

# **34th AAAI Conference on Artificial Intelligence (AAAI-20)**

## **Volume 3: AAAI Technical Tracks**

- Heuristic Search and Optimization
- Human-AI Collaboration
- Humans and AI
- Human-Computation and Crowd Sourcing
- Knowledge Representation and Reasoning

**New York, New York, USA  
7 – 12 February 2020**

ISBN: 978-1-7138-2734-4

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2020) by Association for the Advancement of Artificial Intelligence  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2021)

For permission requests, please contact Association for the Advancement of Artificial Intelligence  
at the address below.

Association for the Advancement of Artificial Intelligence  
2275 East Bayshore Road  
Suite 160  
Palo Alto, California 94303  
USA

Phone: 1-650-328-3123  
Fax: 1-650-321-4457

<https://aaai.org/Press/press.php>

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## AAAI TECHNICAL TRACK: HEURISTIC SEARCH AND OPTIMIZATION

A UNIFYING VIEW ON INDIVIDUAL BOUNDS AND HEURISTIC INACCURACIES IN BIDIRECTIONAL SEARCH .....	2327
<i>Vidal Alcázar, Pat Riddle, Mike Barley</i>	
AN INTERACTIVE REGRET-BASED GENETIC ALGORITHM FOR SOLVING MULTI- OBJECTIVE COMBINATORIAL OPTIMIZATION PROBLEMS .....	2335
<i>Nawal Benabbou, Cassandre Leroy, Thibaut Lust</i>	
LOCAL SEARCH WITH DYNAMIC-THRESHOLD CONFIGURATION CHECKING AND INCREMENTAL NEIGHBORHOOD UPDATING FOR MAXIMUM K-PLEX PROBLEM .....	2343
<i>Peilin Chen, Hai Wan, Shaowei Cai, Jia Li, Haicheng Chen</i>	
ENVELOPE-BASED APPROACHES TO REAL-TIME HEURISTIC SEARCH .....	2351
<i>Kevin Gall, Bence Cserna, Wheeler Ruml</i>	
RUNTIME ANALYSIS OF SOMATIC CONTIGUOUS HYPERMUTATION OPERATORS IN MOEA/D FRAMEWORK .....	2359
<i>Zhengxin Huang, Yuren Zhou</i>	
LEARNING TO OPTIMIZE VARIATIONAL QUANTUM CIRCUITS TO SOLVE COMBINATORIAL PROBLEMS .....	2367
<i>Sami Khairy, Ruslan Shaydulin, Lukasz Cincio, Yuri Alexeev, Prasanna Balaprakash</i>	
HOW THE DURATION OF THE LEARNING PERIOD AFFECTS THE PERFORMANCE OF RANDOM GRADIENT SELECTION HYPER-HEURISTICS .....	2376
<i>Andrei Lissovoi, Pietro Oliveto, John Alasdair Warwicker</i>	
ON PERFORMANCE ESTIMATION IN AUTOMATIC ALGORITHM CONFIGURATION .....	2384
<i>Shengcai Liu, Ke Tang, Yunwei Lei, Xin Yao</i>	
A LEARNING BASED BRANCH AND BOUND FOR MAXIMUM COMMON SUBGRAPH RELATED PROBLEMS .....	2392
<i>Yanli Liu, Chu-Min Li, Hua Jiang, Kun He</i>	
CAKEWALK SAMPLING .....	2400
<i>Uri Patish, Shimon Ullman</i>	
SUBSET SELECTION BY PARETO OPTIMIZATION WITH RECOMBINATION .....	2408
<i>Chao Qian, Chao Bian, Chao Feng</i>	
ASYMPTOTIC RISK OF BÉZIER SIMPLEX FITTING .....	2416
<i>Akinori Tanaka, Akiyoshi Sannai, Ken Kobayashi, Naoki Hamada</i>	
TRADING CONVERGENCE RATE WITH COMPUTATIONAL BUDGET IN HIGH DIMENSIONAL BAYESIAN OPTIMIZATION .....	2425
<i>Hung Tran-The, Sunil Gupta, Santu Rana, Svetha Venkatesh</i>	
REDUCTION AND LOCAL SEARCH FOR WEIGHTED GRAPH COLORING PROBLEM .....	2433
<i>Yiyuan Wang, Shaowei Cai, Shiwei Pan, Ximing Li, Monghao Yin</i>	

