

## Héctor Muñoz-Avila

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### A. Biographical Information

#### Education.

- Ph.D. in Computer Science, University of Kaiserslautern, Kaiserslautern, Germany, 1998
- M.S. in Computer Science, Andes University, Bogota, Colombia, 1991
- B.S. in Mathematics, Andes University, Bogota, Colombia, 1991
- B.S. in Computer Science, Andes University, Bogota, Colombia, 1989

#### Academic Appointments

- Professor, Department of Computer Science and Engineering, Lehigh University. June 2016 – present
  - Program Director for Robust Intelligence, Information and Intelligent Systems Division (CISE/IIS). National Science Foundation. September 2014-August 2016.
  - Visiting faculty, Department of Computer and Information Science (IDI), Norwegian University of Science and Technology (NTNU). Trondheim, Norway. Spring 2014.
  - Associate Professor, Department of Computer Science and Engineering, Lehigh University. August 2007 – May 2016.
  - Assistant Professor, Department of Computer Science and Engineering, Lehigh University. August 2001 – 2007
  - Post-Doctoral researcher, Department of Computer Science, University of Maryland at College Park. July 1998 – July 2001
  - Researcher, intelligent decision support tools for legal reasoning, Research center CIJUS, Law School of the Andes University, Bogota, Colombia. March 1990 – August 1992
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### B. Publications

#### Edited Volumes.

1. Aha, D. W., Cox, M. T., & Munoz-Avila, H. (Eds.) (2013). Proceedings of the 2013 Annual Conference on Advances in Cognitive Systems: Workshop on Goal Reasoning (Tech. Rep. No. CS-TR-5029). College Park, MD: University of Maryland, Department of Computer Science.
2. Kuter, U. & Munoz-Avila, H. (Eds.) (2009). Proceedings of the IJCAI-09 Workshop on Learning Structural Knowledge From Observations. Pasadena, CA: AAAI Press.
3. Munoz-Avila, H. & Francesco Ricci (Eds.) (2005). Case-Based Reasoning Research and Development. Proceedings of the 6th International Conference on Case-based Reasoning (ICCBR-05). Chicago, IL: Springer.
4. Aha, D., Munoz-Avila, H. & Michael van Lent (Eds.) (2005). IJCAI 2005

Workshop on Reasoning, Representation, and Learning in Computer Games. Edinburgh, UK: AAAI Press.

5. Aha, D.W., Becerra-Fernandez, I., Maurer, F., & Munoz-Avila, H. (Eds.) (1999). Exploring Synergies of Knowledge Management and Case-Based Reasoning. Papers from the AAAI Workshop (Technical Report WS-99-10). Menlo Park, CA: AAAI Press.

#### Chapters in Books.

1. Cowling, P., Buro, M., Bouzy, B., Nau, D., Butz, M., Hingston, P., Botea, A., Sipper, M., Muñoz-Avila, H., and Bida, M. (2013) Search in Real-Time Video Games. In: Artificial and Computational Intelligence in Games. Dagstuhl.
2. Muñoz-Avila, H., Bida, M., Kendall, G., Bauckhage, C., and Bates Congdon, C. (2013) Learning and Game AI. In: Artificial and Computational Intelligence in Games. Dagstuhl.
3. Hogg, C., Lee-Urban, S. Muñoz-Avila, H., Auslander, B., and Smith, M. (2011) Game AI for Domination Games. In: *Artificial Intelligence for Computer Games*. Springer
4. Lee-Urban, S., Smith, M. & Munoz-Avila, H. (2008) Learning Winning Policies in Team-Based First-Person Shooter Games. In: *AI Game Programming Wisdom 4*. Charles River Media
5. Muñoz-Avila, H. & Hoang, H. (2006) Coordinating Teams of Bots with Hierarchical Task Network Planning. *AI Game Programming Wisdom 3*. Charles River Media
6. Muñoz-Avila, H., Gupta, K., Aha, D.W., & Nau, D.S. (2002) Knowledge based project planning. In: R. Dieng-Kuntz & N. Matta (Eds.) *Knowledge Management and Organizational Memories*. Kluwer Academic Publishers.
7. Bergmann, R., Muñoz-Avila, H., Veloso, M., Melis, E. (1998). Case-based reasoning applied to planning tasks. In: M. Lenz, B. Bartsch-Spörl, H.-D. Burkhard, & S. Wess (Eds.). *Case-Based Reasoning Technology from Foundations to Applications*, Springer.

#### Refereed Journals

1. Hankui Zhuoa, H., Munoz-Avila, H., Yang, Q. (2014) Learning Hierarchical Task Network Domains from Partially Observed Plan Traces. *Artificial Intelligence*.
2. Song, D., Kim, E., Huang, X., Patruno, J. , Munoz-Avila, H., Hefflin, J., Long, L. R., Antani, S. (2014) Multi-modal Entity Coreference for Cervical Dysplasia Diagnosis and Grading. *IEEE Transactions on Medical Imaging*.
3. Hogg, C., Munoz-Avila, H., Kuter, U. (2014) Learning Hierarchical Task Models from Input Traces. *Computational Intelligence*.
4. Munoz-Avila, H., Stracuzzi, D. (2013) Special Issue on Innovative Applications of AI *AI Magazine*. AAAI Press
5. Fromherz, M., Munoz-Avila, H. (2012) Special Issue on Innovative Applications of AI *AI Magazine*. AAAI Press
6. Bishop, MJ, Weppel, S., & Munoz-Avila, H. (2012) The Design of Scaffolding in Game-based Learning: A Formative Evaluation. *Journal of Interactive Learning Research (JILR)*.
7. Shapiro, D., Stracuzzi, D.J., Munoz-Avila, H. (2011) Special Issue on Transfer of

Structural Knowledge. *AI Magazine*. AAAI Press

8. U. Kuter and H. Muñoz-Avila. (2010) The IJCAI-09 Workshop on Learning Structural Knowledge From Observations (STRUCK-09). *AI Magazine*.
9. Muñoz-Avila, H., & Cox, M. (2008) Case-based plan adaptation: An analysis and review. *IEEE Intelligent Systems*. IEEE inc.
10. Xu, K. & Muñoz-Avila, H. (2007) CaBMA: A Case-Based Reasoning System for Capturing, Refining and Reusing Project Plans. *Knowledge and Information Systems (KAIS)*. Springer.
11. Ponsen, M., Muñoz-Avila, H., Spronk, P., Aha, D. (2007) Knowledge Acquisition for Adaptive Game AI. *Science of Computer Programming, Special Issue on Computer Games*. Elsevier.
12. Cox, M., Muñoz-Avila, H., & Bergmann, R. (2006) Case-based planning. in: *The Knowledge Engineering Review*. Cambridge press.
13. Muñoz-Avila, H., Ricci, F., Burke R. (2006) The Sixth International Conference on Case-Based reasoning. *AI Magazine*. AAAI Press
14. Ponsen, M., Muñoz-Avila, H., Spronk, P., Aha, D. (2006) Automatically generating game tactics with evolutionary learning. *AI Magazine*. AAAI Press.
15. Ilghami, O., Nau, D.S., Muñoz-Avila, H., and Aha, D. (2005) Learning Preconditions for Planning from Plan Traces and HTN Structure. *Computational Intelligence*
16. Nau, T.-C. Au, O. Ilghami, U. Kuter, Muñoz-Avila, H. Murdock, J. W., Wu, D., and Yaman, F. (2005) Applications of SHOP and SHOP2. *IEEE Intelligent Systems*. IEEE inc.
17. Dix, J., Muñoz-Avila, H., Nau D. S. (2003) IMPACTing SHOP: Putting an AI Planner into a Multi-Agent Environment. *Annals of Mathematics and Artificial Intelligence*. Baltzer Science Publishers.
18. Marling, C., Sqalli, M., Rissland, E., Muñoz-Avila, H., & Aha, D.W. (2002) Case-Based Reasoning Integrations. *AI Magazine*. AAAI Press.
19. Muñoz-Avila, H. (2001) Case-Base Maintenance by Integrating Case Index Revision and Case Retention Policies in a Derivational Replay Framework. *Computational Intelligence*. Blackwell Publishers
20. Nau, D.S., Cao, Y., Lotem, A., & Muñoz-Avila, H. (2001) The Shop Planning System. In *AI Magazine*. Vol 3, n. 1. AAAI Press.
21. Aha, D.W., Breslow, L.A., Muñoz-Avila, H. (2001) Conversational Case-Based Reasoning. *Applied Intelligence*. Kluwer Academic Publishers.
22. Muñoz-Avila, H., Hendler, J. A., & Aha, D. W. (1999) Conversational Case-Based Planning. *Review of Applied Expert Systems*. Taylor Graham Publishing.
23. Veloso, M., Muñoz-Avila, H. & Bergmann, R. (1996) Case-based Planning: Selected Methods and Systems. *AI Communications* 9 (3), IOS Press.
24. Bergmann, R., Muñoz-Avila, H. & Veloso, M.M. (1996) Fallbasiertes Planen: Ausgewählte Methoden und Systeme. *KI - Künstliche Intelligenz* Jan. '96.

