

Hung H. Bui

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RESEARCH INTERESTS

My main research interests are in probabilistic graphical models and machine learning, especially models for sequential data, with applications in human activity recognition (in physical environments and computer desktop environments) and natural language processing.

RESEARCH AND ACADEMIC POSITIONS

Artificial Intelligence Center, SRI International

Oct 2003 - Current

Senior Computer Scientist (since 2005), Computer Scientist (2003-2005)

- Principle Investigator, DARPA Mind's Eye research program in high-level activity recognition from video. Research team includes SRI, University of Maryland, and University of Leeds.
- Led a large multi-institution research team in state estimation and activity recognition, as part of the Defence Advanced Research Project Agency (DARPA) Cognitive Agent that Learns and Organizes (CALO) project. Research team includes members from SRI, Stanford, MIT, University of California at Berkeley, and University of Washington, with total annual budget over one million USD.
- Led the SRI team in developing desktop activity and workflow recognition algorithms and prototypes.
- Developed various novel extensions of both generative (dynamic Bayesian networks) and discriminative (conditional random fields) statistical models, with applications in learning and recognizing human activities.
- Co-advised 4 PhD students in the Department of Computer Science, Curtin University of Technology, Perth, Australia, with research focus in the area of graphical models, machine learning and activity recognition. All of them have graduated.

Curtin University of Technology, Perth, Australia

2000 - 2003

Department of Computer Science

Lecturer (Assistant Professor)

Taught several courses including Artificial Intelligence, Discrete Mathematics, Computer Communication at the undergraduate level. Taught advanced topics in Artificial Intelligence including Bayesian networks, graphical models, neural networks. Performed research in probabilistic graphical models with applications in activity and plan recognition. Co-advised several PhD students at the department.

Curtin University of Technology, Perth, Australia

1998-2000

Department of Computer Science

Postdoctoral research fellow

Performed research in Bayesian networks with application in wide-area surveillance.

EDUCATION

Curtin University of Technology, Perth, Australia

1994-1998

PhD (Computer Science)

Dissertation: "An Approach to Coordinating Team of Agents under Incomplete Information"

Curtin University of Technology, Perth, Australia

1991-1994

B.Sc with First Class Honors (Computer Science)

Completed the 4-year degree in 3 years.

Honors Thesis: "Qualitative Modelling of Spatial Environments".

AWARDS

SRI Spot Award for Leading the Development of SRI CALO Activity Recognizer	2007
SRI Presidential Achievement Award (with other members of the AIC)	2006
Australia Postgraduate Research Scholarship for Overseas Student	1994-1997
Curtin University Postgraduate Scholarship	1994-1997
School Prize for Best Honours-Year Computer Science Student	1993
School Prize for Best First-Year Computer Science Student	1991
Vice-Chancellor's List (University Top 1% Students)	1991-1993
Two Winning Prizes, Sydney University Mathematics Society Competition	1991
Silver Medallist, 30th International Mathematics Olympiad, Braunschweig, Germany	1989

RESEARCH GRANTS

- "Activity Recognition and Proactive Assistance", DARPA CALO Research Project. Annual budget over one million USD. (2005-2009).
- "I Sense, Therefore I help: Towards Homes that Sense and Support the Aged and Infirm". Australian Research Council's large grant. Value: 555,000 AUD. (2004-2007).

INVITED TALKS

- *Neural Information Processing Systems (NIPS)* Workshop on Recognition and Discovery of Activities and Interactions, Whistler, Vancouver, BC, Canada. Dec, 2005.
- *Computation Learning Laboratory, Stanford University*, Feb 2005.
- *Redwood Neuroscience Institute*, Menlo Park, CA, Apr 2005.
- *Department of Engineering, Cambridge University*, Cambridge, UK, July 2000.

