Data Science Research
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- Text-to-SQL Systems
- Web Search Engines
- Multimedia Database Systems
- Social Network Analysis
- Resource Optimization in WSNs
Text-to-SQL Systems

- Keyword Mapping
- Explainable Text-to-SQL
- Query Recommendation
Text-to-SQL Systems

Keyword Mapping - mapping between tokens in the query and relational database elements

❖ Keyword mapping formulated as sequence tagging problem in NLP
❖ An end-to-end keyword mapper (DBTagger)

Text-to-SQL Systems

Explainable Text-to-SQL – based on Explainable AI

❖ Explaining the decisions made by the keyword mapping system using LIME
❖ A novel wrapper around LIME
❖ Using a schema graph to explain join-path inference

Text-to-SQL Systems

Query Recommendation

❖ A ranking method to create a list of suggested queries
❖ Distributed representations for database tuples, trained on a relational database
❖ Graph convolutional networks (GCNs) to learn distributed representations
Web Search Engines

- Learning to Rank for Educational Web Search
- Diversification of Search Results
- Efficiency and Scalability Issues for Web-IR

http://www.cs.bilkent.edu.tr/~bilweb
Web Search Engines

Learning to Rank for Educational Web Search - machine-learned ranking models

❖ A rich set of features employed in educational search
❖ Domain knowledge utilized to build query-dependent ranking models

Web Search Engines

Diversification of Search Results

- Multidimensional result diversification
- Supervised learning methods for search result diversification
- Impact of index pruning on diversification performance


Web Search Engines

Efficiency and Scalability Issues

- Methods and algorithms for caching, indexing, and query processing in search engines


Multimedia Databases
(joint work with Prof. Uğur Güdükbay)

- Video Retrieval Systems
- Mobile Visual Search
- Learning Visual Similarity for Image Retrieval

http://www.cs.bilkent.edu.tr/~bilmdg
Multimedia Databases

BilVideo-7: An MPEG-7 Compatible Video Retrieval System

Powerful querying capability for video data
- keyword and content-based queries
- spatio-temporal object queries

Example query formulation:
keywords: trees, greenery, sky – bush, putin, dog
Multimedia Databases

Mobile Image Search Using Multi-View Object Image Queries

Workflow of the Search System

Early and Late fusion methods

Multi-View Dataset and Queries

Learning efficient visual similarity for image retrieval by revealing resemblances and differences between product images.

Social Network Analysis

- Misinformation Propagation in Social Networks
- Social Network Data Analysis on Big Data Processing Platforms
Social Network Analysis

Misinformation Propagation in Social Networks

❖ Misinformation problem modelled as a game based on the notion of cooperative games
❖ Agents defined to maximize the total reward
❖ A blockchain - machine learning hybrid approach for addressing misinformation in a crowdsourced environment

Social Network Analysis

Social Network Data Analysis on Big Data Processing Platforms
(joint work with Prof. İbrahim Körpeoğlu)

❖ Community detection formulated as a multi-k-core problem
❖ Distributed multi-k-core construction and maintenance algorithms running on a big data platform


Resourse Optimization in Wireless Sensor Networks
(joint work with Prof. İbrahim Körpeoğlu)

- Application placement with shared monitoring points in WSNs
- Application scheduling with multiplexed sensing of monitoring points in WSNs
