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Introduction

This has been a momentous year for the BEA Workshop. In its 12th year, the BEA workshop is, for the first time, being held in conjunction with EMNLP. In addition, the workshop is being sponsored by the newly formed Special Interest Group: SIG EDU.1

Since the first workshop in 1997, BEA has become the leading venue for sharing and publishing innovative work that uses NLP to develop educational applications. The consistent interest and growth of the workshop has clear ties to challenges in education. The research presented at the workshop highlights advances in the technology and the maturity of the field of NLP in education. The capabilities serve as a response to educational challenges and are poised to support the needs of a variety of stakeholders, including educators, learners, parents, and administrators.

NLP capabilities now support an array of learning domains, including writing, speaking, reading, and mathematics. In the writing and speech domains, automated writing evaluation (AWE) and speech assessment applications, respectively, are commercially deployed in high-stakes assessment and instructional settings, including Massive Open Online Courses (MOOCs). We also see widely-used commercial applications for plagiarism detection and peer review and explosive growth of mobile applications for game-based applications for instruction and assessment. The current educational and assessment landscape continues to foster a strong interest and high demand that pushes the state of the art in AWE capabilities to expand the analysis of written responses to writing genres other than those traditionally found in standardized assessments, especially writing tasks requiring use of sources and argumentative discourse.

Steady growth in the development of NLP-based applications for education has prompted an increased number of workshops that typically focus on a single subfield. In BEA, we make an effort to have papers from many subfields, for example, tools for automated scoring, automated test-item generation, curriculum development, evaluation of text, dialogue, evaluation of genres beyond essays, feedback studies, and grammatical error correction.

This year we received a record 62 submissions, and accepted 9 papers as oral presentations and 25 as poster presentation and/or demos, for an overall acceptance rate of 55 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 very strong policy to deal with conflicts of interest. First, we made a concerted effort to have papers from many subfields, for example, tools for automated scoring, automated test-item generation, curriculum development, evaluation of text, dialogue, evaluation of genres beyond essays, feedback studies, and grammatical error correction.

While the field is growing, 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 BEA12 workshop has presentations on Automated Writing Evaluation (AWE), item generation,

readability, dialogue and annotation/database schemas, among others:

**AWE Written Assessments:** Whereas much work in scoring at BEA focuses on learner language, Horbach et al. score essays written by proficient native German speakers in a complex writing task. Madnani et al. look at scoring for content in science, math, language arts and social studies. Rei looks at detecting off-topic essay responses to visual prompts. Riordan et al. examine neural architectures for scoring responses to short answer questions. Finally, looking at the bigger picture, Burstein et al. explore the relations between AWE and broader educational outcomes.

**Domain-Specific AWE:** Three papers look at assessments in specific subject domains. For language learning, Tolmachev and Kurohashi extract exemplar sentences to accompany flash cards. Tack et al. investigate the feasibility of automated learner English assessment in the CEFR (European) framework. In the science domain, Nadeem and Ostendorf look at language-based mapping of science assessment items to skills.

**Error Detection and Correction:** Rei and Yannakoudakis use a neural sequence labeling approach to grammatical error detection. Napoles and Callison-Burch adapt Machine Translation (MT) to grammatical error correction. In another use for machine translation, Rei et al. use MT to generate artificial errors for training machine learning systems. Chollampatt and Ng augment an MT approach with neural network models. Farag et al. develop an error-oriented word embedding approach that exploits errors in learner productions. Caines et al. collect crowd-sourced fluency corrections for transcripts of spoken learner English. Finally, Sakaguchi et al. present a position paper on error correction that discusses issues that need to be addressed and provide recommendations.


**Estimating Item Difficulty:** A last topic in the test domain is Pado’s paper on estimating question difficulty in the domain of automatic grading.

**Readability:** Gonzalez-Garduño and Søgaard measure gaze to predict readability while Štajner et al. measure viewing time per word in autistic and neurotypical readers. Yaneva et al. also explore readability assessment for people with cognitive disabilities. Beigman Klebanov et al. study the challenges of varying text complexity in a read-aloud intervention program. Östling and Grigonyte use deep convolutional neural networks to measure text quality. Sheng et al. introduce the pedagogical roles of documents to study pedagogical values. Gordon et al. generate reading lists of technical text. Finally, Wolska and Clausen simplify metaphorical language for young readers.

**Dialogue:** There are two papers on dialogue, but with very different topics. In the first, Lugini and Litman predict specificity in classroom discussions. In the second, Jin et al. develop a system for interpreting questions in a virtual patient dialogue system.

**Annotation/Databases:** Loughnane et al. create a database that links learning content, linguistic annotation and open-source resources. Laarmann-Quante et al. develop a novel German learner corpus.

