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New Frontiers in Artificial Intelligence

JSAI-isAI 2013 Workshops, LENLS, JURISIN, MiMI, AAA, and DDS
Kanagawa, Japan, October 27–28, 2013
Revised Selected Papers
Preface

The JSAI-isAI (JSAl International Symposium on Artificial Intelligence) 2013 was the 5th international symposium on AI supported by the Japanese Society of Artificial Intelligence (JSAI). JSAI-isAI 2013 was successfully held during October 27th to 28th at Keio University in Kanagawa, Japan; 161 people from 16 countries participated. The symposium took place after the JSAI SIG joint meeting. As the total number of participants for these two co-located events was over 400, it was the second-largest JSAI event in 2013 after the JSAI annual meeting.

The JSAI-isAI 2013 included 6 workshops, where 9 invited talks and 48 papers were presented. This volume, New Frontiers in Artificial Intelligence: JSAI-isAI 2013 Workshops, is the post-proceedings of JSAI-isAI 2013. From 5 of the 6 workshops (LENLS10, JURISIN2013, MiMI2013, AAA2013, and DDS2013), 26 papers were carefully selected and revised according to the comments of the workshop Program Committees. About 40% of the total submissions were selected for inclusion in the conference proceedings.

- LENLS (Logic and Engineering of Natural Language Semantics) is an annual international workshop on formal semantics and pragmatics. LENLS10 was the 10th event in the series, and it focused on the formal and theoretical aspects of natural language. The workshop was chaired by Shunsuke Yatabe (West Japan Railway Company).

- JURISIN (Juris-Informatics) 2013 was the 7th event in the series, organized by Katsumi Nitta (Tokyo Institute of Technology). The purpose of this workshop was to discuss fundamental and practical issues for juris-informatics, bringing together experts from a variety of relevant backgrounds, including law, social science, information and intelligent technology, logic, and philosophy (including the area of AI and law).

- MiMI (Multimodality in Multiparty Interaction) 2013 was organized by Mayumi Bono (National Institute of Informatics) and Yasuyuki Sumi (Future University Hakodate). The topics covered in this workshop spanned interaction studies, communication studies, conversation analysis, and workplace studies, as well as their applications in other research fields.

- AAA (Argument for Agreement and Assurance) 2013 focused on the theoretical foundations of argumentation in AI, and the application of argumentation to various fields such as agreement formation and assurance. The organizers were Yoshiki Kinoshita (National Institute of Advanced Industrial Science and Technology), Kazuco Takahashi (Kwansei Gakuin University), Hiroyuki Kido (The University of Tokyo), and Kenji Taguchi (National Institute of Advanced Industrial Science and Technology).

- DDS (Data Discretization and Segmentation for Knowledge Discovery) 2013 was organized by Akihiro Yamamoto (Kyoto University), Hiroshi Sakamoto (Kyushu Institute of Technology), and Tetsuji Kuboyama (Gakushuin University). This workshop
discussed segmentation methods for various types of data, such as graphs, trees, strings, and continuous data, and their applications in the areas of machine learning and knowledge discovery.

It is our great pleasure to be able to share some highlights of these fascinating workshops in this volume. We hope this book will introduce readers to the state-of-the-art research outcomes of JSAI-isAI 2013, and motivate them to participate in future JSAI-isAI events.

April 2014

Yukiko Nakano
Ken Satoh
Daisuke Bekki
Logic and Engineering of Natural Language Semantics (LENLS) 10

Shunsuke Yatabe
Department of Letters, Kyoto University
shunsuke.yatabe@gmail.com

The Workshop

Between October 27 and 28, 2013 the Tenth International Workshop of Logic and Engineering of Natural Language Semantics (LENLS 10) took place at Raiousha Building, Keio University, Kanagawa, Japan. This was held as a workshop of the Fifth JSAI International Symposia on AI (JSAI-isAI 2013), sponsored by The Japan Society for Artificial Intelligence (JSAI).

LENLS is an annual international workshop focusing on topics in formal semantics, formal pragmatics, and related fields. This year the workshop featured invited talks by Nicholas J.J. Smith (the University of Sydney) on “Vagueness, Counting and Cardinality” and Richard Dietz (the University of Tokyo) on “The Possibility of Vagueness”. In addition there were 21 presentations of talks selected by the program committee from the abstracts submitted for presentation.