PROFESSIONAL ACTIVITIES

Charing:

- Vice-Chair, Pacific Rim Conference on Artificial Intelligence (PRICAI 2006, 2008)
- Co-Chair, Workshop on Plan, Activity and Intent Recognition (PAIR) at IJCAI 2009 and AAI 2010

Journal Editorial Board

- ACM Transactions on Intelligent Systems and Technology (ACM TIST)

Program Committee

- American Association for Artificial Intelligence Conferences, AAI 2005, 2006, 2008

- International Joint Conference on Artificial Intelligence, IJCAI 2005, 2009
- International Conference on Automated Planning and Scheduling, ICAPS 2005
- Modelling Other Agents from Observations AAAI Workshop (MOO), 2004, 2005, 2006
- Plan, Activity and Intent Recognition AAAI Workshop (PAIR), 2007
- International Symposium on Location and Context Awareness (LoCA), 2009
- AAAI Spring Symposium on Human Behavior Modeling, 2009

Reviewing

- Regular reviewer for the Artificial Intelligence Journal (AIJ) and the IEEE Transaction on Pattern Analysis and Machine Intelligence (PAMI)
- Reviewer: AAAI 2004, International Conference on Machine Learning (ICML 2002), Machine Learning Journal, International Journal on Robotics Research, International Journal on Pattern Recognition and Artificial Intelligence.

PUBLICATIONS

Journal Papers and Book Chapters

1. Pham D-S, Bui H and Venkatesh S (2010) Bayesian minimax estimation of the normal model with incomplete prior covariance matrix specification. *IEEE Transaction on Information Theory*. To appear.
2. Phung D, Duong T, Bui H, and Venkatesh S (2009) Efficient duration and hierarchical modeling for human activity recognition. *Artificial Intelligence* (173), 2009, pp. 830--856.
3. Peursum P, Bui H, Venkatesh S, and West G (2005) Robust recognition and segmentation of human actions using HMMs with missing observations. *EURASIP Journal of Applied Signal Processing*, Vol 2005 No 13, August 2005, p2110-2126
4. Adams B, Venkatesh S, Bui H, and Dorai C (2005) A probabilistic framework for extracting narrative act boundaries and semantics in motion pictures. *Multimedia Tools and Applications*, Springer, Vol 27 Issue 2, Nov 2005, p195-213
5. Peursum P, Venkatesh S, West G, and Bui H (2004) Using human-object interaction signatures to find and label chairs, floors. *IEEE Pervasive Computing*, Vol 3, No 4, Oct-Dec 2004, p58-65
6. Lazarescu M, Venkatesh S and Bui H (2004) Using multiple windows to track concept drift. *Intelligent Data Analysis*, 8: 29-59.
7. Nguyen N, Bui H, Venkatesh S, and West G (2003) Multiple camera coordination in a surveillance system. *ACTA Automatica Sinica*, Vol 29 (3), p408-422, 2003
8. Bui H, Venkatesh S, and West G (2002) Policy recognition in the Abstract Hidden Markov Model. *Journal of Artificial Intelligence Research*, 17: 451-499.
9. Bui H, Venkatesh S, and West G (2001) Tracking and surveillance in wide-area spatial environments using the Abstract Hidden Markov Model, *International Journal of Pattern Recognition and Artificial Intelligence*, 15(1): 177-195.
10. Bui H, Venkatesh S, and Kieronska D (1999) Learning other agents' preferences in multi-agent negotiation using the Bayesian classifier. *International Journal of Cooperative Information Systems*, 8(4): 275-294.
11. Bui H, Venkatesh S, and West G (1999) Layered dynamic probabilistic networks for spatio-temporal modelling. *Intelligent Data Analysis*, 3(5): 339-361.
12. Bui H, Venkatesh S, and Kieronska D (1998) A framework for coordination and learning among team of agents. In: *Agents and Multi-Agent Systems: Formalisms, Methodologies and Applications*, W. Wobcke, M. Pagnucco, C. Zhang (eds), Lecture Notes in Artificial Intelligence, vol 1441, pages 164-178. Springer-Verlag.

