

NAACL HLT 2018

**Innovative Use of NLP for
Building Educational Applications**

Proceedings of the Thirteenth Workshop

June 5, 2018
New Orleans, Louisiana

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ISBN 978-1-948087-11-7

Introduction

Every year, as we send out the call for papers for the *Workshop on Innovative Use of NLP for Building Educational Applications*, we wonder which subfield of educational applications will be prevalent in the submissions. One year it is speech recognition for automated evaluation, the next it may be grammatical error correction, another year the focus may be on automated scoring of textual assessments. Inevitably, even with more than 130 Program Committee members, we find ourselves scrambling to recruit more reviewers for that year's hot topic.

There was no clear winner this year. The majority of the 2018 submissions were primarily automated writing assessment, automated test generation, and reading. Overall, there was a nice mix of all of the topics above and more.

This year we received 41 submissions and accepted 8 papers as oral presentations and 18 as poster presentations, for an overall acceptance rate of 63 percent. Each paper was reviewed by three members of the Program Committee who were believed to be most appropriate for each paper. We continue to have a strong policy to deal with conflicts of interest. First, we made a concerted effort to not assign papers to reviewers to evaluate if the paper had an author from their institution. Second, organizing committee members recused themselves from discussions of papers when there was a conflict of interest.

We do recognize that there is a core group of institutions and researchers who work in this area. With a higher acceptance rate, we were able to include papers from a wider variety of topics and institutions. The papers accepted were selected on the basis of several factors, including the relevance to a core educational problem space, the novelty of the approach or domain, and the strength of the research. The accepted papers were highly diverse – an indicator of the growing variety of foci in this field. We continue to believe that the workshop framework designed to introduce work in progress and new ideas needs to be revived, and we hope that we have achieved this with the breadth and variety of research accepted for this workshop, a brief description of which is presented below.

The BEA13 workshop has presentations on automated writing evaluation, item generation, readability, dialogue, annotation, speech and grammatical error correction (GEC), annotation and resources:

Automated Writing Evaluation (AWE):

Zhang and Litman present an investigation of using a co-attention based neural network for scoring essays. Horbach et al. investigate the feasibility of cross-lingual content scoring. Gao et al. examine how and why automated content analysis can be used to assess precis writing by university students. Zhang et al. use other texts written by an examinee, in the same test, as extra references in an automated scoring system.

Automated Item Generation (AIG):

Flor and Riordan present a novel rule-based system for automatic generation of factual questions using semantic role labeling. Jiang et al. generate a CLOZE test for Chengyu, a special kind of Chinese idiom. Finally, there are two papers on generating distractors for multiple choice questions. Ha and Yaneva use the question (stem) and the correct answer as input to produce a ranked list of possible distractors. Liang et al. use machine learning models to select distractors that resemble those in actual exam questions.

Reading and Text Complexity:

Bingel et al. predict reading mistakes by children who have reading difficulties by using eye-tracking data. Chinkina et al. automate the selection of reading passages to support teachers. Holz et al. present a web-based application to automatically enhance syllable structure, word stress, and spacing in texts.

Three papers focus specifically on text complexity. Nadeem and Ostendorf propose a neural approach for automated text complexity analysis. Alfter and Volodina investigate the usefulness of previously created word lists to the task of single-word lexical complexity analysis and prediction. Vajjala and Rama explore a universal Common European Framework of Reference (CEFR) classification system.

Dialogue:

When interpreting questions in a virtual patient dialogue system, Jin et al. tackle the challenge of interpreting a long tail of relatively infrequently asked questions. Ramanarayanan and LaMar look at the psychometrics and validity of CALL technologies when evaluating and providing feedback on student learning and conversational ability. Kulkarni and Boyer explore the possibility of building a tutorial question-answering system for Java programming from data sampled from a community-based forum.

Speech:

Loukina et al. look at a new way to test speech systems. As well as training and evaluating against human scores, they report on a system that evaluates a speech scoring engine against corpora.

