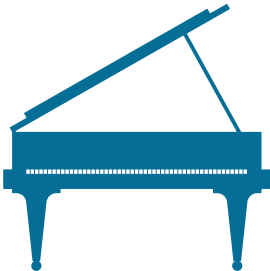




**JOHANNES KEPLER
UNIVERSITY LINZ**





thin

serene

tender
soft

marcato
accentuated
frenetic

wistful
sad
searching

deep
vast
intense

marching

loud
aggressive
harsh
metallic

abrupt
chopped
stuttering
uneven
idiosyncratic

rubato
differentiated

fantastic

monotonous
sterile
controlled
restrained
strict

childlike

free

breathing

dancing



musical, expressive, lyrical, melodic, beautiful, moving, evocative, stirring, powerful, dramatic, emotional, poignant, touching, inspiring, uplifting, heartwarming, soulful, timeless, classic, elegant, sophisticated, refined, polished, professional, polished, professional, polished, professional

sad
tense
nervous

thin
fragile
shy

mysterious
deep
dark

elegant
noble

wistful
searching
nostalgic

delicate
tender
soft
gentle
dreamy

vast
full
round
intense

deliberate
thoughtful
story-telling
professional
careful

cold
sterile
dry

marcato
accentuated
frenetic
dramatic
emphatic

loud
heavy
ponderous
aggressive
harsh
metallic

abrupt
chopped
stuttering
uneven
bumpy
clumsy
sloppy
fuzzy
idiosyncratic

hasty
galloping
etude-like
hectic
pushing forward
chaotic

mechanical
simple
unchanging dynamics
conservative
straightforward
distant
strict
restrained
controlled
monotonous
marching

snopolew
complex
colorful
expressive
differentiated
rubato

determined

passionate
emotional
impetuous

fantastic
mesmerizing
authentic

floating
serene
peaceful
weightless
childlike
innocent

free
breathing
oscillating
dancing
lively
flowing

happy
joyful

ironic
fake

scj

agitated
frenzied
nervous

slow
elegant
robust

slender
fragile
calm

marcato
accentuated
staccato

intense
frenetic
tragic
dramatic

emphatic
dark
solemn

loud
heavy
aggressive
bright
harsh
sharp
metallic
clanking

conservative
distant
holding back
restrained

idiosyncratic
uneven
unpredictable
unrhythmic
lumpy
chopped
stuttering
jabber
bumpy

amateur
clumsy
sloppy
fuzzy
dirty
too much pedal
reverberant
blurry

fantastic
mesmerizing
authentic

shallow
fake
inappropriate
ironic

canard
full
warm
legato
melodious

mysterious
wistful
searching

deliberate
cerebral
thoughtful
pensive
ponderous
story-telling
professional
careful
deep

delicate
tender
soft
gentle
dreamy
mellow

fast

static
technical
mechanical
strict
uniform
controlled
mechanical
marching
etude-like
uninspired
dull
bland
boring
unchanging dynamics

rubato
differentiated
expressive
colorful
complex

determined
eager
bold

romantic
nostalgic
kitschy
energetic
impetuous
emotional
passionate
lively

dancing
serene
soaring
weightless
oscillating
breathing
airy
light
flowing
floating
peaceful

straightforward
simple
easy
free

childlike
playful
joyful
happy
innocent

impatient
clear
clean
dry
sterile
cold
nasty
galloping
hectic
erratic
fast
pushing forward
chaotic
brisk
rushed

authentic
innocent
childlike
playful
joyful

dancing
serene
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oscillating
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airy
light
flowing
floating
peaceful