ENUMERATING MAXIMAL K-PLEXES WITH WORST-CASE TIME GUARANTEE ..... 2442  
*Yi Zhou, Jingwei Xu, Zhenyu Guo, Mingyu Xiao, Yan Jin*

**AAAI TECHNICAL TRACK: HUMAN-AI COLLABORATION**

A HUMAN-AI LOOP APPROACH FOR JOINT KEYWORD DISCOVERY AND  
EXPECTATION ESTIMATION IN MICROPOST EVENT DETECTION ..... 2451  
*Akansha Bhardwaj, Jie Yang, Philippe Cudré-Mauroux*

JUST ASK: AN INTERACTIVE LEARNING FRAMEWORK FOR VISION AND LANGUAGE  
NAVIGATION ..... 2459  
*Ta-Chung Chi, Minmin Shen, Mihail Eric, Seokhwan Kim, Dilek Hakkani-Tur*

ASYMPTOTICALLY UNAMBITIOUS ARTIFICIAL GENERAL INTELLIGENCE ..... 2467  
*Michael Cohen, Badri Vellambi, Marcus Hutter*

A FRAMEWORK FOR ENGINEERING HUMAN/AGENT TEAMING SYSTEMS ..... 2477  
*Rick Evertsz, John Thangarajah*

WHAT IS IT YOU REALLY WANT OF ME? GENERALIZED REWARD LEARNING WITH  
BIASED BELIEFS ABOUT DOMAIN DYNAMICS ..... 2485  
*Ze Gong, Yu Zhang*

EXPLAINABLE REINFORCEMENT LEARNING THROUGH A CAUSAL LENS ..... 2493  
*Prashan Madumal, Tim Miller, Liz Sonenberg, Frank Vetere*

RELATIVE ATTRIBUTING PROPAGATION: INTERPRETING THE COMPARATIVE  
CONTRIBUTIONS OF INDIVIDUAL UNITS IN DEEP NEURAL NETWORKS ..... 2501  
*Woo-Jeoung Nam, Shir Gur, Jaesik Choi, Lior Wolf, Seong-Whan Lee*

HUMAN-MACHINE COLLABORATION FOR FAST LAND COVER MAPPING ..... 2509  
*Caleb Robinson, Anthony Ortiz, Kolya Malkin, Blake Elias, Andi Peng, Dan Morris, Bistra  
Dilkina, Nebojsa Jojic*

HIERARCHICAL EXPERTISE-LEVEL MODELING FOR USER SPECIFIC ROBOT-  
BEHAVIOR EXPLANATIONS ..... 2518  
*Sarath Sreedharan, Tathagata Chakraborti, Christian Muise, Subbarao Kambhampati*

CORPUS-LEVEL END-TO-END EXPLORATION FOR INTERACTIVE SYSTEMS ..... 2527  
*Zhiwen Tang, Grace Hui Yang*

LEARNING TO INTERACTIVELY LEARN AND ASSIST ..... 2535  
*Mark Woodward, Chelsea Finn, Karol Hausman*

CG-GAN: AN INTERACTIVE EVOLUTIONARY GAN-BASED APPROACH FOR FACIAL  
COMPOSITE GENERATION ..... 2544  
*Nicola Zaltron, Luisa Zurlo, Sebastian Risi*

QUERYING TO FIND A SAFE POLICY UNDER UNCERTAIN SAFETY CONSTRAINTS IN  
MARKOV DECISION PROCESSES ..... 2552  
*Shun Zhang, Edmund Durfee, Satinder Singh*

