

# Ying Lu

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## OBJECTIVE

A full-time research or engineering position starting from February 2018.

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## SUMMARY

- Eight-year programmer and researcher specializing in geospatial data management, large-scale mobile video search and analysis, GIS and location-based services.
- Co-author of more than 15 papers published in prestigious venues (e.g., SIGMOD, TODS, SIGSPATIAL).

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## EDUCATION

**University of Southern California, Los Angeles, California, US** 08/2012 – 12/2017 (Expected)

*Ph.D.* Candidate in Computer Science. Advisor: Prof. Cyrus Shahabi

Thesis: *Efficient Indexing and Querying of Geo-tagged User-Generated Videos*

**Renmin University of China, Beijing, China** 09/2009 – 07/2012

*M.Phil.* in Computer Science. Advisor: Prof. Jiaheng Lu

Thesis: *Reverse Top-k Spatial Keyword Search*

**Zhengzhou University, Henan, China** 09/2005 – 07/2009

*B. Eng.* in Computer Science

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## PROFESSIONAL SKILLS

Programming Languages: C/C++, Java, Python, Shell Script, C#, R, JavaScript, PHP, SQL, Matlab

Database Systems: MySQL, Oracle, Teradata, MongoDB, Cassandra

Big Data Highlights: MapReduce, Hadoop, Spark, MS Azure, Parallel Computing

Mobile Computing: Android Application Development, Maps, 3D Virtual Globes and Maps, Unity 3D Game Engine

Computer Vision: OpenCV, FFmpeg, AutoStitch, VLFeat, SfM bundler

Data Analytics: Data Mining, Machine Learning, Tensorflow, Weka

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## RESEARCH EXPERIENCES

**USC – Information Lab., Los Angeles, CA** Research Assistant 08/2012 – present

Topic 1: Large-scale Mobile Video Indexing and Searching

- Challenges: 1) large number of videos; 2) casual way recording; 3) keep increasing.
- Ground Mobile Videos
  - Attacked the challenges by modelling the fields of view (pie-shaped FOVs) of videos with their geo-sensor metadata: camera GPS locations and viewing directions [MMSys'14].
  - Proposed a class of index structures and search algorithms for FOVs to improve the video query performance by a factor of two [GIS'14] [GeoInformatica'16].
- Aerial Mobile Videos / Drone Videos
  - Proposed a pyramid-shaped coverage model for drone videos and proposed a new index structure and a novel search algorithm to improve the query performance by 70% [GIS'17].

Topic 2: Scenic Trip Planning on Road Networks

- Find the most scenic (or safest, cleanest or with the most Pokémon GO items) path from a source to a destination within a travel time budget.
- Challenges: 1) street attractiveness evaluation; 2) large-scale network; 3) NP-hard problem.
- Analyzed geo-tagged photo/videos with machine learning techniques to identify the attractiveness of streets.
- Proposed a heuristic algorithm with spatial indexing and pruning techniques which achieves over 95% accuracy within 0.3 seconds on Los Angeles road network [GIS'15].
- Find the scenic path on time-dependent road networks. Proposed an approximate algorithm which is 10,000 faster than the optimal solution while keeping the accuracy loss less than 50% [CIKM'17].

Topic 3: Key Video Frame Selection with Spatial Filtering for Computer Vision Applications

- Target tracking: 10x speedup, 90% precision, and 75% recall [MMC'15 Best Paper Award] [JIVP'17].
- Panorama generation: 20x speedup while preserving the visual quality [W2GIS'14].
- 3D model construction: 7x speedup while preserving the visual quality [ICME'14].

**Samsung Research America, Mountain View, CA** Research Intern 05/2016 – 08/2016

- Top-k points of interest detection from geo-tagged mobile videos and 360° videos in an area.
- Challenges: 1) videos are large-scale and are continuously generated; 2) city-level areas; 3) time-aware POIs.
- Designed a clustering & incremental sampling algorithm based on the FOVs of videos, offering up to 19x speedup over an optimized baseline, while keeping the accuracy loss less than 20% in most cases [BigSpatial'17].

**Teradata Labs – Optimizer Group, El Segundo, CA**      Software Engineer Intern      05/2015 – 08/2015

- Estimate the query plan costs and query selectivity in Teradata optimizer.
- For the first time to explore machine learning techniques for the estimations.
- Experimental results demonstrate the feasibility and achieve better accuracy and perform more flexible and scalable compared to Teradata existing histogram model, especially for large-scale unseen data or query constraints.

**National University of Singapore, Singapore**      Research Intern      06/2009 - 08/2009

- Geo-textual Data Indexing and Query Processing.
- Proposed a new type of spatial-keyword query: reverse spatial keyword query (RSKQ), which finds objects that have the query object as their top-k spatial-keyword relevant objects.

