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# Text, Speech, and Dialogue

24th International Conference, TSD 2021  
Olomouc, Czech Republic, September 6–9, 2021  
Proceedings

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# Preface

The annual International Conference on Text, Speech and Dialogue (TSD), which emerged in 1998, constitutes a recognized platform for presenting and discussing state-of-the-art technology and recent achievements in computer processing of natural language. It has become a broad interdisciplinary forum, interweaving the topics of speech technology and language processing. The conference attracts researchers not only from Central and Eastern Europe but also from other parts of the world. Indeed, one of its goals has always been bringing together NLP researchers with various interests from different parts of the world and promoting their mutual cooperation. One of the ambitions of the conference is, as its name suggests, not only to deal with dialogue systems but also to improve dialogue among researchers in areas of NLP, i.e., among the “text” and the “speech” and the “dialogue” people.

TSD 2021 (like the previous conference) was unfortunately substantially affected – even though the organizers did their best to reduce the unwanted impacts – by the COVID-19 pandemic. Luckily, in the late summer of 2021, the pandemic was getting under control and life was returning slowly to normal. However, organizing a conference with an expected turnout of some hundred participants was not an easy task when little was known about how the pandemic and the issued counter-pandemic and prevention measures would evolve. Therefore, the conference was prepared in the so-called “hybrid” mode: some participants actually arrived and took part at the venue while some took part remotely, using the video-conferencing software. Needless to say, such a *modus operandi* required more advanced organization procedures, planning, strategic decision-making, and logistics than usual.

We chose the beautiful ancient Moravian city of Olomouc as the TSD 2021 venue. It is a charming and peaceful historical place – once also the capital of Moravia – with the seat of the Roman Catholic Archdiocese of Olomouc and the second-oldest university in the Czech Republic (after the Charles University in Prague) established in 1573.

Therefore, the TSD 2021 conference took place on the campus of the co-organizing institution, the Faculty of Arts of Palacký University, Olomouc, during September 6–9, 2021. The conference schedule and the keynote topics were again co-ordinated with the Interspeech conference, and TSD 2021 was listed as an Interspeech 2021 satellite event. Like its predecessors, TSD 2021 highlighted the importance of language and speech processing to both the academic and scientific world including the most recent breakthroughs in current applications. Both experienced researchers and professionals, and newcomers in the field, found in the TSD conference a forum to communicate with people sharing similar interests.

This volume contains a collection of submitted papers presented at the conference. Each of them was thoroughly reviewed by three members of the conference reviewing team consisting of more than 60 top specialists in the conference topic areas. A total of 46 papers out of 101 submitted, altogether contributed by 177 authors and co-authors, were selected by the Program Committee for presentation at the conference and

publication in this book. Theoretical and more general contributions were presented in common (plenary) sessions. Problem-oriented sessions, as well as panel discussions, then brought together specialists in narrower problem areas with the aim of exchanging knowledge and skills resulting from research projects of all kinds.

Last but not least, we would like to express our gratitude to the authors for providing their papers on time, to the members of the conference reviewing team and the Program Committee for their careful reviews and paper selection, and to the editors for their hard work preparing this volume. Special thanks go to the members of both the Organizing Committee and the local organizing crew in Olomouc for their tireless effort and enthusiasm during the course of preparation of the conference.

We hope that everyone enjoyed this year's TSD and has benefitted from the event and relished the social program prepared by organizers. And you, dear reader, please, enjoy this book of proceedings.

September 2021

Kamil Ekštein  
František Pártl  
Miloslav Konopík

# Organization

The 24th International Conference on Text, Speech and Dialogue – TSD 2021 – was organized by the Department of Computer Science and Engineering and the NTIS (New Technologies for the Information Society) P2 Research Centre of the Faculty of Applied Sciences, University of West Bohemia, Plzeň (Pilsen), Czech Republic, in co-operation with the the Department of General Linguistics of the Faculty of Arts, Palacký University, Olomouc, Czech Republic, and co-organized by the Faculty of Informatics, Masaryk University, Brno, Czech Republic.

The conference website is located at <https://www.kiv.zcu.cz/tsd2021/> or <https://www.tsdconference.org/>.

