

Theory and Applications of Natural Language Processing
Monographs

Verena Rieser
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Reinforcement Learning for Adaptive Dialogue Systems

A Data-driven Methodology for
Dialogue Management and Natural
Language Generation

Reinforcement Learning For Adaptive Dialogue Systems
A Data Driven Methodology For Dialogue Management
And Natural Language Generation Theory And
Applications Of Natural Language Processing

Oliver Lemon, Olivier Pietquin



Reinforcement Learning For Adaptive Dialogue Systems A Data Driven Methodology For Dialogue Management And Natural Language Generation Theory And Applications Of Natural Language Processing:

Reinforcement Learning for Adaptive Dialogue Systems Verena Rieser, Oliver Lemon, 2011-11-23 The past decade has seen a revolution in the field of spoken dialogue systems As in other areas of Computer Science and Artificial Intelligence data driven methods are now being used to drive new methodologies for system development and evaluation This book is a unique contribution to that ongoing change A new methodology for developing spoken dialogue systems is described in detail The journey starts and ends with human behaviour in interaction and explores methods for learning from the data for building simulation environments for training and testing systems and for evaluating the results The detailed material covers Spoken and Multimodal dialogue systems Wizard of Oz data collection User Simulation methods Reinforcement Learning and Evaluation methodologies The book is a research guide for students and researchers with a background in Computer Science AI or Machine Learning It navigates through a detailed case study in data driven methods for development and evaluation of spoken dialogue systems Common challenges associated with this approach are discussed and example solutions are provided This work provides insights lessons and inspiration for future research and development not only for spoken dialogue systems in particular but for data driven approaches to human machine interaction in general

Data-Driven Methods for Adaptive Spoken Dialogue Systems Oliver Lemon, Olivier Pietquin, 2012-10-21 Data driven methods have long been used in Automatic Speech Recognition ASR and Text To Speech TTS synthesis and have more recently been introduced for dialogue management spoken language understanding and Natural Language Generation Machine learning is now present end to end in Spoken Dialogue Systems SDS However these techniques require data collection and annotation campaigns which can be time consuming and expensive as well as dataset expansion by simulation In this book we provide an overview of the current state of the field and of recent advances with a specific focus on adaptivity

Interaction Design for 3D User Interfaces Francisco R. Ortega, Fatemeh Abyarjoo, Armando Barreto, Naphtali Rishe, Malek Adjouadi, 2016-01-06 This book addresses the new interaction modalities that are becoming possible with new devices by looking at user interfaces from an input perspective It deals with modern input devices and user interaction and design covering in depth theory advanced topics for noise reduction using Kalman Filters a case study and multiple chapters showing hands on approaches to relevant technology including modern devices such as the Leap Motion Xbox One Kinect inertial measurement units and multi touch technology It also discusses theories behind interaction and navigation past and current techniques and practical topics about input devices

Towards Omnipresent and Smart Speech Assistants Ingo Siegert, Stefan Hillmann, Benjamin Weiss, Jessica Martina Szczuka, Alexey Karpov, 2022-07-28

The Handbook on Socially Interactive Agents Birgit Lugrin, Catherine Pelachaud, David Traum, 2022-10-19 The Handbook on Socially Interactive Agents provides a comprehensive overview of the research fields of Embodied Conversational Agents Intelligent Virtual Agents and Social