13. Bui H, Venkatesh S, and Kieronska D (1995) Constructing hierarchical abstraction for qualitative representations of space and time. *Australian Journal of Intelligent Information Processing Systems*, 2(3): 36-45.

Refereed Conference and Workshop Papers

14. Madani O, Bui H, and Yeh E (2009) Efficient online learning and prediction of users' desktop commands. *Twenty-First International Joint Conference on Artificial Intelligence (IJCAI-2009)*, July 11-17, Pasadena, CA, USA.
15. de Salvo Braz R, Natarajan S, Bui H, Shavlik J, and Russell S (2009) Anytime lifted belief propagation. *Workshop on Statistical Relational Learning 2009*.
16. Tran T, Phung D, Venkatesh S, and Bui H (2009) MCMC for hierarchical semi-Markov conditional random fields. *NIPS 2009 Workshop on Deep Learning for Speech Recognition and Related Applications*. December, 2009, Whistler, BC, Canada
17. Madani O, Bui H, and Yeh E (2009) Prediction and discovery of users' desktop behavior. *AAAI Spring Symposium on Human Behavior Modeling*. March, 2009, Stanford University.
18. Tran T, Phung D, Bui H, and Venkatesh S (2008) Hierarchical semi-Markov conditional random fields for recursive sequential data. *Twenty-Second Annual Conference on Neural Information Processing Systems (NIPS 2008)*.
19. Bui H, Phung D, Venkatesh S, and Phan H (2008) The hidden permutation model and location-based activity recognition. *Twenty-Third AAAI Conference on Artificial Intelligence (AAAI 2008)*.
20. Bui H, Tyson M, and Yorke-Smith N (2008) Efficient message passing and propagation of simple temporal constraints: results on semi-structured networks. *CP/ICAPS 2008 Joint Workshop on Constraint Satisfaction Techniques for Planning and Scheduling Problems*.
21. Connolly C. I, Burns J. B, and Bui H (2008) Recovering social networks from massive track datasets. *IEEE International Workshop on Applications of Computer Vision*.
22. Natarajan S, Bui H, Tadepalli P, Kersting K, and Wong W (2008) Logical hierarchical hidden Markov models for modeling user activities. *Eighteenth International Conference on Inductive Logic Programming (ILP 2008)*.
23. Bui H, Tyson M, and Yorke-Smith N (2007) Efficient message passing and propagation of simple temporal constraints, *AAAI 2007 Workshop on Spatial and Temporal Reasoning*, Vancouver, Canada, pp. 9-15.
24. Truyen T, Phung D, Bui H, and Venkatesh S (2006) AdaBoost.MRF: Boosted Markov random forests and applications to multilevel activity recognition. *International Conference on Computer Vision and Pattern Recognition (CVPR 2006)*, 17-22 June, New York City.
25. Duong T, Phung D, Bui H, and Venkatesh S (2006) Human behaviour recognition with generic exponential family duration modeling in the Hidden Semi-Markov Model. *International Conference on Pattern Recognition (ICPR 2006)*, 20-24 August, Hong Kong
26. Tran D, Phung D, Bui H, and Venkatesh S (2006) A probabilistic model with parsimonious representation for sensor fusion in recognizing activity in pervasive environment. In *International Conference on Pattern Recognition, ICPR*, pages 168-172, Hong Kong, August 2006. IEEE CS Press.
27. Nguyen N, Bui H, and Venkatesh S (2006) Recognising behaviour of multiple people with hierarchical probabilistic and statistical data association. *17th British Machine Vision Conference (BMVC 2006)*.
28. Phung D, Duong T, Bui H, and Venkatesh S (2005) Topic transition detection using hierarchical hidden Markov and semi-Markov models. *ACM Multimedia (ACM-MM 2005)*, 6-11 Nov, Singapore.
29. Nguyen N, Phung D, Bui H, and Venkatesh S (2005) Learning and detecting activities from movement trajectories Using the hierarchical hidden Markov model. *International Conference on*