### ***Refereed Conference and Workshop Proceedings***

1. Gopalakrishnan, S., Muñoz-Avila, H. and Kuter, U. (2016) WORD2HTN: Learning Task Hierarchies Using Statistical Semantics and Goal Reasoning. *The IJCAI-2016 Workshop on Goal Reasoning*. AAAI Press.
2. Dannenhauer, D., Muñoz-Avila, H., and Cox, M. (2016) Informed Expectations to Guide GDA Agents in Partially Observable Environments. *International Joint Conference on Artificial Intelligence (IJCAI-16)*. AAAI Press. Acceptance rate: 25%
3. Cox, M. T., Alavi, Z., Dannenhauer, D., Eyorokon, V., & Munoz-Avila, H. (2016). MIDCA: A metacognitive, integrated dual-cycle architecture for self-regulated autonomy. To appear in Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI-16). Palo Alto, CA: AAAI Press. Acceptance rate: 26%
4. Dannenhauer, Dustin, and Héctor Muñoz-Avila. Goal-Driven Autonomy with Semantically-Annotated Hierarchical Cases. International Conference on Case-Based Reasoning (ICCBR-2015).
5. Coman, A., Gillespie, K., Muñoz-Avila, H. (2015) Case-based Local and Global Percept Processing for Rebel Agents. *ICCBR-2015 Workshop on Case-Based Agents*.
6. Dannenhauer, D. and Muñoz-Avila, H. (2015) Raising Expectations in GDA Agents Acting in Dynamic Environments. *International Joint Conference on Artificial Intelligence (IJCAI-15)*. AAAI Press. Acceptance rate: 28.8%
7. Coman, A., Gillespie, H., and Muñoz-Avila, H. (2015) Believable Emotion-Influenced Perception: The Path to Motivated Rebel Agents. *Advances in Cognitive Systems Workshop on Goal Reasoning*. Accepted for oral presentation.
8. Dannenhauer, D., Muñoz-Avila, H. and Cox, M. (2015) Towards Cognition-level Goal Reasoning for Playing Real-Time Strategy Games. *Advances in Cognitive Systems Workshop on Goal Reasoning*. Accepted for oral presentation.
9. Muñoz-Avila, H., Wilson, M. and Aha, D.W. (2015) Guiding the Ass with Goal Motivation Weights. *Advances in Cognitive Systems Workshop on Goal Reasoning*. Accepted for oral presentation.
10. Dannenhauer, D. and Muñoz-Avila, H. (2015) Goal-Driven Autonomy with Semantically-annotated Hierarchical Cases. *International Conference on Case-based Reasoning (ICCBR-15)*. Springer. Accepted for oral presentation.
11. O'Séaghdha P. G., Preusse, K. C., Roessler, N., Munoz-Avila, H. (2014). Competitor Activation and Semantic Interference: Evidence from Combined Phonological and Semantic Similarity. *Proceedings of the Annual Meeting of the Cognitive Science Society (CogSci 2014)*. Accepted for oral presentation.
12. Coman, A. and Muñoz-Avila, H. (2014) Motivation Discrepancies for Rebel Agents: Towards a Framework for Case-based Goal-Driven Autonomy for Character Believability. *ICCBR-14 Workshop on Case-based Agents*. Accepted for oral presentation.
13. Öztürk, P., Muñoz-Avila, H., Aamodt, A. (2014) Explanation of Opportunities. *ICCBR-14 Workshop on Case-based Agents*. Accepted for oral presentation.
14. Dannenhauer, D. and Muñoz-Avila, H. (2013) LUIGi: A Goal-Driven Autonomy Agent Reasoning with Ontologies. *Advances in Cognitive Systems Conference (ACS-13)*. AAAI Press.
15. Kuter, U. and Muñoz-Avila, H. (2013) HALTER: Hierarchical Abstraction Learning via Task and Event Regression. *ACS-13 Workshop on Goal Reasoning*. Accepted for oral presentation.
16. O'Séaghdha P. G., Packer, D. P., Frazer, A. K., Preusse, K. C., Hatalis, K., Munoz-Avila, H., Hupbach, A. (2013, November). Does mere co-activation drive semantic interference? *Annual Meeting of the Psychonomic Society, Toronto*. (Abstract)
17. Jaidee, U. and Muñoz-Avila, H. (2013) Modeling Unit Classes as Agents in Real-Time

Strategy Games. *The Ninth Annual AI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE-13)*. AAAI Press

18. Coman, A., Munoz-Avila, H. (2013) Automated Generation of Diverse NPC-controlling FSMs using Nondeterministic Planning Techniques. *The Ninth Annual AI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE-13)*. AAAI Press.
19. Li, H., Munoz-Avila, H., Ke, L., Symborski, C., & Alonso, R. (2013). Discovery of Player Strategies in a Serious Game. In *HCOM 2013 Workshop on Human Computation and Machine Learning in Games*. Accepted for oral presentation.
20. Dannenhauer, D. and Muñoz-Avila, H. (2013) Case-based Goal Selection Inspired by IBM's Watson. *International Conference on Case-based reasoning (ICCBR-13)*. Springer. Accepted for oral presentation.
21. Finestrali, G. and Muñoz-Avila, H. (2013) Case-Based Learning of Applicability Conditions for Stochastic Explanations. *International Conference on Case-based reasoning (ICCBR-13)*. Springer. Accepted for oral presentation.
22. Jaidee, U. Muñoz-Avila, H., Aha, D. (2013) Case-Based Goal-Driven Coordination of Multiple Learning Agents. *International Conference on Case-based reasoning (ICCBR-13)*. Springer. Accepted for oral presentation.
23. Coman, A., Munoz-Avila, H. (2012) Plan-based Character Diversity. *The Eighth Annual AI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE-12)*. AAAI Press.
24. Coman, A., Munoz-Avila, H. (2012) Creating Diverse Storylines by Reusing Plan-Based Stories. ICCBR-12 Workshop on TRUE and Story Cases: Traces for Reusing Users' Experiences - Cases, Episodes, and Stories. Accepted for oral presentation.
25. Coman, A., Munoz-Avila, H. (2012) Diverse Plan Generation by Adapting Episodic Knowledge and by Using Complete Models to Generate Solutions from Scratch: A Comparative Study. *International Conference on Case-based reasoning (ICCBR-12)*. Springer. Nominated for best paper award. Accepted for oral presentation.
26. Jaidee, U., Muñoz-Avila, H., and Aha, D.W. (2012) Learning and Reusing Goal-Specific Policies for Goal-Driven Autonomy. *International Conference on Case-based reasoning (ICCBR-12)*. Springer. Accepted for oral presentation.
27. Jaidee, U., and Muñoz-Avila, H. (2012) CLASS<sub>QL</sub>: A Q-Learning Algorithm for Adversarial Real-Time Strategy Games. AIIDE-12 Workshop on Artificial Intelligence in Adversarial Real-Time Games. Accepted for oral presentation.
28. Coman, A., Munoz-Avila, H. (2011) Generating Diverse Plans Using Quantitative and Qualitative Plan Distance Metrics. *Twenty-Fifth Conference on Artificial Intelligence (AAAI-11)*. AAAI Press. Acceptance rate: 24.8%
29. Zhuo, H. H., Munoz-Avila, H., Yang, Q. (2011) Learning Action Models for Multi-Agent Planning. *International Conference on Autonomous Agents and Multiagent Systems (AAMAS-11)*. Acceptance rate: 22%.
30. Coman, A., Munoz-Avila, H. (2011) Qualitative vs. Quantitative Plan Diversity in Case-Based Planning. *International Conference on Case-based reasoning (ICCBR-11)*. Springer.
31. Jaidee, U., Muñoz-Avila, H., and Aha, D.W. (2011) Case-Based Learning in Goal-Driven Agents for Real-Time Strategy Combat Tasks. *Proceedings ICCBR-2011 Workshop on Case-based reasoning for Computer Games*.