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## **Keynote Speakers**

The organizers would like to thank the following respected scientists and researchers for delivering their keynote talks:

Lucie Flek	Philipps-Universität Marburg, Germany
Kate Knill	University of Cambridge, UK
Olga Vechtomova	University of Waterloo, Canada
Ivan Vulić	University of Cambridge, UK

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Jan Švec

## **Supporting Institution**

The organizers would like to express their gratitude to the following institution for its continuous support and helpful attitude to the TSD conference:

## **International Speech Communication Association**

<https://www.isca-speech.org/iscaweb/>

# About the Venue

## Olomouc, Czechia – More Than Thousand Years of History

Olomouc is a beautiful place on the Morava river with more than a thousand-year-long history. Once a capital of Moravia – one of the three historical Lands of the Bohemian Crown – nowadays it still somehow waits to be rediscovered. The world-renowned tourist guide Lonely Planet highlighted this fact by putting Olomouc onto the list of the top 10 tourist destinations not to be missed during a visit to Europe. It even claimed Olomouc is one of the most unappreciated destinations in the Czech Republic.

By its beauty, Olomouc can, however, easily compete with not only Prague but any of the other most sought-after spots around Europe. It certainly deserves our attention.

One can find the second most important urban conservation zone in the Czech Republic, surrounded by splendorous parks, an incredible concentration of ecclesiastical structures, UNESCO-protected monuments, and even an astronomical clock with a history, perhaps, more interesting than the Prague one. All together safe from the neverending bustle of large cities.

Olomouc has always been the spiritual capital of Moravia. In the Middle Ages, it was the third-largest city in the Lands of the Bohemian Crown (after Prague and Wrocław) and competed with Brno to hold the status of the Moravian administrative center. From 1642 till 1650, the city was occupied by the Swedish Empire's army led by Field Marshal Lennart Torstenson. Later on, in the half of the 18th century, Olomouc was rebuilt into a mighty stronghold, becoming an important strategic defence center and the seat of a powerful military garrison. During the following years, many barracks, training grounds, depots, and other military facilities were erected in and around the city. These were used by the army even after the stronghold was closed down in 1884, during the years of the Czechoslovak (First) Republic, and after World War II too.

From 1968 until 1991 an enormous garrison of the occupying Soviet Army was seated in Olomouc, and from 2003 until 2013 the Joint Forces Headquarters of the Czech Army resided in the city, thus making it the Czech state defence capital.

The first historically documented settlement in the present-day Olomouc area dates back to the end of the 7th century. It was the oldest fortified Slavic settlement in the Czech Republic and was located some 1.5 km (1 mile) south of the current historic center of the city. At the beginning of the 9th century, the old fortress was conquered, and a new one, the Great Moravian fortress, was erected on Peter's hillock (today, the Archbishop's Palace stands on same site).

In the 10th century, during the reign of prince Boleslav I, Olomouc became one of the military and administrative centers of the Přemyslid dynasty on the line of the trans-European trade route from Regensburg through to Kiev.

A highlight of the otherwise dull 11th century was the brave monkey business of prince Břetislav, who in 1021 kidnapped Judith, the daughter of a Bavarian margrave,

from the monastery of Schweinfurt, married her immediately, and moved to Olomouc castle to live there.

Another highlight was the founding of the bishopric of Olomouc in 1063. Centuries later, in 1777, it was raised to the rank of an archbishopric. The bishopric was moved from the church of St. Peter (after having been ruined) to the church of St. Wenceslas in 1141 under the episcopacy of bishop Jindřich Zdík. The new bishop's palace was built in the Romanesque style. The bishopric acquired large tracts of land, especially in northern Moravia, and was one of the richest in the area.

A century, Olomouc became one of the most important settlements in Moravia and a seat of the Přemyslid government and one of the appanage princes. In 1306, King Wenceslas III stopped here on his way to Poland, to fight Władysław I the Elbow-high to claim his rights to the Polish crown, and was assassinated. With his death, the whole Přemyslid dynasty, stretching back to the mythical first Czech prince Přemysl the Ploughman, died out.

The foundation of the city at the location of the original settlement is historically documented in the mid 13th century. It soon became one of the most important trade and power centers in the region. Through the Middle Ages, it was the largest city in Moravia and rivalled Brno in holding the position of the regional capital. Olomouc finally surrendered this title after the Swedish Empire's army took the city and held it for eight years (1642–1650).

In 1235, the Mongols launched an invasion of Europe. After the Battle of Legnica in Poland, the Mongols carried their raids into Moravia but were defensively defeated at the mighty stronghold of Olomouc. The upset Mongols moved south-eastwards and soon invaded and defeated Hungary.

