

A Conceptual Blending Approach to Qualitative Research Using Computational Tools

Using word embedding models to study cultural fields

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4/17/2025

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What is qualitative research?

- Social construction
- Lived experience
- Enacted practices

Often studied using interviews and manually-powered interpretation

Disentangle qualitative research from manual analyses of text!

Mixed methods

- Mixes distinguishable ontologies and epistemologies
- **Qualitative** methods examine **intension**: meaning, experience, construction, and interpretation
- **Quantitative** methods examine **extension**: behavior, extent of cognitions and affects

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Agent: Go-Like Concurrency in Ruby

Concurrency and parallelism are hard. With the traditional threading model, a developer has to constantly ensure threads are not in conflict, which is a very difficult task. The team behind Go implemented fantastic concurrency primitives within the language that make reasoning about concurrent code far easier.

Fortunately, all that goodness is no longer locked up inside Go; there's now a library for Ruby! It's called "Agent" and it implements the Golang-concurrency magic in Ruby.

Before we start using it, it is important to get some background out of the way.

Basics

The Go model for concurrency is based on the theories of pi-calculus and Communicating Sequential Processes (CSPs). Though the math underlying the concepts is quite interesting, a condensed version will get us up to speed much more quickly.

In the old days, we had threads which would communicate with each other by sharing bits of memory. This caused all sorts of problems. There would be times when two threads would try to write to the same thing at once or one thread would attempt to read from something that was being written to by another. Ingenious as they are, computer scientists came up with the concepts of locking, semaphores, etc. to solve these issues.

Go/CSP takes a different approach. Instead of sharing memory, concurrent "processes" (here, I do not mean processes as the *nix term) communicate with messages. Go implements these "processes" as "goroutines" which are like threads but much more "lightweight" in the resources they consume. Initially, the whole "messaging" concept might seem very limiting in comparison to just letting threads access the same set of variables. But it turns out that boxing ourselves in a little produces fantastic results in terms of

of concurrent code.

Agent takes a good portion of Go concurrency and implements it in Ruby. There is, however, one thing to be aware of when using Agent (even Ruby-based concurrency frameworks). The standard Ruby interpreter implements green threading. This means that

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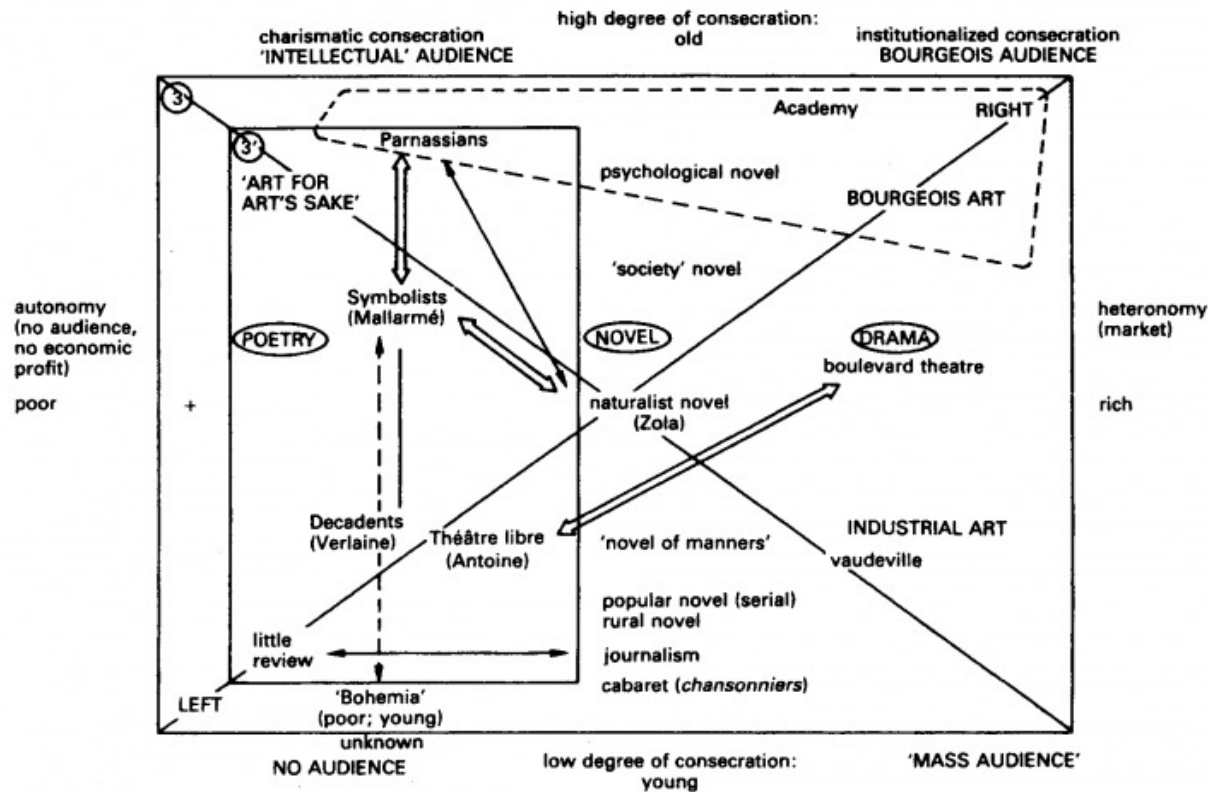
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Achieving rigor using Generative AI is difficult

