Vitae of Professor Ian Davidson

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(A) RESEARCH INTERESTS

◇ **Artificial Intelligence.** Constraint programming and machine learning

◇ **Machine Learning.** Active learning, transfer learning, human in the loop learning, learning with constraints

◇ **Data Mining.** Unsupervised methods such as clustering, graph and tensor analysis with applications to neuroscience, intelligent tutoring systems and social networks.

(B) CAREER AND TRAINING

◇ 2013-: **Full Professor with Tenure**, Department of Computer Science, University of California, Davis. (2008-2013 Associate Professor with Tenure), (2007-2008 Assistant Professor).

◇ 2002 to 2007: **Assistant Professor**, Department of Computer Science, State University of New York, NY.

◇ 2000 to 2002: **Technical Lead**, MineSet Machine Learning Group, Silicon Graphics (SGI), Mountain View, CA.

◇ 1994-2000, Monash University, Australia, Ph.D. in Computer Science, *Information Theoretic Learning - Markov Chain Monte Carlo Sampling and the Minimum Message Length Principle*

(C) RESEARCH IMPACTS AND AWARD 2010-2015

◇ US$3.5+ Million funding including NSF, DoD and DoE for my lab.

◇ DoD- Commercialization of research: i) Human Cultural Behavioral Modeling for War Games, ii) Active Transfer Learning for Intelligent Tutoring.

◇ Yahoo! Faculty Award, Google Research Faculty Awards

◇ National Science Foundation CAREER Award

◇ Best Paper Awards: Winner - SIAM DM 2005, IEEE ICDM 2006, Runner Up SIAM DM 2013, Top 10 - ACM KDD 2011, 2011, 2013

◇ Editorial Board - ACM Transactions of Knowledge Discovery and Data Mining 2010-.

◇ Editorial Board - Springer - Data Mining and Knowledge Discovery 2009-.

◇ Editorial Board - IEEE Transactions on Knowledge and Data Engineering, 2013-.

(D)

LAST | **Refereed Journals**
FOUR | Over my career I have published 15 journal papers in premier venues such as
YEARS | AIJ, DMKD, TKDE, TKDD etc.

1. Walker P., Mehalick M, Glueck A., Tschiffely A., **Davidson I.**, A DECISION FRAMEWORK FOR UNDERSTANDING BLAST-INDUCED MILD TRAUMATIC BRAIN INJURY IN A MILITARY MEDICAL DATABASE, The Journal of Defense Modeling and Simulation, 2017

2. Walker P., Mehalick M, Glueck A., Tschiffely A., **Davidson I.**, APPLICATIONS OF TRANSDUCTIVE SPECTRAL GRAPH METHODS IN A MILITARY MEDICAL CONCUSSION DATABASE, IEEE/ACM transactions on computational biology and bioinformatics 2016.

3. Qian B., Wang X., Cao N., Jiang Y., **Davidson I.**, LEARNING MULTIPLE RELATIVE ATTRIBUTES WITH HUMANS IN THE LOOP. IEEE Transactions on Image Processing 23(12): 5573-5585 (2015)

4. Gilpin S., **Davidson I.**, A FLEXIBLE ILP FORMULATION FOR HIERARCHICAL CLUSTERING Artificial Intelligence Journal, (2015)

5. Qian B., Wang X., Ye J., **Davidson I.**, A RECONSTRUCTION ERROR BASED FRAMEWORK FOR MULTI-LABEL AND MULTI-VIEW LEARNING. IEEE Trans. Knowl. Data Eng. 27(3): 594-607 (2015)

6. Wang X., Qian B., **Davidson I.**, ON CONSTRAINED SPECTRAL CLUSTERING AND ITS APPLICATIONS, Available at CoRR abs/1201.5338, *Knowledge Discovery and Data Mining*, 29 pages, (2015).