Finally there are two papers with content so original that they don’t fit into any of the categories above: Kochmar and Shutova investigate how semantic knowledge is acquired in English as a second language and evaluate the pace of development across a number of dimensions. Chen and Lee predict an audience’s
laughter during an oral presentation.

This year, the workshop is hosting a Shared Task on Native Language Identification\(^2\) (NLI). NLI is the process of automatically identifying the native language (L1) of a non-native speaker based solely on language that he or she produces in another language. Two previous shared tasks on NLI have been organized in which the task was to identify the native language of non-native speakers of English based on essays and spoken responses to a standardized assessment of academic English proficiency. The first shared task\(^3\) was based on the essays only and was also held with the BEA workshop in 2013. Three years later, Computational Paralinguistics Challenge\(^4\) at Interspeech 2016 hosted a sub-challenge on identifying the native language based solely on the spoken responses. This year’s shared task combines the inputs from the two previous tasks. There are three tracks: NLI on the essay only, NLI on the speech response only, and NLI using both responses from a test taker. 19 teams competed in the NLI shared task, with 17 presenting their systems during the poster session. A summary report of the shared task (Malmasi et al.) will be presented orally.

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, Turnitin | LightSide, Grammarly and Duolingo; at the Silver level, Educational Testing Service (ETS), Pacific Metrics, National Board of Medical Examiners (NBME), and iLexIR; at the Bronze level, Cognii. Their contributions help fund workshop extras, such as the dinner which is a great social and networking event, especially for students.

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/site/nlisharedtask/home
\(^3\)https://sites.google.com/site/nlisharedtask2013/home
\(^4\)http://emotion-research.net/sigs/speech-sig/is16-compare
Organizers:
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Jill Burstein, Educational Testing Services
Ekaterina Kochmar, University of Cambridge
Claudia Leacock, Grammarly
Helen Yannakoudakis, University of Cambridge

Program Committee:
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Dimitrios Alikaniotis, University of Cambridge
Øistein E. Andersen, University of Cambridge
Rafael E. Banchs, Institute for Infocomm Research
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Ronan Cummins, University of Cambridge
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Vidas Daudaravicius, VTEX Research
Markus Dickinson, Indiana University
Yo Ehara, National Institute of Advanced Industrial Science and Technology
Keelan Evanini, Educational Testing Service
Table of Contents

Question Difficulty – How to Estimate Without Norming, How to Use for Automated Grading
Ulrike Pado .......................................................................................................................... 1

Combining CNNs and Pattern Matching for Question Interpretation in a Virtual Patient Dialogue System
Lifeng Jin, Michael White, Evan Jaffe, Laura Zimmerman and Douglas Danforth ............... 11

Continuous fluency tracking and the challenges of varying text complexity
Beata Beigman Klebanov, Anastassia Loukina, John Sabatini and Tenaha O’Reilly .............. 22

Auxiliary Objectives for Neural Error Detection Models
Marek Rei and Helen Yannakoudakis .................................................................................. 33

Linked Data for Language-Learning Applications
Robyn Loughnane, Kate McCurdy, Peter Kolb and Stefan Selent ........................................ 44

Predicting Specificity in Classroom Discussion
Luca Lugini and Diane Litman ............................................................................................... 52

A Report on the 2017 Native Language Identification Shared Task
Shervin Malmasi, Keelan Evanini, Aoife Cahill, Joel Tetreault, Robert Pugh, Christopher Hamill,
Diane Napolitano and Yao Qian .......................................................................................... 62

Evaluation of Automatically Generated Pronoun Reference Questions
Arief Yudha Satria and Takenobu Tokunaga ........................................................................ 76

Predicting Audience’s Laughter During Presentations Using Convolutional Neural Network
Lei Chen and Chong Min Lee ................................................................................................. 86

Collecting fluency corrections for spoken learner English
Andrew Caines, Emma Flint and Paula Buttery ....................................................................... 91

Exploring Relationships Between Writing & Broader Outcomes With Automated Writing Evaluation
Jill Burstein, Dan McCaffrey, Beata Beigman Klebanov and Guangming Ling ...................... 101

An Investigation into the Pedagogical Features of Documents
Emily Sheng, Prem Natarajan, Jonathan Gordon and Gully Burns ....................................... 109

Combining Multiple Corpora for Readability Assessment for People with Cognitive Disabilities
Victoria Yaneva, Constantin Orasan, Richard Evans and Omid Rohanian ............................... 121

Automatic Extraction of High-Quality Example Sentences for Word Learning Using a Determinantal Point Process
Arseny Tolmachev and Sadao Kurohashi ............................................................................. 133

