**Goals**

Develop a conditionally independent (aka “single-port”) stochastic turn-taking model \( \Theta \) for \( K \)-party conversation.

\( \Theta \) provides the likelihood of a conversation’s speech/non-speech chronogram, \( Q \):

\[
Q = \begin{bmatrix}
\text{1.095} & \text{1.189} & \text{1.19} & \text{1.195} & \text{1.21} & \text{1.22} & \text{1.225} & \text{1.23} & \text{1.235} & \text{1.24}
\end{bmatrix}
\]

**Prior Model Limitations**

Markov models of 1st order which are in existence fall into two broad categories:

- Conditionally independent, for two-party conversation.
- Conditionally dependent, for \( K \)-party conversation.

As a result:

1. Cannot easily predict/evaluate individual behavior in the context of a given group.
2. Do not know how less-recent history conditions the future.
3. Do not know how history conditions the more-distant future.

**Conclusions**

1. The proposed conditionally independent SPEDO model is at least as good as a \( K \)-party chronogram density estimator as the existing conditionally dependent MPEDO model.
2. The 1st-order form of the model is more compact than its MPEDO counterpart.
3. Overt evidence that participants in \( K \)-party conversation influence one another’s decisions to speak.
4. Longer conditioning histories help: this refutes 2-party findings in the literature.
5. Distant futures are predictable, but only poorly.

**Impact**

I. Can now easily infer a model for any individual from the many conversations which that individual attended.
II. Can now easily compare the behavior of individuals in disparate conversational settings.
III. Can now easily synthesize anticipated emergent group behavior from models of individuals who never previously formed a group.
IV. Can now begin to evaluate the role of prosody in predicting future individual behavior, with zero manual annotation of prosody.

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**Extended-Degree-of-Overlap** (EDO) Models

1. Factor in time, Markovian assumption of order \( m = 1 \):

\[
P(\ldots, x_{t-1}, x_t, x_{t+1}, \ldots) = \cdots \times P(x_{t-1} \mid P(x_t \mid P(x_{t+1} \mid \ldots)) \times \cdots
\]

in the multi-port (MPEDO) model

2. In the conditionally independent single-port (SPEDO) model, factor each further:

\[
P(\ldots, x_{t-1}, x_t, x_{t+1}, \ldots) = \cdots \times P(2 \mid 1) \times P(1 \mid 2) \times P(1 \mid 1) \times \cdots
\]

3. The integer in the conditioning context is the number (degree) of interlocutors speaking simultaneously at instant \( t \). To reduce model size: cluster this number into \( K_{\text{max}} \) bins, with the \( K_{\text{max}} \)th bin containing all degrees \( \geq K_{\text{max}} \).