

# **The 16th Annual SIGdial Meeting on Discourse and Dialogue**

**September 2–4, 2015  
Prague, Czech Republic**



**Conference Handbook**

# Contents

<b>1</b>	<b>Welcome to SIGDIAL 2015</b>	<b>3</b>
	Organizing Committee . . . . .	5
<b>2</b>	<b>Conference Program</b>	<b>9</b>
	Wednesday 2nd September . . . . .	9
	Thursday 3rd September . . . . .	10
	Friday 4th September . . . . .	11
	List of Posters . . . . .	12
	MultiLing 2015 Special Session (3rd Sep., 13:30) . . . . .	15
<b>3</b>	<b>Abstracts</b>	<b>17</b>
	Oral Session 1: Dialogue Management . . . . .	17
	Oral Session 2: Discourse Strategy . . . . .	18
	Oral Session 3: Perspective and Point of View . . . . .	19
	Oral Session 4: New directions . . . . .	20
	Oral Session 5: Neural Network for dialogue processing . . . . .	21
	Poster Session 1 . . . . .	23
	Poster Session 2 . . . . .	29
	MultiLing 2015 Special Session . . . . .	36
<b>4</b>	<b>Local Information</b>	<b>41</b>
	Venue Address . . . . .	41
	Wi-Fi . . . . .	41
	The SIGDIAL dinner . . . . .	41
	Restaurants . . . . .	41

# CONTENTS

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Public Transport . . . . .	43
Taxis . . . . .	43
Currency . . . . .	44
Car rental . . . . .	44
Shopping (groceries and more) . . . . .	44
Sightseeing and more . . . . .	45
Travelling from Prague to Interspeech . . . . .	47
Building Plan . . . . .	48
Map of the Neighborhood . . . . .	IV

# 1 Welcome to SIGDIAL 2015

We are excited to welcome you to this year's SIGDIAL Conference, the 16th Annual Meeting of the Special Interest Group on Discourse and Dialogue. We are pleased to hold the conference this year in Prague, Czech Republic, on September 2nd-4th, in close proximity to INTERSPEECH 2015.

The SIGDIAL conference remains positioned as the publication venue for research under the broad umbrella of discourse and dialogue. This year, the program includes oral presentations and poster sessions on Dialogue Management, Discourse Strategy, Perspective and Point of View, and New Directions. SIGDIAL 2015 also hosts a special session entitled MultiLing 2015: Multilingual Summarization of Multiple Documents, organized by George Giannakopoulos. The papers from this special session that appear in the proceedings were submitted and reviewed as regular SIGDIAL papers, and cleared the same high bar for quality. Papers not accepted through the regular review process are not included in the proceedings, but were still invited to be presented as posters in the special session. Due to the success of last year's special session, this is the second year SIGDIAL has issued a general call for special sessions.

We received a record breaking number of submissions this year, 136 complete submissions altogether, which included 79 long papers, 42 short papers and 15 demo descriptions—from a broad, international set of authors. Additionally, 2 papers were submitted and then withdrawn, and 1 was rejected without review due to being out of scope. All papers received 3 reviews. We carefully considered both the numeric ratings and the tenor of the comments, both as written in the reviews, and as submitted in the discussion period, in making our selection for the program. Overall, the members of the Program Committee did an excellent job in reviewing the submitted papers. We thank them for the important role their reviews have played in selecting the accepted papers and for helping to maintain the high quality of the program. In line with the SIGDIAL tradition, our aim has been to create a balanced program that accommodates as many favorably rated papers as possible.

This year's SIGDIAL conference runs 2.5 days as it did in 2014, with the special session being held on the second day. Of the 79 long paper submissions: 14 were accepted as long papers for oral presentation, 21 were accepted as long papers for poster presentation. Of the 42 short paper submissions, 17 were accepted for poster presentation, for a total of 38 posters. There were 7 demonstration papers that were accepted. 3 of the long papers and 4 of the short papers accepted for poster presentation were accepted for publication to appear in the MULTILING Special Session.

We enthusiastically thank the two keynote speakers, Dilek Hakkani-Tur (Microsoft Research, USA) and Frank Fischer (Ludwigs Maximilian Universität München) and for their contributions to research on discourse and dialogue systems, and we look forward to their keynote talks!

We offer our thanks to Svetlana Stoyanchev, Mentoring Chair for SIGDIAL 2015, for her dedicated work on coordinating the mentoring process, just as last year. The goal of mentoring is to assist authors of papers that contain important ideas but lack clarity. Mentors work with the authors to improve English language usage or paper organization. This year, 3 of the accepted papers were mentored. We thank the Program Committee members who served as mentors: Pamela Jordan, Jason Williams, and Heriberto Cuayahuitl.

We extend special thanks to our local arrangements chair, Filip Jurcicek, and his team Libuse Brdickova, Ondrej Dusek, Lukas Zilka, and Ahmad Agha Ebrahimian. We know SIGDIAL 2015 would not have been possible without Filip and his team, who invested so much effort in arranging the conference hotel venue and accommodations, handling registration, making banquet arrangements, and handling numerous other preparations for the conference. The student volunteers for on-site assistance also deserve our appreciation.

Kristy Boyer, Sponsorships Chair, has earned our appreciation for recruiting and liaising with our conference sponsors, many of whom continue to contribute year after year. The sponsorship program enables valuable aspects of the program, such as the invited speakers, conference reception and dinner. In recognition of this, we gratefully acknowledge the support of our sponsors: Educational Testing Service, Interactions, Microsoft Research, Amazon.com, Honda Research Institute, Mitsubishi Electric Research Laboratories, and Turnitin/LightSide. At the same time, we thank Priscilla Rasmussen at the ACL for tirelessly handling the financial aspects of sponsorship for SIGDIAL 2015, and for securing our ISBN on a moment's notice!

We also thank the SIGdial board, especially officers, Jason Williams, Amanda Stent and Kristiina Jokinen for their advice and support from beginning to end. We especially appreciate Jason's substantial, prompt and patient replies to numerous questions along the way.

Finally, we thank all the authors of the papers in this volume, and all the conference participants for making this stimulating event a valuable opportunity for growth in research in the areas of dialogue and discourse.

Alexander Koller and Gabriel Skantze, General Co-Chairs  
Masahiro Araki and Carolyn Penstein Rosé, Technical Program Co-Chairs

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**Steve Young**, Cambridge University, United Kingdom  
**Kai Yu**, Shanghai Jiao Tong University, China  
**Jian Zhang**, The Hong Kong University of Science and Technology, China

## 2 Conference Program

### Wednesday 2nd September

*(Old Refectory)*

**09:00 Welcome and conference overview**

**09:10 Keynote I**

*Frank Fischer (University of Munich, Germany)*

The Interplay of Discussion, Cognition and Instruction in  
Computer-Supported Collaborative Learning Environments

**10:10 Break**

**10:35 Oral Session 1: Dialogue Management**

Human-Machine Dialogue as a Stochastic Game

*Merwan Barlier, Julien Perolat, Romain Laroche and Olivier Pietquin*

Knowledge transfer between speakers for personalised dialogue  
management

*Inigo Casanueva, Thomas Hain, Heidi Christensen, Ricard Marxer and Phil Green*

Miscommunication Recovery in Physically Situated Dialogue

*Matthew Marge and Alexander Rudnicky*

**11:50 Lunch**

**13:00 Oral Session 2: Discourse Strategy**

Reinforcement Learning in Multi-Party Trading Dialog

*Takuya Hiraoka, Kallirroi Georgila, Elnaz Nouri, David Traum and Satoshi  
Nakamura*

An Incremental Turn-Taking Model with Active System Barge-in for Spoken  
Dialog Systems

*Tiancheng Zhao, Alan W Black and Maxine Eskenazi*

**13:50 Poster madness**

*(Corridor 1st Floor, Room S10, Small Aula)*

**14:10 Poster session (with coffee)**

Group 1

*(Old Refectory)*

**16:30 Oral Session 3: Perspective and Point of View**

I Couldn't Agree More: The Role of Conversational Structure in Agreement and Disagreement Detection in Online Discussions

*Sara Rosenthal and Kathy McKeown*

Memory-Based Acquisition of Argument Structures and its Application to Implicit Role Detection

*Christian Chiarcos and Niko Schenk*

Generating Sentence Planning Variations for Story Telling

*Stephanie Lukin, Lena Reed and Marilyn Walker*

**17:45 Informal announcements**

*(Restaurant Konírna, Maltézske náměstí 10)*

**19:00 Banquet**

## Thursday 3rd September

*(Old Refectory)*

**09:00 Day overview and informational announcements**

**09:05 Keynote II**

*Dilek Hakkani-Tur (Microsoft Research, USA)*

Graph-based Approaches for Spoken Language Understanding

**10:05 Break**

**10:30 Oral Session 4: New directions**

Evaluating Spoken Dialogue Processing for Time-Offset Interaction

*David Traum, Kallirroi Georgila, Ron Artstein and Anton Leuski*

The REAL Challenge 2014: Progress and Prospects

*Maxine Eskenazi, Alan W Black, Sungjin Lee and David Traum*

Argument Mining: Extracting Arguments from Online Dialogue

*Reid Swanson, Brian Ecker and Marilyn Walker*

*(Old Refectory)*

**11:45 Lunch, business meeting, and sponsor talks**

**13:30 Special session (MultiLing 2015)**

*(Room S1)*

**13:30 Open Space**

*(Old Refectory)*

**17:30 Open Space closing session**

**17:45 Informal announcements**

## Friday 4th September

*(Old Refectory)*

**09:00 Day overview and informational announcements**

**09:05 Oral Session 5: Neural Network for dialogue processing**

Stochastic Language Generation in Dialogue using Recurrent Neural Networks with Convolutional Sentence Reranking

