

WMT 2018

**Third Conference on  
Machine Translation**

**Proceedings of the Conference**

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## Introduction

The Third Conference on Machine Translation (WMT 2018) took place on Wednesday, October 31 and Thursday, November 1, 2018 in Brussels, Belgium, immediately preceding the Conference on Empirical Methods in Natural Language Processing (EMNLP 2018).

This is the third time WMT has been held as a conference. The first time WMT was held as a conference was at ACL 2016 in Berlin, Germany, and the second time was at EMNLP 2017 in Copenhagen, Denmark. Prior to being a conference, WMT was held 10 times as a workshop. WMT was held for the first time at HLT-NAACL 2006 in New York City, USA. In the following years the Workshop on Statistical Machine Translation was held at ACL 2007 in Prague, Czech Republic, ACL 2008, Columbus, Ohio, USA, EACL 2009 in Athens, Greece, ACL 2010 in Uppsala, Sweden, EMNLP 2011 in Edinburgh, Scotland, NAACL 2012 in Montreal, Canada, ACL 2013 in Sofia, Bulgaria, ACL 2014 in Baltimore, USA, and EMNLP 2015 in Lisbon, Portugal.

The focus of our conference is to bring together researchers from the area of machine translation and invite selected research papers to be presented at the conference.

Prior to the conference, in addition to soliciting relevant papers for review and possible presentation, we conducted 8 shared tasks. This consisted of three translation tasks: Machine Translation of News, Biomedical Translation, and Multimodal Machine Translation, two evaluation tasks: Metrics and Quality Estimation, as well as the Automatic Post-Editing and Parallel Corpus Filtering tasks. The Parallel Corpus Filtering tasks was run at this year's edition of WMT for the first time. As almost all machine translation system require parallel corpora to train their models, the size and quality of available parallel corpora has a substantial impact on machine translation quality. At the same, sizable, high-quality parallel corpora are not available for many languages. This task addresses the important issue of how to exploit noisy parallel corpora, which are available in much larger quantities and for a larger number of languages.

The results of all shared tasks were announced at the conference, and these proceedings also include overview papers for the shared tasks, summarizing the results, as well as providing information about the data used and any procedures that were followed in conducting or scoring the tasks. In addition, there are short papers from each participating team that describe their underlying system in greater detail.

Like in previous years, we have received a far larger number of submissions than we could accept for presentation. WMT 2018 has received 84 full research paper submissions (not counting withdrawn submissions). This is a record number of research paper submissions and more than double the number of submissions of earlier editions of WMT. In total, WMT 2018 featured 27 full research paper presentations (32% acceptance rate) and 82 shared task poster presentations.

We would like to thank the members of the Program Committee for their timely reviews. We also would like to thank the participants of the shared task and all the other volunteers who helped with the evaluations.

Ondřej Bojar, Rajen Chatterjee, Christian Federmann, Yvette Graham, Barry Haddow, Matthias Huck, Antonio Jimeno Yepes, Philipp Koehn, Christof Monz, Matteo Negri, Aurélie Névéal, Mariana Neves, Matt Post, Lucia Specia, Marco Turchi, Karin Verspoor, and Mark Fishel

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# Conference Program

Wednesday, October 31, 2018

8:45–9:00 Opening Remarks

## 9:00–10:30 Session 1: Shared Tasks Overview Presentations I

9:00–9:30 *Findings of the 2018 Conference on Machine Translation (WMT18)*  
Ondřej Bojar, Christian Federmann, Mark Fishel, Yvette Graham, Barry Haddow, Philipp Koehn and Christof Monz

9:30–9:50 *Findings of the Third Shared Task on Multimodal Machine Translation*  
Loïc Barrault, Fethi Bougares, Lucia Specia, Chiraag Lala, Desmond Elliott and Stella Frank

9:50–10:10 *Findings of the WMT 2018 Biomedical Translation Shared Task: Evaluation on Medline test sets*  
Mariana Neves, Antonio Jimeno Yepes, Aurélie Névéal, Cristian Grozea, Amy Siu, Madeleine Kittner and Karin Verspoor

## Booster Session for Research Papers Presented as Posters

10:16–10:18 *Scaling Neural Machine Translation*  
Myle Ott, Sergey Edunov, David Grangier and Michael Auli