free
easy
straight
forward

impatient
nasty
gloating
bristling
sneaky
eager
crisp
chaotic
pushing
hard

stereotypical
mean
dry
shallow

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nostalgic

lecherous
brunch
silly
karmic

expressive
colorful
complex
different
subtle

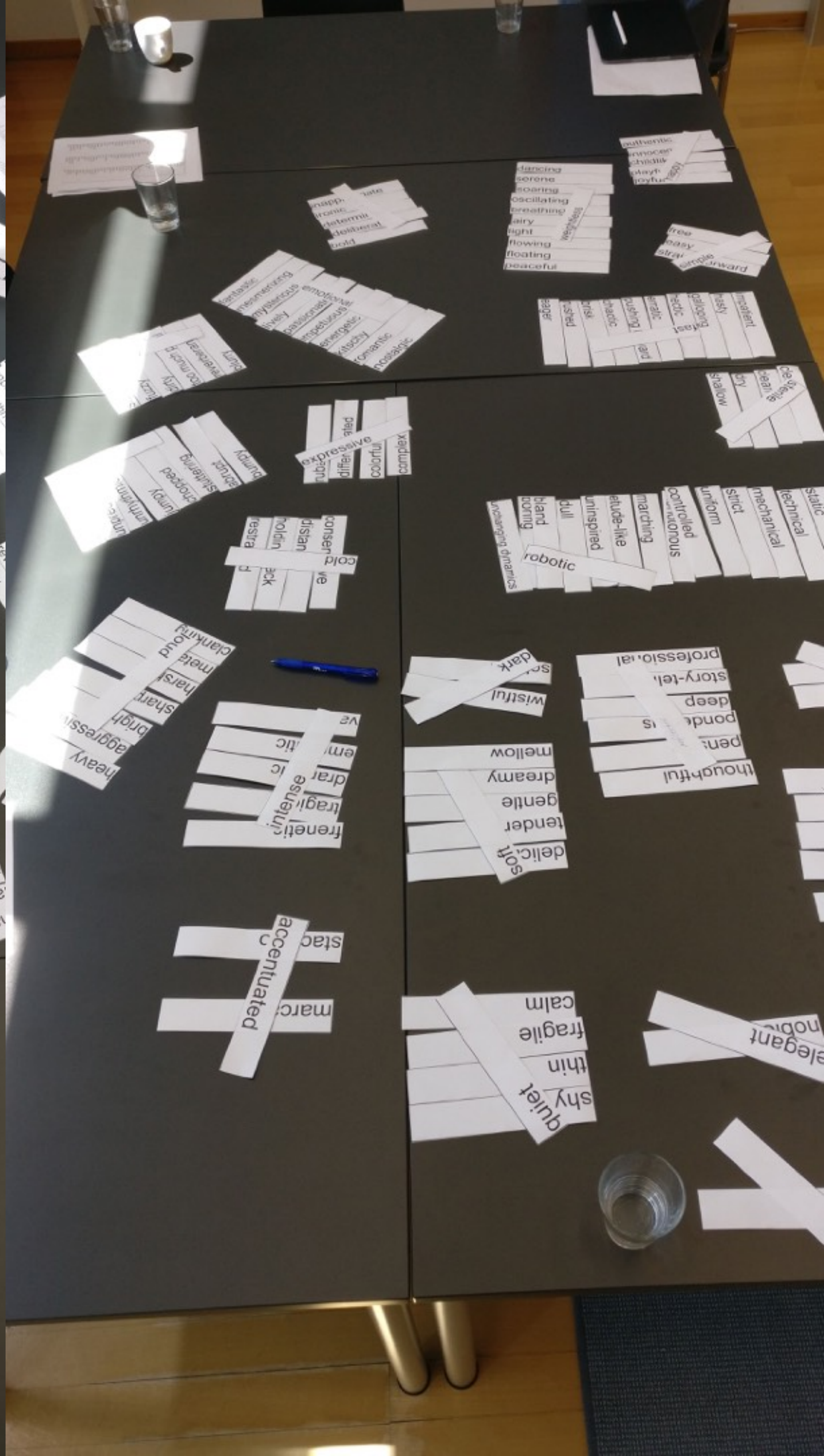
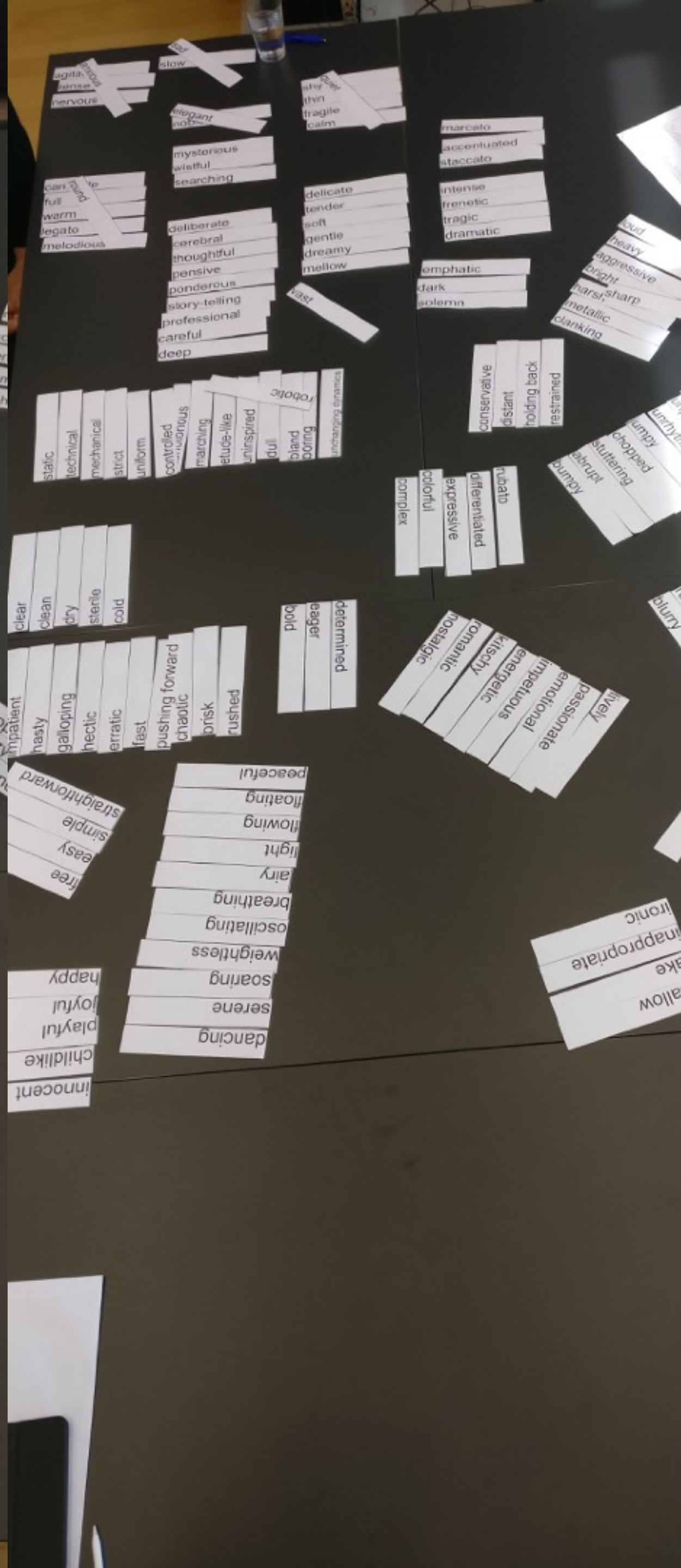
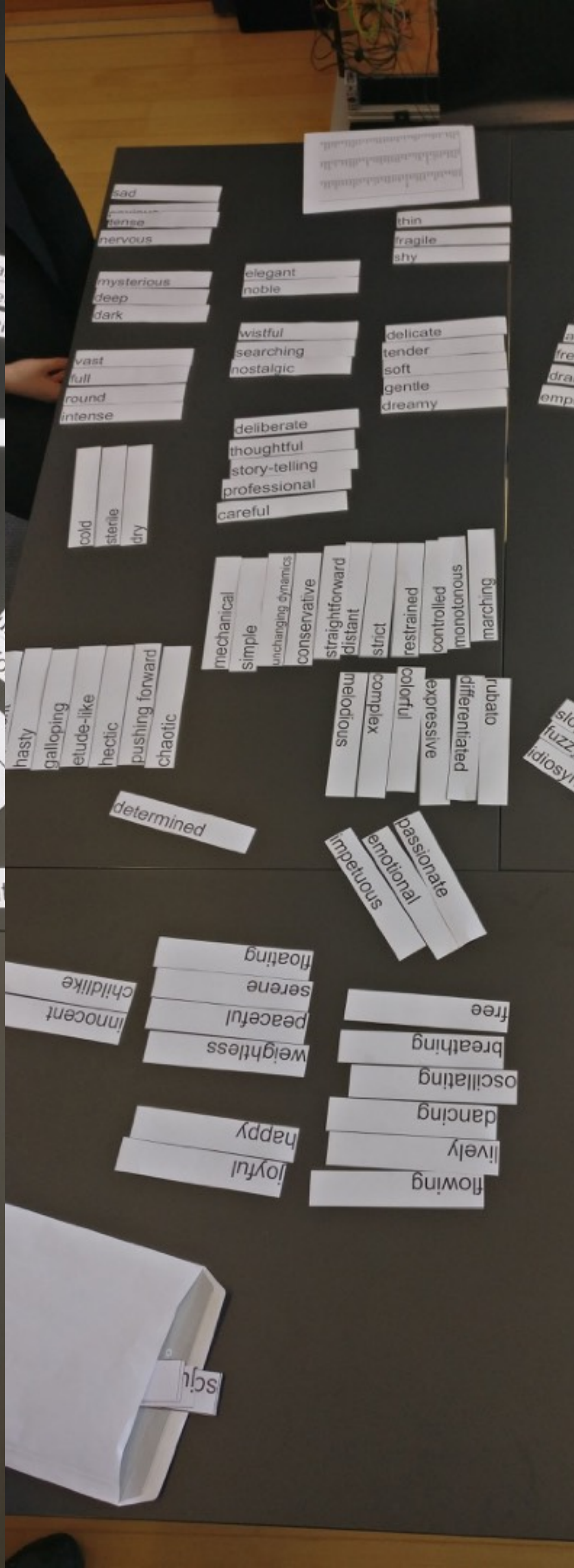
blatant
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dramatic
emotional
ve