- Computer Vision and Pattern Recognition (CVPR 2005)*, 20-25 Jun, San Diego, CA, USA, p955-960.
30. Duong T, Bui H, Phung D, and Venkatesh S (2005) Activity recognition and abnormality detection with the switching hidden semi-Markov model. *International Conference on Computer Vision and Pattern Recognition (CVPR 2005)*, 20-25 Jun, San Diego, CA, USA, p838-845.
 31. Truyen T, Bui H, and Venkatesh S (2005) Human activity learning and segmentation using partially hidden discriminative models. Workshop on Human Activity Recognition and Modelling (HAREM2005), 9 Sep, Oxford, UK
 32. Truyen T, Bui H, and Venkatesh S (2005) Boosted Markov networks for activity recognition. *International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP 2005)*, 5-8 Dec, Melbourne, Australia.
 33. Duong T, Phung D, Bui H, and Venkatesh S (2005). Efficient Coxian duration modelling for activity recognition in smart environment with the hidden semi-Markov model. *International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP2005)*, 5-8 Dec, Melbourne, Australia.
 34. Tran D, Phung D, Bui H, and Venkatesh S (2005) Factored state-abstract hidden Markov models for activity recognition using pervasive multi-modal sensors. *International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP2005)*, 5-8 Dec, Melbourne, Australia.
 35. Bui H, Phung D, and Venkatesh S (2004) Hierarchical hidden Markov models with general state hierarchy. *Nineteenth National Conference on Artificial Intelligence (AAAI-2004)*, San Jose, CA, July 2004.
 36. Peursum P, Bui H, Venkatesh S, and West G (2004) Human action segmentation via controlled use of missing data in HMMs. *International Conference on Pattern Recognition (ICPR-2004)*. Cambridge, UK, August 2004.
 37. Phung D, Bui H, and Venkatesh S (2004) Automatically learning structural units in educational videos using the hierarchical HMM. *International Conference on Image Processing (ICIP2004)*, 24-27 Oct 2004, Singapore
 38. Phung D, Bui H, and Venkatesh S (2004) Content structure discovery in educational videos with shared structures in the hierarchical HMM. *Joint IAPR International Workshops on Structural and Syntactical Pattern Recognition and Statistical Techniques in Pattern Recognition (SSPR2004)*, 18-20 Aug 2004, Lisbon, Portugal, p1155-1163
 39. Nguyen N, Venkatesh S, West G, and Bui H (2004) Learning people movement model from multiple cameras for behaviour recognition. *Joint IAPR International Workshops on Structural and Syntactical Pattern Recognition and Statistical Techniques in Pattern Recognition (SSPR2004)*, 18-20 Aug 2004, Lisbon, Portugal, p315-324
 40. Bui H (2003) A general model for online probabilistic plan recognition. *IJCAI-2003, International Joint Conference on Artificial Intelligence*. Acapulco, Mexico.
 41. Nguyen N, Bui H, Venkatesh S, and West G (2003) Recognising and monitoring high-level behaviours in complex spatial environments. *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR-2003)*. Madison, Wisconsin, USA.
 42. Luhr S, Bui H, Venkatesh S, and West G (2003) Recognition of human activity through hierarchical stochastic learning. *IEEE International Conference on Pervasive Computing and Communications*. Texas, USA.
 43. Peursum P, Venkatesh S, West G, and Bui H (2003) Object labelling from human action recognition. *IEEE International Conference on Pervasive Computing and Communications*. Texas, USA.
 44. Adams B, Dorai C, Venkatesh S, and Bui H (2003) Indexing narrative structure and semantics in motion pictures with a probabilistic framework. *IEEE International Conference on Multimedia and Expo (ICME-2003)*. Baltimore, MD, USA.