32. Jaidee, U., Munoz-Avila, H., Aha, D.W. (2011) Integrated Learning for Goal-Driven Autonomy. Proceedings of the Twenty-Second International Conference on Artificial Intelligence (IJCAI-11). AAAI Press. *Acceptance rate: 31%*
33. Hogg, C., Kuter, U., and Munoz-Avila, H. (2010) Learning Methods to Generate Good Plans: Integrating HTN Learning and Reinforcement Learning. *Proceedings of the Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*. AAAI Press.
34. Coman, A., and Munoz-Avila, H. (2010) Case-based Plan Diversity. *Proceedings of the 18th International Conference on Case Based Reasoning (ICCBR 2010)*. Springer. *Accepted for oral presentation.*
35. Munoz-Avila, H., Aha, D.W., Jaidee, U., Carter, E. (2010) Goal-Driven Autonomy with Case-Based Reasoning. *Proceedings of the 18th International Conference on Case Based Reasoning (ICCBR 2010)*. Springer. *Accepted for oral presentation.*
36. Gillespie, K., Karneeb, J., Lee-Urban, S., and Munoz-Avila, H. (2010) Imitating Inscrutable Enemies: Learning from Stochastic Policy Observation, Retrieval and Reuse. *Proceedings of the 18th International Conference on Case Based Reasoning (ICCBR 2010)*. Springer. *Accepted for oral presentation.*
37. Dilts, M. and Munoz-Avila, H. (2010) Reducing the Memory Footprint of Temporal Difference Learning over Finitely Many States by Using Case-Based Generalization. *Proceedings of the 18th International Conference on Case Based Reasoning (ICCBR 2010)*. Springer. *Accepted for oral presentation.*
38. Muñoz-Avila, H. and Aha, D.W. (2010) A Case Study of Goal-Driven Autonomy in Domination Games. *Proceedings of the AAAI-10 Workshop on Goal Directed Autonomy*. AAAI Press.
39. Munoz-Avila, H., Aha, D.W., Jaidee, U., Klenk, M., & Molineaux, M. (2010). Applying goal directed autonomy to a team shooter game. *Proceedings of the Twenty-Third Florida Artificial Intelligence Research Society Conference*. Daytona Beach, FL: AAAI Press.
40. Hogg, C., Kuter, U., and Munoz-Avila, H. (2009) Learning Hierarchical Task Networks for Nondeterministic Planning Domains. *Proceedings of the Twenty-first International Joint Conference on Artificial Intelligence (IJCAI-09)*. AAAI Press. *Scientific oral presentation Acceptance rate for scientific oral presentations: 331/1290 = 25.7%*
41. Zhuo, H. H., Hu, D. C., Hogg, C., Yang, Q., and Munoz-Avila, H. (2009) Learning HTN Method Preconditions and Action Models from Partial Observations. *Proceedings of the Twenty-first International Joint Conference on Artificial Intelligence (IJCAI-09)*. AAAI Press. *Accepted for oral presentation Acceptance rate for scientific oral presentations: 331/1290 = 25.7%*
42. Zhuo, H. H., Hu, D. C., Hogg, C., Yang, Q., and Munoz-Avila, H. (2009) Learning Model Structures in AI Planning from Partial Observations. *Proceedings of the IJCAI-09 Workshop on Learning Structural Information from Traces (STRUCK-09)*. AAAI Press.
43. Hogg, C., Kuter, U., and Munoz-Avila, H. (2009) From Plan Traces to Hierarchical Task Networks Using Reinforcements: A Preliminary Report. *Proceedings of the IJCAI-09 Workshop on Learning Structural Information from Traces (STRUCK-09)*. AAAI Press.
44. Lee-Urban, S., Munoz-Avila, H. (2009) Adaptation Versus Retrieval Trade-Off

Revisited: an Analysis on Boundary Conditions. *Proceedings of the 8th International Conference on Case-Based Reasoning (ICCBR-09)*. Springer.

45. Li, H., Munoz-Avila, H., Bramsen, D., Hogg, C., Alonso, R. (2009) Spatial Event Prediction by Combining Value Function Approximation and Case-Based Reasoning. *Proceedings of the 8th International Conference on Case-Based Reasoning (ICCBR-09)*. Springer. *Accepted for oral presentation. Acceptance rate for scientific oral presentations: 17/55 = 30%*
46. Hogg, C., Munoz-Avila, H., and Kuter, U. (2008) HTN-MAKER: Learning HTNs with Minimal Additional Knowledge Engineering Required. *Proceedings of the Twenty-Third AAAI Conference on Artificial Intelligence (AAAI-08)*. *Accepted for oral presentation Acceptance rate for oral presentations: 937/227 = 24%*
47. Kuchibatla, V., and Muñoz-Avila, H. (2008) An Analysis on Transformational Analogy: General Framework and Complexity. *Proceedings of the Twenty-Third AAAI Conference on Artificial Intelligence (AAAI-08)*. Nectar track. *Accepted for oral presentation. Acceptance rate for oral presentations: 17/79 = 21%*
48. Vasta, M., Lee-Urban S. & Muñoz-Avila, H. (2007) RETALIATE: Learning Winning Policies in First-Person Shooter Games. *Proceedings of the Seventeenth Innovative Applications of Artificial Intelligence Conference (IAAI-07)*. AAAI Press. *Accepted for oral presentation.*
49. Warfield, I., Hogg, C., Lee-Urban, S., Muñoz-Avila, H. (2007) Adaptation of Hierarchical Task Network Plans. *Proceedings of the Twentieth Flairs International Conference (FLAIRS-07)*. AAAI Press. *Accepted for oral presentation.*
50. Hogg, C. & Munoz-Avila, H. (2007) Learning of Tasks Models for HTN Planning. *Proceedings of the ICAPS-07 Workshop on AI Planning and Learning (AIPL)*. AAAI Press.
51. Lee-Urban, S., Parker, A., Kuter, U., Munoz-Avila, H., & Nau, D. (2007) Transfer Learning of Hierarchical Task-Network Planning Methods in a Real-Time Strategy Game. *Proceedings of the ICAPS-07 Workshop on ICAPS 2007 Workshop on Planning and Learning (AIPL)*. AAAI Press.
52. Sanchez Ruiz-Granados, A., Lee-Urban, S. & Munoz-Avila, H., Gonzalez Calero, P. A., Diaz Agudo, B. (2007) Game AI for a Turn-based Strategy Game with Plan Adaptation and Ontology-based retrieval. *Proceedings of the ICAPS-07 Workshop on ICAPS 2007 Workshop on Planning in Games*. AAAI Press.
53. Kuchibatla, V., and Muñoz-Avila, H. (2006) An Analysis on Transformational Analogy: General Framework and Complexity. *Proceedings of European Conference in Case-based reasoning (ECCBR-06)*. Springer. *Accepted for oral presentation. Acceptance rate for oral presentations: 19/75 = 25%*
54. Lee-Urban, S. Muñoz-Avila, H. (2006) An study of Process Languages for Planning Tasks. *Proceedings of the ICAPS-06 Doctoral Consortium*.
55. Ilghami, O., Nau, D.S., and Muñoz-Avila, H. (2006) Learning to Do HTN Planning. *Proceedings of the International Conference on Automated Planning & Scheduling (ICAPS-06)*. AAAI Press.
56. Xu, K and Muñoz-Avila, H. (2005) A Domain-Independent System for Case-Based Task Decomposition without Domain Theories. *Proceedings of the Twentieth National Conference on Artificial Intelligence (AAAI-05)*. AAAI Press. *Acceptance rate: 148/803 = 18%*