LENLS workshops do not only focus on formal accounts of specific empirical linguistic phenomena, but also attempts to tackle broader theoretical, logical, philosophical and coverage issues. Topics discussed at the workshop included issues as conditionals, plurals, speech acts exhaustivity, lexicon-semantics interface, semantic similarity, an opinion classification task on a French corpus, rhetorical questions, and politeness, as well as more specific issues involving multiple constraints in ACG, type-theoretic approaches to linguistics, ontology on natural language processing, as well as general issues of Dummett’s philosophy of language, modal logics, quantum linguistics and many-valued semantics.

In addition to the workshop, on October 26th, a Tutorial Lecture by Nicholas J. J. Smith was held at the Ochanomizu University in Tokyo. The title of the lecture is “Vagueness and Fuzzy Logic”, and he gave a positive appraisal of the prospects for a fuzzy logic based solution to the problems of vagueness. He also explained his challenge of integrating the fuzzy theory of vagueness into the wider theoretical landscape in the field of degrees of belief.

Papers

The submitted papers in the LENLS part of the present volume are as follows:

“A Type-Theoretic Account of Neg-Raising Predicates in Tree Adjoining Grammars” by Laurence Danlos, Philippe De Groote and Sylvain Pogodalla, which
provides a type theoretic semantics for TAG which derives the NR and non-NR readings of NR predicates in a compositional way.

“Semantic similarity: foundations” by Nicholas Asher, Cedric Degremont and Antoine Venant, which takes up the interesting and useful problem of “semantic similarity” between two discourses, proposes several metrics and investigates their formal properties.

“World history ontology for reasoning truth/falsehood of sentences: Event classification to fill in the gaps between knowledge resources and natural language texts” by Ai Kawazoe, Yusuke Miyao, Takuya Matsuzaki, Hikaru Yokono and Noriko Arai, which provides an ontology for the task of truth/falsehood judgement of simple historical descriptions in university-level history entrance examinations.

“Hypersequent calculi for modal logics extending S4” by Hidenori Kurokawa, which provides hypersequent calculi for S4.2 and S4.3 in addition to S4 and S5 from a uniform perspective.

“Discourse-level Politeness and Implicature” by Eric Mccready and Nicholas Asher, which proposes a game-theoretic analysis of politeness, especially from the perspective of descriptive set theory.

“Bare Plurals in the Left Periphery in German and Italian” by Yoshiki Mori and Hitomi Hirayama, which discusses the interpretation possibilities of bare plurals in the left periphery in German and Italian that cannot be predicted by the so-called neo-Carlsonian approaches to the semantics of nominals.

“Analyzing Speech Acts based on Dynamic Normative Logic” by Yasuo Nakayama, which proposes an alternative approach for dynamic epistemic logic for a dynamic aspect of normative change.

“Constructive Generalized Quantifiers Revisited” by Ribeka Tanaka, Yuki Nakano and Daisuke Bekki, which introduces generalized quantifiers in the type theoretic approach to natural language along the line of Sundholm.

“Argumentative insights from an opinion classification task on a French corpus” by Marc Vincent and Gre’goire Winterstein, which reports on the production of a corpus and the results of using certain automatic techniques for classification of opinion and the interpretation of the task results in a particular semantic/pragmatic framework.

“Exhaustivity through the Maxim of Relation” by Matthijs Westera, which clearly shows that taking a view of proposition as a set of sets of worlds and employing attentive semantics with its entailment relation enables us to derive the exhaustiveness of answers as a conversational implicature with the help of the maxim of relation.

“First-Order Conditional Logic and Neighborhood-Sheaf Semantics for Analysis of Conditional Sentences” by Hanako Yamamoto and Daisuke Bekki, which shows the equivalence between Neighborhood-Sheaf Semantics and Kripke-sheaf semantics with respect to a first-order conditional logic.

Acknowledgements

Let me acknowledge some of those who helped with the workshop. The program committee and organisers, in addition to myself, were Daisuke Bekki (Ochanomizu University/National Institute of Informatics), Alastair Butler (PRESTO JST/Tohoku University), Eric McCready
(Aoyama Gakuin University), Koji Mineshima (Keio University), Yoshiki Mori (University of Tokyo), Yasuo Nakayama (Osaka University), Katsuhiko Sano (Japan Advanced Institute of Science and Technology), Katsuhiko Yabushita (Naruto University of Education), Tomoyuki Yamada (Hokkaido University), and Kei Yoshimoto (Tohoku University). Daisuke Bekki was liaison with JSAI and together with Kei Yoshimoto organised and mentored many aspects of the workshop. Finally, the organisers would like to thank JSAI for giving us the opportunity to hold the workshop.
International Workshop on Juris-Informatics (JURISIN 2013)

Katsumi Nitta
Tokyo Institute of Technology
4259 Nagatsuta, Midori-ku, Yokohama 226-8502, Japan
nitta@dis.titech.ac.jp

The Workshop

JURISIN is the International Workshop on Juris-Informatics. The purpose of JURISIN is to discuss both the fundamental and practical issues for jurisinformatics from various backgrounds such as law, social science, information and intelligent technology, logic and philosophy, including the conventional “AI and law” area. JURISIN 2013 was held on 27 and 28, 2013, in association with the Fifth JSAI International Symposium on AI (JSAI-isAI 2013) supported by the Japanese Society for Artificial Intelligence (JSAI).