Grammatical Error Correction (GEC) – the next steps:

None of these papers report on GEC per se. Instead, they are looking ahead to the next steps. Bryant and Briscoe re-examine the use of language modeling in GEC and argue that it is possible to build a simple system that requires minimal annotated data. Rudzewitz et al. develop an approach to provide feedback for second language learners. Finally, Afrin and Litman focus on the quality of revisions in writing. They introduce a corpus of between-draft revisions of student essays that are annotated as to whether each revision improves essay quality.

Annotation:

Two very interesting novel annotation schemas are presented. King and Dickinson investigate issues of variability and acceptability in written text, for both native and non-native speakers, using a dataset of picture description task responses. They define and annotate a handful of features pertaining to form and meaning in order to capture the multi-dimensional ways in which responses can vary. Lugini et al. annotate student talk in text-based (English Language Arts) classroom discussions. They focus on three aspects of student talk: argumentation, specificity, and knowledge domain.

Resources:

Three new resources are being introduced this year. Del Rio Gayo et al. present NLI-PT, the first Portuguese dataset compiled for Native Language Identification. Tack et al. introduce NT2Lex, a lexical resource for Dutch as a foreign language. Vajjala and Lucic describe the collection and compilation of the OneStopEnglish corpus, a collection of texts written at three reading levels.

In addition, this year the BEA Workshop is sponsoring two shared tasks.

Shared Task on Second Language Acquisition Modeling (SLAM):

Settles et al. present the *Second Language Acquisition Modeling* shared task.¹ Given a history of errors made by learners of a second language, the task is to predict errors that they are likely to make in the future. They describe a large corpus of more than 7M words produced by more than 6k learners of English, Spanish, and French using Duolingo, a popular online language-learning app. Then they report on the results of the challenge. Fifteen teams took part in the task and reports appear in these proceedings.

The Second Shared Task on Complex Word Identification (CWI):

¹<http://sharedtask.duolingo.com>

Yimam et al. report the findings of the *Second Complex Word Identification* shared task.² This shared task features multilingual and multi-genre datasets divided into four tracks: English monolingual, German monolingual, Spanish monolingual, and a multilingual track with a French test set, and two tasks: binary classification and probabilistic classification. A total of 12 teams submitted their results in different task/track combinations and 11 of them wrote system descriptions that appear in these proceedings.

On this 13th edition of the workshop, BEA is officially adolescent. Last year saw the creation of the Special Interest Group on Education and NLP (SIGEDU) which is a major step in growing our subfield. SIGEDU held its first elections this winter with over 20 candidates running. The elected SIGEDU officials are all familiar names with respect to the workshop. Jill Burstein is President, Ekaterina Kochmar is Secretary, and Helen Yannakoudakis is Treasurer. The four Board Members are Claudia Leacock, Nitin Madnani, Ildiko Pilan, and Torsten Zesch. Joel Tetreault, who has been the primary contact for the workshop for the last 11 years, and the interim President, chose not to run for office. At the end of this workshop, the reins will be handed over to the new team. Another development from the last year is the creation of a permanent website for the SIGEDU and BEA workshop.³ Created by Ekaterina Kochmar and Sowmya Vajjala, we hope to develop this into a regularly updated resource and reference site for the community.

We wish to thank everyone who showed interest and submitted a paper, all of the authors for their contributions, the members of the Program Committee for their thoughtful reviews, and everyone who is attending this workshop. We would especially like to thank our sponsors: at the Gold Level, Duolingo, Grammarly®, National Board of Medical Examiners (NBME) and Turnitin®; at the Silver level, Educational Testing Service (ETS®) and iLexIR; at the Bronze level, Cognii. Their contributions help fund workshop extras, such as T-shirts and the dinner, which is a great social and networking event. Also, thanks to Joya Tetreault for designing the t-shirts again this year.