staccato
accentuated
march



Sorting Musical Expression: Characterization of Descriptions of Expressive Piano Performances

Carlos Cancino-Chacón^{1,4}, Silvan Peter¹, Shreyan Chowdhury¹, Anna Aljanaki² and Gerhard Widmer^{1,3}

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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

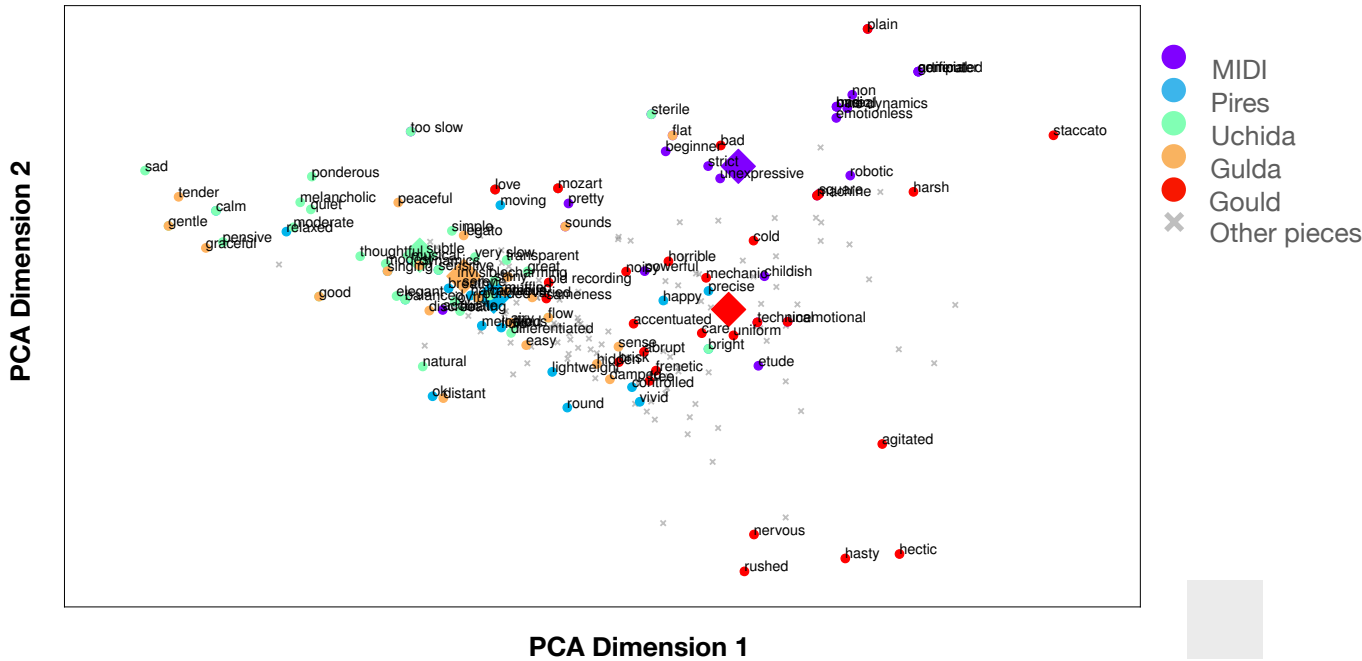
Composer	Piece	#	Pianists
Bach	Prelude No.1 in C, BWV 846 (WTC I)	7	Giesecking, Gould, Grimaud, Kempff, Richter, Stadtfeld, MIDI
Mozart	Piano Sonata K.545 C major, 2nd mvt.	5	Gould, Gulda, Pires, Uchida, MIDI deadpan
Beethoven	Piano Sonata Op.27 No.2 C# minor, 1st mvt.	6	Casadesus, Lazić, Lim, Gulda, 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

