ZHANG HAO

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EDUCATION

Nanyang Technological University (NTU), Singapore **Aug 2015 – Jul 2016**
Master of Science in Communications Engineering, School of Electrical and Electronic Engineering

Dalian University of Technology (DUT), China **Sep 2011 – Jul 2015**
Bachelor of Science in Communications Engineering, School of Electronic Information and Electrical Engineering
Outstanding graduate with Learning Excellence Award and Technological Innovation Award

WORK EXPERIENCE

Agency of Science, Technology and Research (A*Star), Singapore **Jul 2016 – Present**
Research Engineer, Social & Cognitive Computing at Institute of High Performance Computing
As a research engineer, I have varied interests including but not limited to programming, machine learning and artificial intelligence. I am more focus on NLP tasks such as machine comprehension, sequence labeling, commonsense reasoning and so on, and have been involved in several projects at the nexus of natural language processing and machine learning.

PROJECT EXPERIENCE

Social & Cognitive Computing, Institute of High Performance Computing, A*Star, Singapore
Project Title: MARACANA **Oct 2016 – Present**

- The objective of MARACANA project is to develop technology components that can analyse and narrate real world events captured in real-time video, and demonstrate these capabilities in a static surveillance scenario, which includes real-time object detection, event/behaviour understanding, commonsense and behaviour reasoning and natural language representation.
- Responsible for building commonsense reasoning tool based on ConceptNet/PrimeNet and activity labelling user interface, annotate unlabelled activities for video data and extract relative conceptual groundings for given labels.
- Responsible for narrative description generation, use data in elaborated episodic memory and activity prediction from causal learning as inputs, with the help of semantic and syntactic rules as well as NLP methods, to generate the natural and human-liked descriptions.
- Responsible for integration of whole system and build user interface for system interaction.

Social & Cognitive Computing, Institute of High Performance Computing, A*Star, Singapore
Project Title: PrimeNet **Dec 2016 – Present**

- PrimeNet is a human-inspired framework for commonsense knowledge representation and reasoning, which provides access to a vast knowledge resource of concepts involving specific object instances. The goal of PrimeNet is to set out a framework for a commonsense knowledge base that allows for efficient processing, in order to meet the demands of commonsense reasoning and, hence, support intelligent machine performance in real-world tasks.
- Investigate the data and structure of exist relational knowledge bases like ConceptNet, design multi-level structure of commonsense and common ontological knowledge, comprising a small core of primitive concepts and relations, linked to a much more extensive base of factual knowledge instances.
- Explore relational knowledge representation approaches for concepts and relations in PrimeNet, which using machine learning techniques to encode the entities into vectors (embeddings) and measure the reliability of relations and discover new relations.

Social & Cognitive Computing, Institute of High Performance Computing, A*Star, Singapore
Project Title: Punctuation Restoration and Sentence Boundary Detection **Jan 2018 – Apr 2018**

- Aim of the project was to restore punctuations and detect sentence boundaries in a sequence of unpunctuated text from Automatic Speech Recognition (ASR) outputs using lexical and prosodic features.
- Developed a novel and effective approach of using densely connected Bi-LSTM recurrent neural networks plus modified Bahdanau attention mechanism and conditional random field (CRF) model.
- Worked on hyper-parameters tuning and configuration modifying, the proposed approach outperforms state-of-the-arts and show great improvement on some datasets.

Social & Cognitive Computing, Institute of High Performance Computing, A*Star, Singapore
Project Title: Neural Sequence Labelling **Nov 2017 – Feb 2018**

- The goal of this project was to establish a general and flexible tool to assign specific semantic and syntactic labels for raw texts, which is able to significantly increase the effectiveness of subsequent natural language processing.
- Developed a fast and accurate model of using Bi-LSTM recurrent network, convolutional network and CRF for multiple common sequence labelling tasks such as Part-of-Speech (POS) tagging, Chunking, Named Entity Recognition (NER) and etc.
- Investigated the use of scaled dot-product attention method and Luong/Bahdanau attention mechanism to improve the accuracy of the model. Currently, our method achieves/near the state-of-the-art performances on POS, Chunking and NER tasks.

Nanyang Technological University (NTU), Singapore
Dissertation Title: Removing Backscatter to Enhance the Visibility of Underwater Object **Sep 2015 – Apr 2016**

- Studied and analysed the principles and mechanisms that underwater objects that suffer from backscatter effect in various degrees.
- Investigated and devised a video/image restoration method by integrating underwater optical features and image processing technologies to build an efficient physical model-based underwater imaging system.