*Tsung-Hsien Wen, Milica Gasic, Dongho Kim, Nikola Mrksic, Pei-Hao Su, David Vandyke and Steve Young*

The Ubuntu Dialogue Corpus: A Large Dataset for Research in Unstructured Multi-Turn Dialogue Systems

*Ryan Lowe, Nissan Pow, Iulian Serban and Joelle Pineau*

Recurrent Polynomial Network for Dialogue State Tracking with Mismatched Semantic Parsers

*Qizhe Xie, Kai Sun, Su Zhu, Lu Chen and Kai Yu*

**10:20 Poster madness**

*(Corridor 1st floor, Room S10, Small Aula)*

**10:40 Poster session (with coffee)**

Group 2

*(Old Refectory)*

**12:40 Best paper award ceremony and closing**

**13:00 End of conference**

## List of Posters

### Group 1 (2nd Sep., 13:50)

A Discursive Grid Approach to Model Local Coherence in Multi-document Summaries

*Marcio Dias and Thiago Pardo*

A SIP of CoFee: A Sample of Interesting Productions of Conversational Feedback

*Laurent Prevot, Jan Gorsch, Roxane Bertrand, Emilien Gorene and Brigitte Bigi*

Automated Speech Recognition Technology for Dialogue Interaction with Non-Native Interlocutors

*Alexei V. Ivanov, Vikram Ramanarayanan, David Suendermann-Oeft, Melissa Lopez, Keelan Ecanini and Jidong Tao*

Belief Tracking with Stacked Relational Trees

*Deepak Ramachandran and Adwait Ratnaparkhi*

Conversational Knowledge Teaching Agent that uses a Knowledge Base

*Kyusong Lee, Paul Hongsuck Seo, Junhwi Choi, Sangjun Koo and Gary Geunbae Lee*

Dialog Act Annotation for Twitter Conversations

*Elina Zarisheva and Tatjana Scheffler*

Exploiting knowledge base to generate responses for natural language dialog listening agents

*Sangdo Han, Jeesoo Bang, Seonghan Ryu and Gary Geunbae Lee*

Exploring the Effects of Redundancy within a Tutorial Dialogue System: Restating Students' Responses

*Pamela Jordan, Patricia Albacete and Sandra Katz*

Fast and easy language understanding for dialog systems with Microsoft Language Understanding Intelligent Service (LUIS)

*Jason D Williams, Eslam Kamal, Mokhtar Ashour, Hani Amr, Jessica Miller and Geoff Zweig*

Information Theoretical and Statistical Features for Intrinsic Plagiarism Detection

*Rashedur Rahman*

Modelling situated human-robot interaction using IrisTK

*Gabriel Skantze and Martin Johansson*

Multilingual WikiTalk: Wikipedia-based talking robots that switch languages.  
*Graham Wilcock and Kristiina Jokinen*

PDTB Discourse Parsing as a Tagging Task: The Two Taggers Approach  
*Or Biran and Kathleen McKeown*

Reinforcement Learning of Multi-Issue Negotiation Dialogue Policies  
*Alexandros Papangelis and Kallirroi Georgila*

“So, which one is it?” The effect of alternative incremental architectures in a high-performance game-playing agent  
*Maike Paetzel, Ramesh Manuvinakurike and David DeVault*

Towards Improving Dialogue Topic Tracking Performances with Wikification of Concept Mentions  
*Seokhwan Kim, Rafael E. Banchs and Haizhou Li*

Towards Taxonomy of Errors in Chat-oriented Dialogue Systems  
*Ryuichiro Higashinaka, Kotaro Funakoshi, Masahiro Araki, Hiroshi Tsukahara, Yuka Kobayashi and Masahiro Mizukami*

Which Synthetic Voice Should I Choose for an Evocative Task?  
*Eli Pincus, Kallirroi Georgila and David Traum*

## **Group 2 (4th Sep., 10:20)**

A TV Program Discovery Dialog System using recommendations  
*Deepak Ramachandran, Mark Fenty, Ronald Provine, Peter Yeh, William Jarrold, Adwait Ratnaparkhi and Benjamin Douglas*

A distributed cloud-based dialog system for conversational application development  
*Vikram Ramanarayanan, David Suendermann-Oeft, Alexei V. Ivanov and Keelan Evanini*

A statistical approach for Non-Sentential Utterance Resolution for Interactive QA System  
*Dinesh Raghu, Sathish Indurthi, Jitendra Ajmera and Sachindra Joshi*

Acoustic-prosodic entrainment in Slovak, Spanish, English and Chinese: A cross-linguistic comparison  
*Rivka Levitan, Stefan Benus, Agustin Gravano and Julia Hirschberg*

Automatic Detection of Miscommunication in Spoken Dialogue Systems  
*Raveesh Meena, Jose Lopes, Gabriel Skantze and Joakim Gustafson*

### Description of the PatientGenesys Dialogue System

*Leonardo Campillos Llanos, Dhouha Bouamor, Eric Bilinski, Anne-Laure Ligozat, Pierre Zweigenbaum and Sophie Rosset*

### Dialogue Management based on Multi-domain Corpus

*Wendong Ge and Bo Xu*

### Effects of Game on User Engagement with Spoken Dialogue System

*Hayato Kobayashi, Kaori Tanio and Manabu Sassano*

### Evaluation of Crowdsourced User Input Data for Spoken Dialog Systems

*Maria Schmidt, Markus Muller, Martin Wagner, Sebastian Stuker, Alex Waibel, Hansjorg Hofmann and Steffen Werner*

### Hyper-parameter Optimisation of Gaussian Process Reinforcement Learning for Statistical Dialogue Management

*Lu Chen, Pei-Hao Su and Milica Gasic*

### Incremental Coordination: Attention-Centric Speech Production in a Physically Situated Conversational Agent

*Zhou Yu, Dan Bohus and Eric Horvitz*

### Learning Domain-Independent Dialogue Policies via Ontology Parameterisation

*Zhuoran Wang, Tsung-Hsien Wen, Pei-Hao Su and Yannis Stylianou*

### Metaphor Detection in Discourse

*Hyeju Jang, Seungwhan Moon, Yohan Jo and Carolyn Rose*

### Opportunities and Obligations to Take Turns in Collaborative Multi-Party Human-Robot Interaction

*Martin Johansson and Gabriel Skantze*

### Optimising Turn-Taking Strategies With Reinforcement Learning

*Hatim Khouzaimi, Romain Laroche and Fabrice Lefevre*

### Quality-adaptive Spoken Dialogue Initiative Selection And Implications On Reward Modelling

*Stefan Ultes, Matthias Kraus, Alexander Schmitt and Wolfgang Minker*

### Reward Shaping with Recurrent Neural Networks for Speeding up On-Line Policy Learning in Spoken Dialogue Systems

*Pei-Hao Su, David Vandyke, Milica Gasic, Nikola Mrksic, Tsung-Hsien Wen and Steve Young*

The Cohort and Speechify Libraries for Rapid Construction of Speech Enabled Applications for Android

*Tejaswi Kasturi, Haojian Jin, Aasish Pappu, Sungjin Lee, Beverley Harrison, Ramana Murthy and Amanda Stent*

The Interplay of User-Centered Dialog Systems and AI Planning

*Florian Nothdurft, Gregor Behnke, Pascal Bercher, Susanne Biundo and Wolfgang Minker*

User Adaptive Restoration for Incorrectly-Segmented Utterances in Spoken Dialogue Systems

*Kazunori Komatani, Naoki Hotta, Satoshi Sato and Mikio Nakano*

## **MultiLing 2015 Special Session (3rd Sep., 13:30)**

### **13:30 MultiLing Introduction and Overview**

*George Giannakopoulos*

### **13:40 MSS Task Overview**

*John Conroy, Jeff Kubina*

### **13:55 Multilingual Summarization with Polytope Model**

*Marina Litvak and Natalia Vanetik*

### **14:10 The University of Alicante at MultiLing 2015: approach, results and further insights**

*Marta Vicente, Oscar Alcón and Elena Lloret*

### **14:25 MMS Task Overview**

*George Giannakopoulos*

### **14:40 AllSummarizer system at MultiLing 2015: Multilingual single and multi-document summarization**

*Abdelkrime Aries, Djamel Eddine Zegour and Khaled Walid Hidouci*

### **14:55 ExB Text Summarizer**

*Stefan Thomas, Christian Beutenmüller, Xose de la Puente, Robert Remus and Stefan Bordag*

### **15:10 Break**

### **15:25 OnForumS Pilot Overview**

*Josef Steinberger, Mijail A. Kabadjov*



**15:40** Comment-to-Article Linking in the Online News Domain

*Ahmet Aker, Emina Kurtic, Mark Hepple, Rob Gaizauskas and Giuseppe Di Fabbrizio*

**15:55** CCCS Pilot Overview

*Benoit Favre*

**16:10** The NTNU Summarization System at MultiLing 2015

*Hisao-Tsung Hung, Kai-Wun Shih and Berlin Chen*

**16:25** Poster Session

**17:10** MultiLing Conclusion and Planning

## 3 Abstracts

### Oral Session 1: Dialogue Management

#### **Human-Machine Dialogue as a Stochastic Game**

*Merwan Barlier, Julien Perolat, Romain Laroche and Olivier Pietquin*

In this paper, an original framework to model human-machine spoken dialogues is proposed to deal with co-adaptation between users and Spoken Dialogue Systems in non-cooperative tasks. The conversation is modeled as a Stochastic Game: both the user and the system have their own preferences but have to come up with an agreement to solve a non-cooperative task. They are jointly trained so the Dialogue Manager learns the optimal strategy against the best possible user. Results obtained by simulation show that non-trivial strategies are learned and that this framework is suitable for dialogue modeling.

