Meir Kalech November, 2011

CURRICULUM VITAE
AND LIST OF PUBLICATIONS

• Personal Details

Name:	**Meir Kalech**
Date of birth:	December 16, 1970
Affiliation:	Department of Information Systems Engineering, Ben-Gurion University, Israel
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• Education

Ph.D.	2002-2006	Department of Computer Science in Bar-Ilan University, Israel. Advisor: Dr. Gal A. Kaminka. Topic: "Model-Based Diagnosis of multi-Agent Systems"
M.A.	1997-2000	General Philosophy (cum Laude) Bar Ilan University, Israel. Supervised by Prof. Dani Statman
B.Sc.	1995-1996	Computers Science, Bar Ilan University, Israel.
B.A.	1992-1995	1. Jewish Philosophy, Bar Ilan University, Israel. 2. Teaching Diploma from the Teachers Seminar in Alon Shevut, Israel.

• Employment History

10/2008-	Lecturer
Date	Department of Information System Engineering, Ben Gurion University of the Negev, Beer Sheva, Israel.
09/2007-09/2008	Postdoctoral position at Harvard University in the laboratory of Prof. Barbara Grosz and Prof. Avi Pfeffer investigated decision making under uncertainty. I was a participant in the Colored Trails project, a general test bed for

	investigating human-computer decision-making
07/2006-08/2007	Postdoctoral position in Bar-Ilan University in the laboratory of Prof. Gal Kaminka and Prof. Sarit Kraus. I develop distributed technologies for mobile phones in a joint project with Samsung Telecommunications. Supervised two students.
2002-2006	Ph.D. research in Computer Science in Bar-Ilan University, Israel. My research focused on applied diagnosis to distributed tightly-coupled systems and robots. I combine techniques from several areas in artificial intelligence: Model-Based Diagnosis, Multi-Agent Systems, Distributed Constraints Satisfaction and Robotics.
1997-1998	Software engineer in Motorola Israel, Engineering Cellular Department, in Cellular Network Management project.

• Professional Activities

(a) Positions in academic administration (departmental, faculty and university)

2009 – date Member of the under graduated studies of the Department of Information Systems, Ben Gurion University of the Negev, Beer Sheva, Israel.

(b) Professional functions outside universities (inter-university, national, international)

Program Committee member in refereed conferences

1. The Twenty-Sixth International Conference of the American Association for Artificial Intelligence, San-Francisco 2011
2. The Ninth International Conference on Autonomous Agents and multi-Agent Systems, Toronto 2010
3. The Twenty-First International Joint Conference on Artificial Intelligence, Pasadena 2009
4. The Seventh International Conference on Autonomous Agents and multi-Agent Systems, Portugal 2008
5. The Twenty-Third International Conference of the American Association for Artificial Intelligence, Chicago 2008
6. The Twenty-First International Conference of the American Association for Artificial Intelligence, Boston 2006
7. The Twenty International Conference of the American Association for Artificial Intelligence, Pittsburgh 2005

Program Committee member in workshops

1. The Twenty First International Workshop on Principles of Diagnosis, Murnau 2011
2. The Twenty International Workshop on Principles of Diagnosis, Portland 2010
3. The first workshop of Modeling Other Agents from Observations, New-

York 2004

(c) Journal reviewing

1. Artificial Intelligence Journal (AIJ)
2. Journal of Artificial Intelligence Research (JAIR)
3. Journal f Autonomous Agents and Multi Agent Systems (JAMMAS)
4. Transactions on Systems, Man and Cybernetics
5. IEEE Transactions on Robotics
6. Annals of Mathematics and Artificial Intelligence

• Educational activities

(a) Courses taught

(**BGU** - Ben-Gurion University of the Negev, Beer Sheva, Israel;
BIU - Bar-Ilan University, Israel;
Ariel – Ariel College, Israel)

Introduction to Programming	BIU, Ariel	Undergraduate
Object Oriented Programming	BIU, Ariel	Undergraduate
Advanced Programming	BGU	Undergraduate
Data Structures	Ariel	Undergraduate
Files Organization and Processing	BGU	Undergraduate
Model-Based Diagnosis	BGU	MA