Joel Tetreault, Grammarly
Jill Burstein, Educational Testing Services
Ekaterina Kochmar, University of Cambridge
Claudia Leacock, Grammarly
Helen Yannakoudakis, University of Cambridge

²<https://sites.google.com/view/cwisharedtask2018/>

³<https://ekaterinakochmar.wixsite.com/sig-edu>

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Jill Burstein, Educational Testing Service
Ekaterina Kochmar, University of Cambridge
Claudia Leacock, Grammarly
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Marcos Zampieri, University of Wolverhampton
Klaus Zechner, Educational Testing Service

Table of Contents

<i>Using exemplar responses for training and evaluating automated speech scoring systems</i> Anastassia Loukina, Klaus Zechner, James Bruno and Beata Beigman Klebanov	1
<i>Using Paraphrasing and Memory-Augmented Models to Combat Data Sparsity in Question Interpretation with a Virtual Patient Dialogue System</i> Lifeng Jin, David King, Amad Hussein, Michael White and Douglas Danforth	13
<i>Predicting misreadings from gaze in children with reading difficulties</i> Joachim Bingel, Maria Barrett and Sigrid Klerke	24
<i>Automatic Input Enrichment for Selecting Reading Material: An Online Study with English Teachers</i> Maria Chinkina, Ankita Oswal and Detmar Meurers	35
<i>Estimating Linguistic Complexity for Science Texts</i> Farah Nadeem and Mari Ostendorf	45
<i>Second Language Acquisition Modeling</i> Burr Settles, Chris Brust, Erin Gustafson, Masato Hagiwara and Nitin Madnani	56
<i>A Report on the Complex Word Identification Shared Task 2018</i> Seid Muhie Yimam, Chris Biemann, Shervin Malmasi, Gustavo Paetzold, Lucia Specia, Sanja Štajner, Anaïs Tack and Marcos Zampieri	66
<i>Towards Single Word Lexical Complexity Prediction</i> David Alfter and Elena Volodina	79
<i>COAST - Customizable Online Syllable Enhancement in Texts. A flexible framework for automatically enhancing reading materials</i> Heiko Holz, Zarah Weiss, Oliver Brehm and Detmar Meurers	89
<i>Annotating picture description task responses for content analysis</i> Levi King and Markus Dickinson	101
<i>Annotating Student Talk in Text-based Classroom Discussions</i> Luca Lugini, Diane Litman, Amanda Godley and Christopher Olshefski	110
<i>Toward Automatically Measuring Learner Ability from Human-Machine Dialog Interactions using Novel Psychometric Models</i> Vikram Ramanarayanan and Michelle LaMar	117
<i>Generating Feedback for English Foreign Language Exercises</i> Björn Rudzewitz, Ramon Ziai, Kordula De Kuthy, Verena Möller, Florian Nuxoll and Detmar Meurers	127
<i>NT2Lex: A CEFR-Graded Lexical Resource for Dutch as a Foreign Language Linked to Open Dutch WordNet</i> Anaïs Tack, Thomas François, Piet Desmet and Cédric Fairon	137
<i>Experiments with Universal CEFR Classification</i> Sowmya Vajjala and Taraka Rama	147