Robotics Socially Interactive Agents SIAs whether virtually or physically embodied are autonomous agents that are able to perceive an environment including people or other agents reason decide how to interact and express attitudes such as emotions engagement or empathy They are capable of interacting with people and one another in a socially intelligent manner using multimodal communicative behaviors with the goal to support humans in various domains Written by international experts in their respective fields the book summarizes research in the many important research communities pertinent for SIAs while discussing current challenges and future directions The handbook provides easy access to modeling and studying SIAs for researchers and students and aims at further bridging the gap between the research communities involved In two volumes the book clearly structures the vast body of research The first volume starts by introducing what is involved in SIAs research in particular research methodologies and ethical implications of developing SIAs It further examines research on appearance and behavior focusing on multimodality Finally social cognition for SIAs is investigated using different theoretical models and phenomena such as theory of mind or pro sociality The second volume starts with perspectives on interaction examined from different angles such as interaction in social space group interaction or long term interaction It also includes an extensive overview summarizing research and systems of human agent platforms and of some of the major application areas of SIAs such as education aging support autism and games **ECAI 2016** G.A. Kaminka,M. Fox,P. Bouquet,2016-08-24 Artificial Intelligence continues to be one of the most exciting and fast developing fields of computer science This book presents the 177 long papers and 123 short papers accepted for ECAI 2016 the latest edition of the biennial European Conference on Artificial Intelligence Europe s premier venue for presenting scientific results in AI The conference was held in The Hague the Netherlands from August 29 to September 2 2016 ECAI 2016 also incorporated the conference on Prestigious Applications of Intelligent Systems PAIS 2016 and the Starting AI Researcher Symposium STAIRS The papers from PAIS are included in this volume the papers from STAIRS are published in a separate volume in the Frontiers in Artificial Intelligence and Applications FAIA series Organized by the European Association for Artificial Intelligence EurAI and the Benelux Association for Artificial Intelligence BNVKI the ECAI conference provides an opportunity for researchers to present and hear about the very best research in contemporary AI This proceedings will be of interest to all those seeking an overview of the very latest innovations and developments in this field **ECAI 2014** T. Schaub,G. Friedrich,B. O'Sullivan,2014-08 The role of artificial intelligence AI applications in fields as diverse as medicine economics linguistics logical analysis and industry continues to grow in scope and importance AI has become integral to the effective functioning of much of the technical infrastructure we all now take for granted as part of our daily lives This book presents the papers from the 21st biennial European Conference on Artificial Intelligence ECAI 2014 held in Prague Czech Republic in August 2014 The ECAI conference remains Europe s principal opportunity for researchers and practitioners of Artificial Intelligence to gather and to discuss the latest trends and challenges in all subfields of AI as well as to demonstrate

innovative applications and uses of advanced AI technology Included here are the 158 long papers and 94 short papers selected for presentation at the conference Many of the papers cover the fields of knowledge representation reasoning and logic as well as agent based and multi agent systems machine learning and data mining The proceedings of PAIS 2014 and the PAIS System Demonstrations are also included in this volume which will be of interest to all those wishing to keep abreast of the latest developments in the field of AI

Data-Driven Methods for Adaptive Spoken Dialogue Systems Oliver Lemon,Olivier Pietquin,2012-10-20 Data driven methods have long been used in Automatic Speech Recognition ASR and Text To Speech TTS synthesis and have more recently been introduced for dialogue management spoken language understanding and Natural Language Generation Machine learning is now present end to end in Spoken Dialogue Systems SDS However these techniques require data collection and annotation campaigns which can be time consuming and expensive as well as dataset expansion by simulation In this book we provide an overview of the current state of the field and of recent advances with a specific focus on adaptivity

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Natural Language Generation in Interactive Systems Amanda Stent,Srinivas Bangalore,2014-06-12 A comprehensive overview of the state of the art in natural language generation for interactive systems with links to resources for further research

Conversational AI Michael McTear,2020-10-30 This book provides a comprehensive introduction to Conversational AI While the idea of interacting with a computer using voice or text goes back a long way it is only in recent years that this idea has become a reality with the emergence of digital personal assistants smart speakers and chatbots Advances in AI particularly in deep learning along with the availability of massive computing power and vast amounts of data have led to a new generation of dialogue systems and conversational interfaces Current research in Conversational AI focuses mainly on the application of machine learning and statistical data driven approaches to the development of dialogue systems However it is important to be aware of previous achievements in dialogue technology and to consider to what extent they might be relevant to current research and development Three main approaches to the development of dialogue systems are reviewed rule based systems that are handcrafted using best practice guidelines statistical data driven systems based on machine learning and neural dialogue systems based on end to end learning Evaluating the performance and usability of dialogue systems has become an important topic in its own right and a variety of evaluation metrics and frameworks are described Finally a number of challenges for future research are considered including

