

Lin Liao

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RESEARCH INTERESTS

My research interests lie in the application of artificial intelligence techniques – machine learning and probabilistic reasoning – to practical domains, such as human activity recognition, ubiquitous computing, and robotics.

EDUCATION

Summer 2006 (expected)	Ph.D. in Computer Science and Engineering, University of Washington, Seattle <i>Thesis: “Location-based Activity Recognition”</i> <i>Advisors: Dieter Fox and Henry Kautz</i>
2003	M.S. in Computer Science and Engineering, University of Washington, Seattle <i>Thesis: “Learning Motion Patterns from Sensor Data”</i> <i>Advisors: Dieter Fox and Henry Kautz</i>
2001	M.S. in Automation, Tsinghua University, Beijing <i>Graduated with Honors</i> <i>Thesis: “Data Warehousing for Decision Support Systems”</i> <i>Advisor: Wenhuaг Liu</i>
1998	B.S. in Automation, Tsinghua University, Beijing <i>Graduated with Honors</i>

AWARDS

CSE Educator's Fellowship, 2005-2006
Outstanding Paper Award, AAAI, 2004 (1 out of 453 papers)
Outstanding Graduate of Tsinghua University, 2001 (top 2%)

RESEARCH EXPERIENCE

University of Washington (Seattle)

Research Assistant with Professors Dieter Fox and Henry Kautz 2002 ~ present

- *Location-based activity recognition*: My dissertation topic is developing a system that uses GPS traces to learn and infer people’s daily activities (working, shopping, dining, etc.) and transportation routines. I have extended state-of-the-art hierarchical and relational probabilistic models, and developed efficient inference algorithms by applying various techniques such as Rao-Blackwellised particle filters and FFT-based belief propagation. Based on this work we developed a personal guidance system called *Opportunity Knocks*, to help people with cognitive disabilities use public transit. [AAAI 2004, UbiComp 2004, IJCAI 2005, NIPS 2005].
- *Graph-based tracking and model learning*: I presented the approach of location tracking and motion model learning using the graph structure of an environment like an outdoor street map or an indoor generalized Voronoi graph. The graph bridges the gap between continuous sensor data and high-level representations, and makes learning much more efficient [IROS 2003, UbiComp 2003].

Intel Research (Seattle)

Intern with Tanzeem Choudhury

Summer 2005

- *Fine-grained activity recognition from multiple streams of sensor data*: I combined GPS sensors with the Intel multi-sensor board to form a comprehensive system to summarize fine-grained indoor and outdoor human activities [AAAI 2006, in preparation].

Microsoft Research (Redmond)

Intern with Eric Horvitz

Summer 2004

- *Machine learning on freeway traffic data*: I applied particle filtering and model selection techniques to predicting freeway traffic flow and irregularities [UAI 2005].

Tsinghua University (Beijing)

Research Assistant with Professor Wenhuan Liu

1999 ~ 2000

- *Data warehousing for decision support*: I developed a prototype data warehouse system in a computer-controlled manufacturing plant, including the metadata management and data integration systems [CEA 2001].

TEACHING AND ADVISING EXPERIENCE

University of Washington (Seattle)

Graduate Mentor	Worked with gradate student Benson Limketkai in the project of Relational Robotic Mapping [IJCAI 2005]
Invited Lecturer	CSE 574, graduate-level advanced AI course, for one class, spring 2005
Head Teaching Assistant	CSE 142, undergraduate-level introductory programming course, fall 2002
Teaching Assistant	CSE 142 and CSE 143, undergraduate-level programming courses, fall 2001, winter 2002, and spring 2002

Tsinghua University (Beijing)

Teaching Assistant Undergraduate-level Digital Logic Design, fall 1999

INDUSTRY EXPERIENCE

OneWorld Software Solutions (Beijing)

Software Engineer

2001

- Co-designed and co-implemented the DidUBid system, a financial verification system for auction websites based on Microsoft COM+ platform, and PalmChat, an instant chat tool for Palm based on J2ME platform.

IBM Research Laboratory (Beijing)

Part-time Developer

1999 ~ 2000

- Co-designed and co-implemented the Chinese OCR and Multi-line Chinese Handwriting Recognition Engine.