10:18–10:20 *Character-level Chinese-English Translation through ASCII Encoding*  
Nikola Nikolov, Yuhuang Hu, Mi Xue Tan and Richard H.R. Hahnloser

10:20–10:22 *Neural Machine Translation of Logographic Language Using Sub-character Level Information*  
Longtu Zhang and Mamoru Komachi

10:22–10:24 *An Analysis of Attention Mechanisms: The Case of Word Sense Disambiguation in Neural Machine Translation*  
Gongbo Tang, Rico Sennrich and Joakim Nivre

10:24–10:26 *Discourse-Related Language Contrasts in English-Croatian Human and Machine Translation*  
Margita Šoštarić, Christian Hardmeier and Sara Stymne

10:26–10:28 *Coreference and Coherence in Neural Machine Translation: A Study Using Oracle Experiments*  
Dario Stojanovski and Alexander Fraser

10:28–10:30 *A Large-Scale Test Set for the Evaluation of Context-Aware Pronoun Translation in Neural Machine Translation*  
Mathias Müller, Annette Rios, Elena Voita and Rico Sennrich

Wednesday, October 31, 2018 (continued)

10:30-11:00 Coffee Break

**11:00–12:30 Session 2: Poster Session I**

*An Empirical Study of Machine Translation for the Shared Task of WMT18*

Chao Bei, Hao Zong, Yiming Wang, Baoyong Fan, Shiqi Li and Conghu Yuan

*Robust parfda Statistical Machine Translation Results*

Ergun Biçici

*The TALP-UPC Machine Translation Systems for WMT18 News Shared Translation Task*

Noe Casas, Carlos Escolano, Marta R. Costa-jussà and José A. R. Fonollosa

*Phrase-based Unsupervised Machine Translation with Compositional Phrase Embeddings*

Maksym Del, Andre Tättar and Mark Fishel

*Alibaba's Neural Machine Translation Systems for WMT18*

Yongchao Deng, Shanbo Cheng, Jun Lu, Kai Song, Jingang Wang, Shenglan Wu, Liang Yao, Guchun Zhang, Haibo Zhang, Pei Zhang, Changfeng Zhu and Boxing Chen

*The RWTH Aachen University English-German and German-English Unsupervised Neural Machine Translation Systems for WMT 2018*

Miguel Graça, Yunsu Kim, Julian Schamper, Jiahui Geng and Hermann Ney

*Cognate-aware morphological segmentation for multilingual neural translation*

Stig-Arne Grönroos, Sami Virpioja and Mikko Kurimo

*The AFRL WMT18 Systems: Ensembling, Continuation and Combination*

Jeremy Gwinnup, Tim Anderson, Grant Erdmann and Katherine Young

*The University of Edinburgh's Submissions to the WMT18 News Translation Task*

Barry Haddow, Nikolay Bogoychev, Denis Emelin, Ulrich Germann, Roman Grundkiewicz, Kenneth Heafield, Antonio Valerio Miceli Barone and Rico Sennrich

*TencentFmRD Neural Machine Translation for WMT18*

Bojie Hu, Ambyer Han and Shen Huang

Wednesday, October 31, 2018 (continued)

*The MLLP-UPV German-English Machine Translation System for WMT18*

Javier Iranzo-Sánchez, Pau Baquero-Arnal, Gonçal V. Garcés Díaz-Munío, Adrià Martínez-Villaronga, Jorge Civera and Alfons Juan

*Microsoft's Submission to the WMT2018 News Translation Task: How I Learned to Stop Worrying and Love the Data*

Marcin Junczys-Dowmunt

*CUNI Submissions in WMT18*

Tom Kocmi, Roman Sudarikov and Ondřej Bojar

*The JHU Machine Translation Systems for WMT 2018*

Philipp Koehn, Kevin Duh and Brian Thompson

*JUCBNMT at WMT2018 News Translation Task: Character Based Neural Machine Translation of Finnish to English*

Sainik Kumar Mahata, Dipankar Das and Sivaji Bandyopadhyay

*NICT's Neural and Statistical Machine Translation Systems for the WMT18 News Translation Task*