7. Hossain S., Ramakrishnan N., **Davidson I.**, Layne T. Watson: How to "alternatize" a clustering algorithm. Data Min. Knowl. Discov. 27(2): 193-224 (2013)

8. Chattopadhyay R., Wang Z, Fan W., **Davidson I.,**, Panchanathan S., Ye J., BATCH MODE ACTIVE SAMPLING BASED ON MARGINAL PROBABILITY DISTRIBUTION MATCHING. TKDD 7(3): 13 (2013)

9. Rita Chattopadhyay, Qian Sun, Wei Fan, **Ian Davidson**, Sethuraman Panchanathan, Jieping Ye: MULTISOURCE DOMAIN ADAPTATION AND ITS APPLICATION TO EARLY DETECTION OF FATIGUE. *ACM Transactions on Knowledge Discovery and Data Mining* 6(4): 18 (2012)

10. Hossain M., Tadepalli S., Watson L., **Davidson I.**, Ramakrishnan N., FURTHER RESULTS ON UNIFYING DEPENDENT CLUSTERING AND DISPARATE CLUSTERING, *ACM Transactions on Knowledge Discovery and Data Mining*, 24 pages. (2013),

11. Hossain M., Tadepalli S., Watson L., **Davidson I.**, Ramakrishnan N., HOW TO ALTERNATIZE A CLUSTERING ALGORITHM, , *Knowledge Discovery and Data Mining*, 31 pages. (2013).

12. Chattopadhyay R., Ye J., Panchanathan S., Fan W., **Davidson I.**, MULTI-SOURCE DOMAIN ADAPTATION AND ITS APPLICATION TO EARLY DETECTION OF FATIGUE, *ACM Transactions of Knowledge Discovery and Data Mining*, 31 pages. (2013).

13. **Davidson I**, Gilpin S. and Walker P. MINING BEHAVIORAL EVENT DATA, , *Knowledge Discovery and Data Mining*, 21 pages. In Press. (2012)

Refereed Conferences

The premier conferences in my area are ACM KDD and AAAI/IJCAI. I have 19 publications and 12 publications in these venues respectively. Other top tier venues include IEEE ICDM, SIAM DM and CIKM and I have a further 25 publications in these venues. Below are the conference publications in the last four years.

14. Chia-Tung Kuo, S.S. Ravi, C. Vrain, Thi-Bich-Hanh Dao, **Ian Davidson**, A FRAMEWORK FOR CLUSTER MODIFICATION USING CONSTRAINT PROGRAMMING. AAAI 2017

15. Aubrey Gress, **Ian Davidson**: PROBABILISTIC FORMULATIONS OF REGRESSION WITH MIXED GUIDANCE. IEEE ICDM 2016

16. Thi-Bich-Hanh Dao, Christel Vrain, Khanh-Chuong Duong, **Ian Davidson**, A FRAMEWORK FOR ACTIONABLE CLUSTERING USING CONSTRAINT PROGRAMMING. ECAI 2016: 453-461

17. Chia-Tung Kuo, **Ian Davidson**, A FRAMEWORK FOR OUTLIER DE-SCRIPTION USING CONSTRAINT PROGRAMMING. AAAI 2016: 1237-1243

18. Xiang Li, Milad Makkie, Binbin Lin, Mojtaba Sedigh Fazli, **Ian Davidson**, Jieping Ye, Tianming Liu, Shannon Quinn: SCALABLE FAST RANK-1 DICTIONARY LEARNING FOR FMRI BIG DATA ANALYSIS. KDD 2016: 511-519

19. Shuo Zhou, Nguyen Xuan Vinh, James Bailey, Yunzhe Jia, **Ian Davidson**, ACCELERATING ONLINE CP DECOMPOSITIONS FOR HIGHER ORDER TENSORS. KDD 2016: 1375-1384

20. Buyue Qian, Xiang Wang, **Ian Davidson**: PROPAGATING RANKING FUNCTIONS ON A GRAPH: ALGORITHMS AND APPLICATIONS. AAAI 2015: 1833-1839

21. Peter B. Walker, Sean Gilpin, Sidney G. Fooshee, **Ian Davidson**: CON-STRAINED TENSOR DECOMPOSITION VIA GUIDANCE: INCREASED INTER AND INTRA-GROUP RELIABILITY IN FMRI ANALYSES. HCI (15) 2015: 361-369