<i>Chengyu Cloze Test</i>	
Zhiying Jiang, Boliang Zhang, Lifu Huang and Heng Ji	154
<i>LaSTUS/TALN at Complex Word Identification (CWI) 2018 Shared Task</i>	
Ahmed AbuRa'ed and Horacio Saggion	159
<i>Cross-lingual complex word identification with multitask learning</i>	
Joachim Bingel and Johannes Bjerva	166
<i>UnibucKernel: A kernel-based learning method for complex word identification</i>	
Andrei Butnaru and Radu Tudor Ionescu	175
<i>CAMB at CWI Shared Task 2018: Complex Word Identification with Ensemble-Based Voting</i>	
Sian Gooding and Ekaterina Kochmar	184
<i>Complex Word Identification Based on Frequency in a Learner Corpus</i>	
Tomoyuki Kajiwara and Mamoru Komachi	195
<i>The Whole is Greater than the Sum of its Parts: Towards the Effectiveness of Voting Ensemble Classifiers for Complex Word Identification</i>	
Nikhil Wani, Sandeep Mathias, Jayashree Aanand Gajjam and Pushpak Bhattacharyya	200
<i>Grotoco@SLAM: Second Language Acquisition Modeling with Simple Features, Learners and Task-wise Models</i>	
Sigrid Klerke, Héctor Martínez Alonso and Barbara Plank	206
<i>Context Based Approach for Second Language Acquisition</i>	
Nihal V. Nayak and Arjun R. Rao	212
<i>Second Language Acquisition Modeling: An Ensemble Approach</i>	
Anton Osika, Susanna Nilsson, Andrii Sydoruk, Faruk Sahin and Anders Huss	217
<i>Modeling Second-Language Learning from a Psychological Perspective</i>	
Alexander Rich, Pamela Osborn Popp, David Halpern, Anselm Rothe and Todd Gureckis	223
<i>A Memory-Sensitive Classification Model of Errors in Early Second Language Learning</i>	
Brendan Tomoschuk and Jarrett Lovelett	231
<i>Annotation and Classification of Sentence-level Revision Improvement</i>	
Tazin Afrin and Diane Litman	240
<i>Language Model Based Grammatical Error Correction without Annotated Training Data</i>	
Christopher Bryant and Ted Briscoe	247
<i>A Semantic Role-based Approach to Open-Domain Automatic Question Generation</i>	
Michael Flor and Brian Riordan	254
<i>Automated Content Analysis: A Case Study of Computer Science Student Summaries</i>	
Yanjun Gao, Patricia M. Davies and Rebecca J. Passonneau	264
<i>Toward Data-Driven Tutorial Question Answering with Deep Learning Conversational Models</i>	
Mayank Kulkarni and Kristy Boyer	273
<i>Distractor Generation for Multiple Choice Questions Using Learning to Rank</i>	
Chen Liang, Xiao Yang, Neisarg Dave, Drew Wham, Bart Pursel and C Lee Giles	284

<i>A Portuguese Native Language Identification Dataset</i>	
Iria del Río Gayo, Marcos Zampieri and Shervin Malmasi	291
<i>OneStopEnglish corpus: A new corpus for automatic readability assessment and text simplification</i>	
Sowmya Vajjala and Ivana Lucic	297
<i>The Effect of Adding Authorship Knowledge in Automated Text Scoring</i>	
Meng Zhang, Xie Chen, Ronan Cummins, Øistein E. Andersen and Ted Briscoe	305
<i>SB@GU at the Complex Word Identification 2018 Shared Task</i>	
David Alfter and Ildikó Pilán	315
<i>Complex Word Identification: Convolutional Neural Network vs. Feature Engineering</i>	
Segun Taofeek Aroyehun, Jason Angel, Daniel Alejandro Pérez Alvarez and Alexander Gelbukh	
322	
<i>Deep Learning Architecture for Complex Word Identification</i>	
Dirk De Hertog and Anaïs Tack	328
<i>NILC at CWI 2018: Exploring Feature Engineering and Feature Learning</i>	
Nathan Hartmann and Leandro Borges dos Santos	335
<i>Complex Word Identification Using Character n-grams</i>	
Maja Popović	341
<i>Predicting Second Language Learner Successes and Mistakes by Means of Conjunctive Features</i>	
Yves Bestgen	349
<i>Feature Engineering for Second Language Acquisition Modeling</i>	
Guanliang Chen, Claudia Hauff and Geert-Jan Houben	356
<i>TMU System for SLAM-2018</i>	
Masahiro Kaneko, Tomoyuki Kajiwara and Mamoru Komachi	365
<i>Deep Factorization Machines for Knowledge Tracing</i>	
Jill-Jênn Vie	370
<i>CLUF: a Neural Model for Second Language Acquisition Modeling</i>	
Shuyao Xu, Jin Chen and Long Qin	374
<i>Neural sequence modelling for learner error prediction</i>	
Zheng Yuan	381
<i>Automatic Distractor Suggestion for Multiple-Choice Tests Using Concept Embeddings and Information Retrieval</i>	
Le An Ha and Victoria Yaneva	389
<i>Co-Attention Based Neural Network for Source-Dependent Essay Scoring</i>	
Haoran Zhang and Diane Litman	399
<i>Cross-Lingual Content Scoring</i>	
Andrea Horbach, Sebastian Stenmanns and Torsten Zesch	410