Benjamin Marie, Rui Wang, Atsushi Fujita, Masao Utiyama and Eiichiro Sumita

*PROMT Systems for WMT 2018 Shared Translation Task*

Alexander Molchanov

*NTT's Neural Machine Translation Systems for WMT 2018*

Makoto Morishita, Jun Suzuki and Masaaki Nagata

*The Karlsruhe Institute of Technology Systems for the News Translation Task in WMT 2018*

Ngoc-Quan Pham, Jan Niehues and Alexander Waibel

*Tilde's Machine Translation Systems for WMT 2018*

Marcis Pinnis, Matiss Rikters and Rihards Krišlauks

*CUNI Transformer Neural MT System for WMT18*

Martin Popel

*The University of Helsinki submissions to the WMT18 news task*

Alessandro Raganato, Yves Scherrer, Tommi Nieminen, Arvi Hurskainen and Jörg Tiedemann

Wednesday, October 31, 2018 (continued)

*The RWTH Aachen University Supervised Machine Translation Systems for WMT 2018*

Julian Schamper, Jan Rosendahl, Parnia Bahar, Yunsu Kim, Arne Nix and Hermann Ney

*The University of Cambridge's Machine Translation Systems for WMT18*

Felix Stahlberg, Adrià de Gispert and Bill Byrne

*The LMU Munich Unsupervised Machine Translation Systems*

Dario Stojanovski, Viktor Hangya, Matthias Huck and Alexander Fraser

*Tencent Neural Machine Translation Systems for WMT18*

Mingxuan Wang, Li Gong, Wenhuan Zhu, Jun Xie and Chao Bian

*The NiuTrans Machine Translation System for WMT18*

Qiang Wang, Bei Li, Jiqiang Liu, Bojian Jiang, Zheyang Zhang, Yinqiao Li, Ye Lin, Tong Xiao and Jingbo Zhu

*The University of Maryland's Chinese-English Neural Machine Translation Systems at WMT18*

Weijia Xu and Marine Carpuat

*EvalD Reference-Less Discourse Evaluation for WMT18*

Ondřej Bojar, Jiří Mírovský, Kateřina Rysová and Magdaléna Rysová

*The WMT'18 Morpheval test suites for English-Czech, English-German, English-Finnish and Turkish-English*

Franck Burlot, Yves Scherrer, Vinit Ravishankar, Ondřej Bojar, Stig-Arne Grönroos, Maarit Koponen, Tommi Nieminen and François Yvon

*Testsuite on Czech-English Grammatical Contrasts*

Silvie Cinkova and Ondřej Bojar

*A Pronoun Test Suite Evaluation of the English-German MT Systems at WMT 2018*

Liane Guillou, Christian Hardmeier, Ekaterina Lapshinova-Koltunski and Sharid Loáiciga

*Fine-grained evaluation of German-English Machine Translation based on a Test Suite*

Vivien Macketanz, Eleftherios Avramidis, Aljoscha Burchardt and Hans Uszkoreit

*The Word Sense Disambiguation Test Suite at WMT18*

Annette Rios, Mathias Müller and Rico Sennrich

Wednesday, October 31, 2018 (continued)

*LIUM-CVC Submissions for WMT18 Multimodal Translation Task*

Ozan Caglayan, Adrien Bardet, Fethi Bougares, Loïc Barrault, Kai Wang, Marc Masana, Luis Herranz and Joost van de Weijer

*The MeMAD Submission to the WMT18 Multimodal Translation Task*

Stig-Arne Grönroos, Benoit Huet, Mikko Kurimo, Jorma Laaksonen, Bernard Merialdo, Phu Pham, Mats Sjöberg, Umut Sulubacak, Jörg Tiedemann, Raphael Troncy and Raúl Vázquez

*The AFRL-Ohio State WMT18 Multimodal System: Combining Visual with Traditional*

Jeremy Gwinnup, Joshua Sandvick, Michael Hutt, Grant Erdmann, John Duselis and James Davis

*CUNI System for the WMT18 Multimodal Translation Task*

Jindřich Helcl, Jindřich Libovický and Dusan Varis

*Sheffield Submissions for WMT18 Multimodal Translation Shared Task*

Chiraag Lala, Pranava Swaroop Madhyastha, Carolina Scarton and Lucia Specia

*Ensemble Sequence Level Training for Multimodal MT: OSU-Baidu WMT18 Multimodal Machine Translation System Report*