22. Aubrey Gress, **Ian Davidson**: ACCURATE ESTIMATION OF GEN-ERALIZATION PERFORMANCE FOR ACTIVE LEARNING. ICDM 2015: 131-140

23. Chia-Tung Kuo, Xiang Wang, Peter B. Walker, Owen T. Carmichael, Jieping Ye, **Ian Davidson**: UNIFIED AND CONTRASTING CUTS IN MULTIPLE GRAPHS: APPLICATION TO MEDICAL IMAGING SEGMENTATION. KDD 2015: 617-626

24. Sen Yang, Qian Sun, Shuiwang Ji, Peter Wonka, **Ian Davidson**, Jieping Ye: STRUCTURAL GRAPHICAL LASSO FOR LEARNING MOUSE BRAIN CONNECTIVITY. KDD 2015: 1385-1394

25. Peter B. Walker, **Ian Davidson**: LEARNING AUTOMATED AGENTS FROM HISTORICAL GAME DATA VIA TENSOR DECOMPOSITION. SBP 2015: 213-221

26. Peter B. Walker, Sidney G. Fooshee, **Ian Davidson**: COMPLEX INTERACTIONS IN SOCIAL AND EVENT NETWORK ANALYSIS. SBP 2015: 440-445

27. Chia-Tung Kuo, James Bailey, **Ian Davidson**: A FRAMEWORK FOR SIMPLIFYING TRIP DATA INTO NETWORKS VIA COUPLED MATRIX FACTORIZATION. SDM 2015: 739-747

28. Aubrey Gress, **Ian Davidson**: A FLEXIBLE FRAMEWORK FOR PROJECTING HETEROGENEOUS DATA. CIKM 2014: 1169-1178

29. Chia-Tung Kuo, Peter B. Walker, Owen T. Carmichael, **Ian Davidson**: SPECTRAL CLUSTERING FOR MEDICAL IMAGING. ICDM 2014: 887-892

30. Fei Wang, Ping Zhang, Buyue Qian, Xiang Wang, **Ian Davidson**: CLINICAL RISK PREDICTION WITH MULTILINEAR SPARSE LOGISTIC REGRESSION. KDD 2014: 145-154

31. Xiang Wang, Jun Wang, Buyue Qian, Fei Wang, **Ian Davidson**: SELF-TAUGHT SPECTRAL CLUSTERING VIA CONSTRAINT AUGMENTATION. SDM 2014: 416-424

32. Chia-Tung Kuo, **Ian Davidson**: DIRECTED INTERPRETABLE DISCOVERY IN TENSORS WITH SPARSE PROJECTION. SDM 2014: 848-856

33. Sean Gilpin, Siegfried Nijssen, Ian N. Davidson: FORMALIZING HIERARCHICAL CLUSTERING AS INTEGER LINEAR PROGRAMMING. AAAI 2013

34. Weifeng Zhi, Xiang Wang, Buyue Qian, Patrick Butler, Naren Ramakrishnan, **Ian Davidson**: CLUSTERING WITH COMPLEX CONSTRAINTS - ALGORITHMS AND APPLICATIONS. AAAI 2013

35. Sean Gilpin, Buyue Qian, **Ian Davidson**: EFFICIENT HIERARCHICAL CLUSTERING OF LARGE HIGH DIMENSIONAL DATASETS. CIKM 2013: 1371-1380

36. Henry L. Phillips, Peter B. Walker, Carrie H. Kennedy, Owen T. Carmichael, Ian N. Davidson: GUIDED LEARNING ALGORITHMS: AN APPLICATION OF CONSTRAINED SPECTRAL PARTITIONING TO FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI). HCI (24) 2013: 709-716

37. Shayok Chakraborty, Jiayu Zhou, Vineeth Nallure Balasubramanian, Sethuraman Panchanathan, **Ian Davidson**, Jieping Ye: ACTIVE MATRIX COMPLETION. ICDM 2013: 81-90

38. Buyue Qian, Xiang Wang, Jun Wang, Hongfei Li, Nan Cao, Weifeng Zhi, **Ian Davidson**: FAST PAIRWISE QUERY SELECTION FOR LARGE-SCALE ACTIVE LEARNING TO RANK. ICDM 2013: 607-616