Conference Program

Tuesday, June 5, 2018

08:30–09:00 *Loading of Oral Presentations*

09:00–10:30 Oral Presentations (Speech, Dialogue & Reading)

09:00–09:15 *Opening Remarks*

09:15–09:40 *Using exemplar responses for training and evaluating automated speech scoring systems*

Anastassia Loukina, Klaus Zechner, James Bruno and Beata Beigman Klebanov

09:40–10:05 *Using Paraphrasing and Memory-Augmented Models to Combat Data Sparsity in Question Interpretation with a Virtual Patient Dialogue System*

Lifeng Jin, David King, Amad Hussein, Michael White and Douglas Danforth

10:05–10:30 *Predicting misreadings from gaze in children with reading difficulties*

Joachim Bingel, Maria Barrett and Sigrid Klerke

10:30–11:00 Mid-morning break

11:00–12:30 Oral Presentations (Passage Selection, Text Complexity & Reading; Shared Task Reports)

11:00–11:25 *Automatic Input Enrichment for Selecting Reading Material: An Online Study with English Teachers*

Maria Chinkina, Ankita Oswal and Detmar Meurers

11:25–11:50 *Estimating Linguistic Complexity for Science Texts*

Farah Nadeem and Mari Ostendorf

11:50–12:10 *Second Language Acquisition Modeling*

Burr Settles, Chris Brust, Erin Gustafson, Masato Hagiwara and Nitin Madnani

12:10–12:30 *A Report on the Complex Word Identification Shared Task 2018*

Seid Muhie Yimam, Chris Biemann, Shervin Malmasi, Gustavo Paetzold, Lucia Specia, Sanja Štajner, Anaïs Tack and Marcos Zampieri

12:30–14:00 Lunch

Tuesday, June 5, 2018 (continued)

14:00–15:30 BEA & Shared Task Poster and Demo Session

14:00–14:45 Poster Session A

BEA papers

Towards Single Word Lexical Complexity Prediction

David Alfter and Elena Volodina

COAST - Customizable Online Syllable Enhancement in Texts. A flexible framework for automatically enhancing reading materials

Heiko Holz, Zarah Weiss, Oliver Brehm and Detmar Meurers

Annotating picture description task responses for content analysis

Levi King and Markus Dickinson

Annotating Student Talk in Text-based Classroom Discussions

Luca Lugini, Diane Litman, Amanda Godley and Christopher Olshefski

Toward Automatically Measuring Learner Ability from Human-Machine Dialog Interactions using Novel Psychometric Models

Vikram Ramanarayanan and Michelle LaMar

Generating Feedback for English Foreign Language Exercises

Björn Rudzewitz, Ramon Ziai, Kordula De Kuthy, Verena Möller, Florian Nuxoll and Detmar Meurers

NT2Lex: A CEFR-Graded Lexical Resource for Dutch as a Foreign Language Linked to Open Dutch WordNet

Anaïs Tack, Thomas François, Piet Desmet and Cédric Fairon

Experiments with Universal CEFR Classification

Sowmya Vajjala and Taraka Rama

Chengyu Cloze Test

Zhiying Jiang, Boliang Zhang, Lifu Huang and Heng Ji

CWI Shared Task papers

LaSTUS/TALN at Complex Word Identification (CWI) 2018 Shared Task

Ahmed AbuRa'ed and Horacio Saggion

Cross-lingual complex word identification with multitask learning

Joachim Bingel and Johannes Bjerva

UnibucKernel: A kernel-based learning method for complex word identification

Andrei Butnaru and Radu Tudor Ionescu

Tuesday, June 5, 2018 (continued)

CAMB at CWI Shared Task 2018: Complex Word Identification with Ensemble-Based Voting

Sian Gooding and Ekaterina Kochmar

Complex Word Identification Based on Frequency in a Learner Corpus

Tomoyuki Kajiwara and Mamoru Komachi

The Whole is Greater than the Sum of its Parts: Towards the Effectiveness of Voting Ensemble Classifiers for Complex Word Identification