Dimension 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

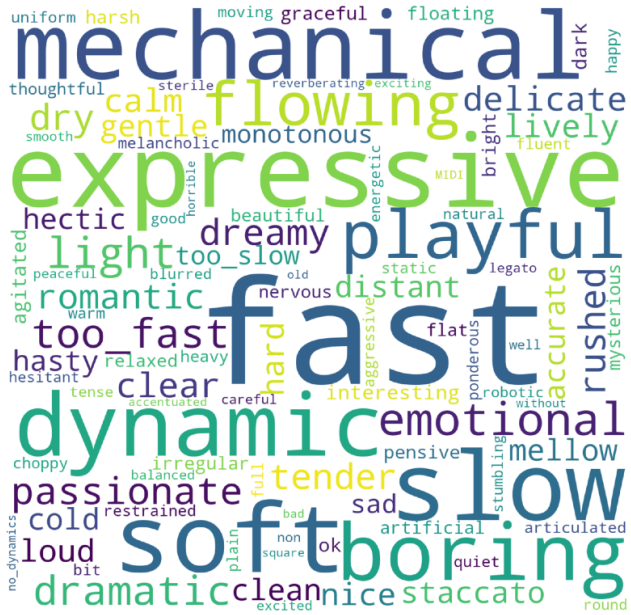
Dimension 3				Dimension 4			
positive correlation		negative correlation		positive correlation		negative correlation	
monotonous	0.22	heavy	-0.14	ok	0.24	cold	-0.15
bad	0.17	graceful	-0.13	happy	0.21	warm	-0.14
warm	0.16	smooth	-0.12	joyful	0.19	floating	-0.14
peaceful	0.16	ponderous	-0.12	free	0.15	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?