#### **Knowledge transfer between speakers for personalised dialogue management**

*Inigo Casanueva, Thomas Hain, Heidi Christensen, Ricard Marxer and Phil Green*

Model-free reinforcement learning has been shown to be a promising data driven approach for automatic dialogue policy optimization, but a relatively large amount of dialogue interactions is needed before the system reaches a reasonable performance. Recently, Gaussian process based reinforcement learning methods have been shown to reduce the number of dialogues needed to reach optimal performance, and pre-training the policy with data gathered from different dialogue systems has further reduced this amount. Following this idea, a dialogue system designed for a single speaker can be initialised with data from other speakers, but if the dynamics of the speakers are very different the model will have a poor performance. When data gathered from different speakers is available, selecting the data from the most similar ones might improve the performance. We propose a method which automatically selects the data to transfer by defining a similarity measure between speakers, and uses this measure to weight the influence of the data from each speaker in the policy model. The methods are tested by simulating users with different severities of dysarthria interacting with a voice enabled environmental control system.

### **Miscommunication Recovery in Physically Situated Dialogue**

*Matthew Marge and Alexander Rudnicky*

We describe an empirical study that crowdsourced human-authored recovery strategies for various problems encountered in physically situated dialogue. The purpose was to investigate the strategies that people use in response to requests that are referentially ambiguous or impossible to execute. Results suggest a general preference for including specific kinds of visual information when disambiguating referents, and for volunteering alternative plans when the original instruction was not possible to carry out.

## **Oral Session 2: Discourse Strategy**

### **Reinforcement Learning in Multi-Party Trading Dialog**

*Takuya Hiraoka, Kallirroi Georgila, Elnaz Nouri, David Traum and Satoshi Nakamura*

In this paper, we apply reinforcement learning (RL) to a multi-party trading scenario where the dialog system (learner) trades with one, two, or three other agents. We experiment with different RL algorithms and reward functions. The negotiation strategy of the learner is learned through simulated dialog with trader simulators. In our experiments, we evaluate how the performance of the learner varies depending on the RL algorithm used and the number of traders. Our results show that (1) even in simple multi-party trading dialog tasks, learning an effective negotiation policy is a very hard problem; and (2) the use of neural fitted Q iteration combined with an incremental reward function produces negotiation policies as effective or even better than the policies of two strong hand-crafted baselines.

### **An Incremental Turn-Taking Model with Active System Barge-in for Spoken Dialog Systems**

*Tiancheng Zhao, Alan W Black and Maxine Eskenazi*

This paper deals with an incremental turn-taking model that provides a novel solution for end-of-turn detection. It includes a flexible framework that enables active system barge-in. In order to accomplish this, a systematic procedure of teaching a dialog system to produce meaningful system barge-in is presented. This procedure improves system robustness and success rate. It includes constructing cost models and learning optimal policy using reinforcement learning. Results show that our model reduces false cut-in rate by 37.1% and response delay by 32.5% compared

to the baseline system. Also the learned system barge-in strategy yields a 27.7% increase in average reward from user responses.

## Oral Session 3: Perspective and Point of View

### **I Couldn't Agree More: The Role of Conversational Structure in Agreement and Disagreement Detection in Online Discussions**

*Sara Rosenthal and Kathy McKeown*

Determining when conversational participants agree or disagree is instrumental for broader conversational analysis; it is necessary, for example, in deciding when a group has reached consensus. In this paper, we describe three main contributions. We show how different aspects of conversational structure can be used to detect agreement and disagreement in discussion forums. In particular, we exploit information about meta-thread structure and accommodation between participants. Second, we demonstrate the impact of the features using 3-way classification, including sentences expressing disagreement, agreement or neither. Finally, we show how to use a naturally occurring data set with labels derived from the sides that participants choose in debates on createdebate.com. The resulting new agreement corpus, Agreement by Create Debaters (ABCD) is 25 times larger than any prior corpus. We demonstrate that using this data enables us to outperform the same system trained on prior existing in-domain smaller annotated datasets.

### **Memory-Based Acquisition of Argument Structures and its Application to Implicit Role Detection**

*Christian Chiarcos and Niko Schenk*

We propose a generic, memory-based approach for the detection of implicit semantic roles. While state-of-the-art methods for this task combine hand-crafted rules with specialized and costly lexical resources, our models use large corpora with automated annotations for explicit semantic roles only to capture the distribution of predicates and their associated roles. We show that memory-based learning can increase the recognition rate of implicit roles beyond the state-of-the-art.

### **Generating Sentence Planning Variations for Story Telling**

*Stephanie Lukin, Lena Reed and Marilyn Walker*

There has been a recent explosion in applications for dialogue interaction ranging from direction-giving and tourist information to interactive story systems. Yet the

natural language generation (NLG) component for most of these systems remains largely handcrafted. This limitation greatly restricts the range of applications; it also means that it is impossible to take advantage of recent work in expressive and statistical language generation that can dynamically and automatically produce a large number of variations of given content. We propose that a solution to this problem lies in new methods for developing language generation resources. We describe the ES-Translator, a computational language generator that has previously been applied only to fables, and show how it allow us to repurpose personal narratives from weblogs. We then take advantage of recent work on language generation to create a parameterized sentence planner for story generation that provides aggregation operations and variations in point of view. Finally, we present a user evaluation of different personal narrative retellings.

## Oral Session 4: New directions

### **Evaluating Spoken Dialogue Processing for Time-Offset Interaction**

*David Traum, Kallirroi Georgila, Ron Artstein and Anton Leuski*

This paper presents the first evaluation of a full automated prototype system for time-offset interaction, that is, conversation between a live person and recordings of someone who is not temporally co-present. Speech recognition reaches word error rates as low as 5% with general-purpose language models and 19% with domain-specific models, and language understanding can identify appropriate direct responses to 60–66% of user utterances while keeping errors to 10–16% (the remainder being indirect, or off-topic responses). This is sufficient to enable a natural flow and relatively open-ended conversations, with a collection of under 2000 recorded statements.

### **The REAL Challenge 2014: Progress and Prospects**

*Maxine Eskenazi, Alan W Black, Sungjin Lee and David Traum*

The REAL Challenge took place for the first time in 2014, with a long term goal of creating streams of real data that the research community can use, by fostering the creation of systems that are capable of attracting real users. A novel approach is to have high school and undergraduate students devise the types of applications that would attract many real users and that need spoken interaction. The projects are presented to researchers from the spoken dialog research community and the researchers and

students work together to refine and develop the ideas. Eleven projects were presented at the first workshop. Many of them have found mentors to help in the next stages of the projects. The students have also brought out issues in the use of speech for real applications. Those issues involve privacy and significant personalization of the applications. While long-term impact of the challenge remains to be seen, the challenge has already been a success at its immediate aims of bringing new ideas and new researchers into the community, and serves as a model for related outreach efforts.

### **Argument Mining: Extracting Arguments from Online Dialogue**

*Reid Swanson, Brian Ecker and Marilyn Walker*

Online forums are now one of the primary venues for public dialogue on current social and political issues. The related corpora are often huge, covering any topic imaginable. Our aim is to use these dialogue corpora to automatically discover the semantic aspects of arguments that conversants are making across multiple dialogues on a topic. We frame this goal as consisting of two tasks: argument extraction and argument facet similarity. We focus here on the argument extraction task, and show that we can train regressors to predict the quality of extracted arguments with RRSE values as low as .73 for some topics. A secondary goal is to develop regressors that are topic independent: we report results of cross-domain training and domain-adaptation with RRSE values for several topics as low as .72, when trained on topic independent features.

## **Oral Session 5: Neural Network for dialogue processing**

### **Stochastic Language Generation in Dialogue using Recurrent Neural Networks with Convolutional Sentence Reranking**

*Tsung-Hsien Wen, Milica Gasic, Dongho Kim, Nikola Mrksic, Pei-Hao Su, David Vandyke and Steve Young*

The natural language generation (NLG) component of a spoken dialogue system (SDS) usually needs a substantial amount of handcrafting or a well-labeled dataset to be trained on. These limitations add significantly to development costs and make cross-domain, multi-lingual dialogue systems intractable. Moreover, human languages are context-aware. The most natural response should be directly learned from data rather than depending on predefined syntaxes or rules. This paper

presents a statistical language generator based on a joint recurrent and convolutional neural network structure which can be trained on dialogue act-utterance pairs without any semantic alignments or predefined grammar trees. Objective metrics suggest that this new model outperforms previous methods under the same experimental conditions. Results of an evaluation by human judges indicate that it produces not only high quality but linguistically varied utterances which are preferred compared to n-gram and rule-based systems.

#### **The Ubuntu Dialogue Corpus: A Large Dataset for Research in Unstructured Multi-Turn Dialogue Systems**

*Ryan Lowe, Nissan Pow, Iulian Serban and Joelle Pineau*

This paper introduces the Ubuntu Dialogue Corpus, a dataset containing almost 1 million multi-turn dialogues, with a total of over 7 million utterances and 100 million words. This provides a unique resource for research into building dialogue managers based on neural language models that can make use of large amounts of unlabeled data. The dataset has both the multi-turn property of conversations in the Dialog State Tracking Challenge datasets, and the unstructured nature of interactions from microblog services such as Twitter. We also describe two neural learning architectures suitable for analyzing this dataset, and provide benchmark performance on the task of selecting the next best response.