## **AAAI TECHNICAL TRACK: HUMAN-COMPUTATION AND CROWD SOURCING**

BAR — A REINFORCEMENT LEARNING AGENT FOR BOUNDING-BOX AUTOMATED REFINEMENT .....	2561
<i>Morgane Ayle, Jimmy Tekli, Julia El-Zini, Boulos El-Asmar, Mariette Awad</i>	
COST-ACCURACY AWARE ADAPTIVE LABELING FOR ACTIVE LEARNING .....	2569
<i>Ruijiang Gao, Maytal Saar-Tsechansky</i>	
HIREPEER: IMPARTIAL PEER-ASSESSED HIRING AT SCALE IN EXPERT CROWDSOURCING MARKETS .....	2577
<i>Yasmine Kotturi, Anson Kahng, Ariel Procaccia, Chinmay Kulkarni</i>	
FINE-GRAINED MACHINE TEACHING WITH ATTENTION MODELING .....	2585
<i>Jiacheng Liu, Xiaofeng Hou, Feilong Tang</i>	

## **AAAI TECHNICAL TRACK: HUMANS AND AI**

COCOX: GENERATING CONCEPTUAL AND COUNTERFACTUAL EXPLANATIONS VIA FAULT-LINES .....	2594
<i>Arjun Akula, Shuai Wang, Song-Chun Zhu</i>	
TOWARDS AWARENESS OF HUMAN RELATIONAL STRATEGIES IN VIRTUAL AGENTS .....	2602
<i>Ian Beaver, Cynthia Freeman, Abdullah Mueen</i>	
REGRESSION UNDER HUMAN ASSISTANCE .....	2611
<i>Abir De, Paramita Koley, Niloy Ganguly, Manuel Gomez-Rodriguez</i>	
MIMAMO NET: INTEGRATING MICRO- AND MACRO-MOTION FOR VIDEO EMOTION RECOGNITION .....	2621
<i>Didan Deng, Zhaokang Chen, Yuqian Zhou, Bertram Shi</i>	
CONDITIONAL GENERATIVE NEURAL DECODING WITH STRUCTURED CNN FEATURE PREDICTION .....	2629
<i>Changde Du, Changying Du, Lijie Huang, Huiguang He</i>	
GASPING FOR UTILITY .....	2637
<i>Mengyang Gu, Debarun Bhattacharjya, Dharmashankar Subramanian</i>	
HARNESSING GANS FOR ZERO-SHOT LEARNING OF NEW CLASSES IN VISUAL SPEECH RECOGNITION .....	2645
<i>Yaman Kumar, Dhruva Sahrawat, Shubham Maheshwari, Debanjan Mahata, Amanda Stent, Yifang Yin, Rajiv Ratn Shah, Roger Zimmermann</i>	
GRAPH-BASED DECODING MODEL FOR FUNCTIONAL ALIGNMENT OF UNALIGNED FMRI DATA .....	2653
<i>Weida Li, Mingxia Liu, Fang Chen, Daoqiang Zhang</i>	
MULTI-SOURCE DOMAIN ADAPTATION FOR VISUAL SENTIMENT CLASSIFICATION .....	2661
<i>Chuang Lin, Sicheng Zhao, Lei Meng, Tat-Seng Chua</i>	
LEARNING GRAPH CONVOLUTIONAL NETWORK FOR SKELETON-BASED HUMAN ACTION RECOGNITION BY NEURAL SEARCHING .....	2669
<i>Wei Peng, Xiaopeng Hong, Haoyu Chen, Guoying Zhao</i>	

