

The Fifth International Automated Negotiating Agents Competition (ANAC2015)

Organizers:

Dr. Reyhan Aydogan, Delft University of Technology

Dr. Katsuhide Fujita, Tokyo University of Agriculture and Technology

Dr. Tim Baarslag, the University of Southampton

Dr. Koen Hindriks, Delft University of Technology

Prof. Dr. Takayuki Ito, Nagoya Institute of Technology

Prof. Dr. Catholijn Jonker, Delft University of Technology

Motivations

- to encourage the design of **practical negotiation agents** that can proficiently negotiate against unknown opponents and in a variety of circumstances
- to provide a **benchmark for objectively evaluating** different negotiation strategies
- to explore **different learning and adaptation strategies** and opponent models
- to **collect state-of-the-art negotiating agents and negotiation scenarios**, and making them available to the wider research community.

Previous Competitions

- Started in 2010, as a joint project of the universities of Delft (group of Prof. Catholijn Jonker, Dr. Koen Hindriks, Dr. Dmytro Tykhonov, Tim Baarslag) and Bar-Ilan (Prof. Sarit Kraus, Dr. Raz Lin)
- In 2011, organized by Nagoya Institute of Technology (Prof. Takayuki Ito, Dr. Katsuhide Fujita)
- In 2012, organized by University of Southampton (Colin Williams, Dr. Valentin Robu, Dr. Enrico Gerding, Prof. Nick Jennings)
- In 2013, organized by Ben Gurion University of the Negev (Litan Ilany, Dr. Yaakov (Kobi) Gal)
- In 2014, organized by Tokyo University of Agriculture and Technology and Nagoya Institute of Technology (Dr. Katsuhide Fujita, Prof. Takayuki Ito)

ANAC2010 - 2014

	2010	2011	2012	2013	2014
Agents	7	18	17	19	21
Domains	3	8	24	24	12
Rules		Discount Factor	Reservation Value	Bid History	Nonlinear Domain

- **Organizers**
 - Tim Baarslag, the University of Southampton
 - Kobi Gal, Ben-Gurion University
 - Enrico Gerding, University of Southampton
 - Koen Hindriks, Delft University of Technology
 - Reyhan Aydogan, Delft University of Technology
 - Takayuki Ito, Nagoya Institute of Technology
 - Katsuhide Fujita, Tokyo University of Agriculture and Technology
 - Nicholas R. Jennings, University of Southampton
 - Catholijn Jonker, Delft University of Technology
 - Sarit Kraus, University of Maryland and Bar-Ilan University
 - Raz Lin, Bar-Ilan University
 - Valentin Robu, University of Southampton
 - Colin R. Williams, University of Southampton

Competition Setup

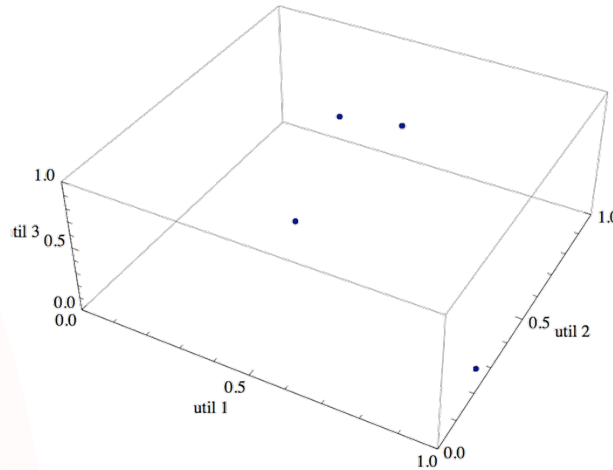
- **Multi-party Negotiation**
 - Stacked Alternating Offers Protocol for Multi-Lateral Negotiation (SAOPMN)
 - Negotiation among three agents
 - Incomplete information (preferences)
- Real time with a deadline after 3 minutes
- Discounting Factor (from 2011)
- Reservation value (from 2012)
- Utility functions are linear
- Tournament setup where agents negotiate about a large set of previously unknown domains
- Best overall average wins (individual, social category)