#### **Recurrent Polynomial Network for Dialogue State Tracking with Mismatched Semantic Parsers**

*Qizhe Xie, Kai Sun, Su Zhu, Lu Chen and Kai Yu*

Recently, constrained Markov Bayesian polynomial (CMBP) has been proposed as a data-driven rule-based model for dialog state tracking (DST). CMBP is an approach to bridge rule-based models and statistical models. Recurrent Polynomial Network (RPN) is a recent statistical framework taking advantages of rule-based models and can achieve state-of-the-art performance on the data corpora of DSTC-3, outperforming all submitted trackers in DSTC-3 including RNN. It is widely acknowledged that SLU's reliability influences tracker's performance greatly, especially in cases where the training SLU is poorly matched to the testing SLU. In this paper, this effect is analyzed in detail for RPN. Experiments show that RPN's tracking result is consistently the best compared to rule-based and statistical models investigated on different SLUs including mismatched ones and demonstrate RPN's is very robust to mismatched semantic parsers.

## Poster Session 1

### **A Discursive Grid Approach to Model Local Coherence in Multi-document Summaries**

*Marcio Dias and Thiago Pardo*

Multi-document summarization is a very important area of Natural Language Processing (NLP) nowadays because of the huge amount of data in the web. People want more and more information and this information must be coherently organized and summarized. The main focus of this paper is to deal with the coherence of multi-document summaries. Therefore, a model that uses discursive information to automatically evaluate local coherence in multi-document summaries has been developed. This model obtains 92.69% of accuracy in distinguishing coherent from incoherent summaries, outperforming the state of the art in the area.

### **A SIP of CoFee: A Sample of Interesting Productions of Conversational Feedback**

*Laurent Prevot, Jan Gorisch, Roxane Bertrand, Emilien Gorene and Brigitte Bigi*

Feedback utterances are among the most frequent in dialogue. Feedback is also a crucial aspect of linguistic theories that take social interaction, involving language, into account. This paper introduces the corpora and datasets of a project scrutinizing this kind of feedback utterances in French. We present the genesis of the corpora (for a total of about 16 hours of transcribed and phone force-aligned speech) involved in the project. We introduce the resulting datasets and discuss how they are being used in on-going work with focus on the form-function relationship of conversational feedback. All the corpora created and the datasets produced in the framework of this project are available for research purposes.

### **Automated Speech Recognition Technology for Dialogue Interaction with Non-Native Interlocutors**

*Alexei V. Ivanov, Vikram Ramnarayanan, David Suendermann-Oeft, Melissa Lopez, Keelan Ecanini and Jidong Tao*

Dialogue interaction with remote interlocutors is a difficult application area for speech recognition technology because of the limited duration of acoustic context available for adaptation, the narrow-band and compressed signal encoding used in telecommunications, high variability of spontaneous speech and the processing time constraints. It is even more difficult in the case of interacting with non-native speakers because of the broader allophonic variation, less canonical prosodic



patterns, higher rate of false starts and incomplete words, unusual word choice and lesser probability to have a grammatically well formed sentence. We present a comparative study of various approaches to speech recognition in non-native dialogic context. Comparing accuracy and real-time factor we find that a Kaldi-based Deep Neural Network Acoustic Model (DNN-AM) system with online speaker adaptation by far outperforms other available methods.

#### **Belief Tracking with Stacked Relational Trees**

*Deepak Ramachandran and Adwait Ratnaparkhi*

We describe a new model for Dialog State Tracking called a Stacked Relational Tree, which naturally models complex relationships between entities across user utterances. It can represent multiple conversational topics and the change of focus between them. Updates to the model are made by a rule-based system in a language of tree regular expressions. We also introduce a probabilistic version that can handle ASR/NLU uncertainty and ambiguity. We show how the parameters can be trained from log data, showing gains on a variety of standard Belief Tracker metrics, and a measurable impact on the success rate of an end-to-end dialog system for TV program discovery.

#### **Conversational Knowledge Teaching Agent that uses a Knowledge Base**

*Kyusong Lee, Paul Hongsuck Seo, Junhwi Choi, Sangjun Koo and Gary Geunbae Lee*

When implementing a conversational educational teaching agent, user-intent understanding and dialog management in a dialog system are not sufficient to give users educational information. In this paper, we propose a conversational educational teaching agent that gives users some educational information or triggers interests on educational contents. The proposed system not only converses with a user but also answer questions that the user asked or asks some educational questions by integrating a dialog system with a knowledge base. We used the Wikipedia corpus to learn the weights between two entities and embedding of properties to calculate similarities for the selection of system questions and answers.

#### **Dialog Act Annotation for Twitter Conversations**

*Elina Zarisheva and Tatjana Scheffler*

We present a dialog act annotation for German Twitter conversations. In this paper, we describe our annotation effort of a corpus of German Twitter conversations using a full schema of 57 dialog acts, with a moderate inter-annotator agreement of  $\text{multi-}\pi = 0.56$  for three untrained annotators. This translates to an agreement of 0.76

for a minimal set of 10 broad dialog acts, comparable to previous work. Based on multiple annotations, we construct a merged gold standard, backing off to broader categories when needed. We draw conclusions wrt. the structure of Twitter conversations and the problems they pose for dialog act characterization.

### **Exploiting knowledge base to generate responses for natural language dialog listening agents**

*Sangdo Han, Jeesoo Bang, Seonghan Ryu and Gary Geunbae Lee*

We developed a natural language dialog listening agent that uses a knowledge base (KB) to generate rich and relevant responses. Our system extracts an important named entity from a user utterance, then scans the KB to extract contents related to this entity. The system can generate diverse and relevant responses by assembling the related KB contents into appropriate sentences. Fifteen students tested our system; they gave it higher approval scores than they gave other systems. These results demonstrate that our system generated various responses and encouraged users to continue talking.

### **Exploring the Effects of Redundancy within a Tutorial Dialogue System: Restating Students' Responses**

*Pamela Jordan, Patricia Albacete and Sandra Katz*

Although restating part of a student's correct response correlates with learning and various types of restatements have been incorporated into tutorial dialogue systems, this tactic has not been tested in isolation to determine if it causally contributes to learning. When we explored the effect of tutor restatements that support inference on student learning, it did not benefit all students equally. We found that students with lower incoming knowledge tend to benefit more from an increased level of these types of restatement while students with higher incoming knowledge tend to benefit more from a decreased level of such restatements. This finding has implications for tutorial dialogue system design since an inappropriate use of restatements could dampen learning.

### **Fast and easy language understanding for dialog systems with Microsoft Language Understanding Intelligent Service (LUIS)**

*Jason D Williams, Eslam Kamal, Mokhtar Ashour, Hani Amr, Jessica Miller and Geoff Zweig*

With Language Understanding Intelligent Service (LUIS), developers without machine learning expertise can quickly build and use language understanding models

specific to their task. LUIS is entirely cloud-based: developers log into a website, enter a few example utterances and their labels, and then deploy a model to an HTTP endpoint. Utterances sent to the endpoint are logged and can be efficiently labeled using active learning. Visualizations help identify issues, which can be resolved by either adding more labels or by giving hints to the machine learner in the form of features. Altogether, a developer can create and deploy an initial language understanding model in minutes, and easily maintain it as usage of their application grows.

#### **Information Theoretical and Statistical Features for Intrinsic Plagiarism Detection**

*Rashedur Rahman*

In this paper we present some information theoretical and statistical features including function word skip n-grams for detecting plagiarism intrinsically. We train a binary classifier with different feature sets and observe their performances. Basically, we propose a set of 36 features for classifying plagiarized and non-plagiarized texts in suspicious documents. Our experiment finds that entropy, relative entropy and correlation coefficient of function word skip n-gram frequency profiles are very effective features. The proposed feature set achieves F-Score of 85.10%.

#### **Modelling situated human-robot interaction using IrisTK**

*Gabriel Skantze and Martin Johansson*

In this demonstration we show how situated multi-party human-robot interaction can be modelled using the open source framework IrisTK. We will demonstrate the capabilities of IrisTK by showing an application where two users are playing a collaborative card sorting game together with the robot head Furhat, where the cards are shown on a touch table between the players. The application is interesting from a research perspective, as it involves both multi-party interaction, as well as joint attention to the objects under discussion.

#### **Multilingual WikiTalk: Wikipedia-based talking robots that switch languages.**

*Graham Wilcock and Kristiina Jokinen*

At SIGDIAL-2013 our talking robot demonstrated Wikipedia-based spoken information access in English. Our new demo shows a robot speaking different languages, getting content from different language Wikipedias, and switching languages to meet the linguistic capabilities of different dialogue partners.

## **PDTB Discourse Parsing as a Tagging Task: The Two Taggers Approach**

*Or Biran and Kathleen McKeown*

Full discourse parsing in the PDTB framework is a task that has only recently been attempted. We present the Two Taggers approach, which reformulates the discourse parsing task as two simpler tagging tasks: identifying the relation within each sentence, and identifying the relation between each pair of adjacent sentences. We then describe a system that uses two CRFs to achieve an F1 score of 39.33, higher than the only previously existing system, at the full discourse parsing task. Our results show that sequential information is important for discourse relations, especially cross-sentence relations, and that a simple approach to argument span identification is enough to achieve state of the art results. We make our easy to use, easy to extend parser publicly available.

## **Reinforcement Learning of Multi-Issue Negotiation Dialogue Policies**

*Alexandros Papangelis and Kallirroi Georgila*

We use reinforcement learning (RL) to learn a multi-issue negotiation dialogue policy. For training and evaluation, we build a hand-crafted agenda-based policy, which serves as the negotiation partner of the RL policy. Both the agenda-based and the RL policies are designed to work for a large variety of negotiation settings, and perform well against negotiation partners whose behavior has not been observed before. We evaluate the two models by having them negotiate against each other under various settings. The learned model consistently outperforms the agenda-based model. We also ask human raters to rate negotiation transcripts between the RL policy and the agenda-based policy, regarding the rationality of the two negotiators. The RL policy is perceived as more rational than the agenda-based policy.