UCF-STAR: A LARGE SCALE STILL IMAGE DATASET FOR UNDERSTANDING HUMAN ACTIONS .....	2677
<i>Marjaneh Safaei, Pooyan Balouchian, Hassan Foroosh</i>	
TOWARDS SOCIALLY RESPONSIBLE AI: COGNITIVE BIAS-AWARE MULTI-OBJECTIVE LEARNING .....	2685
<i>Procheta Sen, Debasis Ganguly</i>	
REINFORCING AN IMAGE CAPTION GENERATOR USING OFF-LINE HUMAN FEEDBACK .....	2693
<i>Paul Hongsuck Seo, Piyush Sharma, Tomer Levinboim, Bohyung Han, Radu Soricut</i>	
INSTANCE-ADAPTIVE GRAPH FOR EEG EMOTION RECOGNITION .....	2701
<i>Tengfei Song, Suyuan Liu, Wenming Zheng, Yuan Zong, Zhen Cui</i>	
VARIATIONAL PATHWAY REASONING FOR EEG EMOTION RECOGNITION .....	2709
<i>Tong Zhang, Zhen Cui, Chunyan Xu, Wenming Zheng, Jian Yang</i>	
CROWD-ASSISTED DISASTER SCENE ASSESSMENT WITH HUMAN-AI INTERACTIVE ATTENTION .....	2717
<i>Daniel (Yue) Zhang, Yifeng Huang, Yang Zhang, Dong Wang</i>	

### **AAAI TECHNICAL TRACK: KNOWLEDGE REPRESENTATION AND REASONING**

LEARNING AND REASONING FOR ROBOT SEQUENTIAL DECISION MAKING UNDER UNCERTAINTY .....	2726
<i>Saeid Amiri, Mohammad Shokrolah Shirazi, Shiqi Zhang</i>	
QUERY REWRITING FOR ONTOLOGY-MEDIATED CONDITIONAL ANSWERS .....	2734
<i>Medina Andresel, Magdalena Ortiz, Mantas Simkus</i>	
REVISITING THE FOUNDATIONS OF ABSTRACT ARGUMENTATION – SEMANTICS BASED ON WEAK ADMISSIBILITY AND WEAK DEFENSE .....	2742
<i>Ringo Baumann, Gerhard Brewka, Markus Ulbricht</i>	
FORGETTING AN ARGUMENT .....	2750
<i>Ringo Baumann, Dov Gabbay, Odinaldo Rodrigues</i>	
CHECKING CHASE TERMINATION OVER ONTOLOGIES OF EXISTENTIAL RULES WITH EQUALITY .....	2758
<i>David Carral, Jacopo Urbani</i>	
MODEL-BASED DIAGNOSIS WITH UNCERTAIN OBSERVATIONS .....	2766
<i>Dean Cazes, Meir Kalech</i>	
PARAME: REGARDING NEURAL NETWORK PARAMETERS AS RELATION EMBEDDINGS FOR KNOWLEDGE GRAPH COMPLETION .....	2774
<i>Feihu Che, Dawei Zhang, Jianhua Tao, Mingyue Niu, Bocheng Zhao</i>	
ANSWERING CONJUNCTIVE QUERIES WITH INEQUALITIES IN DL-LITER .....	2782
<i>Gianluca Cima, Maurizio Lenzerini, Antonella Poggi</i>	
EPISTEMIC INTEGRITY CONSTRAINTS FOR ONTOLOGY-BASED DATA MANAGEMENT .....	2790
<i>Marco Console, Maurizio Lenzerini</i>	