(b) Research students

2009 – Now	Lihi Naamani, (Ph.D. adjunct advisor), topic: Voting with reduced votes (advising jointly with Lior Rokach and Bracha Shapira)
2009 – Now	Roni Stern, (Ph.D. adjunct advisor), topic: Search in unknown graphs (advising jointly with Ariel Felner)
2011-Now	Eliahu Khalastchi, (Ph.D. adjunct advisor), topic: Autonomous Anomaly Detection and Diagnosis (advising jointly with Lior Rokach)
2009 – Now	Eli Maman, M.Sc., topic: Decision making with dynamic information
2010 – Now	Vladimir Sadov, M.A., topic: Model Identification for MBD (advising jointly with Gal Kamika – Bar-Ilan University)
2010 – Now	Ayelet Urieli, M.Sc., topic: Survival Analysis in Large-Scale Systems (advising jointly with Lior Rokach)
2010 – Now	Betty Sayag, M.Sc, topic: Model-Based Diagnosis with Data Mining

Techniques
(advising jointly with Lior Rokach)

• Awards, Honors,

(a) Honors, Awards and Grants (including during studies)

2010-2011	Project joint with General Motors: Using Anomaly Detection Techniques to Diagnose and Prognosticate Faults in Vehicles Prognosticate Faults in Vehicles	$50000
2005	The Schuff Scholarship for excellent and community involvement (competitive award).	$10000
2003	Rector List in Ph.D. studies in Computer Science department, Bar-Ilan University – Israel	$1000
2000	Excellence in M.A studies (including Thesis) in General Philosophy, Bar-Ilan University – Israel.	

• Scientific Publications

Thesis and Books

1. Kalech, M. Diagnosing Coordination Faults in Multi-Agent Systems, Ph.D. thesis in Computer Science, Bar-Ilan University, Istrael, 2006
2. Kalech, M. *Data Structures*, Opus Press, Tel-Aviv 2002 (in Hebrew)
3. Thesis for MA in Philosophy department: Kalech, M. *Leibowich: between Cognitive and Conative,* Bar-Ilan 2000 (in Hebrew)

Journal Papers:

1. *Roni Stern, Meir Kalech, Ariel Felner, Finding Patterns in an Unknown Graph, *AI-Communications*, 2012 (in press)
2. *Meir Kalech, Diagnosis of Coordination Faults: A Matrix-Based Approach, *Journal of Autonomous Agents and Multi-Agent System*, Volume 24, Issue 1, Page 69-103, 2012
   5-years impact factor of JAAMAS-10 is: 2.163.

3. *Lior Rokach, Meir Kalech, Ido Blank, Rami Stern, Who is Going to Win the Next AAAI Fellowship Award? Evaluating Researchers by Mining Bibliographic Data, *Journal of the American Society for Information Science and Technology (JASIST),* volume 62, issue 12, pp. 2456-2470, 2011
   5-years impact factor of JASIST-10 is: 2.113.
4. *Meir Kalech, Sarit Kraus, Gal A. Kaminka, Claudia V. Goldman, Practical voting rules with partial information, *Journal of Autonomous Agents and Multi-Agent System,* 22:151–182, 2011
   5-years impact factor of JAAMAS-10 is: 2.163
5. *Meir Kalech, Gal A Kaminka, Coordination Diagnostic Algorithms for Teams of Situated Agents: Scaling-Up, *Computational Intelligence*, volume 27 issue 3, pp. 393-421, 2010
   5-years impact factor of CI-09 is: 0.854.
6. *Michael Lindner, Meir Kalech, Gal A. Kaminka, A Representation for Coordination Fault Detection in Large-Scale Multi-Agent Systems, *Annals of Mathematics and Artificial Intelligence, 5*6, 2, pp. 153-186, 2009
   5-years impact factor of AMAI -09 is: 1.097.
7. Kalech, M. Kaminka, On the Design of Coordination Diagnosis Algorithms for Teams of Situated Agents, *Artificial Intelligence Journal*, 71, 2007 pp. 491-513
   5-years impact factor of AI -07 is: 4.112.