10 domains for ANAC2015

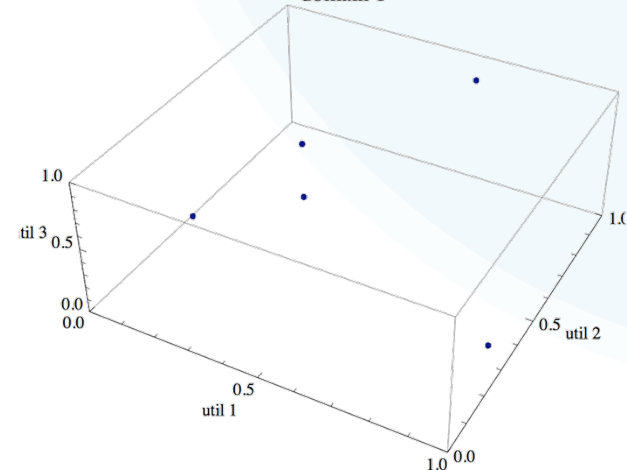
	# of issues (size)	Discount Factor	Reservation Value	Cooperativeness
1	1 issue (5 outcomes)	1.0 (N)	0.5	very competitive
2		1.0 (N)	0.5	a bit cooperative
3	2 issue (25 outcomes)	0.2	0 (N)	very competitive
4		1.0 (N)	0.5	quite collaborative
5	4 issues (320 outcomes)	0.5	0 (N)	competitive
6		0.5	0 (N)	collaborative
7	8 issues (3 ⁸ outcomes)	1.0 (N)	0 (N)	competitive
8		1.0 (N)	0 (N)	collaborative
9	16 issues (2 ¹⁶ outcomes)	0.4	0.7	very collaborative
10		0.4	0.7	very competitive

3D negotiation space plotting

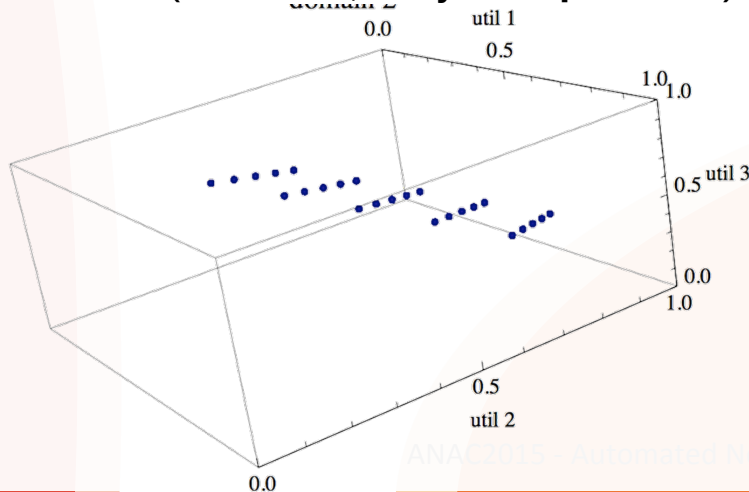
Domain1 (1 issue, very competitive)



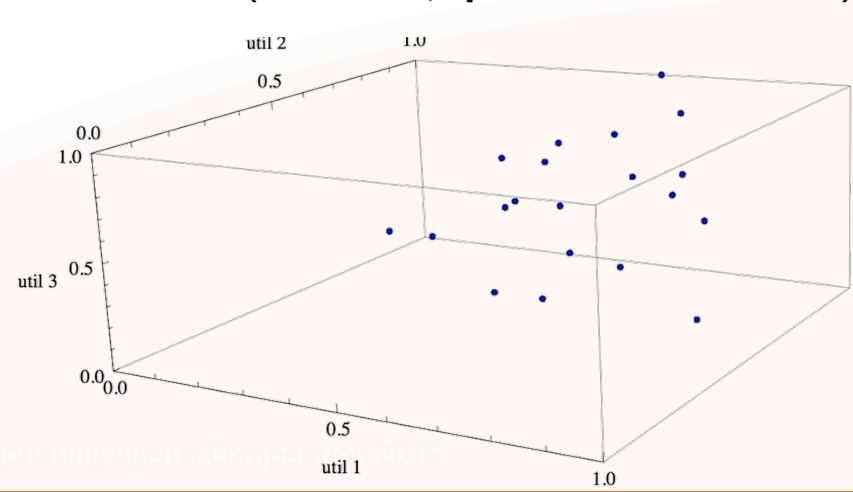
Domain2 (1 issues, a bit cooperative)



Domain3 (2 issues, very competitive)

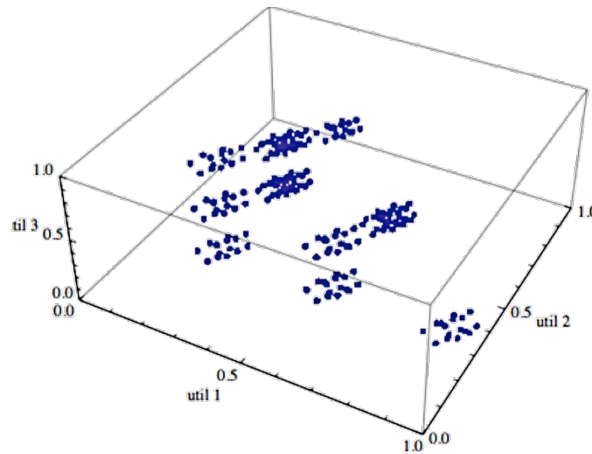


Domain4 (2 issues, quite collaborative)