## **“So, which one is it?” The effect of alternative incremental architectures in a high-performance game-playing agent**

*Maike Paetzel, Ramesh Manuvinakurike and David DeVault*

This paper introduces Eve, a high-performance agent that plays a fast-paced image matching game in a spoken dialogue with a human partner. The agent can be optimized and operated in three different modes of incremental speech processing that optionally include incremental speech recognition, language understanding, and dialogue policies. We present our framework for training and evaluating the agent’s dialogue policies. In a user study involving 125 human participants, we evaluate three incremental architectures against each other and also compare their performance to human-human gameplay. Our study reveals that the most fully incre-

mental agent achieves game scores that are comparable to those achieved in human-human gameplay, are higher than those achieved by partially and non-incremental versions, and are accompanied by improved user perceptions of efficiency, understanding of speech, and naturalness of interaction.

#### **Towards Improving Dialogue Topic Tracking Performances with Wikification of Concept Mentions**

*Seokhwan Kim, Rafael E. Banchs and Haizhou Li*

Dialogue topic tracking aims at analyzing and maintaining topic transitions in on-going dialogues. This paper proposes to utilize Wikification-based features for providing mention-level correspondences to Wikipedia concepts for dialogue topic tracking. The experimental results show that our proposed features can significantly improve the performances of the task in mixed-initiative human-human dialogues

#### **Towards Taxonomy of Errors in Chat-oriented Dialogue Systems**

*Ryuichiro Higashinaka, Kotaro Funakoshi, Masahiro Araki, Hiroshi Tsukahara, Yuka Kobayashi and Masahiro Mizukami*

This paper presents a taxonomy of errors in chat-oriented dialogue systems. Compared to human-human conversations and task-oriented dialogues, little is known about the errors made in chat-oriented dialogue systems. Through a data collection of chat dialogues and analyses of dialogue breakdowns, we classified errors and created a taxonomy. Although the proposed taxonomy may not be complete, this paper is the first to present a taxonomy of errors in chat-oriented dialogue systems. We also highlight the difficulty in pinpointing errors in such systems.

#### **Which Synthetic Voice Should I Choose for an Evocative Task?**

*Eli Pincus, Kallirroi Georgila and David Traum*

We explore different evaluation methods for 4 different synthetic voices and 1 human voice. We investigate whether intelligibility, naturalness, or likability of a voice is correlated to the voice's evocative function potential, a measure of the voice's ability to evoke an intended reaction from the listener. We also investigate the extent to which naturalness and likability ratings vary depending on whether or not exposure to a voice is extended and continuous vs. short-term and sporadic (interleaved with other voices). Finally, we show that an automatic test can replace the standard intelligibility tests for text-to-speech (TTS) systems, which eliminates the need to hire humans to perform transcription tasks saving both time and money.

## Poster Session 2

### **A TV Program Discovery Dialog System using recommendations**

*Deepak Ramachandran, Mark Fanty, Ronald Provine, Peter Yeh, William Jarrold, Adwait Ratnaparkhi and Benjamin Douglas*

We present an end-to-end conversational system for TV program discovery that uniquely combines advanced technologies for NLU, Dialog Management, Knowledge Graph Inference and personalized recommendations. It uses a semantically rich relational representation of dialog state and knowledge graph inference for queries. The recommender combines evidence for user preferences from multiple modalities such as dialog, user viewing history and touch logs. It is tightly integrated with the Dialog System, especially for explanations of recommendations. A demo of the system on a iPad will be shown.

### **A distributed cloud-based dialog system for conversational application development**

*Vikram Ramanarayanan, David Suendermann-Oeft, Alexei V. Ivanov and Keelan Evonini*

We have previously presented HALEF—an open-source spoken dialog system—that supports telephonic interfaces and has a distributed architecture. In this paper, we extend this infrastructure to be cloud-based, and thus truly distributed and scalable. This cloud-based spoken dialog system can be accessed both via telephone interfaces as well as through web clients with WebRTC/HTML5 integration, allowing in-browser access to potentially multimodal dialog applications. We demonstrate the versatility of the system with two conversation applications in the educational domain.

### **A statistical approach for Non-Sentential Utterance Resolution for Interactive QA System**

*Dinesh Raghu, Sathish Indurthi, Jitendra Ajmera and Sachindra Joshi*

Non-Sentential Utterances (NSUs) are short utterances that do not have the form of a full sentence but nevertheless convey a complete sentential meaning in the context of a conversation. NSUs are frequently used to ask follow up questions during interactions with question answer (QA) systems resulting into in-correct answers being presented to their users. Most of the current methods for resolving such NSUs have adopted rule or grammar based approach and have limited applicability. In this paper, we present a data driven statistical method for resolving such NSUs. Our method is based on the observation that humans identify keyword appearing in

an NSU and place them in the context of conversation to construct a meaningful sentence. We adapt the keyword to question (K2Q) framework to generate natural language questions using keywords appearing in an NSU and its context. The resulting questions are ranked using different scoring methods in a statistical framework. Our evaluation on a data-set collected using mTurk shows that the proposed method perform significantly better than the previous work that has largely been rule based.

#### **Acoustic-prosodic entrainment in Slovak, Spanish, English and Chinese: A cross-linguistic comparison**

*Rivka Levitan, Stefan Benus, Agustin Gravano and Julia Hirschberg*

It is well established that speakers of Standard American English entrain, or become more similar to each other as they speak, in acoustic-prosodic features of their speech as well as other behaviors. Entrainment in other languages is less well understood. This work uses a variety of metrics to measure acoustic-prosodic entrainment in four comparable corpora of task-oriented conversational speech in Slovak, Spanish, English and Chinese. We report the results of these experiments and describe trends and patterns that can be observed from comparing acoustic-prosodic entrainment in these four languages. We find evidence of a variety of forms of entrainment across all the languages studied, with some evidence of individual differences as well within the languages.

#### **Automatic Detection of Miscommunication in Spoken Dialogue Systems**

*Raveesh Meena, Jose Lopes, Gabriel Skantze and Joakim Gustafson*

In this paper, we present a data-driven approach for detecting instances of miscommunication in dialogue system interactions. A range of generic features that are both automatically extractable and manually annotated were used to train two models for online detection and one for offline analysis. Online detection could be used to raise the error awareness of the system, whereas offline detection could be used by a system designer to identify potential flaws in the dialogue design. In experimental evaluations on system logs from three different dialogue systems that vary in their dialogue strategy, the proposed models performed substantially better than the majority class baseline models.

#### **Description of the PatientGenesys Dialogue System**

*Leonardo Campillos Llanos, Dhouha Bouamor, Eric Bilinski, Anne-Laure Ligozat, Pierre Zweigenbaum and Sophie Rosset*

This paper describes the work-in-progress prototype of a dialog system that simu-

lates a virtual patient (VP) consultation. We report some challenges and difficulties that are found during its development, especially in managing the conversational interaction and the vocabulary from the medical domain.

### **Dialogue Management based on Multi-domain Corpus**

*Wendong Ge and Bo Xu*

Dialogue Management (DM) is a key issue in Spoken Dialogue System. Most of the existing data-driven DM schemes train the dialogue policy for some specific domain (or vertical domain), only using the dialogue corpus in this domain, which might suffer from the scarcity of dialogue corpus in some domains. In this paper, we divide Dialogue Act (DA), as semantic representation of utterance, into DA type and slot parameter, where the former one is domain-independent and the latter one is domain-specific. Firstly, based on multiple-domain dialogue corpus, the DA type prediction model is trained via Recurrent Neural Networks (RNN). Moreover, DA type decision problem is modeled as a multi-order POMDP, and transformed to be a one-order MDP with continuous states, which is solved by Natural Actor Critic (NAC) algorithm and applicable for every domain. Furthermore, a slot parameter selection scheme is designed to generate a complete machine DA according to the features of specific domain, which yields the Multi-domain Corpus based Dialogue Management (MCDM) scheme. Finally, extensive experimental results illustrate the performance improvement of the MCDM scheme, compared with the existing schemes.

### **Effects of Game on User Engagement with Spoken Dialogue System**

*Hayato Kobayashi, Kaori Tanio and Manabu Sassano*

In this study, we examine the effects of using a game for encouraging the use of a spoken dialogue system. As a case study, we developed a word-chain game, called Shiritori in Japanese, and released the game as a module in a Japanese Android/iOS app, Onsei-Assist, which is a Siri-like personal assistant based on a spoken dialogue technology. We analyzed the log after the release and confirmed that the game can increase the number of user utterances. Furthermore, we discovered a positive side effect, in which users who have played the game tend to begin using non-game modules. This suggests that just adding a game module to the system can improve user engagement with an assistant agent.



#### **Evaluation of Crowdsourced User Input Data for Spoken Dialog Systems**

*Maria Schmidt, Markus Muller, Martin Wagner, Sebastian Stuker, Alex Waibel, Hansjorg Hofmann and Steffen Werner*

Using the Internet for the collection of data is quite common these days. This process is called crowdsourcing and enables the collection of large amounts of data at reasonable costs. While being an inexpensive method, this data typically is of lower quality. Filtering data sets is therefore required. The occurring errors can be classified into different groups. There are technical issues and human errors. For speech recording, technical issues could be a noisy background. Human errors arise when the task is misunderstood. We employ several techniques for recognizing errors and eliminating faulty data sets in user input data for a Spoken Dialog System (SDS). Furthermore, we compare three different kinds of questionnaires (QNRs) for a given set of seven tasks. We analyze the characteristics of the resulting data sets and give a recommendation which type of QNR might be the most suitable one for a given purpose.

