

## **Quantum Theory-Inspired Search**

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## **Classical Search**



## How Search Engines View the Problem

- $\blacktriangleright \mathrm{A}$  person is looking for information about A and says A.
- $\blacktriangleright$  A variety of dimensions of context (the user, the task, the weather or the place) are *ignored*.
- $\blacktriangleright A$  refers to unambiguous meanings (the user's A is the book's A).
- $\blacktriangleright$  It also refers to one single, static unambiguous need.
- $\blacktriangleright$  The user is *uncorrelated* from any other users.
- ▶ Information do *not mutually interfere* and the user's assessment and behaviour are *unconditioned*.

## The State-of-the-Art

- $\blacktriangleright$  Ambiguity and superposition cannot be (easily) detected.
- ▶ Context modeling is ignored (it is too difficult).
- $\blacktriangleright$  Query expansion adds noise and user effort.
- $\blacktriangleright$  Correlations among users, information, queries are not modeled, or if they are, computation is too expensive or data are insufficient.
- $\blacktriangleright$  Emergent or unexpected word associations cannot be modeled.
- ▶ Heuristic approaches are likely inconclusive.
- $\blacktriangleright$  A unified framework to seamlessly integrate the dimensions of context is our approach.

**Quantum Theory-Inspired Search** 



# How Search Engines Shall View the Problem

- $\blacktriangleright$  A person is looking for information about A but his expression is variegated in a *superposition*.
- $\blacktriangleright$  A variety of dimensions of context (the user, the task, the weather or the place) are simultaneously modeled.
- ▶ Any expression refers to *ambiguous* meanings.
- ▶ It also refers to ambiguous needs (a father and his child wanting A may have incompatible aims).
- ▶ The user is *entangled* with other users due to history, habits, etc...
- $\blacktriangleright$  Information mutually *interfere* and the user's assessment or behaviour are *conditioned.*

## The Art-of-the-State

- $\blacktriangleright$  Information represented as superposed state.
- ► Variety of dimensions of context *simultaneously* modeled in a *single abstract space*.
- ▶ Prediction of emergent or unexpected word associations using *quantum probability* where probability distributions are *states* and observables are *subspaces*.
- ► Modeling correlations among dimensions of context using *entanglement* where correlations are inside observables and not only in states.
- ▶ Ranking algorithms that incorporate *interference* among the user's assessments or behaviours so that information delivery depends on how the user's *interact* with information