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ConversationAlign: An R package for Computing Linguistic Alignment and Corpus Analytics in Dyadic Conversation Transcripts

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Abstract

`ConversationAlign` is an R package that executes a series of operations upon one or more conversation transcripts (i.e., two-person dialogues). Transcripts nominally contain at least two variables (speaker identity and text). In addition to these essential fields, `ConversationAlign` will retain all other meta-data such as timestamps, demographics, and grouping variables. `ConversationAlign` imports raw transcripts into R, appends unique document identifiers, and concatenates all conversations into a single dataframe. `ConversationAlign` generates corpus analytics characterizing the conversation transcript(s) of interest. Users guide a number of text cleaning operations such as stopword removal and lemmatization. The package ultimately vectorizes the original text into a one-word-per-row format. `ConversationAlign` yokes published norms to each content word spanning more than 40 lexical, affective, and semantic dimensions (e.g. word length, morphological complexity, arousal, valence). `ConversationAlign` outputs summary data for each conversation including main effects and indices of local and global alignment for each specified dimension of interest.

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Statment of Need

Although many excellent text analysis applications exist (e.g., Quanteda (Benoit et al., 2018) and Korpus (Michalke, Brown, Mirisola, Brulet, & Hauser, 2018)), we know of no R packages that are tailored to the unique demands of conversation analysis (but for Python see ALIGN (Duran, Paxton, & Fusaroli, 2019)). `ConversationAlign` offers a comprehensive text processing pipeline and novel algoirthms for computing linguistic alignment in 2-person dialogues. This software offers standardization and automation advantages that are in great need in a field that has historically relied heavily upon manual coding systems and subjective human judgment.

Background

Conversation is among the most complex behaviors that humans routinely undertake. In a dyadic interaction, conversation partners modify the form and content of their own production to align with each other (Pickering & Garrod, 2021). This process, known as linguistic alignment, occurs across many dimensions. `ConversationAlign` offers an automated approach to computing linguistic alignment across >40 distinct psycholinguistic

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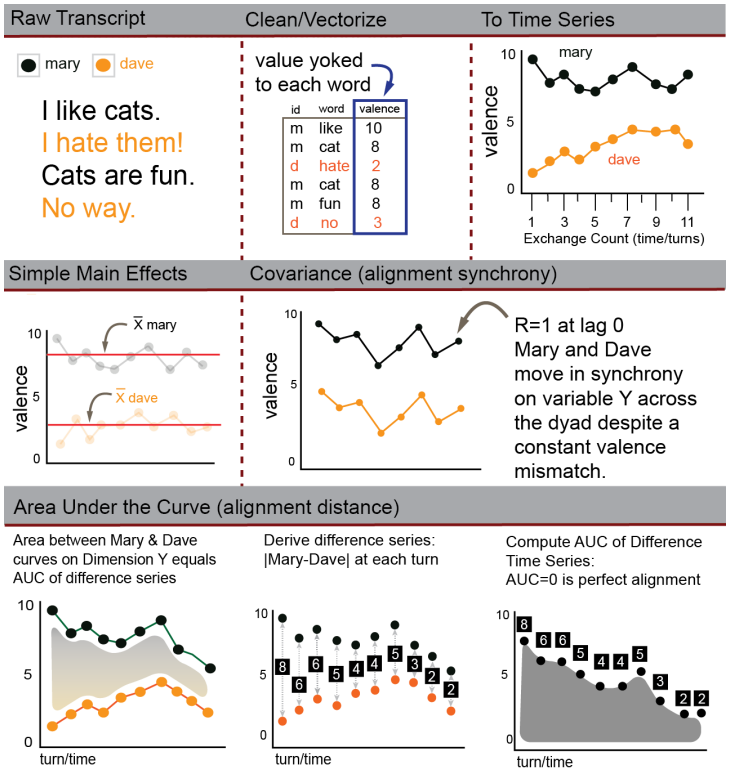

Figure 1: Overview of ConversationAlign Pipeline

dimensions (e.g., word length, valence, concreteness), leveraging recent advances in natural language processing to examine dynamics of human interaction at an unprecedented scale.

`ConversationAlign` is **NOT** a large language model (LLM). It instead indexes an static lexical lookup database populated with published norms for >100,000 English words across more than 40 unique dimensions spanning affective (e.g., happiness, valence), semantic (e.g., concreteness, semantic density), lexical (e.g., age-of-scqusition, morphological complexity), and phonological (e.g., word length, syllable length) information. During processing, `ConversationAlign` transforms words into time series objects aggregated by speaker, turn, and conversation. Figure 1 illustrates the primary steps undertaken by `ConversationAlign` in executing these transformations.

Key Components of the ConversationAlign Pipeline

`ConversationAlign` processes dyadic (2-person) conversation transcripts via a series of four customizable functions:

1. **read_dyads()**: imports one or more conversation transcripts into R, concatenating all transcripts into a single dataframe marked with its unique filename as a document identifier.
2. **prep_dyads()**: executes numerous text cleaning and formatting operations (e.g., to lowercase, expand contractions, remove special characters, squish whitespace). Options include stopword removal, stopword list specification, and lemmatization. `prep_dyads()' splits the raw text into a one word per row format then`

`prompts the user to select up to three dimensions for computing main effects and alignment.`prep_dyads()' returns a dataframe with values for the variables of interest (e.g., word length, word frequency, valence) to each running content word.

3. **summarize_dyads()**: produces a summary dataframe with main effects and alignment indices for the user-specified variables of interest summarized by conversation (Event_ID) and participant (Participant_ID). Alignment indices include: a) lagged spearman R correlation values reflecting turn-by-turn covariance between interlocutors across each dimension of interest (e.g., Mary uses unpleasant words, Dave immediately responds with unpleasant words); b) dAUC: global distance between partners by conversation across each variable of interest (e.g., 'pleasantness' distance between Dave and Mary across all turns). `summarize_dyads()` produces raw AUC and AUC normalized to a fixed conversation length (i.e., 50 exchanges, 100 turns) to promote standardization/comparison across different conversation durations.
4. **corpus_analytics()**: produces text analytics and descriptive statistics for your conversation corpus, including total number of tokens, average number of turns per conversation, average number of words-per-turn by conversation, average word length (letter count) by conversation, type token ratio by converation (for comprehensive list see package documentation). Summary dataframe readily exportable to a table for journal submission.

Uses of `ConversationAlign`

`ConversationAlign` has numerous applications for measuring and modeling conversation dynamics, including: - Assesing alignment dynamics between conversation partners across individual difference factors (e.g., age, culture, education level, socio-economic status). - Asessing pre/post changes in naturalistic language use as a function of a specific intervention (e.g., meta-cognitive training for traumatic brain injury). - Measuring alignment dynamics between friends (and rivals) to elucidate semantic, affective, and lexical dynamics that mark 'good' conversations. - Examining alignment (and misalignment) between people with neurological and/or communicative disorders and their significant others (spouses, friends, children) to improve the quality of communication and reduce the prevalence of communication breakdown. - Syncrhonizing language with physiological data (e.g., biosignals) to examine real-time coupling between interacting people and brains.

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