#### **Hyper-parameter Optimisation of Gaussian Process Reinforcement Learning for Statistical Dialogue Management**

*Lu Chen, Pei-Hao Su and Milica Gasic*

Gaussian processes reinforcement learning provides an appealing framework for training the dialogue policy as it takes into account correlations of the objective function given different dialogue belief states, which can significantly speed up the learning. These correlations are modelled by the kernel function which may depend on hyper-parameters. So far, for real-world dialogue systems the hyper-parameters have been hand-tuned, relying on the designer to adjust the correlations, or simple non-parametrised kernel functions have been used instead. Here, we examine different kernel structures and show that it is possible to optimise the hyper-parameters from data yielding improved performance of the resulting dialogue policy. We confirm this in a real user trial.

#### **Incremental Coordination: Attention-Centric Speech Production in a Physically Situated Conversational Agent**

*Zhou Yu, Dan Bohus and Eric Horvitz*

Inspired by studies of human-human conversations, we present methods for incrementally coordinating speech production with listeners' visual foci of attention. We introduce a model that considers the demands and availability of listeners' attention at the onset and throughout the production of system utterances, and that incrementally coordinates speech synthesis with the listener's gaze. We present an

implementation and deployment of the model in a physically situated dialog system and discuss lessons learned.

### **Learning Domain-Independent Dialogue Policies via Ontology Parameterisation**

*Zhuoran Wang, Tsung-Hsien Wen, Pei-Hao Su and Yannis Stylianou*

This paper introduces a novel approach to eliminate the domain dependence of dialogue state and action representations, such that dialogue policies trained based on the proposed representation can be transferred across different domains. The experimental results show that the policy optimised in a restaurant search domain using our domain-independent representations can be deployed to a laptop sale domain, achieving a task success rate very close (96.4% relative) to that of the policy optimised on in-domain dialogues.

### **Metaphor Detection in Discourse**

*Hyeju Jang, Seungwhan Moon, Yohan Jo and Carolyn Rose*

Understanding contextual information is key to detecting metaphors in discourse. Most current work aims at detecting metaphors given a single sentence, thus focusing mostly on local contextual cues within a short text. In this paper, we present a novel approach that explicitly leverages global context of a discourse to detect metaphors. In addition, we show that syntactic information such as dependency structures can help better describe local contextual information, thus improving detection results when combined. We apply our methods on a newly annotated on-line discussion forum, and show that our approach outperforms the state-of-the-art baselines in previous literature.

### **Opportunities and Obligations to Take Turns in Collaborative Multi-Party Human-Robot Interaction**

*Martin Johansson and Gabriel Skantze*

In this paper we present a data-driven model for detecting opportunities and obligations for a robot to take turns in multi-party discussions about objects. The data used for the model was collected in a public setting, where the robot head Furhat played a collaborative card sorting game together with two users. The model makes a combined detection of addressee and turn-yielding cues, using multi-modal data from voice activity, syntax, prosody, head pose, movement of cards, and dialogue context. The best result for a binary decision is achieved when several modalities

are combined, giving a weighted F1 score of 0.876 on data from a previously unseen interaction, using only automatically extractable features.

#### **Optimising Turn-Taking Strategies With Reinforcement Learning**

*Hatim Khouzaimi, Romain Laroche and Fabrice Lefevre*

In this paper, reinforcement learning (RL) is used to learn an efficient turn-taking management model in a simulated slotfilling task with the the objective of minimising the dialogue duration and maximising the completion task ratio. Turntaking decisions are handled in a separate new module, the Scheduler. Unlike traditional dialogue systems, a dialogue turn is split into micro-turns and the Scheduler makes a decision for each one of them. A Fitted Value Iteration algorithm, Fitted-Q, with a linear state representation is used for learning the state to action policy. Comparison between non-incremental and incremental handcrafted strategies, taken as baselines, and incremental RL-based strategy, based on the same turn-taking phenomena, shows the latter to be significantly more efficient, especially in noisy environments.

#### **Quality-adaptive Spoken Dialogue Initiative Selection And Implications On Reward Modelling**

*Stefan Ultes, Matthias Kraus, Alexander Schmitt and Wolfgang Minker*

Adapting Spoken Dialogue Systems to the user is supposed to result in more efficient and successful dialogues. In this work, we present an evaluation of a quality-adaptive strategy with a user simulator adapting the dialogue initiative and show that it outperforms conventional non-adaptive strategies and a random strategy. Furthermore, we indicate a correlation between Interaction Quality and dialogue completion rate, task success rate, and average dialogue length. Finally, we analyze the correlation between task success and interaction quality in more detail identifying the usefulness of interaction quality for modelling the reward of reinforcement learning strategy optimization.

#### **Reward Shaping with Recurrent Neural Networks for Speeding up On-Line Policy Learning in Spoken Dialogue Systems**

*Pei-Hao Su, David Vandyke, Milica Gasic, Nikola Mrksic, Tsung-Hsien Wen and Steve Young*

Statistical spoken dialogue systems have the attractive property of being able to be optimised from data via interactions with real users. However in the reinforcement learning paradigm the dialogue manager (agent) often requires significant time to

explore the state-action space to learn to behave in a desirable manner. This is a critical issue when the system is trained on-line with real users where learning costs are expensive. Reward shaping is one promising technique for addressing these concerns. Here we examine three recurrent neural network (RNN) approaches for providing reward shaping information in addition to the primary (task-orientated) environmental feedback. These RNNs are trained on returns from dialogues generated by a simulated user and attempt to diffuse the overall evaluation of the dialogue back down to the turn level to guide the agent towards good behaviour faster. In both simulated and real user scenarios these RNNs are shown to increase policy learning speed. Importantly, they do not require prior knowledge of the user's goal.

### **The Cohort and Speechify Libraries for Rapid Construction of Speech Enabled Applications for Android**

*Tejaswi Kasturi, Haojian Jin, Aasish Pappu, Sungjin Lee, Beverley Harrison, Ramana Murthy and Amanda Stent*

Despite the prevalence of libraries that provide speech recognition and text-to-speech synthesis "in the cloud", it remains difficult for developers to create user-friendly, consistent spoken language interfaces to their mobile applications. In this paper, we present the Speechify / Cohort libraries for rapid speech enabling of Android applications. The Speechify library wraps several publicly available speech recognition and synthesis APIs, incorporates state-of-the-art voice activity detection and simple and flexible hybrid speech recognition, and allows developers to experiment with different modes of user interaction. The Cohort library, built on a stripped-down version of OpenDial, facilitates flexible interaction between and within "Speechified" mobile applications.

### **The Interplay of User-Centered Dialog Systems and AI Planning**

*Florian Nothdurft, Gregor Behnke, Pascal Bercher, Susanne Biundo and Wolfgang Minker*

Technical systems evolve from simple dedicated task solvers to cooperative and competent assistants, helping the user with increasingly complex and demanding tasks. For this, they may proactively take over some of the users responsibilities and help to find or reach a solution for the user's task at hand, using e. g. AI (Artificial Intelligence) Planning techniques. However, this intertwining of user-centered dialog and AI planning systems, often called mixed-initiative planning (MIP), does not only facilitate more intelligent and competent systems, but does also raise new questions related to the alignment of AI and human problem solving. In this paper, we describe our approach on integrating AI Planning techniques into a dialog system, explain reasons and effects of arising problems, and provide at the same time

our solutions, resulting in a coherent, user-friendly and efficient mixed-initiative system. Finally, we evaluate our MIP system and provide remarks on the use of explanations in MIP-related phenomena.

#### **User Adaptive Restoration for Incorrectly-Segmented Utterances in Spoken Dialogue Systems**

*Kazunori Komatani, Naoki Hotta, Satoshi Sato and Mikio Nakano*

Ideally, the users of spoken dialogue systems should be able to speak at their own tempo. The systems thus need to correctly interpret utterances from various users, even when these utterances contain disfluency. In response to this issue, we propose an approach based on a posteriori restoration for incorrectly segmented utterances. A crucial part of this approach is to classify whether restoration is required or not. We improve the accuracy by adapting the classifier to each user. We focus on the dialogue tempo of each user, which can be obtained during dialogues, and determine the correlation between each user's tempo and the appropriate thresholds for the classification. A linear regression function used to convert the tempos into thresholds is also derived. Experimental results showed that the proposed user adaptation for two classifiers, thresholding and decision tree, improved the classification accuracies by 3.0% and 7.4%, respectively, in ten-fold cross validation.

## **MultiLing 2015 Special Session**

#### **MultiLing 2015: Multilingual Summarization of Single and Multi-Documents, On-line Fora, and Call-center Conversations**

*George Giannakopoulos, Jeff Kubina, John Conroy, Josef Steinberger, Benoit Favre, Mijail Kabadjov, Udo Kruschwitz and Massimo Poesio*

In this paper we present an overview of MultiLing 2015, a special session at SIGdial 2015. MultiLing is a community-driven initiative that pushes the state-of-the-art in Automatic Summarization by providing data sets and fostering further research and development of summarization systems. There were in total 23 participants this year submitting their system outputs to one or more of the four tasks of MultiLing: MSS, MMS, OnForumS and CCCS. We provide a brief overview of each task and its participation and evaluation.

## **Multilingual Summarization with Polytope Model**

*Natalia Vanetik and Marina Litoak*

The problem of extractive text summarization for a collection of documents is defined as the problem of selecting a small subset of sentences so that the contents and meaning of the original document set are preserved in the best possible way. In this paper we describe the linear programming-based global optimization model to rank and extract the most relevant sentences to a summary. We introduce three different objective functions being optimized. These functions define a relevance of a sentence that is being maximized, in different manners, such as: coverage of meaningful words of a document, coverage of its bigrams, or coverage of frequent sequences of words. We supply here an overview of our system's participation in the MultiLing contest of SIGDial 2015.