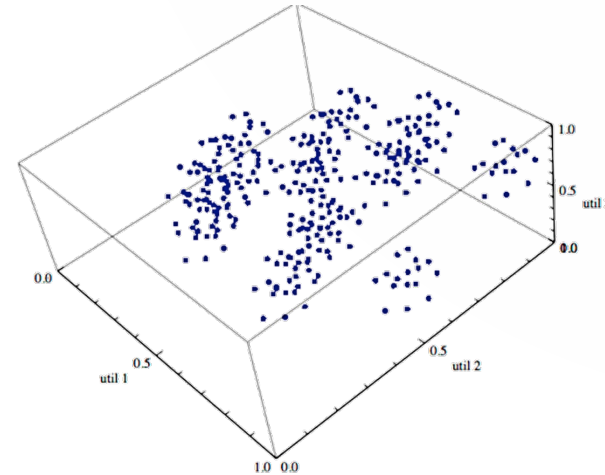


3D negotiation space plotting

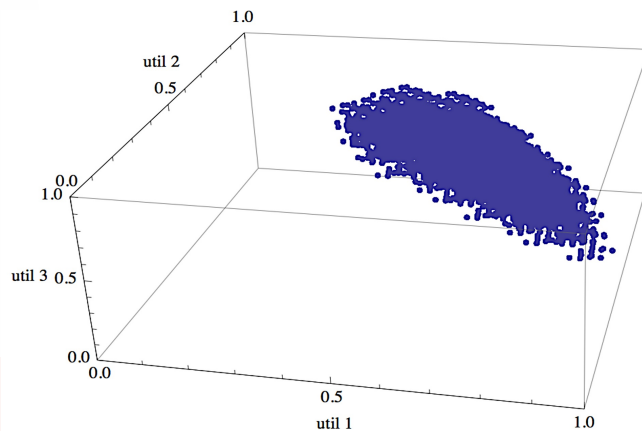
Domain5 (4 issues, competitive)



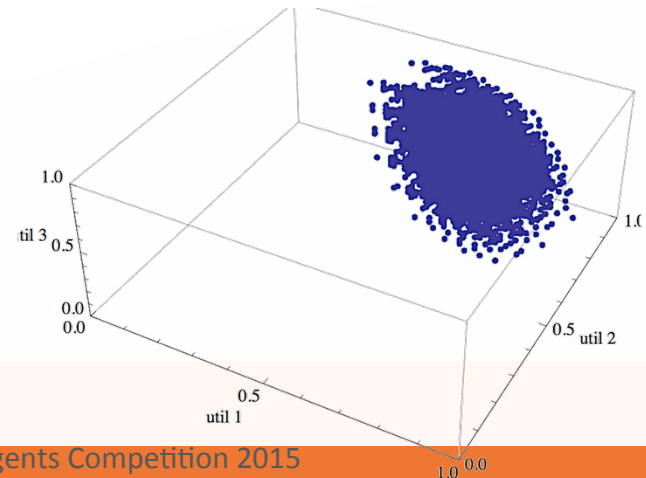
Domain6 (4 issues, cooperative)



Domain7 (8 issues, competitive)

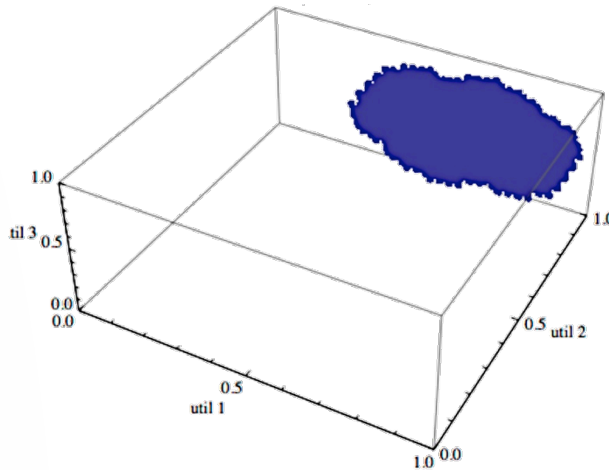


Domain8 (8 issues, cooperative)