Nikhil Wani, Sandeep Mathias, Jayashree Aanand Gajjam and Pushpak Bhat-tacharyya

SLAM Shared Task papers

Grotoco@SLAM: Second Language Acquisition Modeling with Simple Features, Learners and Task-wise Models

Sigrid Klerke, Héctor Martínez Alonso and Barbara Plank

Context Based Approach for Second Language Acquisition

Nihal V. Nayak and Arjun R. Rao

Second Language Acquisition Modeling: An Ensemble Approach

Anton Osika, Susanna Nilsson, Andrii Sydorhuk, Faruk Sahin and Anders Huss

Modeling Second-Language Learning from a Psychological Perspective

Alexander Rich, Pamela Osborn Popp, David Halpern, Anselm Rothe and Todd Gureckis

A Memory-Sensitive Classification Model of Errors in Early Second Language Learning

Brendan Tomoschuk and Jarrett Lovelett

14:45–15:30 Poster Session B

BEA papers

Annotation and Classification of Sentence-level Revision Improvement

Tazin Afrin and Diane Litman

Language Model Based Grammatical Error Correction without Annotated Training Data

Christopher Bryant and Ted Briscoe

A Semantic Role-based Approach to Open-Domain Automatic Question Generation

Michael Flor and Brian Riordan

Tuesday, June 5, 2018 (continued)

Automated Content Analysis: A Case Study of Computer Science Student Summaries

Yanjun Gao, Patricia M. Davies and Rebecca J. Passonneau

Toward Data-Driven Tutorial Question Answering with Deep Learning Conversational Models

Mayank Kulkarni and Kristy Boyer

Distractor Generation for Multiple Choice Questions Using Learning to Rank

Chen Liang, Xiao Yang, Neisarg Dave, Drew Wham, Bart Pursel and C Lee Giles

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OneStopEnglish corpus: A new corpus for automatic readability assessment and text simplification

Sowmya Vajjala and Ivana Lucic

The Effect of Adding Authorship Knowledge in Automated Text Scoring

Meng Zhang, Xie Chen, Ronan Cummins, Øistein E. Andersen and Ted Briscoe

CWI Shared Task papers

SB@GU at the Complex Word Identification 2018 Shared Task

David Alfter and Ildikó Pilán

Complex Word Identification: Convolutional Neural Network vs. Feature Engineering

Segun Taofeek Aroyehun, Jason Angel, Daniel Alejandro Pérez Alvarez and Alexander Gelbukh

Deep Learning Architecture for Complex Word Identification

Dirk De Hertog and Anaïs Tack

NILC at CWI 2018: Exploring Feature Engineering and Feature Learning

Nathan Hartmann and Leandro Borges dos Santos

Complex Word Identification Using Character n-grams

Maja Popović

SLAM Shared Task papers

Predicting Second Language Learner Successes and Mistakes by Means of Conjunctive Features

Yves Bestgen

Feature Engineering for Second Language Acquisition Modeling

Guanliang Chen, Claudia Hauff and Geert-Jan Houben

Tuesday, June 5, 2018 (continued)

TMU System for SLAM-2018

Masahiro Kaneko, Tomoyuki Kajiwara and Mamoru Komachi

Deep Factorization Machines for Knowledge Tracing

Jill-Jênn Vie

CLUF: a Neural Model for Second Language Acquisition Modeling

Shuyao Xu, Jin Chen and Long Qin

Neural sequence modelling for learner error prediction

Zheng Yuan

15:30–16:00 Mid-afternoon break

16:00–17:30 Oral Presentations (Item Generation, Essay/Content Scoring & Writing)

16:00–16:25 *Automatic Distractor Suggestion for Multiple-Choice Tests Using Concept Embeddings and Information Retrieval*

Le An Ha and Victoria Yaneva

16:25–16:50 *Co-Attention Based Neural Network for Source-Dependent Essay Scoring*

Haoran Zhang and Diane Litman

16:50–17:15 *Cross-Lingual Content Scoring*

Andrea Horbach, Sebastian Stenmanns and Torsten Zesch

17:15–17:30 *Closing Remarks*