**Renmin University of China, Beijing, China**      Research Assistant      09/2009 – 07/2012

- Geo-textual Data Indexing and Query Processing for RSKQ.
- Challenge: Geo-textual data includes both spatial and textual information.
- Proposed a class of hybrid index structures and branch-and-bound search algorithms to answer RSKQ, which outperform a non-naïve baseline by two orders of magnitude [SIGMOD'11].
- Proposed a model to theoretically analyze the query costs for RSKQ [TODS'14].

**Nanyang Technological University, Singapore**      Research Intern      09/2010 – 05/2011

- Geo-textual Data Indexing and Query Processing for RSKQ.
- Proposed an optimized algorithm to minimize I/O costs for processing RSKQ [GIS'15].

## KEY PROJECTS

**MediaQ ([Website](#) and [Demo](#))**      08/2012 – present

MediaQ is a system to collect, analyze, share and search mobile videos. Each frame is modeled with W4-metadata: capture time (when), location (where), keywords (what) and people shown in the frame (who).

- Leading the development team in media collection and system backend web services:
  - Developed Android and iOS apps to collect videos and geo-sensor data through spatial crowdsourcing.
  - Database schema design and indexing. Used MySQL & MongoDB.
  - Advanced video search. Used PHP.
  - Video auto-tagging via OpenStreetMap. Used Java servlet.
  - Face detection from videos. Use C++.
- Released a five-year worldwide [geo-video dataset](#) [MMSys'16].

**DroneQ ([Demo](#))**      04/2017 – present

DroneQ is a system to collect, organize and search drone videos using automatically tagged geospatial metadata.

- Leading in the system design and development.
  - Each drone video frame is modeled as a 3D pyramid-shaped field of view.
  - Support 3D spatial queries of drone videos on Google Earth and Cesium 3D maps. Used JavaScript.

**iWatch ([Details](#))**      08/2012 – 09/2014

iWatch is a multi-source collection and event detection for intelligent surveillance of criminal activity.

- Developed an Android app for continuous mobile video collection. Used Java and Google Cloud Message.
- Developed algorithms for continuous spatio-temporal video querying. Used JavaScript and PHP.
- Developed algorithms for stalking event detection from mobile video trajectories and tweets. Used Java.

## SELECTED PUBLICATIONS

1. **Y. Lu** and C. Shahabi. “Efficient Indexing and Querying of Geo-tagged Aerial Videos.” In ACM SIGSPATIAL GIS, 2017 (to appear).
2. **Y. Lu\***, G. Jossé\*, T. Emrich, U. Demiryurek, M. Renz, C. Shahabi, and M. Schubert (\*Equal Contributions). “Scenic Routes Now: Efficiently Solving the Time-Dependent Arc Orienteering Problem.” In ACM International Conference on Information and Knowledge Management (CIKM), 2017 (**Best Paper Nomination**, to appear).
3. **Y. Lu** and J. A. Colmenares. Efficient Detection of Points of Interest from Georeferenced Visual Contents. In ACM SIGSPATIAL GIS Workshop, BigSpatial 2017 (to appear).
4. **Y. Lu**, C. Shahabi and S. Kim. “Efficient Index and Retrieval of Large-scale Geo-tagged Video Databases.” In Journal of Geoinformatica, pages 1 – 29, 2016.
5. **Y. Lu** and C. Shahabi. “An Arc Orienteering Algorithm to Find the Most Scenic Path on a Large-scale Road Network.” In ACM SIGSPATIAL GIS, pages 46:1 – 46:10, 2015.
6. Y. Cai, **Y. Lu**, S. Kim, L. Nocera and C. Shahabi. “GIFT: A Geospatial Image and Video Filtering Tool for Computer Vision Applications with Geo-tagged Mobile Videos.” In IEEE Intl. Workshop on Mobile Multimedia Computing (MMC), pages 1 – 6, 2015 (**Best Paper Award**).
7. **Y. Lu**, C. Shahabi and S. Kim. “An Efficient Index Structure for Large-scale Geo-tagged Video Databases.” In ACM SIGSPATIAL GIS, pages 465-468, 2014.
8. **Y. Lu**, J. Lu, G. Cong, W. Wu, and C. Shahabi. “Efficient Algorithms and Cost Models for Reverse Spatial-Keyword k-Nearest Neighbor Search.” In ACM Trans. Database Syst. (TODS) 39(2):13, 2014.
9. J. Lu, **Y. Lu**, and G. Cong. “Reverse Spatial and Textual k Nearest Neighbor Search.” In ACM Conference on Management of Data (SIGMOD), pages 349 – 360, 2011.