Refereed Conference Papers

1. *Meir Kalech, Shulamit Reches, Rami Stern, When to Stop? That is the Question, in *The Twenty-Fifth National Conference on Artificial Intelligence (AAAI-11),* San-Francisco, 2011 (acceptance rate: 24.8%).
2. *Eliahu Khalastchi, Meir Kalech, Gal A. Kaminka and Raz Lin, Online Anomaly Detection in Unmanned Vehicles, in *the Tenth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS*-11*),* Taiwan 2011 (Acceptance rate: 22%)
3. *Lihi Naamani Dery, Meir Kalech, Lior Rokach, Bracha Shapira, Iterative Voting under Uncertainty for Group Recommender Systems, in *ACM Recommender Systems*, Barcelona 2010 (Acceptance rate: 42.3%)
4. *Meir Kalech, Avi Pfeffer, Decision Making with Dynamically Arriving Information, *the Ninth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-10),* Toronto 2010 (Acceptance rate: 23.7%)
5. *Asaf Shiloni, Alon Levy, Ariel Felner and Meir Kalech, Ants Meeting Algorithms, *the Ninth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-10),* Toronto 2010 (in press). (Acceptance rate: 23.7%). An earlier version appeared in the *10th International Workshop on Multi-Agent-Based Simulation*. May 2009.

6. Kalech, M. Lindner M. Kaminka G. A., "Matrix-Based Representation for Coordination Fault Detection: A Formal Approach", *Autonomous Agents and Multi-Agent System (AAMAS),* Hawaii 2007 (Acceptance rate: 22.8%). An earlier version appeared in the Workshop on Modeling and Solving Problems with Constraints, the Nineteenth International Joint Conference on Artificial Intelligence (IJCAI-05), 2005
7. Kalech, M. Kaminka, A. G. Meisels, A. Elmaliah, Y.**,** Diagnosis of Multi-Robot Coordination Failures Using Distributed CSP Algorithms, *The Twenty-First National Conference on Artificial Intelligence (AAAI-06),* Boston 2006. (Acceptance rate: 21%). An earlier version appeared in *The 3rd Monet Workshop on Model-Based Systems, The 17th European Conference on Artificial Intelligence (ECAI-06),* 2006
8. Kalech, M. Kaminka, A. G.**,** Diagnosing a Team of Agents: Scaling-Up, *the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-05),* Holland 2005. (Acceptance rate: 24.5%). An earlier version appeared in *the Fifteenth International Workshop on Principles of Diagnosis (DX-04),* 2004
9. Kalech, M. Kaminka, A. G.**,** Towards Model-Based Diagnosis of Coordination Failures**,** *the Twenty National Conference on Artificial Intelligence (AAAI-05),* Pittsburgh 2005. (Acceptance rate: 18.4%). An earlier version appeared in *the Sixteenth International Workshop on Principles of Diagnosis (DX-05),* 2005
10. Kalech, M. Kaminka, A. G. On the Design of Social Diagnosis Algorithms for Multi-Agent Teams, *the Seventeenth International Joint Conference on Artificial Intelligence (IJCAI-03),* Acapulco 2003 (Acceptance rate: 20.7%)
11. Gal A. Kaminka, Yehuda Elmaliach, Inna Frenkel, Ruti Glick, Meir Kalech, Tom Shpigelman, Towards a Comprehensive Framework for Teamwork in Behavior-Based Robots, *Conference on Intelligence Autonomous System 8,* Amsterdam 2003

Workshop and Symposium papers:

1. *Betty Keren, Meir Kalech, Lior Rokach, Model-Based Diagnosis with Multi-Label Classification, in the *Nineteenth International Workshop on Principles of Diagnosis (DX-11),* Murnau 2011
2. *Vladimir Sadov, Eliahu Khalastchi, Meir Kalech, Gal Kaminka, Towards Partial (and Useful) Model Identification for Model-Based Diagnosis, in the *Eighteenth International Workshop on Principles of Diagnosis (DX-10),* Portland 2010
3. *Roni Stern, Meir Kalech, MBD Techniques for Internet Delay Diagnosis, in the *Eighteenth International Workshop on Principles of Diagnosis (DX-10),* Portland 2010
4. *Roni Stern, Meir Kalech and Ariel Felner, Searching for a k-Clique in Unknown Graphs, in *Symposium on Combinatorial Search,* 2010

5. Roie Zivan, Uri Shapen, Amnon Meisels, and Meir Kalech. Hybrid Search for Dynamically Changing CSPs, *Annual ERCIM Workshop on Constraint Solving and Constraint Logic Programming (CSCLP 2008)*, 2008
6. Kalech, M. Lindner, M. Kaminka, A. G., Diagnosis of Coordination Faults: A Matrix-Based Formulation, in the *Sixteenth International Workshop on Principles of Diagnosis (DX-08)*, Australia 2008
7. Kalech, M. Kaminka, A. G., Modelling multi-agent systems as constraints for model-based diagnosis, in the *Workshop on Modeling and Solving Problems with Constraints, the Nineteenth International Joint Conference on Artificial Intelligence (IJCAI-05)*, France 2005

Abstract and Posters:

1. *Roni Stern, Meir Kalech and Ariel Felner, Searching for a k-Clique in Unknown Graphs, *the Ninth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-10)*, Toronto 2010
2. Kalech, M. Kaminka, A. G.**,** Model-based Diagnosis of Multi-agent Systems *the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-05)*, Holland 2005 (student abstract)
3. Kalech, M. Kaminka, A. G.**,** Diagnosing a Team of Agents: Scaling-Up, *the Third International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-04)*, New-York 2004
4. Kalech, M. Kaminka, A. G. Diagnosing multi-agent Systems, *in IEEE International Conference on Software, Science, Technology and Engineering*, 2003 (student abstract)

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• Lectures and Presentations at Invited Seminars not Followed by Published Proceedings

1. 2007, 2008, 2009: School of Engineering and Applied Sciences, Harvard University
   1. Practical Voting Rules with Partial Information
   2. Matrix-Based Representation for Coordination Fault Diagnosis: A Formal Approach
   3. Decision Making with Dynamically Arriving Information
2. 2008, 2009: Computer Science and Artificial Intelligence Laboratory, MIT
   1. **Practical Voting Rules with Partial Information**
   2. Decision Making with Dynamically Arriving Information
3. 2009: Electrical Engineering, Mathematics and Computer Science, Delft University of Technology.
   Model-Based Diagnosis of Coordination Failures

4. 2009: Dipartiment of Information, Università di Torino.
   Model-Based Diagnosis of Coordination Failures
5. 2005: Computer Science & Industrial and Systems Engineering Departments, University of Southern California
   Diagnosing a Team of Agents
6. 2006: IBM Research, Haifa.
   An Introduction to Model-Based Diagnosis
7. 2003, 2004, 2006: Computer Science department, Bar-Ilan University
   1. Model-Based Diagnosis of Coordination Failures
   2. Diagnosis of Multi-Agent Systems: Scaling-Up
   3. Matrix-Based Representation for Coordination Fault Diagnosis: A Formal Approach
8. 2010: Computer Science department, Ben-Gurion University
   Decision Making with Dynamically Arriving Information
9. 2006, 2007, 2009, 2010: Information System Engineering, Ben-Gurion University.
   1. Model-Based Diagnosis of Coordination Failures
   2. Diagnosis of Multi-Agent Systems: Scaling-Up
   3. Practical Voting Rules with Partial Information
   4. Decision Making with Dynamically Arriving Information

• **Patents**

1. Anomaly Detection for Robots and Medical Applications
   Eliyahu Khalastchi, Gal A. Kaminka, Raz Lin, and Meir Kalech
   US patent application, Provisional, 2011
2. Voting by Peers with Limited Resources,
   Meir Kalech, Sarit Karus, Gal A. Kaminka, and Claudia V. Goldman-Shenhar.
   US Patent application No. 11/905,481, Pending 2007.