HYPOTHETICAL ANSWERS TO CONTINUOUS QUERIES OVER DATA STREAMS .....	2798
<i>Luis Cruz-Filipe, Isabel Nunes, Graça Gaspar</i>	
ELGOLOG: A HIGH-LEVEL PROGRAMMING LANGUAGE WITH MEMORY OF THE EXECUTION HISTORY .....	2806
<i>Giuseppe De Giacomo, Yves Lespérance, Eugenia Ternovska</i>	
EFFICIENT MODEL-BASED DIAGNOSIS OF SEQUENTIAL CIRCUITS .....	2814
<i>Alexander Feldman, Ingo Pill, Franza Wotawa, Ion Matei, Johan De Kleer</i>	
PROPORTIONAL BELIEF MERGING .....	2822
<i>Adrian Haret, Martin Lackner, Andreas Pfandler, Johannes P. Wallner</i>	
STRUCTURAL DECOMPOSITIONS OF EPISTEMIC LOGIC PROGRAMS .....	2830
<i>Markus Hecher, Michael Morak, Stefan Woltran</i>	
GOING DEEP: GRAPH CONVOLUTIONAL LADDER-SHAPE NETWORKS .....	2838
<i>Ruiqi Hu, Shirui Pan, Guodong Long, Qinghua Lu, Liming Zhu, Jing Jiang</i>	
AGGREGATION OF PERSPECTIVES USING THE CONSTELLATIONS APPROACH TO PROBABILISTIC ARGUMENTATION .....	2846
<i>Anthony Hunter, Kawsar Noor</i>	
LEAST GENERAL GENERALIZATIONS IN DESCRIPTION LOGIC: VERIFICATION AND EXISTENCE .....	2854
<i>Jean Christoph Jung, Carsten Lutz, Frank Wolter</i>	
COMPLEXITY AND EXPRESSIVE POWER OF DISJUNCTION AND NEGATION IN LIMIT DATALOG .....	2862
<i>Mark Kaminski, Bernardo Cuenca Grau, Egor V. Kostylev, Ian Horrocks</i>	
LOGICS FOR SIZES WITH UNION OR INTERSECTION .....	2870
<i>Caleb Kisby, Saul Blanco, Alex Kruckman, Lawrence Moss</i>	
FASTLAS: SCALABLE INDUCTIVE LOGIC PROGRAMMING INCORPORATING DOMAIN-SPECIFIC OPTIMISATION CRITERIA .....	2877
<i>Mark Law, Alessandra Russo, Elisa Bertino, Krysia Broda, Jorge Lobo</i>	
AUTOMATIC VERIFICATION OF LIVENESS PROPERTIES IN THE SITUATION CALCULUS .....	2886
<i>Jian Li, Yongmei Liu</i>	
PATH RANKING WITH ATTENTION TO TYPE HIERARCHIES .....	2893
<i>Weiyu Liu, Angel Daruna, Zsolt Kira, Sonia Chernova</i>	
K-BERT: ENABLING LANGUAGE REPRESENTATION WITH KNOWLEDGE GRAPH .....	2901
<i>Weijie Liu, Peng Zhou, Zhe Zhao, Zhiruo Wang, Qi Ju, Haotang Deng, Ping Wang</i>	
EXPLANATIONS FOR INCONSISTENCY-TOLERANT QUERY ANSWERING UNDER EXISTENTIAL RULES .....	2909
<i>Thomas Lukasiewicz, Enrico Malizia, Cristian Molinaro</i>	
RESILIENT LOGIC PROGRAMS: ANSWER SET PROGRAMS CHALLENGED BY ONTOLOGIES .....	2917
<i>Sanja Lukumbuzya, Magdalena Ortiz, Mantas Šimkus</i>	