multimodality in dialogue systems visual dialogue data efficient dialogue model learning using knowledge graphs discourse and dialogue phenomena hybrid approaches to dialogue systems development dialogue with social robots and in the Internet of Things and social and ethical issues Learning the Parameters of Reinforcement Learning from Data for Adaptive Spoken Dialogue Systems Layla El Asri, 2016 This document proposes to learn the behaviour of the dialogue manager of a spoken dialogue system from a set of rated dialogues This learning is performed through reinforcement learning Our method does not require the definition of a representation of the state space nor a reward function These two high level parameters are learnt from the corpus of rated dialogues It is shown that the spoken dialogue designer can optimise dialogue management by simply defining the dialogue logic and a criterion to maximise e g user satisfaction The methodology suggested in this thesis first considers the dialogue parameters that are necessary to compute a representation of the state space relevant for the criterion to be maximized For instance if the chosen criterion is user satisfaction then it is important to account for parameters such as dialogue duration and the average speech recognition confidence score The state space is represented as a sparse distributed memory The Genetic Sparse Distributed Memory for Reinforcement Learning GSDMRL accommodates many dialogue parameters and selects the parameters which are the most important for learning through genetic evolution The resulting state space and the policy learnt on it are easily interpretable by the system designer Secondly the rated dialogues are used to learn a reward function which teaches the system to optimise the criterion Two algorithms reward shaping and distance minimisation are proposed to learn the reward function These two algorithms consider the criterion to be the return for the entire dialogue These functions are discussed and compared on simulated dialogues and it is shown that the resulting functions enable faster learning than using the criterion directly as the final reward A spoken dialogue system for appointment scheduling was designed during this thesis based on previous systems and a corpus of rated dialogues with this system were collected This corpus illustrates the scaling capability of the state space representation and is a good example of an industrial spoken dialogue system upon which the methodology could be applied

Spoken Dialogue Systems Kristiina Jokinen, Michael McTear, 2010 Offers a comprehensive view of state of the art techniques that are used to build spoken dialogue systems It provides an overview of the basic issues such as system architectures various dialogue management methods system evaluation and also surveys advanced topics concerning extensions of the basic model to more conversational setups **Reinforcement Learning Methods in Speech and Language Technology** Baihan Lin, 2024-11-11 This book offers a comprehensive guide to reinforcement learning RL and bandits methods specifically tailored for advancements in speech and language technology Starting with a foundational overview of RL and bandit methods the book dives into their practical applications across a wide array of speech and language tasks Readers will gain insights into how these methods shape solutions in automatic speech recognition ASR speaker recognition diarization spoken and natural language understanding SLU NLU text to speech TTS synthesis natural

language generation NLG and conversational recommendation systems CRS Further the book delves into cutting edge developments in large language models LLMs and discusses the latest strategies in RL highlighting the emerging fields of multi agent systems and transfer learning Emphasizing real world applications the book provides clear step by step guidance on employing RL and bandit methods to address challenges in speech and language technology It includes case studies and practical tips that equip readers to apply these methods to their own projects As a timely and crucial resource this book is ideal for speech and language researchers engineers students and practitioners eager to enhance the performance of speech and language systems and to innovate with new interactive learning paradigms from an interface design perspective

Natural Language Dialog Systems and Intelligent Assistants G.G. Lee,H.K. Kim,M. Jeong,J.-H. Kim,2015-09-28 This book covers state of the art topics on the practical implementation of Spoken Dialog Systems and intelligent assistants in everyday applications It presents scientific achievements in language processing that result in the development of successful applications and addresses general issues regarding the advances in Spoken Dialog Systems with applications in robotics knowledge access and communication Emphasis is placed on the following topics speaker language recognition user modeling simulation evaluation of dialog system multi modality emotion recognition from speech speech data mining language resource and databases machine learning for spoken dialog systems and educational and healthcare applications