Renjie Zheng, Yilin Yang, Mingbo Ma and Liang Huang

*Translation of Biomedical Documents with Focus on Spanish-English*

Mirela-Stefania Duma and Wolfgang Menzel

*Ensemble of Translators with Automatic Selection of the Best Translation*

– the submission of FOKUS to the WMT 18 biomedical translation task –  
Cristian Grozea

*LMU Munich's Neural Machine Translation Systems at WMT 2018*

Matthias Huck, Dario Stojanovski, Viktor Hangya and Alexander Fraser

*Hunter NMT System for WMT18 Biomedical Translation Task: Transfer Learning in Neural Machine Translation*

Abdul Khan, Subhadarshi Panda, Jia Xu and Lampros Flokas

*UFRGS Participation on the WMT Biomedical Translation Shared Task*

Felipe Soares and Karin Becker

Wednesday, October 31, 2018 (continued)

*Neural Machine Translation with the Transformer and Multi-Source Romance Languages for the Biomedical WMT 2018 task*

Brian Tubay and Marta R. Costa-jussà

12:30–14:00 Lunch

**14:00–15:20 Session 3: Research Papers on Embedding and Context**

14:00–14:20 *Beyond Weight Tying: Learning Joint Input-Output Embeddings for Neural Machine Translation*

Nikolaos Pappas, Lesly Miculicich and James Henderson

14:20–14:40 *A neural interlingua for multilingual machine translation*

Yichao Lu, Phillip Keung, Faisal Ladhak, Vikas Bhardwaj, Shaonan Zhang and Jason Sun

14:40–15:00 *Improving Neural Language Models with Weight Norm Initialization and Regularization*

Christian Herold, Yingbo Gao and Hermann Ney

15:00–15:20 *Contextual Neural Model for Translating Bilingual Multi-Speaker Conversations*

Sameen Maruf, André F. T. Martins and Gholamreza Haffari

15:30–16:00 Coffee Break

**16:00–17:20 Session 4: Research Papers on Analysis and Data**

16:00–16:20 *Attaining the Unattainable? Reassessing Claims of Human Parity in Neural Machine Translation*

Antonio Toral, Sheila Castilho, Ke Hu and Andy Way

16:20–16:40 *Freezing Subnetworks to Analyze Domain Adaptation in Neural Machine Translation*

Brian Thompson, Huda Khayrallah, Antonios Anastasopoulos, Arya D. McCarthy, Kevin Duh, Rebecca Marvin, Paul McNamee, Jeremy Gwinnup, Tim Anderson and Philipp Koehn

16:40–17:00 *Denoising Neural Machine Translation Training with Trusted Data and Online Data Selection*

Wei Wang, Taro Watanabe, Macduff Hughes, Tetsuji Nakagawa and Ciprian Chelba

17:00–17:20 *Using Monolingual Data in Neural Machine Translation: a Systematic Study*

Franck Burlot and François Yvon

**Thursday, November 1, 2018**

**9:00–10:30 Session 5: Shared Tasks Overview Presentations I**

- 9:00–9:20 *Results of the WMT18 Metrics Shared Task: Both characters and embeddings achieve good performance*  
Qingsong Ma, Ondřej Bojar and Yvette Graham
- 9:20–9:40 *Findings of the WMT 2018 Shared Task on Quality Estimation*  
Lucia Specia, Frédéric Blain, Varvara Logacheva, Ramón Astudillo and André F. T. Martins
- 9:40–9:55 *Findings of the WMT 2018 Shared Task on Automatic Post-Editing*  
Rajen Chatterjee, Matteo Negri, Raphael Rubino and Marco Turchi
- 9:55–10:10 *Findings of the WMT 2018 Shared Task on Parallel Corpus Filtering*  
Philipp Koehn, Huda Khayrallah, Kenneth Heafield and Mikel L. Forcada

