Personalization of Search Results using Interactive Intent Modeling

Interactive Intent Modeling

Problem
- In exploratory search, user is uncertain of precise search intent
- User needs to learn while searching
- How to allow the user to learn quickly and to find relevant results?

User perspective
- Need easy and meaningful ways to modify query
- Need to get approximate understanding of information space quickly
- Easier to recognize relevant search features than to generate them

Interactive intent modeling [1, 2]
- After user initiates search session, a search intent model is constructed
- The intent model is visualized to the user, along with the search results
- User can modify her query by making changes to the intent model
- Dynamic approach to personalization

User Interface

Experimental Results

Extensions

Controllability [3]
- "How to enable the user to achieve the kind of changes in the search model that the users wants to happen?"

Solution: Choose the weight for the most recent user feedback adaptively, so that the resulting user model agrees well enough with it.

Predictability [3]
- "How to allow the user to predict what essential changes will happen in the user model as a consequence of different actions?"

Solution: Simulate 'possible future models' when user is choosing what feedback to give, visualize approximate resulting model on-line to the user.

Drift Detection [4]
- "How to detect what user feedback is still relevant to modeling the current user interest?"

Solution: Estimate accuracy of each user feedback (simultaneously with the current user model), highlight feedbacks with low accuracy to the user so that she can either correct the feedback or indicate that the feedback was accurate.

User Models

LinRel exploration/exploitation model [Auer 2002]
- A linear regression model with error bounds.
- Balances between exploration and exploitation by using Upper Confidence Bound estimates for the relevance of keywords.

\[
\begin{align*}
a_i &= x_i^T(X^T X + \mu)^{-1}X^T \\
ue_i &= a_i(Y + C a_i^T)
\end{align*}
\]

Automatic Relevance Determination model
- Linear Bayesian regression model that also estimates the accuracy of keyword feedback.
- Can incorporate feedback on the accuracy by changing the prior of w_i according to feedback

\[
\begin{align*}
y_i &\sim \text{Normal}(x_i \phi_i, \sigma_i^2) \\
\phi_i &\sim \text{Normal}(\mu, \sigma^2) \\
\sigma_i &\sim \text{InverseGamma}(\alpha_\sigma, \beta_\sigma) \\
\psi_i &\sim \text{Gamma}(\alpha_w, \beta_w) \\
\psi_0 &\sim \text{Delta}(1.0)
\end{align*}
\]

Fig 1: Avg F1-score / iterations

Fig 2: Avg F1-score / iterations

References