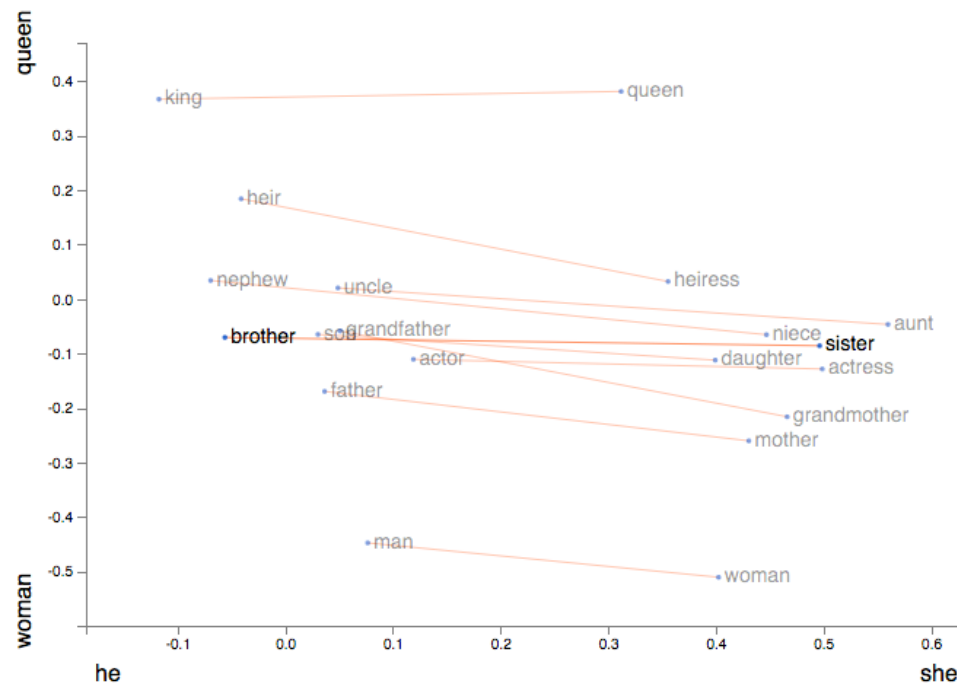
- Validity
- Reliability
- Replicability