45. Bui H (2002) Efficient approximate inference for online probabilistic plan recognition. *AAAI Fall Symposium on Intent Inference for Users, Teams and Adversaries*. Falmouth, MA, USA.
46. Chambers G, Venkatesh S, West G, and Bui H (2002) Hierarchical recognition of intentional human gestures for sports video annotation. *International Conference on Pattern Recognition (ICPR-2002)*. Quebec, Canada.
47. Nguyen H, Venkatesh S, West G, and Bui H (2002) Hierarchical monitoring of people's behaviours in complex environment using multiple cameras. *International Conference on Pattern Recognition (ICPR-2002)*. Quebec, Canada.
48. Nguyen N, Venkatesh S, West G, and Bui H (2002) Coordination of multiple cameras to track multiple people. *Fifth Asian Conference on Computer Vision (ACCV-2002)*. Melbourne, Australia.
49. Bui H (2001) Abstract Hidden Markov Models for online probabilistic plan recognition. *AAAI Fall Symposium on Intent Inference for Collaborative Tasks*. Falmouth, MA, USA.
50. Bui H, Venkatesh S, and West G (2000) On the recognition of abstract Markov policies. *AAAI-2000, Seventeenth National Conference on Artificial Intelligence*, Austin, Texas, August 2000.
51. Bui H, Venkatesh S, and West G (2000) A probabilistic framework for tracking in wide-area environments. *ICPR-2000, International Conference on Pattern Recognition*. Barcelona, September 2000.
52. Bui H, Venkatesh S, and West G (1999) Probabilistic querying at multiple levels of abstraction in large spatial domains. *Fifth Biennial Conference on Digital Image Computing: Techniques and Applications (DICTA-99)*, pages 285-289. Perth, December 1999.
53. Bui H, Kieronska D, and Venkatesh S (1997) Optimal communication among team members. *Tenth Australian Joint Conference on Artificial Intelligence, (AI-97)*, Perth, December 1997. Also in *Advanced Topics in Artificial Intelligence*, A. Sattar (eds), Lecture Notes in Artificial Intelligence, vol 1342, pages 116-126. Springer-Verlag.
54. Bui H, Kieronska D, and Venkatesh S (1996) Learning other agents' preferences in multiagent negotiation. *AAAI-96, Thirteenth National Conference on Artificial Intelligence*, Portland, Oregon, August 1996.
55. Bui H, Kieronska D, and Venkatesh S (1996) Negotiating agents that learn about others' preferences. *AAAI Spring Symposium on Adaptation, Co-evolution and Learning in Multiagent Systems*. Stanford University, March 1996.
56. Bui H, Venkatesh S, and Kieronska D (1995) A multi-agent incremental negotiation scheme for meetings scheduling. *ANZIIS-95, the Third Australian and New Zealand Conference on Intelligent Information Systems*, Perth, WA, Australia.
57. Bui H, Venkatesh S, and Kieronska D (1994) A formal framework for qualitative knowledge representations. *ICARCV 1994, the Third International Conference on Automation, Robotics and Computer Vision*, pp. 846-851.

Technical Reports

58. Connolly C. I, Burns J. B, and Bui H (2007) Recovering social networks from massive track datasets. Technical Report 564. SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025, October 2007.

Theses

59. Bui H (1998) An Approach to Coordinating Team of Agents under Incomplete Information. Phd Thesis, School of Computing Science, Curtin University of Technology, WA, Australia.
60. Bui H (1993) Qualitative Modelling of Spatial Environments. Honours Thesis. School of Computing Science, Curtin University of Technology, WA, Australia.

COMPUTER SKILLS

Platforms: Windows, Linux, Eclipse
Languages: Java, Matlab

PERSONAL INFORMATION

Born: 26th Nov, 1973
Citizenship: Australian and Vietnamese (US green card holder)
Languages: English and Vietnamese (both fluent)

REFERENCES

Available upon request.