REFERRED JOURNALS AND MAGAZINES

- [1] L. Liao, D. Fox, and H. Kautz. Extracting activities and significant places from GPS traces. *International Journal of Robotics Research (IJRR)*, 2006 (submitted, special issue on selected papers at ISRR 2005).

- [2] L. Liao, D. J. Patterson, D. Fox, and H. Kautz. Learning and inferring transportation routines. *Artificial Intelligence (AIJ)*, 2006 (invited and submitted for fast track review).
- [3] D. Fox, J. Hightower, L. Liao, D. Schulz, and G. Borriello. Bayesian filtering for location estimation. *IEEE Pervasive Computing*, 2(3):24–33, 2003.
- [4] L. Liao, L. Wang, and W. Liu. CIMS data environment design based on data warehouse. *Computer Engineering and Applications*, 2001 (Chinese journal).

REFERRED CONFERENCES

- [5] L. Liao, D. Fox, and H. Kautz. Location-based activity recognition. In *Advances in Neural Information Processing Systems (NIPS)*, 2005.
- [6] E. Horvitz, J. Apacible, R. Sarin, and L. Liao. Prediction, expectation, and surprise: methods, designs, and study of a deployed traffic forecasting service. In *Proceedings of the Conference on Uncertainty in Artificial Intelligence (UAI)*, 2005.
- [7] L. Liao, D. Fox, and H. Kautz. Location-based activity recognition using relational Markov networks. In *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI)*, 2005.
- [8] B. Limketkai, L. Liao, and D. Fox. Relational object maps for mobile robots. In *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI)*, 2005.
- [9] D. J. Patterson, L. Liao, K. Gajos, M. Collier, N. Livic, K. Olson, S. Wang, D. Fox, and H. Kautz. Opportunity Knocks: a system to provide cognitive assistance with transportation services. In *Proceedings of the International Conference on Ubiquitous Computing (UbiComp)*, 2004.
- [10] L. Liao, D. Fox, and H. Kautz. Learning and inferring transportation routines. In *Proceedings of the National Conference on Artificial Intelligence (AAAI)*, 2004. **Best Paper Award**
- [11] D. J. Patterson, L. Liao, D. Fox, and H. Kautz. Inferring high-level behavior from low-level sensors. In *Proceedings of the International Conference on Ubiquitous Computing (UbiComp)*, 2003.
- [12] L. Liao, D. Fox, J. Hightower, H. Kautz, D. Schulz. Voronoi tracking: location estimation using sparse and noisy sensor data. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2003.

REFERRED WORKSHOPS

- [13] L. Liao, D. J. Patterson, D. Fox, and H. Kautz. Building personal maps from GPS data. In *Proceedings of IJCAI Workshop on Modeling Others from Observations (MOO)*, 2005.
- [14] L. Liao, D. J. Patterson, D. Fox, and H. Kautz. Behavior recognition in assisted cognition. In *Proceedings of AAAI Workshop on Supervisory Control of Learning and Adaptive Systems*, 2004.
- [15] P. Domingos, et al. Research on statistical relational learning at the University of Washington. In *Proceedings of IJCAI Workshop on Learning Statistical Models from Relational Data*, 2003.

UNREFEREED AND INVITED ARTICLES

- [16] L. Liao, D. Fox, and H. Kautz. Extracting activities and significant places from GPS traces. In *Proceedings of the International Symposium of Robotics Research (ISRR)*, 2005.
- [17] D. Fox, J. Hightower, H. Kautz, L. Liao, D. J. Patterson. Bayesian techniques for location estimation. In *Proceedings of the UbiComp Workshop on Location-Aware Computing*, 2003.
- [18] L. Liao. Stock option pricing using Bayes filters. *Technical report #2003-12-07*, Department of Computer Science and Engineering, University of Washington, 2003.

PROFESSIONAL SERVICE

Program committee member, AAAI, 2005

Conference reviewer: AAAI, UbiComp

Journal reviewer: IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Transactions on Mobile Computing, IEEE Pervasive Computing

UW CSE Ph.D. admissions committee member, 2003

UW CSE prospective graduate student recruiting committee, 2003

CITIZENSHIP

P. R. China, student (F1) visa

REFERENCES

Dieter Fox

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Henry Kautz

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