From submitted papers, we accepted ten papers. They cover various topics such as legal reasoning systems, formal argumentation theory, legal text processing, and so on.

As guest speakers, we invited Professor Davide Grossi from University of Liverpool, UK, Professor Martin Caminada from University of Aberdeen, UK, and Professor Kotaro Takagi from Aoyamagakuin University, Japan. Professor Davide Grossi and Professor Martin Caminada are leading scientists in the field of argumentation theory. And Professor Kotaro Takagi is one of leading scientists in the field of legal communication from the view of social informatics. And, as the guest speaker of AAA 2013, Professor Tim Kelly from University of York, UK, and Professor Thomas Agotnes from University of Bergen, Norway gave talks.

Papers

According to discussions of JURISIN 2013, authors revised their papers. The program committee reviewed these revised papers, and selected five papers.

“Requirements of legal knowledge management systems to aid normative reasoning in specialist domains” (Alessio Antonini, et. al.) focuses on the interplay between industry/professional standards and legal norms, the information gap between legal and specialist domains and the need for interpretation at all stages of compliance. They propose extensions to the Eunomos legal knowledge management tool to help address the information gap, with particular attention to aligning norms with operational procedures, and the use of domain-specific specialist ontologies from multiple domains to help users understand and reason with norms on specialist topics.

“ArgPROLEG: A Normative Framework for The JUF Theory” (Zohreh Shams, et. al.) proposes ArgPROLEG, a normative framework for legal reasoning based on
PROLEG, an implementation of the the Japanese “theory of presupposed ultimate facts” (JUF). This theory was mainly developed with the purpose of modelling the process of decision making by judges in the court.

“Answering Yes/No Questions in Legal Bar Exams” (Mi-Young Kim, et. al.) develops a QA approach to answer yes/no questions relevant to civil laws in legal bar exams. The first step is to identify legal documents relevant to the exam questions; the second step is to answer the questions by analyzing the relevant documents. Their experimental results show reasonable performance, which improves the baseline system, and outperforms an SVM-based supervised machine learning model.

“Answering Legal Questions by Mining Reference Information” (Oanh Thi Tran, et. al.) presents a study on exploiting reference information to build a question answering system restricted to the legal domain. To cope with referring to multiple documents, they propose a novel approach which exploits the reference information among legal documents to find answers. he experimental results showed that the proposed method is quite effective and outperform a traditional QA method, which does not use reference information.

“Belief Re-revision in Chivalry Case” (Pimolluck Jirakunkanok, et. al.) proposes a formalization of legal judgment revision in terms of dynamic epistemic logic, with two dynamic operators; commitment and permission. In order to demonstrate their formalization, they analyze judge’s belief change in Chivalry Case in which a self-defense causes a misconception.

Acknowledgement

JURISIN 2013 was held in conjunction with JSII-isAI 2013 supported by JSAI. We thank all staffs of JSII-isAI 2013 and JSAI for their supports.

And also JURISIN 2013 was supported by members of the steering committee, the program committee and advisory committee. We really appreciate their support.
Multimodality in Multiparty Interaction (MiMI2013)

Mayumi Bono$^{1,2}$ and Yasuyuki Sumi$^3$

$^1$ Digital Content and Media Sciences Research Division, National Institute of Informatics
$^2$ Department of Informatics, School of Multidisciplinary Sciences, Graduate University of Advanced Studies (SOKENDAI)
$^3$ Department of Complex and Intelligent Systems, Future University Hakodate

The Workshop

The International Workshop on Multimodality in Multiparty Interaction (MiMI2013) took place at Keio University, Kanagawa, on October 28, 2013. This was held as part of the Japan Society for Artificial Intelligence (JSAI) International Symposia on Artificial Intelligence (JSAI-isAI 2013), sponsored by JSAI and Innovation for Interdisciplinary Approaches across the Humanities and Social Sciences, of the Japan Society for the Promotion of Science (JSPS).

