Quantum Theory-Inspired Search

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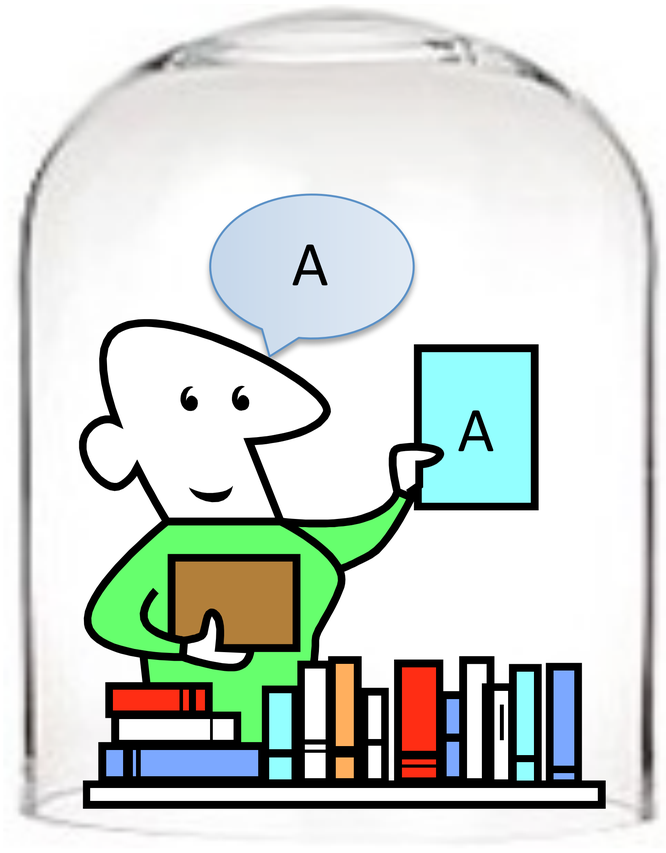
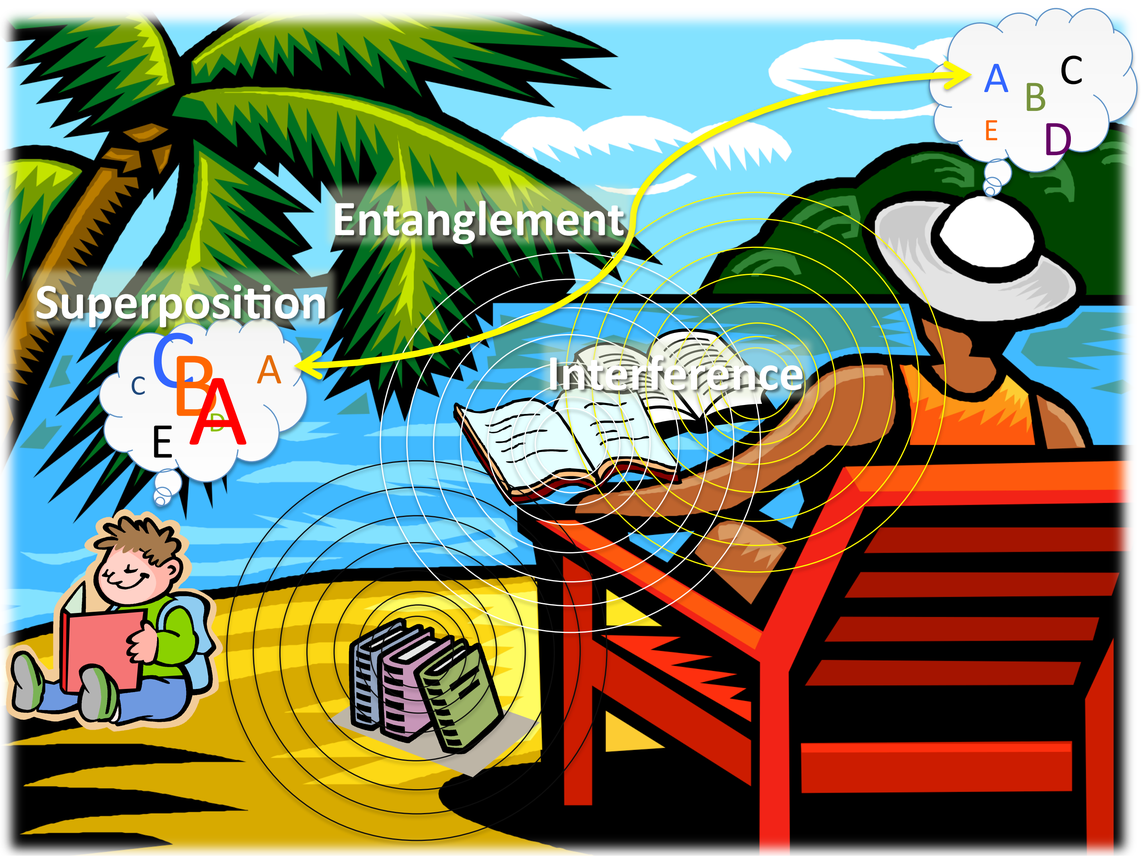
Classical Search



Quantum Theory-Inspired Search



How Search Engines View the Problem

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

How Search Engines Shall View the Problem

- A person is looking for information about A but his expression is variegated in a *superposition*.
- 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..
- Information mutually *interfere* and the user's assessment or behaviour are *conditioned*.

The State-of-the-Art

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

The Art-of-the-State

- 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