57. Hoang, H., Lee-Urban, S., and Muñoz-Avila, H. (2005) Hierarchical Plan Representations for Encoding Strategic Game AI . *Proceedings of Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE-05)*. AAAI Press. *Accepted for oral presentation.*
58. Ponsen, M., Muñoz-Avila, H., Spronck, P., and Aha, D. (2005) Automatically Acquiring Domain Knowledge For Adaptive Game AI Using Evolutionary Learning . *Proceedings of the Seventeenth Innovative Applications of Artificial Intelligence Conference (IAAI-05)*. AAAI Press. *Accepted for oral presentation.*
59. Ponsen, M., Lee-Urban, S., Muñoz-Avila, H. (2005). Stratagus: An open-source game engine for research in real-time strategy games. In *Reasoning Representation, and Learning in Computer Games: Papers from the IJCAI Workshop*.
60. Ilghami, O., Muñoz-Avila, H., Nau, D.S., and Aha, D. Learning Approximate Preconditions for Methods in Hierarchical Plans. *Proceedings of the 22nd International Conference on Machine Learning (ICML-05)*. AAAI Press. *Acceptance rate: 135/491 = 27%*
61. Xu, K., & Muñoz-Avila, H. (2004) CaBMA: Case-Based Project Management Assistant. *Proceedings of the Sixteenth Innovative Applications of Artificial Intelligence Conference (IAAI-04)*. AAAI Press. *Accepted for oral presentation.*
62. Muñoz-Avila, H. & Aha, D. (2004) On the Role of Explanation for Hierarchical Case-Based Planning in Real-Time Strategy Games. *Proceedings of ECCBR-04 Workshop on Explanations in CBR*. Springer. *Accepted for oral presentation.*
63. Sahasrabudhe, S., & Muñoz-Avila, H. (2004) Discovering Causal Chains by Integrating Plan Recognition and Sequential Pattern Mining. *Proceedings of the Seventeenth Flairs International Conference (FLAIRS-04)*. AAAI Press. *Accepted for oral presentation.*
64. Muñoz-Avila, H. & Fisher, T. (2004) Strategic Planning for Unreal Tournament Bots. *Proceedings of AAAI-04 Workshop on Challenges on Game AI*. AAAI Press. *Accepted for oral presentation.*
65. Qasem, A., Heflin J., and Muñoz-Avila, H. (2004) Efficient Source Discovery and Service Composition for Ubiquitous Computing Environments. In *Workshop on Semantic Web Technology for Mobile and Ubiquitous Applications, ISWC 2004*.
66. Xu, K. & Muñoz-Avila, H. (2003) Maintaining Consistency in Project Planning Reuse. *Fifth International Conference on Case-based Reasoning (ICCBR-03)*. Springer. *Accepted for oral presentation. Acceptance rate for oral presentations: 19/92 = 21%*
67. Xu, K. & Muñoz-Avila, H. (2003) CBM-Gen+: An Algorithm for Reducing Case Base Inconsistencies in Hierarchical and Incomplete Domains. *Fifth International Conference on Case-based Reasoning (ICCBR-03)*. Springer. *Accepted for oral presentation. Acceptance rate for oral presentations: 19/92 = 21%*
68. Au, T.C., Muñoz-Avila, H., & Nau, D.S. (2002) On the Complexity of Plan Adaptation by Derivational Analogy in a Universal Classical Planning Framework. In *proceedings of the Sixth European Conference on Case-Based Reasoning (ECCBR-02)*. **Best Research Paper Award**. *Accepted for oral presentation. Accepted for oral presentation. Acceptance rate: 23/88 = 26%*
69. Mukammalla, S. & Muñoz-Avila, H. (2002) Case Acquisition in a Project Planning Environment. In *proceedings of the Sixth European Conference on Case-Based Reasoning (ECCBR-02)*. Springer. *Nominated for Best Research Paper Award. Accepted*



*for oral presentation. Accepted for oral presentation. Acceptance rate: 23/88 = 26%*

70. Dix, J., Munoz-Avila, H., Nau D., and Zhang, L. Planning in a Multi-Agent Environment: Theory and Practice. In proceedings of AAMAS 2002: C. Castelfranchi and W. L. Johnson (Eds.): Proceedings of the First International Joint Conference on Autonomous Agents and Multiagent Systems. July 15-19, 2002, Bologna, Italy. *Extended Abstract*.
71. Ilghami, O., Nau, D.S., Muñoz-Avila, H., & Aha, D.W. (2002) CaMeL: Learning Methods for HTN Planning. In *Proceedings of the The Sixth International Conference on AI Planning & Scheduling (AIPS'02)*. AAAI Press.
72. Heflin, J. and Munoz-Avila, H. (2002) LCW-Based Agent Planning for the Semantic Web. In *Ontologies and the Semantic Web. Papers from the 2002 AAAI Workshop WS-02-11*. AAAI Press, Menlo Park, CA. *Accepted for oral presentation*.
73. Muñoz-Avila, H., Aha, D.W., Nau D. S., Breslow, L.A., Weber, R., & Yamal, F. (2001) SiN: Integrating Case-based Reasoning with Task Decomposition. *Proceedings of the Seventeenth International Joint Conference on Artificial Intelligence (IJCAI-2001)*. AAAI Press. *Acceptance rate: 25%*
74. Nau D. S., Muñoz-Avila, H., Cao, Y., Lotem, A., & Mitchel, S. (2001) Total-Order Planning with Partially Ordered Subtasks. *Proceedings of the Seventeenth International Joint Conference on Artificial Intelligence (IJCAI-2001)*. AAAI Press. *Acceptance rate: 25%*
75. Aha, D.W., Weber, R., Muñoz-Avila, H., Breslow, L.A., Gupta, K.M. (2001) Bridging the Lesson Distribution Gap. *Proceedings of the Seventeenth International Joint Conference on Artificial Intelligence (IJCAI-2001)*. AAAI Press. *Acceptance rate: 25%*
76. Muñoz-Avila, H., Gupta, K., Aha, D.W., Nau, D.S. (2001) Knowledge Based Project Planning. In *IJCAI-2001 Workshop on Knowledge Management and Organizational Memories*. *Accepted for oral presentation*
77. Muñoz-Avila, H. Aha, D. W., Breslow, L. A., Nau, D.S. & Weber, R. (2000), Integrating Conversational Case Retrieval with Generative Planning. *Proceedings of the Fourth European Workshop on Case-Based Reasoning (EWCBR-2000)*, Trento, Italy: Springer-Verlag, LNCS/LNAI series 1898. *Accepted for oral presentation*.
78. Weber, R., Aha, D.W., Muñoz-Avila, H. & Breslow, L.A. (2000) Active Delivery for Lessons Learned Systems. *Proceedings of the Fifth European Workshop on Case Based Reasoning, (EWCBR-2000)*, Trento, Italy: Springer-Verlag, LNCS/LNAI series 1898. *Accepted for oral presentation*.
79. Dix, J., Muñoz-Avila, H. & Nau, D.S. (2000) IMPACTing SHOP: Planning in a Multi-Agent Environment *CLIMA 2000: Workshop on Computational Logic in Multi Agency at CL 2000*, Fariba Sadri and Ken Satoh (eds.). London, UK: Imperial College. *Accepted for oral presentation*
80. Weber, R., Aha, D.W., Muñoz-Avila, H., & Breslow, L.A. (2000) *An intelligent lessons learned process*. Proceedings of the Twelfth International Symposium on Methodologies for Intelligent Systems. Charlotte, NC: Springer-Verlag. *Accepted for oral presentation*.
81. Nau, D. S., Aha, D. W., and Muñoz-Avila, H. (2000) Ordered task decomposition. *AAAI-2000 Workshop on Representational Issues for Real-World Planning Systems*. AAAI Press. *Accepted for oral presentation*.
82. Muñoz-Avila, H. (1999) A Case Retention Policy based on Detrimental Retrieval.

- Proceedings of the Third International Conference on Case-Based Reasoning (ICCBR-99).* Munich, Germany: Springer-Verlag, LNCS/LNAI 1650. *Accepted for oral presentation.* *Acceptance rate for oral presentations: 24/80 = 30%*
83. Muñoz-Avila, H., McFarlane, D., Aha, D.W., Ballas, J. Breslow, L. & Nau, D. (1999) Using guidelines to constrain interactive case-based HTN planning. *Proceedings of 3rd International Conference on Case-Based Reasoning (ICCBR-99).* Munich, Germany: Springer-Verlag, LNCS/LNAI 1650. **Naval Research Laboratory Alan Berman Paper award.** *Accepted for oral presentation.* *Acceptance rate for oral presentations: 24/80 = 30%*
84. Muñoz-Avila, H., Aha, D.W., Breslow, L. & Nau, D. (1999) HICAP: An Interactive Case-Based Planning Architecture and its Application to Noncombatant Evacuation Operations. *Proceedings Of the 1999 Innovative Applications of Artificial Intelligence Conference (IAAI-99).* Orlando, FL: AAAI Press. *Accepted for oral presentation.*
85. Nau, D., Cao, Y., Lotem, A., & Muñoz-Avila, H. (1999) SHOP: Simple Hierarchical Ordered Planner. *Proceedings of the Sixteenth International Joint Conference on Artificial Intelligence (IJCAI-99).* Stockholm, Sweden: AAAI Press. *Acceptance rate: 195/750 = 26%*
86. Carranza, C., Muñoz-Avila, H., Weberskirch F., & Bergman, R. (1998) Proposal for a Planning Approach for Information Seeking, In R. Bergmann & A. Kott (Eds) *AIPS'98 Workshop on Integrating Planning, Scheduling and Execution in Dynamic and Uncertain Environments.* Technical Report WS-98-02, AAAI Press (1998). *Accepted for oral presentation.*
87. Muñoz-Avila, H. & Weberskirch, F. (1997) A Case Study on the Mergeability of Cases with a Partial-Order Planner. In S. Steel & R. Alami (Eds.): *Recent Advances in AI Planning. Proceedings of the third European Conference on AI Planning (ECP-97),* Toulouse, France: Springer-Verlag, LNCS/LNAI series 1348. *Accepted for oral presentation.* *Acceptance rate for oral presentations: 28/102 = 27%*
88. Muñoz-Avila, H., Weberskirch, F. & Roth-Berghofer, T. (1997) On the Relation between the Context of a Feature and the Domain Theory in Case-Based Planning. In David Leake & Enric Plaza (Eds). *Proceedings 2nd Int. Conference on Case-Based Reasoning (ICCBR-97),* Providence, RI: Springer-Verlag, LNCS/LNAI 1266. *Accepted for oral presentation.*
89. Muñoz-Avila, H. & Weberskirch, F. Looking at Features within a Context from a Planning Perspective. (1997) In David W. Aha & Dietrich Wettschreck (Eds). *Proceedings ECML-97 MLNet Workshop: Case-Based Learning: Beyond Classification of Feature Vectors.* Prague, Czech Republic. (Technical Report AIC-97-005). Washington, DC: Naval Research Laboratory. *Accepted for oral presentation.*
90. Weberskirch, F. & Muñoz-Avila, H. (1997) Advantages of Types in Partial-Order Planning. In: *Beiträge zum 11. Workshop Planen und Konfigurieren (PuK-97).* Bonn, Germany: FORWISS-REPORT FR-1997-001. *Accepted for oral presentation.*
91. Muñoz-Avila, H. & Weberskirch, F. (1996) Planning for Manufacturing Workpieces by Storing, Indexing and Replaying Planning Decisions. In: *Proceedings 3rd International Conference on AI Planning Systems (AIPS-96),* Edinburgh, UK: AAAI-Press. *Accepted for oral presentation.*
92. Muñoz-Avila, H. & Huellen, J. (1996) Feature Weighting by Explaining Case-based Planning Episodes. *Proceedings European Workshop on Case-Based Reasoning*