In this workshop, we tried to cover a broad range of perspectives related to interaction studies, communication studies, conversation analysis, and workplace studies and their application to other research fields including, but not limited to, human–computer interaction (HCI). Moreover, we tried to provide a space where HCI researchers who have created original work can start collaborative projects with interaction and communication analysts to evaluate their products and upgrade their perspectives on human interaction in our daily lives. Recently, the interest of linguists, interaction analysts, and conversation analysts has turned increasingly toward observing interactional practices in the material world (Streeck et al., 2011). To turn to new domains of communication, we need to focus not only on the systematic structure of dyadic dialogue, i.e., two-party interaction, but also on the complexity of conversations involving more than three. Our daily communication is not limited to dyadic dialogue, but open to multi-party interactions.

Multimodality is a research concept that emerges from the history of traditional language research that has treated only verbal and text information of human language. Human social interaction involves the intertwined interaction of different modalities, such as talk, gesture, gaze, and posture. Human–computer interactions involve studying, planning, and designing interactions between humans and computers. Traditionally, HCI researchers have adopted the methodologies of experimental psychology to evaluate their products by measuring human behaviors and human knowledge under experimental conditions. However, we believe that experimental settings are limited in their ability to study human daily interactions.

Since 2012, we have been conducting the Ido-Robo project as one of the grand challenge projects at the National Institute of Informatics (NII-Today, 2014). Can a robot engage in communicative activities such as gossiping beside the well? Ido-bata
kaigi (congregate at the side of a well) is a concept in Japanese that reflects how women living in villages used to chat, circulate gossip, and exchange community information as they gathered beside a well and washed clothes and pumped water from the well. Now, that phrase refers to spontaneous congregations that serve as hubs for the communicative, intellectual, and political life of Japanese people. Such a phenomenon is not yet possible even for a robot manufactured with the latest technology.

Figuratively speaking, we hope to build an infrastructure that will enable robots to congregate and engage in small talk, which is based on an interdisciplinary research framework involving scholars in linguistics, cognitive science, information science, sociology, and robotics. In this workshop, we discussed how a marriage between interaction studies and informatics could affect developments in both research fields.

Papers and Future plans

This one-day workshop included two invited talks and five general papers. The first invited talk was a curious talk entitled ‘Social Robotics in Classrooms’ by Prof. Fumihide Tanaka from the perspective of engineering research. Then Prof. Morana Alač gave an insightful talk entitled ‘Just a Robot: Haptic Interaction and the Thingness of the Social Robot’ from the perspective of the social sciences. These two speakers once collaborated at the University of California, San Diego (UCSD). From their different perspectives, they outlined how they conducted their research projects in classrooms using social robotics. These invited talks were a good example of the marriage between interaction studies and informatics.

The general paper sessions discussed several aspects of multi-party interactions: listener’s nonverbal behaviors in Bibliobattle; the sequential structure of improvisation in Robot-Human Theater; listener’s behaviors during table talk; conversation during table cooking; and the home position of gestures in multi-party conversation. We accepted one paper from the invited session and one paper from the general session for the post-proceedings.

Currently, we are preparing for a special session of Multimodality in Multiparty Interactions (MiMI) with Social Robots: Exploring Human–Robot Interaction (HRI) in the Real World (MiMI2014), for the 23rd IEEE International Symposium on Robot and Human Interactive Communication (IEEE RO-MAN 2014), which will be held in Edinburgh, Scotland, on August 25-29, 2014. As we discussed numerous aspects of multi-party interactions at MiMI2013, we will try to focus on a number of aspects of interactions with social robots. Through such activities, we hope to continue to be able to discuss the main issues of MiMI.

References

2. NII Today: Can a Robot Join an Idobata Kaigi?. NII Today No.48 (2014)
Preface

Lattice theoretical and combinatorial analysis of argumentation has now become an established field in Artificial Intelligence and there is much hope for its application to agreement formation and consensus building. On the other hand, there is a growing interest in assurance cases in Assurance Engineering, where the logical analysis of arguments by Toulmin is much appreciated. Both of these two activities aim at analysis of arguments, but it seems they have had rather few interaction with each other. The aim of this workshop is to encourage exchange of idea between these two fields. To that end, we called for submissions of the work in the following topics.

- Abstract and structured argumentation systems including studies of frameworks, proof-theories, semantics and complexity.
- Dialogue systems for persuasion, negotiation, deliberation, eristic and information-seeking dialogues.
- Applications of argumentation and dialogue systems to various fields such as agreement technologies, systems assurance, safety engineering, multi-agent systems, practical reasoning, belief revision, learning and semantic web.
- Agreement and assurance technologies through arguments including safety cases, assurance cases and dependability cases.
- Tools for argumentation systems, dialogue systems, argument-based stakeholders' agreement, argument-based accountability achievement, argument-based open systems dependability and argument-based verification and validation.