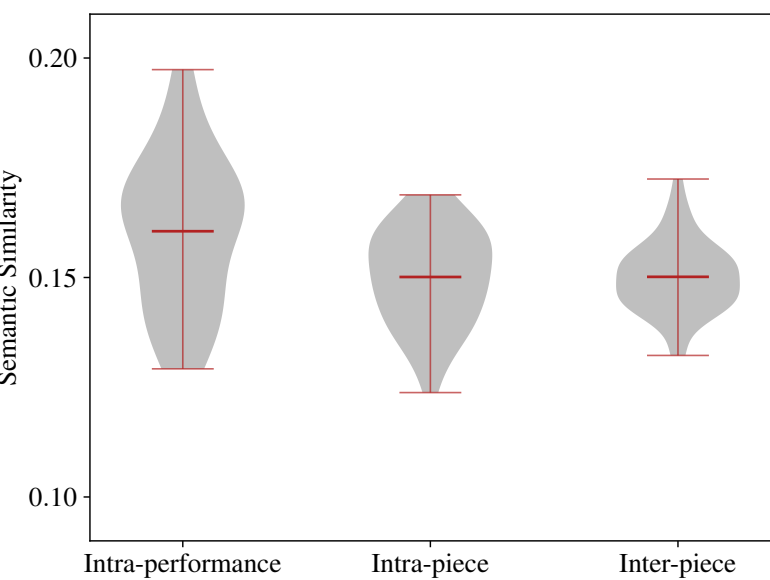
Distribution of Terms

- 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

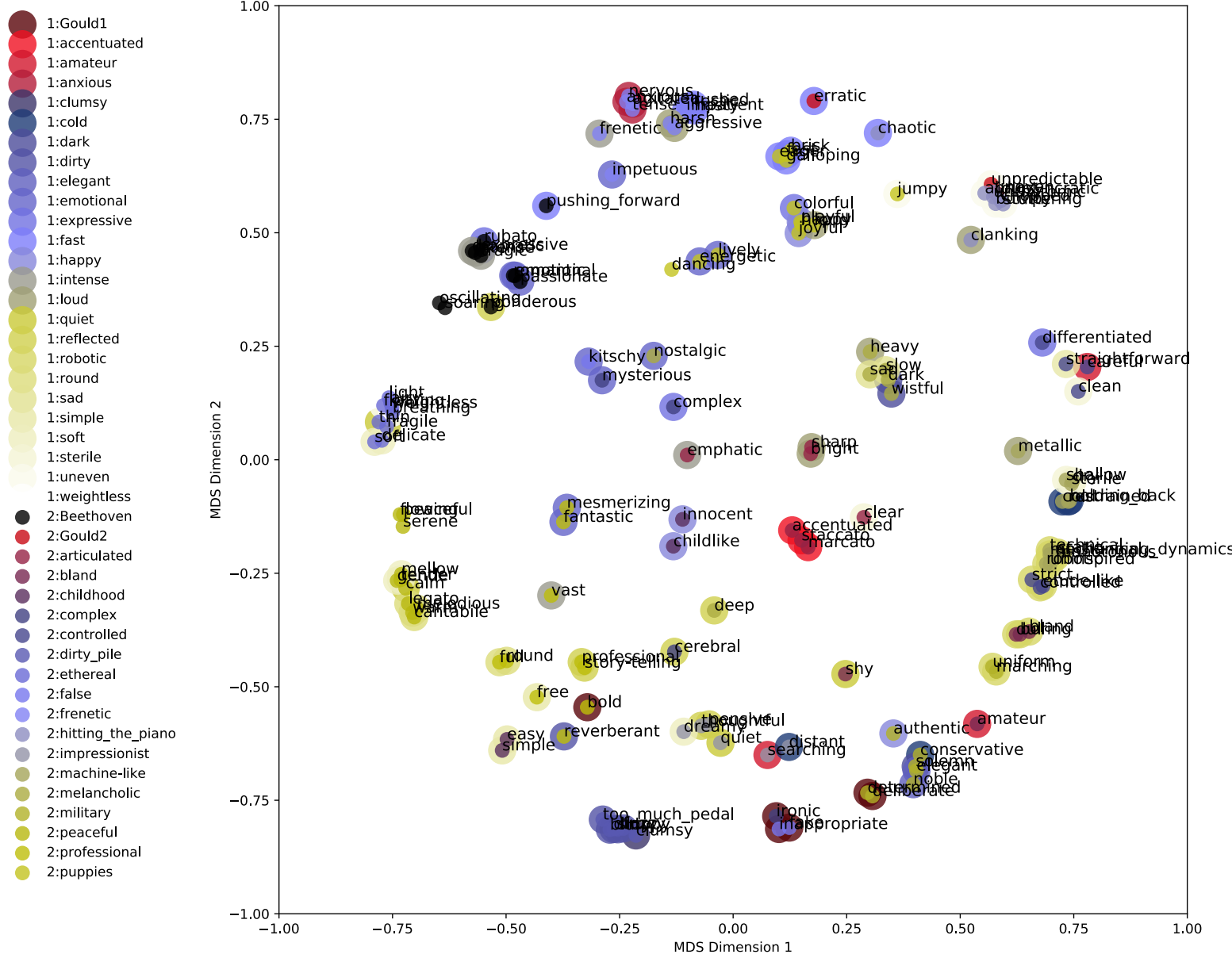
- Two groups of expert musicians (G1 and G2)
- Each group sorted (independently) 150 of the most frequently used terms that had been collected through the CEG.
- The number of piles as well as the types of similarity within the piles were left open.



Explore the interactive visualization!

Results

- G1 (25 piles), G2 (19 piles)
- 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



Get the Dataset!



Acknowledgements

This research has received support from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme under grant agreement No. 670035 (project "Con Espressione") and by the Research Council of Norway through its Centers of Excellence scheme, project number 262762 and the MIRAGE project, grant number 287152.



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