39. Rita Chattopadhyay, Wei Fan, **Ian Davidson**, Sethuraman Panchanathan, Jieping Ye: JOINT TRANSFER AND BATCH-MODE ACTIVE LEARNING. ICML (3) 2013: 253-261

40. Buyue Qian, Xiang Wang, Fei Wang, Hongfei Li, Jieping Ye, **Ian Davidson**: ACTIVE LEARNING FROM RELATIVE QUERIES. IJCAI 2013

41. Sean Gilpin, Tina Eliassi-Rad, Ian N. Davidson: GUIDED LEARNING FOR ROLE DISCOVERY (GLRD): FRAMEWORK, ALGORITHMS, AND APPLICATIONS. KDD 2013: 113-121

42. Ian N. Davidson, Sean Gilpin, Owen T. Carmichael, Peter B. Walker: NETWORK DISCOVERY VIA CONSTRAINED TENSOR ANALYSIS OF FMRI DATA. KDD 2013: 194-202

43. **Qian, B., Davidson I.**, ACTIVE LEARNING TO RANK USING PAIRWISE SUPERVISION, SIAM DM, 2013 .

44. **Wang, X., Qian, B., Davidson I.**, MULTI-OBJECTIVE MULTI-VIEW SPECTRAL CLUSTERING VIA PARETO OPTIMIZATION,, SIAM DM, 2013 .

45. Wang, X., Qian, B., **Davidson I.**, IMPROVING DOCUMENT CLUSTERING USING AUTOMATED MACHINE TRANSLATION, ACM CIKM, 2012

46. Wang, X., Qian, B., **Davidson I.**, A UNIFIED VIEW OF LABEL PROPAGATION AND SPECTRAL DECOMPOSITION, IEEE ICDM, 2012

47. **Davidson I.**, TWO APPROACHES TO UNDERSTANDING WHEN CONSTRAINTS HELP CLUSTERING, KDD, 2012.

48. Chattopadhyay R., Ye J., Panchanathan S., Fan W., **Davidson I.**, BATCH MODE ACTIVE SAMPLING BASED ON MARGINAL PROBABILITY DISTRIBUTION MATCHING, KDD, 2012.

(E) **RELEVANT** **AI/DM/ML** **ACTIVE** **GRANTS**	◇ Yahoo! Research Award: Transfer Learning to Rank with a Human in the Loop (2015-) Role: Single PI. A key problem of Yahoo! is annotating documents with relevance to a topic. We learn multiple ranking functions simultaneously to achieve this aim. Total Gift Amount: $50,000
	◇ NSF: IIS Discovering Functional Networks in Medical Imaging (2015-) Role: PI. The use of spectral graph and tensor decomposition methods to analyze networks in brain data. Total Amount $499,999, my lab $300,000
	◇ ONR: Phase 1 & 2 : Active Transfer Learning for Intelligent Tutoring Systems (2017-2019) Role: PI of Educational Institution. The application of active and transfer learning to intelligent tutoring systems. Total Amount $1,200,000 (my sub-award of $590,000)
	◇ ONR: Human in the Loop Learning Methods for Electronic Medical Record Analysis (2017-2019) Role: PI. Total Amount $300,000
	◇ ONR: Small World Properties in Brain Imaging Data Role: PI. Total Amount $200,000
	◇ Google Research Award: Building Hierarchies Efficiently Role: Single PI. A key problem of Google is building a hierarchy from unstructured documents, images, product descriptions etc. Total Gift Amount: $100,000
(F) **RELEVANT** **AI/DM/ML** **RECENT** **EXPIRED** **GRANTS**	◇ Transfer Learning (2010-2016), Office of Naval Research Role: PI. We examine information processing for transfer learning. Total Amount: $591,000 including $130,000 sub-award to ASU
	◇ NSF CAREER: Knowledge Enhanced Clustering (2008-13) Role: Single PI. Investigates adding domain knowledge to unsupervised learning. Total Amount: $600,000
	◇ Human Cultural Behavioral Modelling (2009-2014), Office of Naval Research Role: Single PI. A key problem of this research is to find network patterns to distinguish types of behavior. Total Amount: $868,000