We have seven contributed talks and one invited lecture by Professor Tim Kelly in the workshop. Moreover, AAA 2013 have made an agreement with JURISIN 2013 that participants of AAA are encouraged to attend the JURISIN invited lecture by Dr. Caminada.
Workshop on Data Discretization and Segmentation for Knowledge Discovery (DDSS13)

Akihiro Yamamoto¹, Tetsuji Kuboyama², and Hiroshi Sakamoto³

¹ Graduate School of Informatics, Kyoto University, Japan
   akihiro@i.kyoto-u.ac.jp
² Computer Centre, Gakushuin University, Japan
   ori-ds2013@tk.cc.gakushuin.ac.jp
³ Graduate School of Computer Science and Systems Engineering,
   Kyushu Institute of Technology, Japan
   hiroshi@ai.kyutech.ac.jp

The Workshop

The Workshop on Data Discretization and Segmentation for Knowledge Discovery (DDSS13) was held on October 27th at Keio University in the fifth JSAI International Symposia on AI (JSAI-isAI 2013), sponsored by the Japan Society for Artificial Intelligence (JSAI).

DDSS13 is the first workshop on subjects related to discretization and segmentation of data in developing methods for discovering knowledge from large-scale data. Originally, decomposing one datum into a set of several small data is found to play a crucial role in computer science. Decomposition usually indicates an operation to consecutive data structure, but in the context of Machine Learning and Knowledge Discovery, it can include, for example, segmentation of sentences in natural languages and segmentation of time series. Moreover decomposition can be extended so that it may include discretization of continuous data, data compression, and algebraic methods for Knowledge Discovery. We focus this workshop on decomposition methods of various types of data, such as graphs, trees, strings, and continuous data, and their applications to Machine Learning and Knowledge Discovery. We welcomed scientific results based on, but not restricted to, decomposition of data and its applications to bioinformatics, natural language processing, social network analysis, and other related areas.

We first organized the program committee consisting of 14 researchers concerning with subjects in the workshop scope, and announced a call for papers. As the result of review by the PC members, 10 submitted papers were accepted. More information on DDSS13 is available at the workshop homepage¹. The proceedings were published from JSAI².

¹ https://sites.google.com/site/dds13workshop
Post-Workshop Proceedings

Five papers in those presented in the workshop were submitted after revision to this post-workshop proceedings. Each of them was peer reviewed by three PC members, which consists of two PC members previously assigned plus another, and eventually the PC selected three papers.

Two of the papers are focused on trees. Kernel functions for structured data such as trees are in the scope of the workshop because most of them are defined by decomposing input data along the structure. The third paper treats mixed-type data, which contain both discrete and continuous features. In order to treat such types of data in formal concept analysis (FCA), an algebraic method for analyzing data, the author discretizes continuous features. The abstracts of the three papers are following.

Hamada et al. introduced a kernel for tree data based on counting all of the agreement subtree mappings, and designed an efficient algorithm to compute the kernel value for unordered leaf-labeled full binary trees. Then they applied it to analysis of nucleotide sequences for A (H1N1) influenza viruses. They also showed that the problem of counting all of the agreement subtree mappings is \#P-complete unless the trees are full binary.

Shin et al. provided comprehensive research on various tree kernels proposed previously, in order to choose good ones for analyzing data. They picked up 32 algorithms for tree kernels under two different parameter settings, and showed that three of the 64 tree kernels are superior to the others with proving statistically significant through t-tests.

Sugiyama introduced a method for detecting outliers in mixed-type data, based on FCA. In this method, a lattice of concepts which represents a hierarchy of clusters is constructed, and outliers are clusters highly isolated in the hierarchy. Though continuous features are discretized for the method, he showed by experiments that the method detects outliers more effectively than other popular distance-based methods.

Acknowledgments

DDS13 was closed successfully. We are grateful for the great support received from the program committee members: Hiroki Arimura, Basabi Chakraborty, Kouichi Hirata, Yoshinobu Kawahara, Nobuhiro Kaji, Noriaki Kawamae, Tesuhiro Miyahara, Yoshiaki Okubo, Takeshi Shinozaka, and Tomoyuki Uchida. Most of the PC members are steering members of the Special Interest Group on Fundamental Problems in AI (SIG-FPAI), chaired by Kuboyama. We are thankful to Prof. Yukiko Nakano for her organization of JSAI-isAI 2013. We also thank Prof. Ken Satoh and Prof. Daisuke Bekki for their arrangement to publish the LNAI volume of these post-workshop proceedings. Finally, we thank all speakers and all audiences who attended the workshop.
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