(*EWCBR-96*), Lausanne, Switzerland: Springer-Verlag, LNCS/LNAI series 1168. *Accepted for oral presentation.*

93. Muñoz-Avila, H. & Weberskirch, F. (1996) Complete Eager Replay. In J. Sauer, A. Guenter, J. Hetzberg (Eds.). *Beiträge zum 10. Workshop Planen und Konfigurieren (PuK-96)*, Infix. *Accepted for oral presentation.*
94. Muñoz-Avila, H. & Huellen, J. (1995) Retrieving Cases in Structured by Using Goal Dependencies. In M.M. Veloso, A. Aamodt (Eds). *Case-Based Reasoning Research and Development. First International Conference (ICCBR-95)*, Sesimbra, Portugal: Springer-Verlag, LNCS/LNAI series 1010. *Accepted for oral presentation. Acceptance rate for scientific oral presentations: 22/89 = 24%.*
95. Muñoz-Avila, H., Paulokat, J. & Wess, S. (1995) Controlling Nonlinear Hierarchical Planning by Case Replay. In: *Proceedings European Workshop on Case-Based Reasoning (EWCBR-94)*. Chantilly, France: Springer-Verlag: LNCS/LNAI series 984. *Accepted for oral presentation. Acceptance rate for oral presentations: 19/60 = 31%.*

### Reports:

- Cowling, P., Buro, M., Bouzy, B., Nau, D., Butz, M., Hingston, P., Botea, A., Sipper, M. Muñoz-Avila, H., and Bida, M. (2012) Search in Real-Time Video Games. Report from Dagstuhl Seminar 12191
- Muñoz-Avila, H., Bida, M., Kendall, G., Bauckhage, C., and Bates Congdon C. (2012) Learning and Game AI. Report from Dagstuhl Seminar 12191

### Invited paper:

- Muñoz-Avila, H. (2003) On The Role of The Cases in Case-Based Planning. Extended Abstract to the Invited Talk at *Fifth International Conference on Case-based Reasoning (ICCBR-03)*. Springer.

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## C. Awards

- Lehigh Class of 61 Professorship (2008)
- National Science Foundation CAREER Award (2007).

### Paper Awards.

- Au, T.C., Muñoz-Avila, H., & Nau, D.S. (2002) On the Complexity of Plan Adaptation by Derivational Analogy in a Universal Classical Planning Framework. In *proceedings of the Sixth European Conference on Case-Based Reasoning (ECCBR-02)*. **Best Research Paper Award.**
- Muñoz-Avila, H., McFarlane, D., Aha, D., Ballas, J., Breslow, L., & Nau, D. (1999) Using guidelines to constrain interactive case-based HTN planning. *Proceedings of 3rd International Conference on Case-Based Reasoning (ICCBR-99)*. Munich, Germany: Springer-Verlag, LNCS/LNAI 1650. **Naval Research Laboratory Alan Berman Paper award.**

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## D. Research Funding

### Competitively Awarded Research Grants.

- PI. Goal-Driven Autonomy and Robust Architectures for Long-Duration Missions. Office of Naval Research (subcontracting from Wright State Research Institute). Total award: \$141,596, 2015-2017.
- Sr. Personnel. Title: CyberSEES: Type 2: Ocean Wave Energy and the Power Grid: Optimization and Integration. National Science Foundation. Total award: \$900,000,

2015-2018.

- co-PI. Identifying Stable and Dynamic Representations of Meaning through Computational, Behavioral, and Brain Imaging Triangulation. Lehigh CORE grant. Total: \$60,000, 2012.
- PI. Title: Goal-Driven Autonomy. National Science Foundation. Total award: \$263,870 2012-2016.
- PI. Title: Generating Diverse Solutions in Nondeterministic Environments. Naval Research Laboratory. Total award: \$38,511, 2012-2013.
- PI. Title: Integrated Improvised Explosive Device (IED). AFRL STTR. Total award: \$21,871, 2008-2009.
- PI. Title: CAREER: A Unified Architecture for Learning of, and Reasoning with, Task Models: Theory and Applications. National Science Foundation. Total award: \$400,000, 2007-2013.
- PI. Title: Transfer Learning and Hierarchical Task Network Representations and Planning. Funding Agency: DARPA Transfer Learning Program. Total award: \$169,540 Optional: \$50K for third year. 2005-2007.
- PI. Title: Modeling and Learning AI Opponent's Behavior. Funding Agency: DARPA. Total award: \$92,000, 2004-2005.
- PI. Title: Dynamic Case Replanning for Computer-Generated Forces under Real-Time Constraints. Funding Agency: Office of Naval Research. Total award: \$35,000, 2004-2005.
- PI. Title: HTN Planning and Learning in Interactive Cognitive Systems. Funding Agency: Naval Research Laboratory. Total award: \$20,000, 2004.

#### Others

- Poker Academy, a private software company, donates \$13K worth of *Texas Hold'em Poker* Software for use in artificial intelligence research projects. 2005

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#### E. Editor for Scholarly Publications

1. Aha, D., Cox, M., Munoz-Avila, H (2013) *ACS-13 Workshop on Goal Reasoning: An alternate model of intelligent autonomy.*
2. Fromherz, M., Munoz-Avila, H (2012) *Special issue of the Innovative Applications of AI.* AI Magazine. AAAI Press.
3. Shapiro, D., Stracuzzi, D.J., Munoz-Avila, H. (2011) *Special Issue on Transfer of Structural Knowledge.* AI Magazine. AAAI Press
4. Aha, D., Klenk, M., Munoz-Avila, H., Ram, A., and Shapiro, D. *AAAI-10 Workshop: Goal Directed Autonomy*

5. Kuter, U. & Muñoz-Avila, H. (Eds.) (2009). *Proceedings of the IJCAI-09 Workshop on Learning Structural Knowledge From Observations*. Pasadena, CA: AAAI Press.
6. Muñoz-Avila, H. & Francesco Ricci (Eds.) (2005). *Case-Based Reasoning Research and Development. Proceedings of the 6th International Conference on Case-based Reasoning (ICCBR-05)*. Chicago, IL: Springer.
7. Aha, D., Muñoz-Avila, H. & van Lent, M. (Eds.) (2005). *IJCAI 2005 Workshop on Reasoning, Representation, and Learning in Computer Games*. Edinburgh, UK: AAAI Press.
8. Aha, D., & Muñoz-Avila, H. (2001) *Special Issue on Interactive Case-Based Reasoning*. Applied Intelligence. Kluwer Academic Publishers
9. Aha, D.W., Becerra-Fernandez, I., Maurer, F., & Muñoz-Avila, H. (Eds.) (1999). *Exploring Synergies of Knowledge Management and Case-Based Reasoning.. Papers from the AAAI Workshop (Technical Report WS-99-10)*. Menlo Park, CA: AAAI Press.

