# Second Experiment

- December 2020
- Online (via Zoom)
- 3 Pianists, 1 Opera singer
  - All finished or near finished conservatory/university music performance degrees
  - Two pianists have doctoral degrees in Music Psychology, the other is an advanced conservatory student
  - The singer has an undergraduate Opera performance degree, and completed 70% of an undergraduate piano performance degree



# Results

- Number of piles
  - Group 1 (G1): 25 piles
  - Group 2 (G2): 19 piles
- Average maximal overlap (Szymkiewicz-Simpson coefficient):
  - 62 % piles G1 with piles G2
  - 65% piles G2 with piles G1
- Multidimensional Scaling (MDS) to explore the structure of the terms



# Sorting Musical Expression: Characterization of Descriptions of Expressive Piano Performances

Carlos Cancino-Chacón<sup>1,4</sup>, Silvan Peter<sup>1</sup>, Shreyan Chowdhury<sup>1</sup>, Anna Aljanaki<sup>2</sup> and Gerhard Widmer<sup>1,3</sup>

Institute of Computational Perception, Johannes Kepler University Linz, Austria <sup>2</sup>Institute of Computer Science, University of Tartu, Estonia <sup>2</sup>LIT AI Lab, Linz Institute of Technology, Linz, Austria















# The Con Espressione Game

Research Aims: Find the dimensions of musical expression that can be attributed to a performance, as perceived and described in natural language by listeners

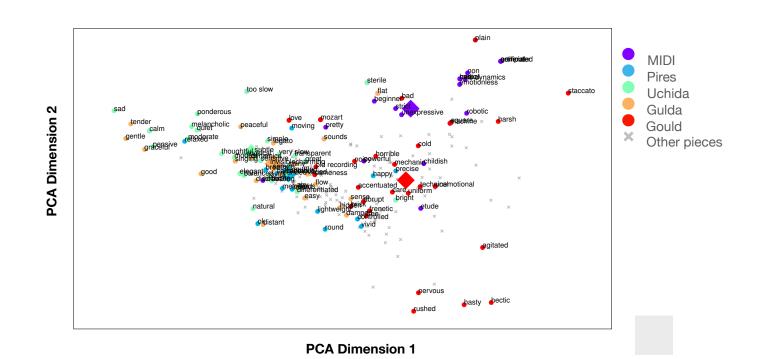
- · Web based questionnaire: verbal descriptors of expressive performance.
- Different performances of 9 classical piano pieces (45 performances)
- Dataset enriched with score-to-performance alignments

Composer	Piece	#	Pianists
Bach	Prelude No.1 in C, BWV 846 (WTC I)	7	Gieseking, Gould, Grimaud, Kempff, Richter, Stadtfeld, MIDI
Mozart	Piano Sonata K.545 C major, 2nd mvt.	5	Gould, Gulda, Pires, Uchida, MIDI deadpan
Beethoven	Piano Sonata Op.27 No.2 C# minor, 1st mvt.	6	Casadesus, Lazić, Lim, Gulda, Schiff, Schirmer
Schumann	Arabeske Op.18 C major (excerpt 1)	4	Rubinstein, Schiff, Vorraber, Horowitz
Schumann	Arabeske Op.18 C major (excerpt 2)	4	Rubinstein, Schiff, Vorraber, Horowitz
Schumann	Kreisleriana Op.16; 3. Sehr aufgeregt (ex 1)	5	Argerich, Brendel, Horowitz, Vogt, Vorraber
Schumann	Kreisleriana Op.16; 3. Sehr aufgeregt (ex 2)	5	Argerich, Brendel, Horowitz, Vogt, Vorraber
Liszt	Bagatelle sans tonalité, S.216a	4	Bavouzet, Brendel, Katsaris, Gardon
Brahms	4 Klavierstücke Op.119, 2. Intermezzo E minor	5	Angelich, Ax, Serkin, Kempff, Vogt

# What are the main dimensions for expressive character?

Principal component analysis (PCA) on the occurrence matrix of the terms and find 4 principal dimensions

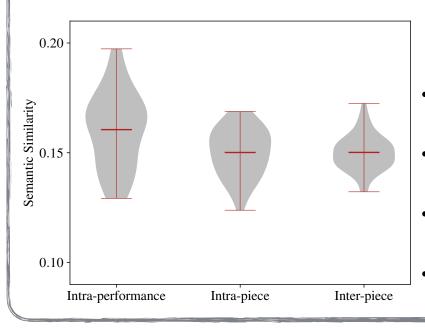
	Dimer	nsion 1		Dimension 2				
positive correlation		negative correlation		positive correlation		negative correlation		
hectic	0.17	sad	-0.20	rushed	0.22	hard	-0.19	
staccato	0.15	gentle	-0.18	nervous	0.20	stumbling	-0.18	
hasty	0.15	tender	-0.18	too fast	0.17	staccato	-0.17	
agitated	0.14	calm	-0.16	bit	0.16	ponderous	-0.14	
irregular	0.14	graceful	-0.16	hasty	0.15	monotonous	-0.13	
	Dime	nsion 3		Dimension 4				
positive com	relation	negative correlation		positive correlation		negative correlation		
monotonous	0.22	heavy	-0.14	ok	0.24	cold	-0.15	
bad	0.17	graceful	-0.13	happy	0.21	warm	-0.14	
warm	0.16	smooth	-0.12	joyful	0.19	floating	-0.14	
peaceful	0.16	ponderous	-0.12	free	0.15	blurred	-0.14	
beautiful	0.15	soaring	-0.10	breathy	0.14	mysterious	-0.13	



# How similarly do listeners describe the performance of a piece?

### **Distribution of Terms**

- 94 participants (on average listened to 4.5 out of 9 pieces)
- 88% had some musical training
- 1,515 individual descriptions, 3,166 terms (45% unique)





### **Semantic Similarity**

- Semantic similarity for short sentences by [Li et al., 2007]
- Intra-performance: same piece, same pianist
- Intra-piece: same piece, other pianists
- inter-piece: other pieces

# **Pile Sorting Experiment**

#### **Participants**

- Two groups of expert musicians (G1 and G2)
- Each group sorted (independently) 150 of the most frequently used terms that had been collected through the CEG.
- The number of piles as well as the types of similarity within the piles were left open.

## **Explore the** interactive visualization!

#### Results

- G1 (25 piles), G2 (19 piles)
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## **Get the Dataset!**



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