An alternative: Word Embedding Models

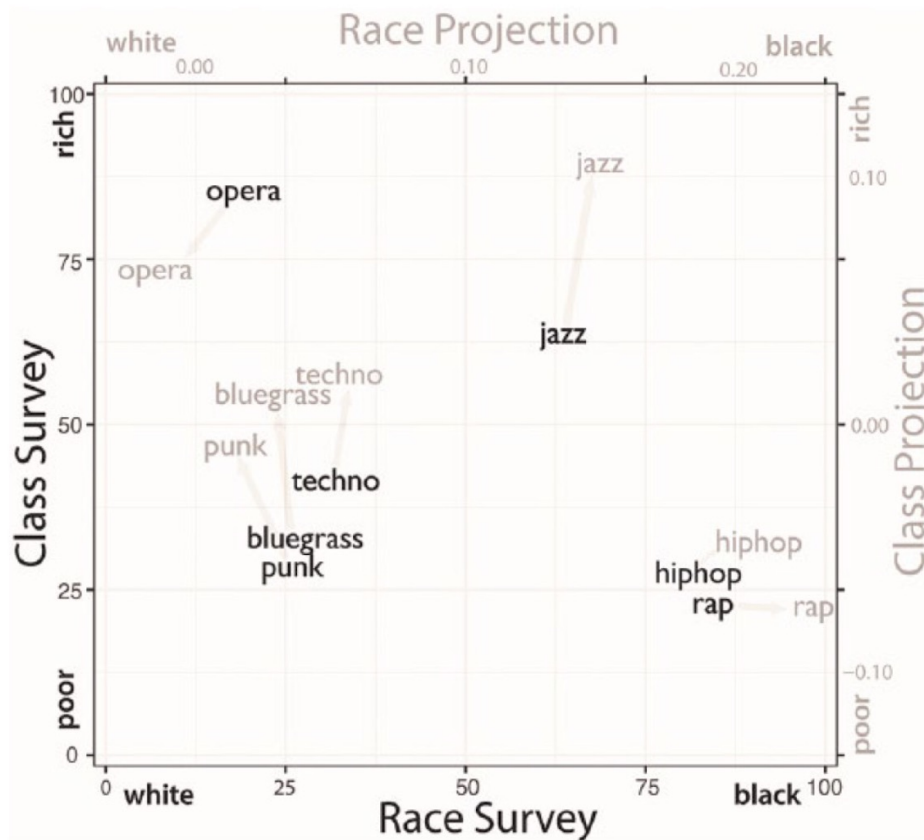
Field Theory



Word Embedding Projected on a 2-dimensional space



Conceptual spaces: Spaces defined by one or more axes capturing semantic continua between two concepts. The positioning of a concept in the space define a concept in relation to other concepts



Constitutive Analysis

Kozlowski, Austin C., Matt Taddy, and James A. Evans. "The Geometry of Culture: Analyzing the Meanings of Class through Word Embeddings." *American Sociological Review* 84, no. 5 (October 2019): 905–49.

Figure 3. Projection of Music Genres onto Race and Class Dimensions of the Google News Word Embedding (Gray) and Average Survey Ratings for Race and Class Associations (Black)