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## F. Professional Presentations

### Invited Talks.

- University of Alberta. Invited Lecture. *Informed expectations: Balancing Agents' Self-Monitoring Commitments and Sensing Costs*. May, 2016. Edmonton, Canada.
- Georgia Tech. Cognitive Systems Seminar Series. *Raising Expectations: Self-Monitoring Goal-Driven Autonomy Agents*. January, 2016. Atlanta, Georgia.
- ICCBR-15 Workshop on Case-Based Agents. *Towards Scalable Autonomous Agents for Real-Time Strategy Games*. September 2015. Frankfurt, Germany.
- University of Trondheim (NTNU). *Goal-Driven Autonomy: Reflective learning for Real-Time Strategy Games*. March, 2014. Trondheim, Norway.
- Huazhong University of Science and Technology. *HTN learning and HTN adaptation*, December, 2012. Wuhan, China.
- Lafayette College. *Goal-Driven Autonomy*. November, 2011. Easton, PA
- ICCBR-11 Workshop on Case-Based Reasoning for Computer Games. *A Case Study for Generating Strategic Game AI: From HTN Planning to Multi-Modal Learning*. London, UK.
- Universidad Carlos III de Madrid. *Learning Hierarchical Task Networks: Instance-based, Non-deterministic, and Optimality studies*. February, 2010: Madrid, Spain
- Universidad Carlos III de Madrid. *Game AI through HTN Planning, Case-based Reasoning, and Reinforcement learning: a comparative study*. February, 2010: Madrid, Spain
- Universidad Complutense de Madrid. *Learning Hierarchical Task Networks*. February, 2010: Madrid, Spain
- SET Corporation. *Case-based reasoning: Foundations and Challenges*. July, 2009: Washington, DC.
- SET Corporation. *A Case Study of Online Adaptive AI for a Real-Time Game*. July, 2008: Washington, DC.
- Hong Kong University of Science and technology. *Learning preconditions and Structure of Hierarchical Task Networks: an Overview*. May, 2008: Hong Kong, China.
- National Tsing Hua University. *Two Case Studies of Adaptive AI in Team-based First Person*

*Shooter (FPS) Games*. June, 2007: HsinChu, Taiwan.

- National Taiwan University. *Automated Planning and Learning of Adaptive AI in Team-Based First Person Shooter (FPS) Games*. June, 2007: Taipei, Taiwan.
  - Rutgers Laboratory for Real-Life *Reinforcement Learning. Overview of Research from the InSyTe Lab*. June, 2006: New Jersey.
  - Third Annual Invitational Knowledge Fusion Research Workshop (KFRW 05) *OntoPlan: Planning Knowledge Fusion for Decision Support Using Semantic Web Ontologies*. October, 2004: Maryland.
  - Naval Research Laboratory. Seminar Series. *Universal SiN: Integrating Planning and Case-Based Reasoning in an Universal Classical Planning Framework*. October, 2003: Washington, DC, USA
  - Fifth International Conference on Case-based Reasoning (ICCB-03). *On the Role of Cases in Case-Based Planning*. July, 2003: Trondheim, Norway.
  - Lockheed Martin Advanced Technology Laboratories. Seminar Series. *Integrating HTN Planning and Case-Based Reasoning*. 2001. Camden, NJ, USA.
  - University of Massachusetts Boston. *SiN: Integrating Case-Based Reasoning with Task Decomposition*. 2001. Boston, MA, USA
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## G. Teaching and Advising

### Courses taught.

- CSE 318. Automata Theory and Formal Languages. Fall 2001 (instructor evaluation: 4.67/5.00; course evaluation: 4.52/5.00), Fall 2002 (instructor evaluation: 4.67/5.00; course evaluation: 4.55/5.00), Fall 2003 (instructor evaluation: 4.24/5.00; course evaluation: 4.12/5.00), Fall 2004 (instructor evaluation: 4.21/5.00; course evaluation: 4.11/5.00), Fall 2005 (instructor evaluation: 4.4/5.00; course evaluation: 4.27/5.00), Fall 2006 (instructor evaluation: 4.90/5.00; course evaluation: 4.70/5.00), Fall 2007 (instructor evaluation: 3.55/5.00; course evaluation: 3.55/5.00). Fall 2008 (instructor evaluation: 4.75/5.00; course evaluation: 4.63/5.00). Fall 2009 (instructor evaluation: 4.92/5.00; course evaluation: 4.85/5.00). Fall 2010 (instructor evaluation: 4.85/5.00; course evaluation: 4.54/5.00). Fall 2011 (instructor evaluation: 4.67/5.00; course evaluation: 4.56/5.00). Fall 2012 (instructor evaluation: 4.50/5.00; course evaluation: 4.53/5.00). Fall 2013 (instructor evaluation: 4.07/5.00; course evaluation: 3.89/5.00). Between 20 and 40 students enrolled in CSE 318 at any one semester. CSE 318 is a required course for the CSE degree.
- CSE 340. Design and Analysis of Algorithms. Spring 2003 (instructor evaluation: 4.35/5.00; course evaluation: 4.10/5.00), Spring 2004 (instructor evaluation: 4.31/5.00; course evaluation: 4.13/5.00), Spring 2005 (instructor evaluation: 4.75/5.00; course evaluation: 4.58/5.00). Approximate enrollment each semester is 45 students. Required course for CSE and CSB degrees.
- CSE 435/335. Intelligent Decision Support Systems. Spring 2002 (instructor evaluation: 5.00/5.00; course evaluation: 5.00/5.00). Enrollment: 9 graduate students. Fall 2003 (instructor evaluation: 4.47/5.00; course evaluation: 4.47/5.00). Spring 2005 (instructor evaluation: 4.67/5.00; course evaluation: 4.56/5.00). Enrollment: 10 graduate students. Fall 2006 (instructor evaluation: 4.27/5.00; course evaluation: 4.18/5.00). Enrollment: 10 graduate and undergraduate students. Fall 2010 (instructor evaluation: 4.58/5.00; course evaluation: 4.33/5.00). Enrollment: 15 graduate and undergraduate students. Fall 2012 (instructor evaluation: 4.57/5.00; course evaluation: 4.57/5.00). Enrollment: 10

students; mostly graduate students.

- CSE 348/448: Topics on AI Game Programming. Fall 2004. (instructor evaluation: 4.33/5.00; course evaluation: 4.53/5.00) Enrollment: 18 graduate students. Fall 2005 (instructor evaluation: 4.57/5.00; course evaluation: 4.57/5.00) Enrollment: 10 undergraduate students, 10 graduate students. Fall 2008 (instructor evaluation: 3.82/5.00; course evaluation: 4.24/5.00) Enrollment: 20 undergraduate. Spring 2010 (instructor evaluation: 4.44/5.00; course evaluation: 4.56/5.00) Enrollment: 20 undergraduate students and 1 graduate student). Spring 2012 (instructor evaluation: 3.92/5.00; course evaluation: 4.15/5.00) Enrollment: 15 undergraduate students
- CSE 042: Computer Game Design. Spring 2006. (instructor evaluation: 4.08/5.00; course evaluation: 4.15/5.00) Enrollment: 35 undergraduate students. Spring 2007. (instructor evaluation: 4.56/5.00; course evaluation: 4.59/5.00) Enrollment: 30 undergraduate students, 6 graduate students (EDUC 497). Spring 2009. (instructor evaluation: 4.68/5.00; course evaluation: 4.73/5.00) Enrollment: 25 undergraduate students, 1 graduate student (EDUC 497). Spring 2011. (instructor evaluation: 4.7/5.00; course evaluation: 4.68/5.00) Enrollment: 35 undergraduate students. Fall 2013. (instructor evaluation: 4.57/5.00; course evaluation: 4.33/5.00) Enrollment: 30 undergraduate students.
- CSE 498 Automated Planning. Spring 2007 instructor evaluation: 4.57/5.00; course evaluation: 4.43/5.00. Enrollment: 8 graduate students
- CSE 409 Theory of Computation. Spring 2009 instructor evaluation: 4.92/5.00; course evaluation: 4.75/5.00. Enrollment: 12 graduate students. Spring 2010 instructor evaluation: 4.83/5.00; course evaluation: 4.67/5.00. Enrollment: 5 graduate students. Spring 2011 instructor evaluation: 5.00/5.00; course evaluation: 4.86/5.00. Enrollment: 9 graduate students. Spring 2012 instructor evaluation: 4.75/5.00; course evaluation: 4.75/5.00. Enrollment: 7 graduate students. Spring 2013 instructor evaluation: 4.89/5.00; course evaluation: 4.89/5.00. Enrollment: 9 graduate students.
- CSE 437/337 Reinforcement Learning and Markov Decision Processes. Fall 2009 instructor evaluation: 4.90/5.00; course evaluation: 4.80/5.00. Enrollment: 10 graduate students. Fall 2011 instructor evaluation: 4.83/5.00; course evaluation: 5.00/5.00. Enrollment: 10 undergraduate students, 4 graduate students.