## **The University of Alicante at MultiLing 2015: approach, results and further insights**

*Marta Vicente, Oscar Alcon and Elena Lloret*

In this paper we present the approach and results of our participation in the 2015 MultiLing Single-document Summarization task. Our approach is based on the Principal Component Analysis (PCA) technique enhanced with lexical-semantic knowledge. For testing our approach, different configurations were set up, thus generating different types of summaries (i.e., generic and topic-focused), as well as testing some language-specific resources on top of the language-independent basic PCA approach, submitting a total of 6 runs for each selected language (English, German, and Spanish). Our participation in MultiLing has been very positive, ranking at intermediate positions when compared to the other participant systems, showing that PCA is a good technique for generating language-independent summaries, but the addition of lexical-semantic knowledge may heavily depend on the size and quality of the resources available for each language.

## **AllSummarizer system at MultiLing 2015: Multilingual single and multi-document summarization**

*Abdelkrime Aries, Djamel Eddine Zegour and Khaled Walid Hidouci*

In this paper, we evaluate our automatic text summarization system in multilingual context. We participated in both single document and multi-document summarization tasks of MultiLing 2015 workshop.

Our method involves clustering the document sentences into topics using a fuzzy clustering algorithm. Then each sentence is scored according to how well it cov-

ers the various topics. This is done using statistical features such as TF, sentence length, etc. Finally, the summary is constructed from the highest scoring sentences, while avoiding overlap between the summary sentences. This makes it language-independent, but we have to afford preprocessed data first (tokenization, stemming, etc.).

#### **ExB Text Summarizer**

*Stefan Thomas, Christian Beutenmuller, Xose de la Puente, Robert Remus and Stefan Bordag*

We present our state of the art multilingual text summarizer capable of single as well as multi document text summarization. The algorithm is based on repeated application of TextRank on a sentence similarity graph, a bag of words model for sentence similarity and a number of linguistic pre- and post-processing steps using standard NLP tools. We submitted this algorithm for two different tasks of the MultiLing 2015 summarization challenge: Multilingual Single-document Summarization and Multilingual Multi-document Summarization.

#### **Comment-to-Article Linking in the Online News Domain**

*Ahmet Aker, Emina Kurtic, Mark Hepple, Rob Gaizauskas and Giuseppe Di Fabbrizio*

Online commenting to news articles provides a communication channel between media professionals and readers offering a crucial tool for opinion exchange and freedom of expression. Currently, comments are detached from the news article and thus removed from the context that they were written for. In this work, we propose a method to connect readers' comments to the news article segments they refer to. We use similarity features to link comments to relevant article segments and evaluate both word-based and term-based vector spaces. Our results are comparable to state-of-the-art topic modeling techniques when used for linking tasks. We demonstrate that article segments and comments representation are relevant to linking accuracy since we achieve better performances when similarity features are computed using similarity between terms rather than words.

#### **Call Centre Conversation Summarization: A Pilot Task at Multiling 2015**

*Benoit Favre, Evgeny Stepanov, Jeremy Trione, Frederic Bechet and Giuseppe Riccardi*

This paper describes the results of the Call Centre Conversation Summarization task at Multiling'15. The CCCS task consists in generating abstractive synopses from call centre conversations between a caller and an agent. Synopses are summaries of the problem of the caller, and how it is solved by the agent. Generating them is

a very challenging task given that deep analysis of the dialogs and text generation are necessary. Three languages were addressed: French, Italian and English translations of conversations from those two languages. The official evaluation metric was ROUGE-2. Two participants submitted a total of four systems which had trouble beating the extractive baselines. The datasets released for the task will allow more research on abstractive dialog summarization.





## 4 Local Information

### Venue Address

Faculty of Mathematics and Physics  
Charles University in Prague  
Malostranské náměstí 25  
118 00 Prague 1  
Czech Republic

### Wi-Fi

There is an **Eduroam** coverage in the whole building (as well as in other university buildings around the city and even train stations), so Eduroam will just work if you already have access to it.

Passwords to the conference Wi-Fi network will be provided upon arrival.

The network might get slow in the main conference room. In that case, try using a different AP in the corridor (there are seats on the 4th floor) or in the computer lab on the ground floor.

### The SIGDIAL dinner

The SIGDIAL dinner will take place on Wednesday, **September 2nd** at **7pm** in the **Konírna restaurant** (Maltézské náměstí 10, <http://www.konirna.eu>), about 5 minutes' walk from the venue (see the map at the back of the handbook).

### Restaurants

Here is a non-exhaustive list of lunch/dinner options around the conference venue (you can find them on the map at the back of the handbook and in the annotated Google Map at <http://bit.ly/sigdial2015-map>):

- **Profesní dům** (Malostranské náměstí 25, <http://www.profesnidum.cz>) – rather a cafeteria, not great, but OK and you do not have to leave the building (just go down to -1<sup>st</sup> floor)
- **Malostranská beseda** (Malostranské náměstí 21, <http://www.malostranska-beseda.cz>) – a Czech/international restaurant, just across the street from the venue
- **Pivo & Basilico** (Zámecká 2, <http://www.pivobasilico.cz>) – a stylish international restaurant offering pizza and pasta as well as Czech cuisine (just around the corner from the venue)
- **Malostranská Ferdinanda** (Karmelitská 18, <http://www.ferdinanda.cz>) – a Czech restaurant with good and cheap daily lunch menus, a bit limited choice in the evening (5 minutes from the venue)
- **Lokál U Bílé kuželky** (Míšeňská 12, <http://lokál-ubilekuzelky.ambi.cz>) – a Czech restaurant/pub with traditional meals and Pilsner beer (5 minutes from the venue)
- **Konírna** (Maltézské náměstí 10, <http://www.konirna.eu/>) – a stylish Czech restaurant serving traditional and modern cuisine (this is where the conference dinner will take place, it's 5 minutes from the venue)
- **Kočár z Vídně** (Saská 3, <http://www.kocarzvidne.cz>) – a stylish restaurant serving imperial Austrian cuisine (5 minutes from the venue)
- **Baráčnická rychta** (Tržiště 23, <http://www.baracnickarychta.cz>) – a traditional Czech restaurant/pub (7 minutes from the venue)
- **Barbar** (Všehrdova 17, <http://www.bar-bar.cz>) – a stylish restaurant offering international cuisine (10 minutes from the venue, or 2 tram stops)
- **Green Spirit** (Hellichova 14, <http://www.greenspiritbistro.cz>) – a vegetarian café restaurant (about 7 minutes from the venue)
- **Golden Tikka** (Konviktská 9, <http://www.tikka.cz/konviktska/>) – Indian restaurant (about 20 minutes from the venue, in the Old Town)
- **Ananta** (Elišky Peškové 6, <http://www.anantasesa.cz>) – oriental-style vegetarian restaurant and tea house (about 15 mins. from the venue, or 3 tram stops)

Many restaurants in Prague offer daily lunch menus from about 11:30am till 2pm, with usually two to five options, cheaper and faster than the usual menu. Most restaurants in the city accept major CCs, but certainly not all of them.

## Public Transport

Prague has an excellent public transport network that includes Metro (subway), trams, buses, suburban trains, and river ferries. It is the recommended means of transportation around the city. It operates 5am-midnight, with some night trams running overnight. It is quite reliable and safe (safe to the extent as any capital city may be – beware of pickpockets!).

Ticket prices (more details can be found on the Prague Transport Co. website, <http://www.dpp.cz>):

- **default – 90 minutes:** 32 CZK (1.30 USD/1.20 EUR)
- **short-term – 30 minutes:** 24 CZK (1 USD/0.90 EUR)
- **unlimited 24hr ticket:** 110 CZK (4.50 USD/4 EUR)
- **unlimited 72hr ticket:** 310 CZK (12.80 USD/11.30 EUR)

Any **transfers are allowed** among regularly scheduled routes within the city limits and within the max. time bought. The unlimited 24hr/72hr tickets pay off only if you take more than 4 trips per day.

Tickets **must be bought before boarding**, either at ticket machines (most of them accept CZK coins only) at some tram stops and most subway stations, or at some newspaper stands. One such newspaper stand is directly at Malostranské náměstí, and a ticket machine is at the tram stop at Malostranské náměstí.

Tickets **have to be stamped upon entry** to the first tram/bus/subway station (stick the ticket into any of the yellow boxes with a slot; it will print the validity start time).

## Taxis

Taxi drivers in the Prague city center are notorious for overcharging. This happens mostly when taking a “no-name” taxi on the street, so to be on the safe side, prefer ordering a taxi from a larger company online or on the phone:

- **AAA Taxi** (+420-222-333-222, <http://www.aaataxi.cz>)
- **111 airport cars** (+420-722-555-525, <http://www.airportcars.cz>), for Airport transfers only

- **TickTack** (14-222 or +420-721-300-300, <http://www.ticktack.cz>)

Taxi stands at the airport and the train stations should be OK.

When using a taxi, ask about the fare and payment options (CC, EUR) beforehand.

## Currency

The local currency is the **Czech Crown** (Česká Koruna, **CZK**). The exchange course was about 24 CZK/1 USD and 27 CZK/1 EUR in August 2015.

When exchanging currency on the street, always check for commission charge and/or worse rates for lower amounts exchanged. Depending on the conditions of your home bank, the best way to get Czech Crowns might be using an ATM, which are plentiful around the city (in that case, letting your bank handle the exchange is usually preferable to using the ATM's rate).

Here are some exchange offices known to offer reasonable rates without commission charges:

- **Exchange.cz** (<http://www.exchange.cz>, Kaprova 13, in the Old Town)
- **Superior Investments** (Štefánikova 25, near Nový Smíchov shopping mall)
- **Numedia Change** (Malostranské náměstí 19, near the venue)

## Car rental

The usual car rental companies (Avis, Hertz, Budget, Europcar, Sixt) and many other national ones are in the ground floor of the Prague Airport Terminal 1 building, and also in the Airport Parking garage "C".

