Bing Dialog Model: Intent, Knowledge, and User Interaction

Harry Shum, PhD
Corporate Vice President
Microsoft Corporation
www.bing.com
Faculty Summit 2010

Future Web – Intelligence, Ubiquity, and Trust

Evelyne Viegas, PhD
Senior Research Program Manager
Microsoft Corporation
A Year Ago: The Challenge
A Year Later: The Bing Momentum

- Launched on June 1, 2009 and called a “Decision Engine”
- Fastest growing search engine in 2009
- “The best new product of the year 2009” - Crunchies Award by TechCrunch

(U.S. Unique Users) 
- 92M
- 28%
- 71.7m

(U.S. Market Share)
- 12.1%
- 51%

(Perception)
- 64%
- 34%

(Untitled)
- Unaided Awareness
- Perception Bing is a ‘Decision Engine’
Google’s not just a brand; it’s a habit

- Tough Love for Microsoft Search: Danny Sullivan
  - Dec. 30, 2008
Elements of Search Quality

Relevance

Ensuring that best results rank at top
Completeness
Freshness

Speed

How fast do result pages render?

Ease of Use

Simple interface
Query & click
Semantic Impact on Search Quality

**Relevance**

Selection and ranking based on **meaning and concepts**, not keywords

Direct answers

**Speed**

Reduce efforts to **task completion**

Direct answers

Fewer clicks

**Ease of Use**

Intuitive queries

**Simplified tasks**

Information aggregation & classification
Los Links Episode Dào
The Search Evolution: Organizing the Web for Tasks

**Search**
- Hit or Miss model
  - Relevance of 10 blue links
  - Understanding query
  - Minimizing time of URL/query matching

**Bing**
- Dialog model
  - Whole page to whole session
  - Understanding intent
  - Minimizing efforts to completing tasks
Bing Dialog Model: A Stateful Feedback System

- $U_t$: User behavior
- $I_t$: System’s understanding of user intent
- $A_t$: System’s action
- $K$: System’s knowledge

Flowchart:
- Expected Behavior → Intent Model
- $K, I_{t-1} → I_t$ → Interaction Model → $A_t$ → User Behavior Observer
- $U_t$ feeds into the system.
Applying Bayesian Minimum Risk (BMR) Framework

- Intent Model: \( I_t = \text{argmax}_I P(I | U_t, I_{t-1}; K) \)
- Interaction Model: \( A_t = \text{argmin}_A E[\text{Cost}(A, I_t)] \)

Considering productization feasibility
- Local optimum vs. theoretical optimum

Leveraging rich presentation capability
- Infer multiple intent candidates
- Generate dialog actions at multiple levels
**Bing Dialog Model Implementation**

**Equations:**

\[ I_t = \text{argmax}_I P(I | U_t, I_{t-1} ; K) \]

\[ A_t = \text{argmin}_A E[\text{Cost}(A, I_t)] \]

**When applied to Autosuggest:**

- \( U_t \) is key stroke
- \( I_t \) is closest seen queries
- \( A_t \) is list of suggested queries
- \( \text{Cost}() \) is selection efforts
Simple & Explicit Query-Level Dialog
Structured Query Composition

Kuansan Wang, PhD
Principal Researcher
Microsoft Research
Quick Tabs for relevant Bing verticals, domains, answers

Entity-based result summary

All Bing Vertical Services
Driving the Search Evolution from topical directory to site finder to task completion

- Acquiring and computing knowledge
- Understanding user intent and designing user interaction
- Minimizing Cost() i.e. the user efforts to accomplish a task
• Microsoft Web N-gram Services
  • Provide large scale web index data for language modeling research work
  • Public beta since April 2010 (http://research.microsoft.com/web-ngram)
  • SIGIR workshop July 2010
  • New API Services and query data in Microsoft Web N-gram Services starting TODAY on http://research.microsoft.com/web-ngram

• Announcing the first Bing-MSR Challenge (Fall 2010)
  • Awards
    • Bing-MSR Fellowships
    • Conference/Workshop Travel grants
  • Check http://research.microsoft.com/web-ngram for more details beginning August