Distractor Generation for Chinese Fill-in-the-blank Items
Shu Jiang and John Lee ......................................................................................................... 143

An Error-Oriented Approach to Word Embedding Pre-Training
Youmna Farag, Marek Rei and Ted Briscoe ........................................................................ 149

Investigating neural architectures for short answer scoring
Brian Riordan, Andrea Horbach, Aoife Cahill, Torsten Zesch and Chong Min Lee ............. 159
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human and Automated CEFR-based Grading of Short Answers</td>
<td>Anaïs Tack, Thomas François, Sophie Roekhaut and Cédrick Fairon</td>
<td>169</td>
</tr>
<tr>
<td>GEC into the future: Where are we going and how do we get there?</td>
<td>Keisuke Sakaguchi, Courtney Napoles and Joel Tetreault</td>
<td>180</td>
</tr>
<tr>
<td>Detecting Off-topic Responses to Visual Prompts</td>
<td>Marek Rei</td>
<td>188</td>
</tr>
<tr>
<td>Combining Textual and Speech Features in the NLI Task Using State-of-the-Art Machine Learning Techniques</td>
<td>Pavel Ircing, Jan Svec, Zbynek Zajic, Barbora Hladka and Martin Holub</td>
<td>198</td>
</tr>
<tr>
<td>Native Language Identification Using a Mixture of Character and Word N-grams</td>
<td>Elham Mohammadi, Hadi Veisi and Hessam Amini</td>
<td>210</td>
</tr>
<tr>
<td>Ensemble Methods for Native Language Identification</td>
<td>Sophia Chan, Maryam Honari Jahromi, Benjamin Benetti, Aazim Lakhani and Alona Fyshe</td>
<td>217</td>
</tr>
<tr>
<td>Can string kernels pass the test of time in Native Language Identification?</td>
<td>Radu Tudor Ionescu and Marius Popescu</td>
<td>224</td>
</tr>
<tr>
<td>Neural Networks and Spelling Features for Native Language Identification</td>
<td>Johannes Bjerva, Gintare Grigonyte, Robert Östling and Barbara Plank</td>
<td>235</td>
</tr>
<tr>
<td>A study of N-gram and Embedding Representations for Native Language Identification</td>
<td>Sowmya Vajjala and Sagnik Banerjee</td>
<td>240</td>
</tr>
<tr>
<td>A Shallow Neural Network for Native Language Identification with Character N-grams</td>
<td>Yunita Sari, Muhammad Rifqi Fatchurrahman and Meisyarah Dwiastuti</td>
<td>249</td>
</tr>
<tr>
<td>Fewer features perform well at Native Language Identification task</td>
<td>Taraka Rama and Çağrı Çöltekin</td>
<td>255</td>
</tr>
<tr>
<td>Structured Generation of Technical Reading Lists</td>
<td>Jonathan Gordon, Stephen Aguilar, Emily Sheng and Gully Burns</td>
<td>261</td>
</tr>
<tr>
<td>Effects of Lexical Properties on Viewing Time per Word in Autistic and Neurotypical Readers</td>
<td>Sanja Štajner, Victoria Yaneva, Ruslan Mitkov and Simone Paolo Ponzetto</td>
<td>271</td>
</tr>
<tr>
<td>Transparent text quality assessment with convolutional neural networks</td>
<td>Robert Östling and Gintare Grigonyte</td>
<td>282</td>
</tr>
<tr>
<td>Artificial Error Generation with Machine Translation and Syntactic Patterns</td>
<td>Marek Rei, Mariano Felice, Zheng Yuan and Ted Briscoe</td>
<td>287</td>
</tr>
<tr>
<td>Modelling semantic acquisition in second language learning</td>
<td>Ekaterina Kochmar and Ekaterina Shutova</td>
<td>293</td>
</tr>
<tr>
<td>Multiple Choice Question Generation Utilizing An Ontology</td>
<td>Katherine Stasaski and Marti A. Hearst</td>
<td>303</td>
</tr>
<tr>
<td>Simplifying metaphorical language for young readers: A corpus study on news text</td>
<td>Magdalena Wolska and Yulia Clausen</td>
<td>313</td>
</tr>
</tbody>
</table>
Language Based Mapping of Science Assessment Items to Skills
Farah Nadeem and Mari Ostendorf .......................................................... 319

Connecting the Dots: Towards Human-Level Grammatical Error Correction
Shamil Chollampatt and Hwee Tou Ng.......................................................... 327

Question Generation for Language Learning: From ensuring texts are read to supporting learning
Maria Chinkina and Detmar Meurers ......................................................... 334

Systematically Adapting Machine Translation for Grammatical Error Correction
Courtney Napoles and Chris Callison-Burch .............................................. 345