Evolutionary Analysis

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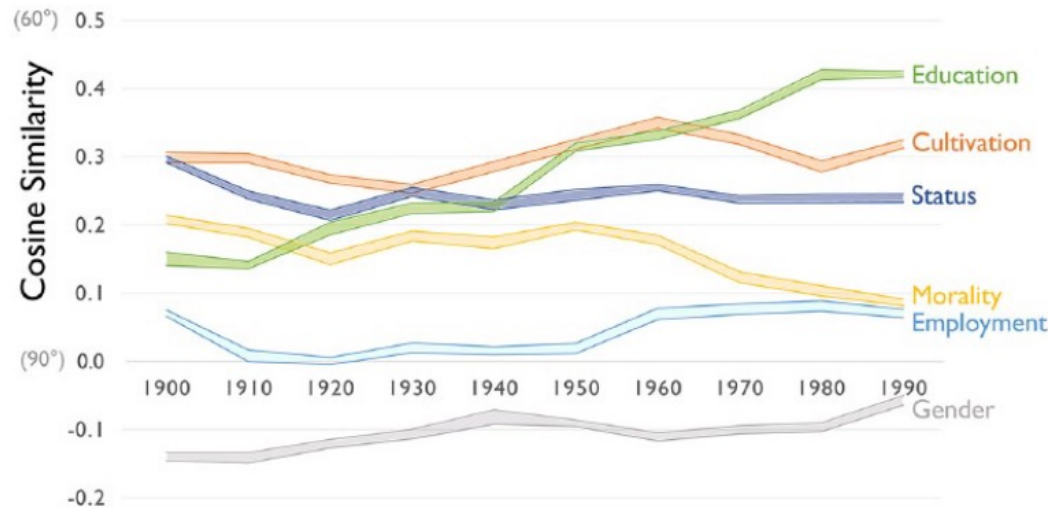
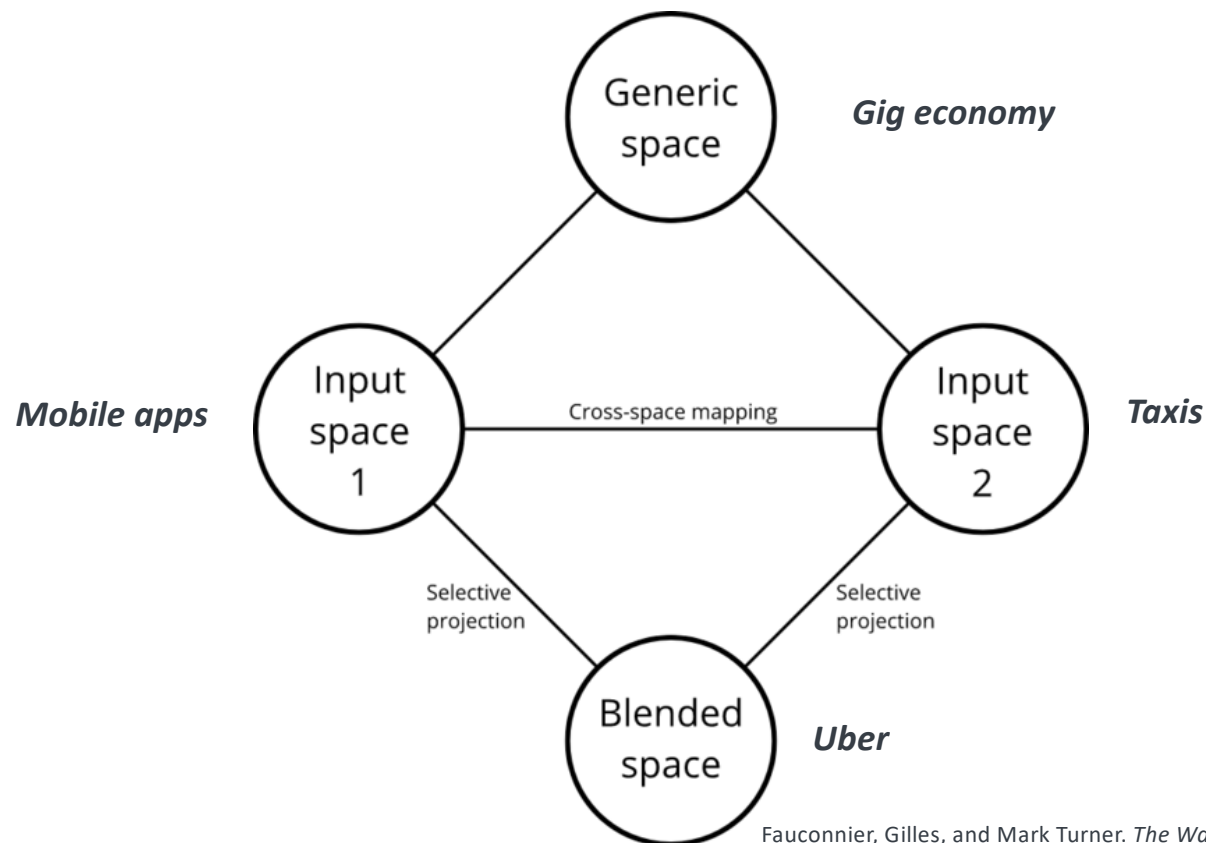


Figure 5. Cosine Similarity between the Affluence Dimension and Six Other Cultural Dimensions of Class by Decade; 1900 to 1999 Google Ngrams Corpus
Note: Bands represent 90 percent bootstrapped confidence intervals produced by subsampling.

How do we **build theories** using word embeddings?

Blending Theory explains Conceptual Creativity



Theorizing Moves

1. Constructing the spaces
2. Modulating the dimensionality of spaces
3. Interrelating multiple spaces
4. Interpreting the positions of words
5. "Leap of faith" model construction

Constructing the spaces

- Deciding on the polar ends of 1-3 axes
- Deciding on which words to project onto each space
- Guided by theory or prior empirical work