- # Research Synopsis

My research interests are in Artificial Intelligence. In particular I am interested in the following topics:

1. **Model-based diagnosis:**
   Model-based diagnosis (MBD) relies on a model of the diagnosed system, which is utilized to simulate the behavior of the system given the inputs. The outputs are compared to the actual behavior to detect discrepancies indicating failures. The model can then be used to pinpoint possible failing components within the system. MBD is increasingly being applied in distributed and multi-agent systems (MAS). While successfully addressing key challenges, MBD has not been applied successfully for diagnosing coordination failures. This is because many such failures take place at the boundaries between the agents and their environment, including other agents. For instance, in a team, an agent may send a message that another agent, but the second agent does not receive it, due to a broken radio. As a result, the two agents disagree on the action to be taken.
   It is often possible to detect and diagnose coordination failures, given the actions of agents and the coordination constraints that should ideally hold between them. In the above example, knowing that the two agents should be in agreement as to their actions and seeing that their actions are not in agreement, is sufficient (1) to show that a coordination failure has occurred, and (2) to propose several possible diagnoses for it (e.g., the first agent did not send a message, the second agent did not receive it, etc.).
   In my research I develop an MBD framework to solve coordination failures in MAS, considering static, dynamic and temporal interactions between the agents. In addition, I develop algorithms to solve the problem in MAS environments with partial and uncertainty observation.

2. **Voting procedures to minimize preference elicitation:**
   Voting is an essential decision-making mechanism in multi-agent systems (MAS) that allows multiple agents to rank possible candidates and chooses a winner that reflects their joint preferences.
   Previous work has typically assumed that the voters provide a complete set of preferences to the center. However, in practice, especially in distributed settings, it may not be feasible for all agents to submit a complete set of preferences. First, in real-world applications, it may be impractical to expect individuals to provide all their preferences for a large number of candidates, from the perspective of the human interface and due to the need to interrupt the human as less as possible. For example, if a group of friends wish to choose a movie to watch together, it would be impractical to ask all the members to individually rate all current movies, i.e., the candidate set.
   A second motivating scenario for submitting an incomplete set of preferences requirement may be seen in telecommunications. In this domain, a basic

requirement is to save on communications in order to reduce bandwidth overhead. For example, consider a meeting schedule involving prospective participants using their PDAs to vote on meeting times. A user would not specify preferences for all possible slots since there are hundreds a month. Furthermore, it would be costly to communicate all preferences to the center conducting the vote.
In practice, it is possible to determine a winner by specifically requesting agents for certain preferences rather than for their whole set of preferences. A key question is what partial information is essential for determining a winner? In my research I address this question in three aspects:
(1) Developing anytime methods to estimate the probability of each candidate to win based on incomplete information.
(2) Developing protocols to gather the preferences of the agents over the candidates that minimize communication costs.
(3) Developing improved methods when the center has prior knowledge about the probability distribution of the agents' preferences over the candidates.

3. **Decision making under uncertainty**:
   How to make decisions when faced with dynamically changing information is an important problem. Do you stop at a particular point and make the best decision you can, given the information you have so far, or do you wait until more information arrives so you can make a better decision?
   When there is a cost to waiting, this problem becomes nontrivial. As an example, consider a meeting scheduling system. Determining the best time for a meeting could depend on many factors like other meetings, location and attendees. Typically, these factors may change dynamically. The longer one waits, the more information becomes available, and the higher the probability of choosing the best time. However, waiting to make the decision could be associated with a cost, for instance because the chosen time slot might no longer be available.
   Our research addresses two major challenges associated with decision making with dynamically arriving information:
   (1) Development of models of dynamic information and how they affect the utility of the candidates.
   (2) Development of methods to make a decision and pick the best candidate when the information is accumulating dynamically.