Fine-grained essay scoring of a complex writing task for native speakers
Andrea Horbach, Dirk Scholten-Akoun, Yuning Ding and Torsten Zesch ........ 357

Exploring Optimal Voting in Native Language Identification
Cyril Goutte and Serge Léger ........................................................................ 367

CIC-FBK Approach to Native Language Identification
Ilia Markov, Lingzhen Chen, Carlo Strapparava and Grigori Sidorov .............. 374

The Power of Character N-grams in Native Language Identification
Artur Kulmizev, Bo Blankers, Johannes Bjerva, Malvina Nissim, Gertjan van Noord, Barbara Plank and Martijn Wieling ................................................. 382

Classifier Stacking for Native Language Identification
Wen Li and Liang Zou .................................................................................. 390

Native Language Identification on Text and Speech
Marcos Zampieri, Alina Maria Ciobanu and Liviu P. Dinu ................................ 398

Native Language Identification using Phonetic Algorithms
Charese Smiley and Sandra Kübler ............................................................. 405

A deep-learning based native-language classification by using a latent semantic analysis for the NLI Shared Task 2017
Yoo Rhee Oh, Hyung-Bae Jeon, Hwa Jeon Song, Yun-Kyung Lee, Jeon-Gue Park and Yun-Keun Lee ................................................................. 413

Fusion of Simple Models for Native Language Identification
Fabio Kepler, Ramón Astudillo and Alberto Abad ......................................... 423

Stacked Sentence-Document Classifier Approach for Improving Native Language Identification
Andrea Cimino and Felice Dell’Orletta .......................................................... 430

Using Gaze to Predict Text Readability
Ana Valeria Gonzalez-Garduño and Anders Søgaard .................................... 438

Annotating Orthographic Target Hypotheses in a German L1 Learner Corpus
Ronja Laarmann-Quante, Katrin Ortmann, Anna Ehler, Maurice Vogel and Stefanie Dipper ................................................................. 444

A Large Scale Quantitative Exploration of Modeling Strategies for Content Scoring
Nitin Madnani, Anastassia Loukina and Aoife Cahill ..................................... 457
Workshop Program

Friday, September 8, 2017

8:45–9:00  *Load Oral Presentations*

9:00–10:30  Session 1

9:00–9:15  *Opening Remarks*

9:15–9:40  *Question Difficulty – How to Estimate Without Norming, How to Use for Automated Grading*  
Ulrike Pado

9:40–10:05  *Combining CNNs and Pattern Matching for Question Interpretation in a Virtual Patient Dialogue System*  
Lifeng Jin, Michael White, Evan Jaffe, Laura Zimmerman and Douglas Danforth

10:05–10:30  *Continuous fluency tracking and the challenges of varying text complexity*  
Beata Beigman Klebanov, Anastassia Loukina, John Sabatini and Tenaha O’Reilly

10:30–11:00  Break

11:00–12:35  Session 2

11:00–11:25  *Auxiliary Objectives for Neural Error Detection Models*  
Marek Rei and Helen Yannakoudakis

11:25–11:50  *Linked Data for Language-Learning Applications*  
Robyn Loughnane, Kate McCurdy, Peter Kolb and Stefan Selent

11:50–12:10  *Predicting Specificity in Classroom Discussion*  
Luca Lugini and Diane Litman

12:10–12:35  *A Report on the 2017 Native Language Identification Shared Task*  
Shervin Malmasi, Keelan Evanini, Aoife Cahill, Joel Tetreault, Robert Pugh, Christopher Hamill, Diane Napolitano and Yao Qian

12:35–14:00  Lunch
14:00–15:30  Poster Session

14:00–14:45  Poster Session A

*Evaluation of Automatically Generated Pronoun Reference Questions*
Arief Yudha Satria and Takenobu Tokunaga

*Predicting Audience’s Laughter During Presentations Using Convolutional Neural Network*
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14:45–15:30  Poster Session B

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Stacked Sentence-Document Classifier Approach for Improving Native Language Identification
Andrea Cimino and Felice Dell’Orletta
Friday, September 8, 2017 (continued)

15:30–16:00  Break

16:00–17:30  Session 3

16:00–16:25  Using Gaze to Predict Text Readability
Ana Valeria Gonzalez-Garduño and Anders Søgaard

16:25–16:50  Annotating Orthographic Target Hypotheses in a German L1 Learner Corpus
Ronja Laarmann-Quante, Katrin Ortmann, Anna Ehlert, Maurice Vogel and Stefanie Dipper

16:50–17:15  A Large Scale Quantitative Exploration of Modeling Strategies for Content Scoring
Nitin Madnani, Anastassia Loukina and Aoife Cahill

17:15–17:30  Closing Remarks