#### **Courses developed.**

- CSE 337/437 Reinforcement Learning. First taught in 2009. Course is approved and in the university catalog.
- CSE 435/335. Intelligent Decision Support Systems. First taught in Spring 2002. Course is approved and in the university catalog.
- CSE 348/448: AI Game Programming. First taught in Fall 2004. Course is approved and in the university catalog.
- CSE 042: Computer Game Design. First taught in Spring 2006. Course is approved and in the university catalog.

#### **Advising other than research direction.**

(approximate number of students per year)

- Undergraduate: 12 approximately. Since 2002, always advising freshman students enrolled in Engineering

- Graduate: 2
- Other advising activities: presentations to freshman students in Engineering, various presentations and meetings with prospective students and parents, open house events.

### **Advising research direction.**

- Undergraduate (independent studies):

(1) Kit Ming Chan (2002), (2) Michael Zurat (2003), (3) Jason Carini (2003), (4) Bryn Chung (2002), (5) Aaron Batalion (2003), (6) Todd Fisher (2003; 2004), (7) Lars Holzman (2003), (8) Jing Rong (2004), (9) Kevin Gaittens (2004), (10) Hai Hoang (2004), (11) Lars Holzman (2004), (12) Michael Moll (2004), (13) Jarret Raim (2004), (14) John Garace (2004), (15) Megan Vasta (2004-2005), (16) Christopher Krammer (2005-2006), (17) Liam Page (2008), (18) Bryan Auslander (2007-2008), (19) Matt Dilts (2007-2008), (20) Amanda Eyler (2007-2008), (21) Justin Karneeb (2009), (22) Kellen Guillespie (2009), (23) James Pratt (2011), (24) Konstantinos Hatalis (summer 2012), (25) Seth T. Denburg (NSF REU; 2012-13), (26) Nicholas E. Roessler (NSF REU; 2012-13; Independent studies 2009), (27) Nicholas W. (Nick) Wuensch (2013), (28) Pierre J. (Pete) Biencourt (2013), (29) Matthew Kilgore (Spring 2013), (30) Steven R. Stinson (2013), (31) Dane Thomas (Cognitive Science; 2013).

- Undergraduate (senior project):

(1) Kit Ming Chan (2003), (2) Ian Ma (2003), (3) Hai Hoang (2003), (4) Scott Taubman (2003), (5) Frank Cremen (2002), (6) Ben Mautner (2002), (7) Chris Olsisnki (2002), (8) Paul Tsai (2002), (9) David Kirsch (2002), (10) Mark Austin (2004), (11) Adam Lupinacci (2005), (12) Jonathan Martin (2005), (13) Nikolai Moukhine (2005), (14) Adrienne Platner (2005), (15) Jay Shipper (2006), (16) Douglas Paul (2006), (17) Emily Cohen (2007), (18) David Heefner (2007), (19) Liam Page (2007), (20) Matt Dilts (2008), (21) James Morrison (2008), (22) Justin Karneeb (2009), (23) Zubair Chaudary (2009), (24) Jon Shiavo (2011; Department representative's to University Undergraduate Research Symposium), (25) Dylan H. Rush (2011; Department representative's to University Undergraduate Research Symposium), (26) Ethan Nadler (2013), (27) Lucien Knechtli (2013), (28) Doug Christman (2013 - winner Best Senior Project), (29) Eric Mills (2013 - winner Best Senior Project), (30) Noah Reifsnyder (2016), (31) Rachel Santangelo (2016).

- Undergraduate (Cognitive Science Thesis):

1. Eustace J. Mann (*The Influence of meaning: how meaningful flow affects performance and strategy formation in games*, 2009)
2. Constantin Savtchenko (*Stimulating Flow Through Dynamic Difficulty in Physically Grounded Games*, 2010)
3. Matthew Mitchell (*Cognitive Load in Video Games*, 2013)
4. Nicholas E. Roessler (*Extending a Semantic Interference Model for Remote Association Tasks*, 2014)

- Masters:

1. Sasidhar Mukkamalla (2003; thesis: *Automated Case Acquisition and Reuse in Project Planning*)
2. Ke Xu (2003; thesis: *Maintaining Consistency in Project Plan Reuse*)
3. Hai Hoang (2005; thesis: *Planning to Coordinate: Using HTN to Coordinate Unreal® Tournament Bots*)
4. Stephen Lee-Urban (2005; thesis: *TMK Models to HTNs: Translating Process*)



*Models into Hierarchical Task Networks*)

5. Ian Warfield (2005; thesis: *Repair-SHOP: A Method to Minimize HTN Replanning Cost Through Integration of SHOP and GoalGraph*)
  6. Kuchibatla Venkata, Sarat Chandra V (2006; thesis: *Transformational Analogy: A General Framework, Semantics and Complexity*)
  7. Ushhan Gundevia (2006; thesis: *Integrating War Game Simulations with AI Testbeds: Integrating Call To Power 2 with Tietl*)
  8. Megan Vasta (2007; thesis: *Reinforcement Learning for Controlling a Team of Bots in an FPS game*)
  9. Joe Souto (2007; thesis: *A gaming platform for testing AI*)
  10. Brian Auslendar (2009; thesis: *Recognizing the Enemy: Combining Reinforcement Learning with Case Based Reasoning in Domination Games*)
  11. Matthew Dilts (2010; thesis: *Similarity Abstraction for Reinforcement Learning Agents in a Turn Based Game Environment*)
  12. Kellen Gillespie (2010; thesis: *JuKeCB: A Case-Based Reasoning System*)
  13. Justin Karneeb (2010; thesis: *JuKeCB: Creating, Maintaining and Optimizing a Case Based Reasoning System*)
  14. Giulio Finestralli (2013; thesis: *Stochastic Explanations: Learning From Mistakes In Stochastic Domains*)
  15. Konstantinos Hatalis (2013; thesis: *Computationally Modeling an Incremental learning Account of Semantic Interference through phonological influence*)
  16. Daniel Phang (2014; Thesis: *Intelligent Camera Control in Game Replays*)
  17. Tyler Seip (2015; thesis: *Cumulative Semantic Interference from Incremental Learning: Extensions to the Oppenheim et al. Model*)
  18. Jundong Yao (2015; thesis: *Using Planning Landmarks to Control Camera Movement in DOTA 2 Games*)
- Doctoral.
1. Ke Xu (graduated in 2006; dissertation: *Case-Based Task Decomposition with Incomplete Domain Descriptions*; after graduation: Microsoft; Redmond, Washington)
  2. Stephen Lee-Urban (graduated in 2012; dissertation: *Hierarchical Planning Knowledge for Refining Partial-Order Plans*; after graduation: post-doc at Georgia Tech; Atlanta, GA)
  3. Chad Hogg (graduated 2012; dissertation: *Learning Hierarchical Task Networks*; after graduation: tenure-track assistant professor - King's College; Wilkes-Barre, PA )
  4. Alexandra Coman (graduated in 2013; dissertation: *Qualitative and Quantitative Solution Diversity in Heuristic-Search and Case-Based Planning*; after graduation: tenure-track assistant professor - Ohio Northern University; Aca, Ohio)
  5. Ulit Jaidee (graduated in 2013; dissertation: *Integrated Learning for Goal-Driven Autonomy*; after graduation: accepted faculty position at King

Mongkut's of University Technology North Bangkok, Thailand)

6. Dustin Dannenhauer (*currently*; started in 2012)
  7. Sriram Gopalakrishnan (*started* in Fall 2015)
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## H. Service

### University.

- Service to university
  1. Co-chair of Lehigh's Educational Policy Committee (EdPol) 2011-12; co-vice-chair 2010-11; RCEAS College representative 2009-2012.
  2. Member University Steering Committee (2011-12)
  3. Member Standing of Students (SOS) Committee (2010)
  4. Chair 2009 Lehigh's Graduate and Undergraduate Students Exhibition (2009)
  3. Member Student Appraisal of Instruction & Courses (2008)
  4. Member Cognitive Science Steering Committee (since 2006)
  
- Service to college
  1. Member CSE Chair search committee (2003)
  2. Cognitive Science Steering Committee (since 2006)
  