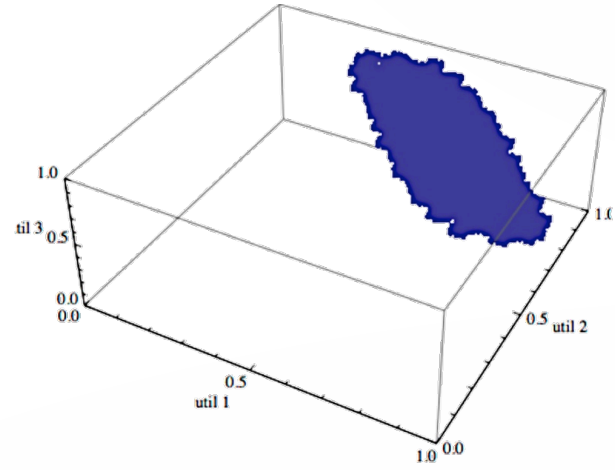


3D negotiation space plotting

Domain9 (16 issues, very cooperative)



Domain10 (16 issues, very competitive)



Participants

- **24 Teams Entered**
- **9 Institutions from 7 countries**
 - The Chinese University of Hong Kong, Hong Kong
 - Nanyang Technological University, Singapore
 - University of Isfahan, Iran
 - Nagoya Institute of Technology, Japan
 - Tokyo University of Agriculture and Technology, Japan
 - Delft University of Technology, Netherlands
 - Maastricht University, Netherlands
 - Norwegian University of Science and Technology, Norway
 - University of Tulsa, US



QUALIFICATION RESULTS

Qualifying Round

- 24 agents are divided to four groups (pools), randomly
 - DrageKnight, agentBuyog, SENGOKU, Pnegotiator, PokerFace, Mercury
 - AgentX, Atlas3, XianFaAgent, AgentHP, MeanBot, TUDMixedStrategyAgent
 - AgentW, kawaii, CUHKAgent2015, ParsAgent, JonnyBlack, Group2
 - AgentNeo, RandomDance, AgentH, PhoenixParty, AresParty, Forseti
- Top two agents in Individual Utility and Nash Product in each pool proceed to the final round

Qualifying Round Setup

- GENIUS 5.2.5
- Allocating the entire matches to 10 computers in Japan
 - For finishing the qualifying round in some weeks



Qualifying Round Results (Pool1)

Agent Name	Average (Individual)	Rank (Individual)	Average (Nash Product)	Rank (Nash)
agentBuyogV2	0.597955067	1	0.275919234	2
PokerFace	0.594266467	2	0.268609115	5
PNegotiator	0.591739600	3	0.268958032	4
DrageKnight	0.571351533	4	0.272096395	3
Mercury	0.550937867	5	0.300345722	1
SENGOKU	0.547276433	6	0.263140705	6

To Final:

**agentBuyogV2(Individual/Nash),
PokerFace(Individual), Mercury(Nash)**

Qualifying Round Results (Pool2)

Agent Name	Average (Individual)	Rank (Individual)	Average (Nash Product)	Rank (Nash)
Atlas3	0.680664517	1	0.309788773	1
XianFaAgent	0.633863800	2	0.288605994	3
MeanBot	0.584072250	3	0.223485414	6
AgentX	0.571492517	4	0.290723081	2
AgentHP	0.535089883	5	0.254176388	5
TUDMixed	0.504430117	6	0.284713164	4

To Final:

**Atlas3(Individual/Nash),
XianFaAgent(Individual), AgentX (Nash)**

Qualifying Round Results (Pool3)

Agent Name	Average (Individual)	Rank (Individual)	Average (Nash Product)	Rank (Nash)
ParsAgent	0.582228250	1	0.226744176	6
kawaii	0.575404450	2	0.224477192	5
Group2	0.567122400	3	0.230310631	4
CUHKAgent2015	0.552638067	4	0.268464466	1
AgentW	0.518159433	5	0.237260891	3
JonnyBlack	0.491797117	6	0.261849645	2

To Final:

**ParsAgent(Individual), kawaii(Individual)
CUHKAgent2015(Nash), JonnyBlack(Nash)**

Qualifying Round Results (Pool4)

Agent Name	Average (Individual)	Rank (Individual)	Average (Nash Product)	Rank (Nash)
RandomDance	0.408558450	1	0.182175298	1
PhoenixParty	0.380885900	2	0.136591820	6
AresParty	0.378801767	3	0.147792872	4
AgentNeo	0.356815667	4	0.141631385	5
AgentH	0.339627333	5	0.163050174	2
Forseti	0.258990217	6	0.151909061	3

To Final:

**RandomDance(Individual/Nash),
PhoenixParty(Individual), AgentH(Nash)**



Final Round Results

Final Round

- We ran tournaments among 8 winners in two categories (Individual Utility and Nash Product)
- The entire matches played among 8 agents
 - 10 linear domains (same as the qualifying Round)
 - Deadline: 3 min.
 - 336 negotiation sessions
 - The results are the average of 5 trials
- GENIUS 5.2.5

Prizes

1 st Place (Individual Utility Category)	€250
2 nd Place (Individual Utility Category)	€150
3 rd Place (Individual Utility Category)	€100
1 st Place (Nash Product Category)	€200
2 nd Place (Nash Product Category)	€175
3 rd Place (Nash Product Category)	€125

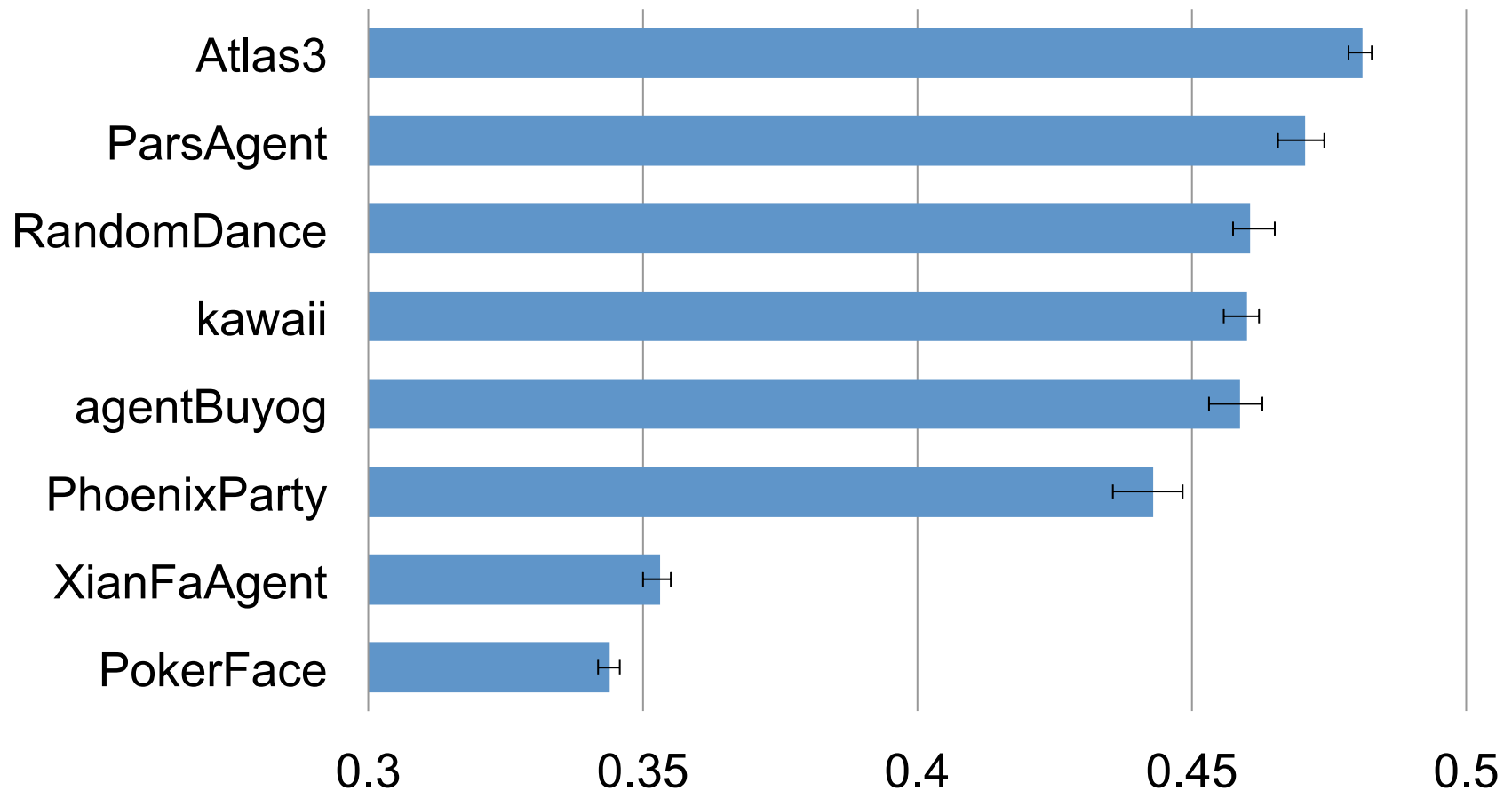
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Overall Ranking (Individual Utility)



Overall Ranking (Nash Product)