This often requires "close reading" of the data

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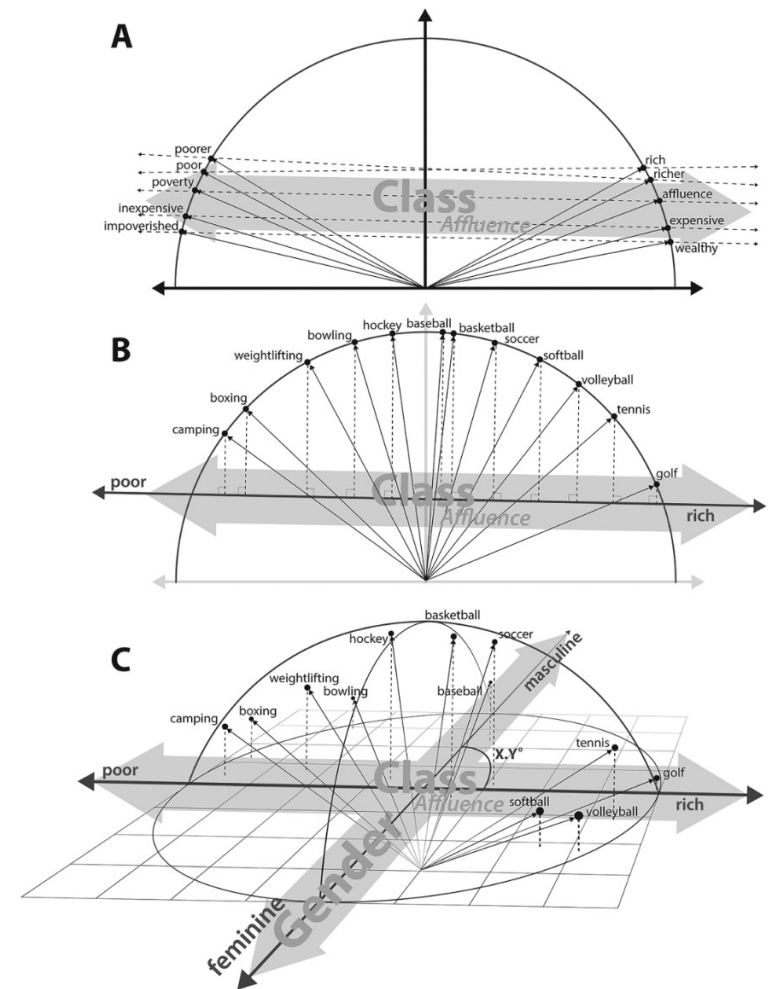


Figure 2. Conceptual Diagram of (A) the Construction of a Cultural Dimension; (B) the Projection of Words onto That Dimension; and (C) the Simultaneous Projection of Words onto Multiple Dimensions

Modulating the dimensionality of spaces

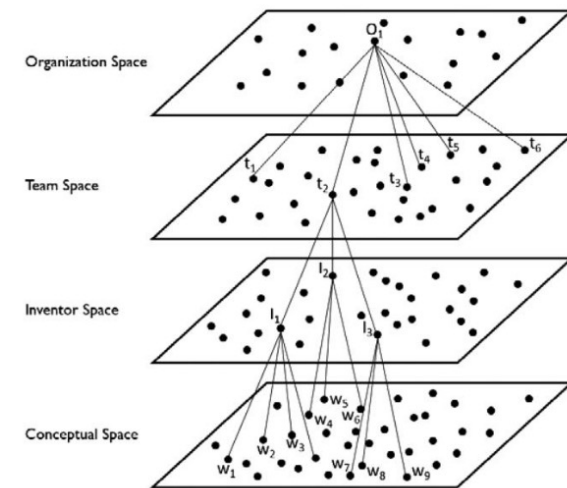
- Iterative modification, addition, and deletion of axes
- Reformulating the continua of axes
- Formulating multiple spaces which together may tell a rich, coherent story

Interrelating multiple spaces

Building multiple, interrelated spaces to model rich semantic constructions:

- Theorizing social constructions across more than 3 axes
- Tracing evolution over time through “temporal bracketing”
- Comparing multiple units of analysis/cases
- Multi-level analyses

Figure 1. Embeddings as Fine-Grained Representations of Concepts, People, Groups, and Organizations



Aceves, Pedro, and James Evans. “Mobilizing Conceptual Spaces: How Word Embedding Models Can Inform Measurement and Theory Within Organization Science.” *Organization Science* 35, no. 3 (June 2024): 788–814.