- Service to department
  1. Faculty Search Committee (2012-13)
  2. Advisor for PhD program (2012-2013)
  3. Member of Publicity and Web Committee (2011)
  4. Member Graduate Admissions Committee (since 2011)
  5. Member Curriculum Committee (2001-2006)
  6. Chair Curriculum Committee (2002-2003)
  7. Chair CSE Seminars (2002-2003)
  8. Member Graduate Committee (2001-2002)
  9. Member Reform of Graduate Program Committee (2004)
  10. PhD Qualifier Committee (318 & 340; 2005-2011)
  11. Chair Laboratory Renovation Committee (2005-2007)
  12. Computer Science and Design Arts Program committee (2007)
  13. Community Committee (2007)
  14. Chair Graduate Admissions (2008-2009)
  15. Member faculty search committee (2009; 2010)
  16. Member Curriculum Committee (2009; 2010)

## Professional.

- Program Chair or co-chair

1. *AIIDE-14 First Workshop on Diversity in Games Research (DiGR)* (2014, Raleigh, NC)
2. *IAAI-13: Innovative Applications of AI* (2013, Bellevue, Washington, United States)
3. *AIIDE-12 Workshop on Artificial Intelligence in Adversarial Real-Time Games*
4. *IAAI-12: Innovative Applications of AI* (2012, Toronto, Canada)
5. Struck-2009: the IJCAI-09 Workshop on Learning Structural Knowledge From Observations. (2009, Pasadena, CA)
6. *ICCBR-2005: The Sixth International Conference on Case-Based Reasoning* (2005, Chicago, IL)
7. *IJCAI-2005 Workshop on Reasoning, Representation, and Learning in Computer Games* (2005, Edinburgh, UK)
8. *Special Track on CBR at FLAIRS-03* (2003, St. Augustine, FL)
9. *Special Track on CBR at FLAIRS-02* (2002, Pensacola, FL)
10. *AAAI-99 Workshop: Exploring Synergies of Knowledge Management and Case-Based Reasoning* (Orlando, FL)

- Member of Program Committee

1. IJCAI-15: International Joint Conference on AI (*Area Chair*)
2. AAAI-14: AAAI conference (*senior PC*)
3. FDG-14: Foundations of Digital games
4. AIIDE-14: Artificial Intelligence and Interactive Digital Entertainment
5. CIG-14: IEEE Conference on Computational Intelligence and Games
6. ICCBR-14: International Conference on Case-based reasoning
7. Special Track on CBR at FLAIRS-14
8. CIG-13: IEEE Conference on Computational Intelligence and Games
9. AIIDE-13: Artificial Intelligence and Interactive Digital Entertainment
10. Special Track on CBR at FLAIRS-13 International Committee
11. ICCBR-13: International Conference on Case-based reasoning International Committee
12. BICA-13: Biologically Inspired Cognitive Architectures International Committee
13. ExaCt 2013: Explanation-aware Computing Workshop International Committee
14. IAAI-12: The Conference on Innovative Applications of Artificial Intelligence International Committee

15. AIIDE-12: Artificial Intelligence and Interactive Digital Entertainment
16. Special Track on CBR at FLAIRS-12 International Committee
17. ICCBR-12: International Conference on Case-based reasoning International Committee
18. BICA-12: Biologically Inspired Cognitive Architectures International Committee
19. ExaCt 2012: Explanation-aware Computing Workshop International Committee
20. IAAI-11: The Conference on Innovative Applications of Artificial Intelligence International Committee
21. AIIDE-11: Artificial Intelligence and Interactive Digital Entertainment
22. Special Track on CBR at FLAIRS-11 International Committee
23. IJCAI-11: International Joint Conference on AI International Committee (*senior PC*)
24. ICCBR-11: International Conference on Case-based reasoning International Committee
25. ICCBR-11 Workshop on Case-Based Reasoning for Computer Games International Committee
26. BICA-11: Biologically Inspired Cognitive Architectures International Committee
27. AAMAS-11 Workshop on the uses of Agents for Education, Games and Simulations International Committee
28. ExaCt 2011: Explanation-aware Computing Workshop International Committee
29. IAAI-10: The Conference on Innovative Applications of Artificial Intelligence
30. AIIDE-10: Artificial Intelligence and Interactive Digital Entertainment Conference
31. ICCBR-10: International Conference on Case-based reasoning
32. Special Track on CBR at FLAIRS-10
33. AAMAS 2010 Agents for Games & Simulations workshop
34. ICAPS'10 Workshop "Planning in Games"
35. SNPD 2010: ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing
36. AIG-09: ECAI Workshop on Artificial Intelligence in Games
37. AIIDE-09: Artificial Intelligence and Interactive Digital Entertainment Conference
38. IAAI-09: The Innovations in AI Conference
39. ICCBR-09: Conference on Case-based reasoning

40. ExaCt-2009: Workshop on Explanation-aware Computing
41. Special Track on CBR at FLAIRS-09
42. AIG-08: ECAI Workshop on Artificial Intelligence in Games
43. AIIDE-08: Artificial Intelligence and Interactive Digital Entertainment Conference
44. IAAI-08: The Innovations in AI Conference
45. ECCBR-08: Conference on Case-based reasoning
46. AAAI-08 Nectar: The National Conference on Artificial Intelligence
47. ExaCt-2008: Workshop on Explanation-aware Computing
48. Special Track on CBR at FLAIRS-08
49. AIPS-07 Workshop on AI Planning & Games
50. AIPS-07 Workshop on AI planning & Learning
51. AAAI-07: The National Conference on Artificial Intelligence
52. ICCBR-2007: The Seventh International Conference on Case-Based Reasoning
53. Special Track on CBR at FLAIRS-07
54. AIIDE-07: Artificial Intelligence and Interactive Digital Entertainment Conference.
55. Special Track on CBR at FLAIRS-06
56. AAAI-06: The National Conference on Artificial Intelligence
57. ECCBR-06: Conference on Case-based reasoning
58. AIIDE-06: Artificial Intelligence and Interactive Digital Entertainment Conference.
59. ECML-06: 17th European Conference on Machine Learning
60. ICEIS-05: 7th International Conference on Enterprise Information Systems
61. ICML-05: 12<sup>th</sup> International Conference on Case-based reasoning
62. ECCBR-04: 7th European Conference on Case-based Reasoning
63. AAAI-04: The National Conference on Artificial Intelligence
64. Special Track on CBR at FLAIRS-05
65. Special Track on CBR at FLAIRS-04
66. ICCBR-03: 5th International Conference on Case-Based Reasoning
67. ICCBR-03 Workshop on Mixed-Initiative Case-Based Reasoning
68. ICEIS-03: 5th International Conference on Enterprise Information Systems
69. AAAI-02: The National Conference on Artificial Intelligence
70. ICCBR-2001: The Fourth International Conference on Case-Based

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71. ICML-2000: The Seventeenth International Conference on Machine Learning
  72. AAAI-99 Workshop: Exploring Synergies of Knowledge Management and Case-Based Reasoning
  73. ICCBR-99: The Third International Conference on Case-Based Reasoning
  74. AAAI-99: The National Conference on Artificial Intelligence
  75. AIPS-98: Workshop: Integrating Planning, Scheduling and Execution in Dynamic and Uncertain Environments.
  76. ECML-97 MLnet Workshop Case-based Learning: Beyond Classification of Feature Vectors
- Editorial Board / Associate Editor
    1. ACM Transactions on Intelligent Systems and Technology (TIST) (since 2012)
    2. International Journal of e-Collaboration (IJeC)
    3. IEEE Transactions on Computational Intelligence and AI in Games (since 2009-2013)
    4. AI Magazine (since Fall 2010)
  - Advisory Committee
    1. Department of Computer Science, Kutztown University (2010-2013)
    2. Selection Committee - 2010 Class of Computing Innovation Fellows (Computing Research Association (CRA))
  - Reviewer
    1. 7 NSF proposal review panels
    2. CRA Computing Innovation Fellows (CIFellows) selection committee (2011)
    3. AI Magazine
    4. IEEE Intelligent Systems
    5. Journal of AI Research
    6. Thomas Gabel. Multi-Agent Reinforcement Learning Approaches for Distributed Job-Shop Scheduling Problems. PhD Dissertation. University of Freiburg, Germany. 2009.
    7. Stefan Wender. Integrating Reinforcement Learning into Strategy Games. MS Thesis. University of Auckland, New Zealand. 2009.
    8. Shahin Maghsoudi. Case-Based Planning Adaptation Using Epistemic Logic Revision. MS Thesis. University of Auckland, New Zealand. 2005.
    9. Stefan Wender. A Multi-Layer Case-Based & Reinforcement Learning Approach to Adaptive Tactical Real-Time Strategy Game AI. PhD Dissertation. University of Auckland, New Zealand. 2015.

10. David Churchill. Heuristic Search Techniques for Real-Time Strategy Games. University of Alberta. Edmonton, CA. 2016.