## Shopping (groceries and more)

Prague city center is full of restaurants and souvenir shops, but it might be a bit tricky to find basic groceries and other everyday stuff at reasonable prices. Here are a few shops nearby the venue:

- **Vacek Bio-Market** (Mostecká 3) – a small supermarket, with mostly groceries
- **Fruits and vegetables** (Tržiště 11)
- **Tesco My** (<http://www.mystores.cz>) and **Quadrio** (<http://www.quadrio.cz>) near Národní třída (Národní 26, Spálená 22) – a department store and a smaller shopping mall, ca. 20 min. walk from the venue
- **Nový Smíchov** (Plzeňská 8, <http://www.novysmichov.eu>) – nearest large shopping mall (ca. 10 min./5 stops by tram no. 12 or 20, direction *Sídlíště Barrandov*)

The nearest ones are marked on the map at the back of this handbook. Most shops and restaurants in the city accept major CCs, but not all of them.

## Sightseeing and more

### Historical sites

The Prague official sightseeing site (<http://www.prague.eu>) offers a lot of information about the main historical sites in Prague. We list here just a few, to give you an idea. You can also check out the map you received in your conference package.

Signature Prague sights:

- **Prague Castle**, the largest ancient castle in the world with a history dating back to 9th century, now the seat of the president; with St. Vitus cathedral, ancient ceremonial halls, castle guards, and more
- **Charles Bridge**, a gothic bridge with many baroque statues
- **Old Town Square**, with the gothic Old Town Hall and its astronomical clock

Old religious buildings:

- **Prague Loreto** (baroque, with a nice chimes)
- **St. Nicholas** at Malá Strana (baroque, directly adjacent to the venue)
- **Our Lady before Týn** (gothic, near Old Town square)
- **Infant Jesus of Prague** (5 min. from the venue at Karmelitská st., with the famous statue of Infant Jesus)
- **Strahov Monastery** up the hill from the venue, baroque, with the old library (and a restaurant)

- **Břevnov Monastery** (a bit away from the center, baroque, with a nice garden and a brewery/restaurant)
- **Prague Synagogues** (several of them scattered in the Old Town, formerly the Jewish quarter)

Towers with a nice view over the city:

- **Petřín Tower**, a 1:6 copy of the Eiffel tower (on top a the hill that makes up for the size difference)
- **Charles Bridge Towers** on both sides of the bridge
- **Žižkov TV Tower**, the highest building in Prague

Parks and gardens:

- **Petřín** – near the venue, with the lookout tower on top and a cable car on the hillside (public transport tickets accepted)
- **Waldstein Garden** with an artificial grotto, now part of the Czech senate, but publicly accessible
- **Stromovka** – very large, near the Vltava river; great place for walks or sports
- **Chateau, Botanical Garden, and Zoo** in Troja

## Culture

Prague has many museums, galleries, music clubs, theaters, and other places to find culture.

In **theater**, Prague's specialties are *Laterna Magika* at the National Theater (Národní 4, <http://www.narodni-divadlo.cz/en/laterna-magika>) and *Black Light Theater* (several venues, see [http://en.wikipedia.org/wiki/Black\\_light\\_theatre](http://en.wikipedia.org/wiki/Black_light_theatre)); you can also find good opera and ballet at the National Theater (Národní 2, <http://www.narodni-divadlo.cz>). Note that many theaters in Prague use English subtitles, but not all of them, so be sure to check this before you buy tickets.

Regarding **music**, there are numerous options in the city center, starting from classical music venues such as the Rudolfinum Concert Hall (Alšovo nábřeží 12, <http://www.rudolfinum.cz/en/concert-schedule/>), followed by jazz clubs, e.g., *Agharta* (Železná 16, <http://www.agharta.cz>), *Reduta* (Národní 116, <http://www.redutajazzclub.cz>), *U Malého Glena* (Karmelitská 23, <http://malyglen.cz>),

U Staré Paní (Michalská 9, <http://www.jazzstarapani.cz>), or Ungelt (Malá Štupartská 1, <http://www.jazzungelt.cz>), up to pop/rock music clubs, such as Lucerna Music Bar (Vodičkova 36, <http://www.musicbar.cz>), Roxy (Dlouhá 33, <http://www.roxy.cz>), Rock Café (Národní 20, <http://www.rockcafe.cz>), or Palác Akropolis (Kubelíkova 27, <http://www.palacakropolis.cz>).

For **dancing**, regular “Tea Dances” (ballroom dancing) take place Tuesdays, Fridays, and Saturdays at the EuroDanceCenter just across the river (Voršilská 14, <http://www.plaminek.cz/chci-si-jen-zatancit/>). You can also check out some of Prague’s discos, e.g., at Karlovy Lázně (largest disco in Central Europe, Smetanovo nábřeží 1, <http://www.karlovylazne.cz>), Lucerna Music Bar (Vodičkova 36, <http://www.musicbar.cz>), or Radost FX (Bělehradská 120, <http://www.radostfx.cz>).

You can find more about other cultural events and venues in Prague at GoOut.cz (<https://goout.cz/en/prague/>).

## Other useful information

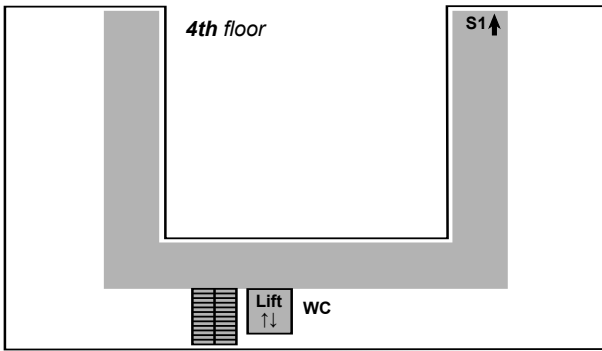
- **Weather in Prague** can be found at the Czech Weather Service website (<http://chmu.cz>).
- **Prague Directory** of various services is provided by the Expats portal (<http://www.expats.cz/directory/>).

## Travelling from Prague to Interspeech

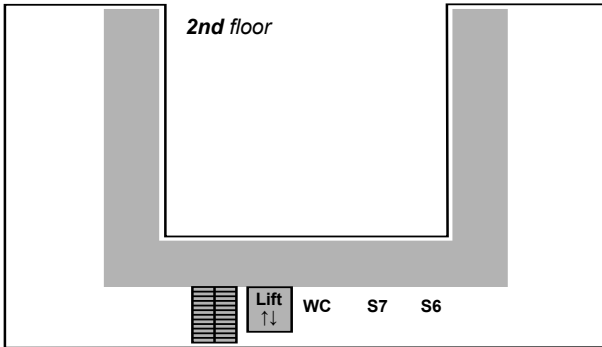
Dresden is only about 120 km away from Prague. Probably the best option is to **take a train** – there are direct EuroCity trains that run every 2 hours during the day (4:30am–6:30pm), the journey takes 2:15h. You can buy the ticket online from Czech Railways (<https://www.cd.cz/eshop/>; it may be cheaper if you book early). To order the ticket, search for a direct route from “Praha hl. n.” (Prague main station) to “Dresden Hbf” (Dresden main station).

Another option is to take a **bus or a car**, the journey takes also about 2 hours. You can book a bus ticket online with Student Agency (<https://jizdenky.studentagency.cz>) or EuroLines (<https://www.elines.cz>).



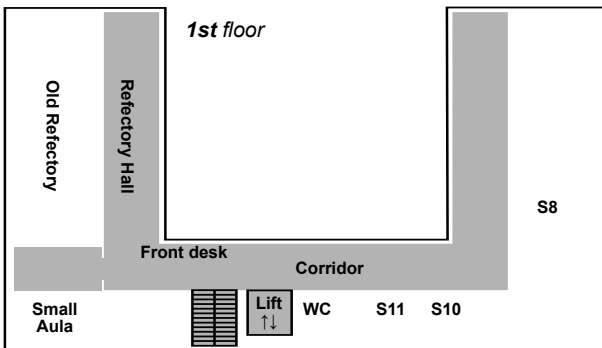


The OpenSpace will start in **Room S1**



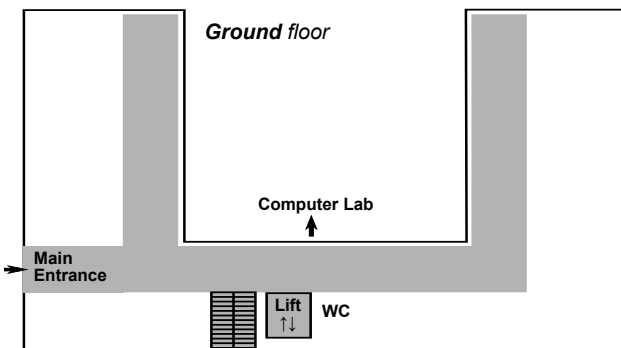
## SIGDIAL 2015 Building Plan

Venue Address:  
Malostranské náměstí 25  
118 00 Praha 1



Most events take place in the **Old Refectory**

Poster sessions are held in the **corridor**, in **Room S10**, and in the **Small Aula**





**Prague Castle**

**Pivo&Basilico**

**Pharmacy**

**Baráčnická Rychta**

**Conf. Venue**

**Exchange**

**Subway (Malostranská)**

**Malostranská Beseda**

**Newsstand**

**Tram Tickets**

**ATMs**

**Lokál**

**Hospital**

**Fruits&Vegetables**

**Vacek Bio-Market**

**Kočár z Vidně**

**Charles Bridge & Old Town**

**Ferdinanda**

**Konírna (dinner)**

**Green Spirit**

**Bar Bar**

**Golden Tikka  
Tesco My Quadrio**

# SIGDIAL 2015 Venue & Neighborhood

The full annotated Google Map is available at <http://bit.ly/sigdial2015-map>

**Nový Smíchov**

**Ananta**