoretic approach to determine effects of age and bandwidth on cepstral features.
- Part of a larger study that explores linguistic, social and technological issues in the design and implementation of child-machine interactions

**Research Areas**
- User-Centered Sciences
- Sensory Interfaces
- Information Management
- Media Communications
- Media Immersive Environments
- Application Research Projects