Interpreting the positions of words

- Clustering
- Differentiation by distance
- Interpretation relative to “close reading” of text

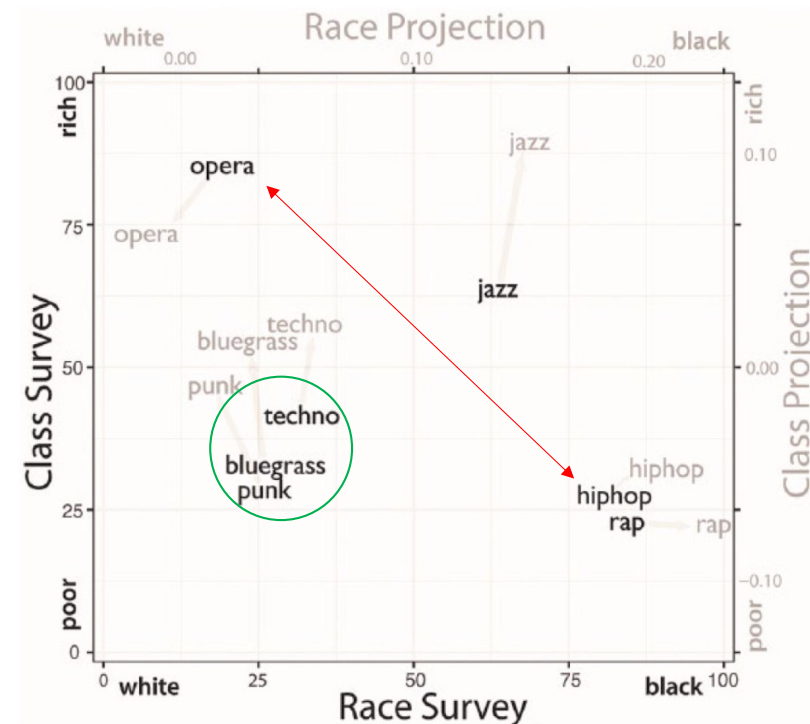
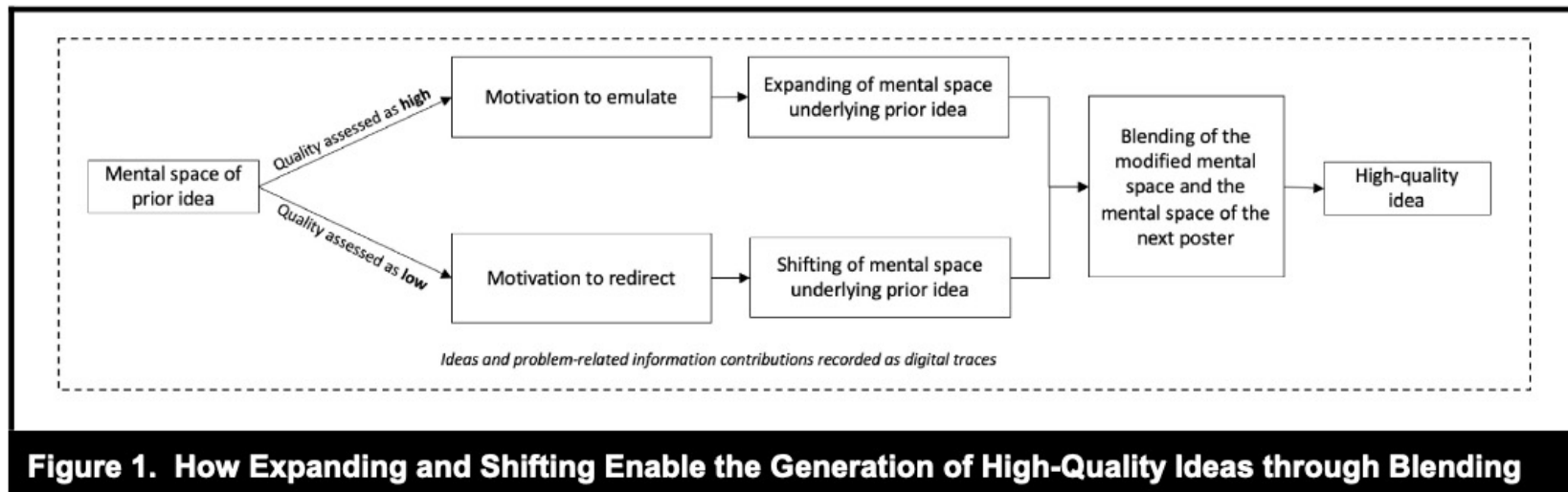


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“Leap of faith” model construction



1. Transposing analytical displays to constructs and theoretical relationships
2. Suggestions of mechanisms which drive identified patterns
3. Constant comparison of extant and emergent theory
4. Geared towards theoretical contribution (new insights)

What research does this mobilize?

- Mutually constitutive models of social construction
- Cultural & discursive evolution
- Comparing multiple life worlds
- “Distant reading” complements traditional qualitative “close reading”



THANK YOU

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