In modern history, Olomouc participated in the Protestant Reformation. During the Thirty Years' War, it was occupied by the Swedes and they devastated it almost entirely. In the 1740s, Olomouc was held by the Prussians for a short period. The wars between the Habsburg Empress Maria Theresa and the Prussian King Frederick the Great brought Olomouc strong new fortifications, and Frederick was not successful in trying to besiege the city in 1758.

In 1746 the first learned society in the lands under the control of the Austrian Habsburgs, the *Societas eruditorum incognitorum in terris Austriacis*, was founded in Olomouc to spread Enlightenment ideas. Its monthly *Monatliche Auszüge* was the first scientific journal published in the Habsburg empire.

In the revolution year of 1848, Olomouc set the scene for the abdication of the Austro-Hungarian Emperor Ferdinand. Two years later, the Austrian and the Prussian leaders met here at the event called the Punctation of Olmütz. This conference brought them together to plan the restoration of the German Confederation and Prussia accepted leadership by the Austrians.

After the foundation of the Czechoslovak Republic (1918), the importance of the city as an administrative center dimmed slightly in favour of Brno. However, it brought more peacefulness and serenity to the locality, making it a very pleasant place to stay.

## **Abstracts of Keynotes**

# Towards User-Centric Text-to-Text Generation: A Survey

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**Abstract.** Natural Language Generation (NLG) has received much attention with rapidly developing models and ever-more available data. As a result, a growing amount of work attempts to personalize these systems for better human interaction experience. Still, diverse sets of research across multiple dimensions and numerous levels of depth exist and are scattered across various communities. In this work, we survey the ongoing research efforts and introduce a categorization of these under the umbrella user-centric natural language generation. We further discuss some of the challenges and opportunities in NLG personalization.

**Keywords:** User modeling • Personalization • NLG

# Wasserstein Autoencoders with Mixture of Gaussian Priors for Stylized Text Generation

Amirpasha Ghabussi<sup>1</sup>, Lili Mou<sup>2</sup>, and Olga Vechtomova<sup>1</sup>

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**Abstract.** Probabilistic autoencoders are effective for text generation. However, they are unable to control the style of generated text, despite the training samples explicitly labeled with different styles. We present a Wasserstein autoencoder with a Gaussian mixture prior for style-aware sentence generation. Our model is trained on a multi-class dataset and generates sentences in the style of the desired class. It is also capable of interpolating multiple classes. Moreover, we can train our model on relatively small datasets. While a regular WAE or VAE cannot generate diverse sentences with few training samples, our approach generates diverse sentences and preserves the style of the desired classes.

**Keywords:** Wasserstein autoencoder • Stylized text generation • Natural language processing

# Use of Deep Learning in Free Speaking Non-native English Assessment

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**Abstract.** More than 1.5 billion people worldwide use English as an additional language which has created a large demand for teaching and assessment. To help meet this need automatic assessment systems can provide support, and an alternative, to human examiners. The ability to provide remote assessment has become even more important with the COVID-19 pandemic. Learners and teachers can benefit from online systems available 24/7 to monitor their progress whenever and wherever the learners like. Free speaking tests where open responses are given to prompted questions allow a learner to demonstrate their proficiency at speaking English. This presents a number of challenges with their spontaneous speech not known in advance. An auto-marker must be able to accurately assess this free speech independent of the speaker's first language (L1) and the audio recording quality which can vary considerably. This talk will look at how deep learning can be applied to help solve free speaking spoken non-native English assessment.



# Cross-Lingual Knowledge Transfer and Adaptation in Low-Data Regimes: Achievements, Trends, and Challenges

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**Abstract.** A key challenge in cross-lingual NLP is developing general language-independent architectures that will be equally applicable to any language. However, this ambition is hindered by the large variation in 1) structural and semantic properties of the world's languages, as well as 2) raw and task data scarcity for many different languages, tasks, and domains. As a consequence, existing language technology is still largely limited to a handful of resource-rich languages. In this talk, we introduce and discuss a range of recent techniques and breakthroughs that aim to deal with such large cross-language variations and low-data regimes efficiently. We cover a range of cutting-edge approaches including adapter-based models for cross-lingual transfer, contextual parameter generation and hypernetworks, learning in few-shot and zero-shot scenarios, and typologically driven learning and source selection. Finally, this talk demonstrates that low-resource languages, despite very positive research trends and results achieved in recent years, still lag behind major languages, and outline several key challenges for future research in this area.

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