PUBLICATIONS

A. Huminski, **H. Zhang**. "Action Hierarchy Extraction and its Application". In Language Resources and Evaluation Conference, Workshop Annotation, Recognition and Evaluation of Actions. May 2018, Miyazaki, Japan.

A. Huminski, **H. Zhang**. "WordNet Troponymy and Extraction of Manner-Result Relations". In The 9th Global WordNet Conference. January 2018, Singapore.

UNDERGRADUATE PROJECTS

Dalian University of Technology (DUT), China

Dissertation Title: Research on an Improved Method for Image Enhancement Based on the Retinex Theory **Dec 2014 – Jun 2015**

- Investigated the factors of image degradation, studied Retinex theory and related algorithms on pattern recognition, image enhancement, fusion and compression fields.
- Devised a Retinex theory based approach for contrast and illuminance enhancement in images of low light or unevenly illuminated scenes. The proposed method involves several techniques such as dual-tree complex wavelet transform, adaptive local tone mapping, wavelet shrinkage, fuzzy enhancing, colour space transformation and etc.

Research Assistant, Electrical Innovation and Practice Laboratory (DUT)

Project Title: Family Remote Control System **Sep 2013 – Sep 2014**

- Investigated state-of-the-art remote control system techniques. Explored recognition parts of the project, designed the access system based on face recognition technology, skin colour detection method is adopted to optimize Haar features detection process; Hidden Markov Model is used to recognize the faces.
- Developed research skill and ability of literature retrieval via searching, selecting and studying numerous research articles.

College Students' Innovation Entrepreneurial Training Plan (National Level)

Project Title: Mobile Payment System based on NFC Technology and QR Code **May 2013 – Mar 2014**

- Investigated and Developed an Android mobile payment application with NFC technology and QR code recognizer to achieve information extraction, analysis and invoke other applications.
- Explored operating principles of NFC technology, executing NFC hardware module debugging and software development, bug fixing and system integration.

LEADERSHIP / CO-CURRICULAR ACTIVITIES

Teaching Assistant of Computer Installation and Test Laboratory, Dalian University of Technology Sep 2011 – Mar 2014

- Conveyed knowledge of computer structures, server technology and related fittings.
- Trained students and newcomers to produce network cable, (dis)assemble computers and build server.
- Developed and maintained attendance and course selection system for laboratory; repairing computers after laboratory course.
- Enhanced organization ability and language competence; gained confidence after much useful knowledge acquisition.

Vice Minister of Academic Department, Dalian University of Technology Sep 2012 – Jun 2013

- Organized different school activities (e.g. student extracurricular knowledge contests, study experience exchange meetings).
- Trained department members to develop their practical ability, sociability and problem-solving ability via specific training.
- Built rapport and relationship based on trust with associated members.
- Skilled in leadership, negotiation, organization and communication skills.

ACHIEVEMENTS AND AWARDS

Third Prize in 2014 American College Student Mathematical Modeling Contest	**Mar 2014**
First Prize in 2013 Dalian University of Technology Freescale Intelligent Car Contest	**Nov 2013**
Second Prize in 2013 Higher Education Press Cup College Student Mathematical Modeling Contest (National Level)	**Nov 2013**
First Prize in 2013 Higher Education Press Cup College Student Mathematical Modeling Contest (Provincial Level)	**Oct 2013**
Second Prize in 2013 ACM/ICPC The Third Dalian City Programming Contest	**Apr 2013**
Second Prize in Neusoft Cup Science and Technology Culture Festival Software Design Contest	**Mar 2013**
First Prize in 21st College Student Advanced Mathematics Contest, Dalian City	**Jun 2012**
Third Prize in 2012 ACM/ICPC The Second Dalian City Programming Contest	**Apr 2012**

COMPETENCIES / INTERESTS

Language Skills: Fluent in English and Chinese (Mandarin).
Programming Skills: Java, Python, C/C++ (Prior Exp), Matlab (Prior Exp), Scala (Elementary).
Web Technologies: HTML, JavaScript, CSS, jQuery, Bootstrap.
Tools & Platforms: Mac OS X, Linux (Ubuntu), Windows, Google App Engine, Android (Prior Exp).
Frameworks: TensorFlow, DeepLearning4J, Stanford NLP, Spark, Scikit-Learn, NLTK, Neo4J, ConceptNet and etc.
Interests: Natural Language Processing, Machine Learning Techniques, Artificial Intelligence, Developmental Programming.