COMMONSENSE KNOWLEDGE BASE COMPLETION WITH STRUCTURAL AND SEMANTIC CONTEXT .....	2925
<i>Chaitanya Malaviya, Chandra Bhagavatula, Antoine Bosselut, Yejin Choi</i>	
BLAMEWORTHINESS IN SECURITY GAMES .....	2934
<i>Pavel Naumov, Jia Tao</i>	
DECIDING ACCEPTANCE IN INCOMPLETE ARGUMENTATION FRAMEWORKS .....	2942
<i>Andreas Niskanen, Daniel Neugebauer, Matti Järvisalo, Jörg Rothe</i>	
RULE-GUIDED COMPOSITIONAL REPRESENTATION LEARNING ON KNOWLEDGE GRAPHS .....	2950
<i>Guanglin Niu, Yongfei Zhang, Bo Li, Peng Cui, Si Liu, Jingyang Li, Xiaowei Zhang</i>	
LEARNING QUERY INSEPARABLE ELH ONTOLOGIES .....	2959
<i>Ana Ozaki, Cosimo Persia, Andrea Mazzullo</i>	
GRAPH REPRESENTATIONS FOR HIGHER-ORDER LOGIC AND THEOREM PROVING .....	2967
<i>Aditya Paliwal, Sarah Loos, Markus Rabe, Kshitij Bansal, Christian Szegedy</i>	
RELATEDNESS AND TBOX-DRIVEN RULE LEARNING IN LARGE KNOWLEDGE BASES .....	2975
<i>Giuseppe Pirrò</i>	
A FRAMEWORK FOR MEASURING INFORMATION ASYMMETRY .....	2983
<i>Yakoub Salhi</i>	
ADVERSARIAL DEEP NETWORK EMBEDDING FOR CROSS-NETWORK NODE CLASSIFICATION .....	2991
<i>Xiao Shen, Quanyu Dai, Fu-Lai Chung, Wei Lu, Kup-Sze Choi</i>	
CONTEXTUAL PARAMETER GENERATION FOR KNOWLEDGE GRAPH LINK PREDICTION .....	3000
<i>George Stoica, Otilia Stretcu, Emmanouil Antonios Platanios, Tom Mitchell, Barnabás Póczos</i>	
INTERACTE: IMPROVING CONVOLUTION-BASED KNOWLEDGE GRAPH EMBEDDINGS BY INCREASING FEATURE INTERACTIONS .....	3009
<i>Shikhar Vashishth, Soumya Sanyal, Vikram Nitin, Nilesh Agrawal, Partha Talukdar</i>	
QUERY ANSWERING WITH GUARDED EXISTENTIAL RULES UNDER STABLE MODEL SEMANTICS .....	3017
<i>Hai Wan, Guohui Xiao, Chenglin Wang, Xianqiao Liu, Junhong Chen, Zhe Wang</i>	
COTSAE: CO-TRAINING OF STRUCTURE AND ATTRIBUTE EMBEDDINGS FOR ENTITY ALIGNMENT .....	3025
<i>Kai Yang, Shaoqin Liu, Junfeng Zhao, Yasha Wang, Bing Xie</i>	
RANKING-BASED SEMANTICS FOR SETS OF ATTACKING ARGUMENTS .....	3033
<i>Bruno Yun, Srdjan Vesic, Madalina Croitoru</i>	
FEW-SHOT KNOWLEDGE GRAPH COMPLETION .....	3041
<i>Chuxu Zhang, Huaxiu Yao, Chao Huang, Meng Jiang, Zhenhui Li, Nitesh V. Chawla</i>	
TOWARDS UNIVERSAL LANGUAGES FOR TRACTABLE ONTOLOGY MEDIATED QUERY ANSWERING .....	3049
<i>Heng Zhang, Yan Zhang, Jia-Huai You, Zhiyong Feng, Guifei Jiang</i>	



ON THE EXPRESSIVITY OF ASK QUERIES IN SPARQL .....	3057
<i>Xiaowang Zhang, Jan Van Den Bussche, Kewen Wang, Heng Zhang, Xuanxing Yang, Zhiyong Feng</i>	
LEARNING HIERARCHY-AWARE KNOWLEDGE GRAPH EMBEDDINGS FOR LINK PREDICTION .....	3065
<i>Zhanqiu Zhang, Jianyu Cai, Yongdong Zhang, Jie Wang</i>	
A PRACTICAL APPROACH TO FORGETTING IN DESCRIPTION LOGICS WITH NOMINALS .....	3073
<i>Yizheng Zhao, Renate Schmidt, Yuejie Wang, Xuanming Zhang, Hao Feng</i>	
DECIDING THE LOOSELY GUARDED FRAGMENT AND QUERYING ITS HORN FRAGMENT USING RESOLUTION .....	3080
<i>Sen Zheng, Renate Schmidt</i>	
LTL <sub>f</sub> SYNTHESIS WITH FAIRNESS AND STABILITY ASSUMPTIONS .....	3088
<i>Shufang Zhu, Giuseppe De Giacomo, Geguang Pu, Moshe Y. Vardi</i>	

**Author Index**