**Boaster Session for Research Papers Presented as Posters**

- 10:14–10:16 *Neural Machine Translation into Language Varieties*  
Surafel Melaku Lakew, Aliia Erofeeva and Marcello Federico
- 10:16–10:18 *Effective Parallel Corpus Mining using Bilingual Sentence Embeddings*  
Mandy Guo, Qinlan Shen, Yinfei Yang, Heming Ge, Daniel Cer, Gustavo Hernandez Abrego, Keith Stevens, Noah Constant, Yun-hsuan Sung, Brian Strope and Ray Kurzweil
- 10:18–10:20 *On The Alignment Problem In Multi-Head Attention-Based Neural Machine Translation*  
Tamer Alkhouli, Gabriel Bretschner and Hermann Ney
- 10:20–10:22 *A Call for Clarity in Reporting BLEU Scores*  
Matt Post
- 10:22–10:24 *Exploring gap filling as a cheaper alternative to reading comprehension questionnaires when evaluating machine translation for gisting*  
Mikel L. Forcada, Carolina Scarton, Lucia Specia, Barry Haddow and Alexandra Birch
- 10:24–10:26 *Simple Fusion: Return of the Language Model*  
Felix Stahlberg, James Cross and Veselin Stoyanov

**Thursday, November 1, 2018 (continued)**

10:26–10:28 *Correcting Length Bias in Neural Machine Translation*

Kenton Murray and David Chiang

10:28–10:30 *Extracting In-domain Training Corpora for Neural Machine Translation Using Data Selection Methods*

Catarina Cruz Silva, Chao-Hong Liu, Alberto Poncelas and Andy Way

10:30-11:00 Coffee Break

**11:00–12:30 Session 6: Poster Session II**

*Meteor++: Incorporating Copy Knowledge into Machine Translation Evaluation*

Yinuo Guo, Chong Ruan and Junfeng Hu

*ITER: Improving Translation Edit Rate through Optimizable Edit Costs*

Joybrata Panja and Sudip Kumar Naskar

*RUSE: Regressor Using Sentence Embeddings for Automatic Machine Translation Evaluation*

Hiroki Shimanaka, Tomoyuki Kajiwara and Mamoru Komachi

*Keep It or Not: Word Level Quality Estimation for Post-Editing*

Prasenjit Basu, Santanu Pal and Sudip Kumar Naskar

*RTM results for Predicting Translation Performance*

Ergun Biçici

*Neural Machine Translation for English-Tamil*

Himanshu Choudhary, Aditya Kumar Pathak, Rajiv Ratan Saha and Ponnurangam Kumaraguru

*The Benefit of Pseudo-Reference Translations in Quality Estimation of MT Output*

Melania Duma and Wolfgang Menzel

*Supervised and Unsupervised Minimalist Quality Estimators: Vicomtech's Participation in the WMT 2018 Quality Estimation Task*

Thierry Etchegoyhen, Eva Martínez Garcia and Andoni Azpeitia

**Thursday, November 1, 2018 (continued)**

*Contextual Encoding for Translation Quality Estimation*

Junjie Hu, Wei-Cheng Chang, Yuexin Wu and Graham Neubig

*Sheffield Submissions for the WMT18 Quality Estimation Shared Task*

Julia Ive, Carolina Scarton, Frédéric Blain and Lucia Specia

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**Thursday, November 1, 2018 (continued)**

*STACC, OOV Density and N-gram Saturation: Vicomtech's Participation in the WMT 2018 Shared Task on Parallel Corpus Filtering*

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**Thursday, November 1, 2018 (continued)**

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Rui Wang, Benjamin Marie, Masao Utiyama and Eiichiro Sumita

12:30–14:00 Lunch

**14:00–15:30 Session 3: Invited Talk**

15:30–16:00 Coffee Break

**16:00–17:20 Session 8: Research Papers on Multilingual Translation**

16:00–16:20 *Massively Parallel Cross-Lingual Learning in Low-Resource Target Language Translation*

Zhong Zhou, Matthias Sperber and Alexander Waibel

16:20–16:40 *Trivial Transfer Learning for Low-Resource Neural Machine Translation*

Tom Kocmi and Ondřej Bojar

16:40–17:00 *Input Combination Strategies for Multi-Source Transformer Decoder*

Jindřich Libovický, Jindřich Helcl and David Mareček

17:00–17:20 *Parameter Sharing Methods for Multilingual Self-Attentional Translation Models*

Devendra Sachan and Graham Neubig

**Thursday, November 1, 2018 (continued)**