Lifelong and Continual Learning Dialogue Systems Sahisnu Mazumder,Bing Liu,2024-01-08 This book introduces the new paradigm of lifelong and continual learning dialogue systems to endow dialogue systems with the ability to learn continually by themselves through their own self initiated interactions with their users and the working environments The authors present the latest developments and techniques for building such continual learning dialogue systems The book explains how these developments allow systems to continuously learn new language expressions lexical and factual knowledge and conversational skills through interactions and dialogues Additionally the book covers techniques to acquire new training examples for learning new tasks during the conversation The book also reviews existing work on lifelong learning and discusses areas for future research

[Towards Adaptive Spoken Dialog Systems](#) Alexander Schmitt,Wolfgang Minker,2012-09-19 In *Monitoring Adaptive Spoken Dialog Systems* authors Alexander Schmitt and Wolfgang Minker investigate statistical approaches that allow for recognition of negative dialog patterns in Spoken Dialog Systems SDS The presented stochastic methods allow a flexible portable and accurate use Beginning with the foundations of machine learning and pattern recognition this monograph examines how frequently users show negative emotions in spoken dialog systems and develop novel approaches to speech based emotion recognition using hybrid approach to model emotions The authors make use of statistical methods based on acoustic linguistic and contextual features to examine the relationship between the interaction flow and the occurrence of emotions using non acted recordings several thousand real users from commercial and non commercial SDS Additionally the authors present novel statistical methods that spot problems within a dialog based on

interaction patterns The approaches enable future SDS to offer more natural and robust interactions This work provides insights lessons and inspiration for future research and development not only for spoken dialog systems but for data driven approaches to human machine interaction in general *A Framework for Unsupervised Learning of Dialogue Strategies* Olivier Pietquin,2005-08 This book addresses the problems of spoken dialogue system design and especially automatic learning of optimal strategies for man machine dialogues Besides the description of the learning methods this text proposes a framework for realistic simulation of human machine dialogues based on probabilistic techniques which allows automatic evaluation and unsupervised learning of dialogue strategies This framework relies on stochastic modelling of modules composing spoken dialogue systems as well as on user modelling Special care has been taken to build models that can either be hand tuned or learned from generic data *Domain-Level Reasoning for Spoken Dialogue Systems* Dirk Bühler,Wolfgang Minker,2011-04-07 Reasoning for Information Seeking and Planning Dialogues provides a logic based reasoning component for spoken language dialogue systems This component called Problem Assistant is responsible for processing constraints on a possible solution obtained from various sources namely user and the system s domain specific information The authors also present findings on the implementation of a dialogue management interface to the Problem Assistant The dialogue system supports simple mixed initiative planning interactions in the TRAINS domain which is still a relatively complex domain involving a number of logical constraints and relations forming the basis for the collaborative problem solving behavior that drives the dialogue *Spoken Dialogue Systems Technology and Design* Wolfgang Minker,Gary Geunbae Lee,Satoshi Nakamura,Joseph Mariani,2010-11-09 Spoken Dialogue Systems Technology and Design covers key topics in the field of spoken language dialogue interaction from a variety of leading researchers It brings together several perspectives in the areas of corpus annotation and analysis dialogue system construction as well as theoretical perspectives on communicative intention context based generation and modelling of discourse structure These topics are all part of the general research and development within the area of discourse and dialogue with an emphasis on dialogue systems corpora and corpus tools and semantic and pragmatic modelling of discourse and dialogue

Reinforcement Learning For Adaptive Dialogue Systems A Data Driven Methodology For Dialogue Management And Natural Language Generation Theory And Applications Of Natural Language Processing Book Review:
Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has are more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Reinforcement Learning For Adaptive Dialogue Systems A Data Driven Methodology For Dialogue Management And Natural Language Generation Theory And Applications Of Natural Language Processing**," published by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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