

# Auto-completion for classical music motives

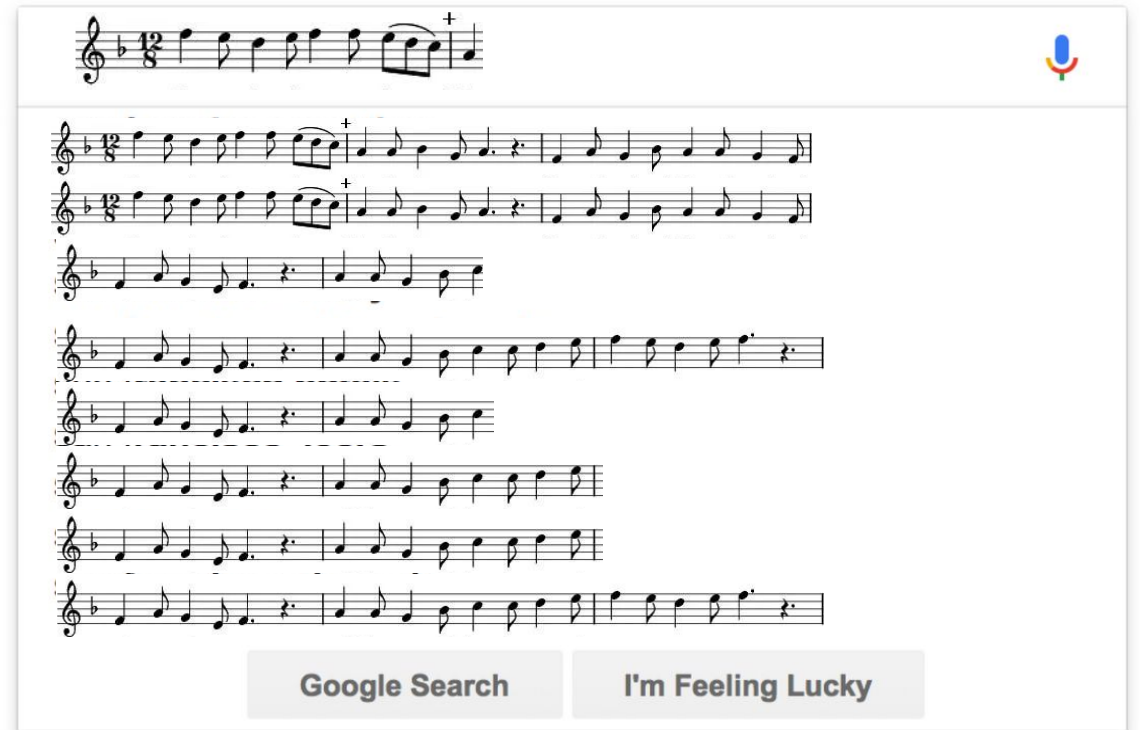
Artur Dobija, Björn Keyser | room 04.28



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# Introduction



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# Research question

*Does an auto-completion system  
for classical music motives  
educate users  
on classical piano sonata repertoire?*

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# Auto-completion

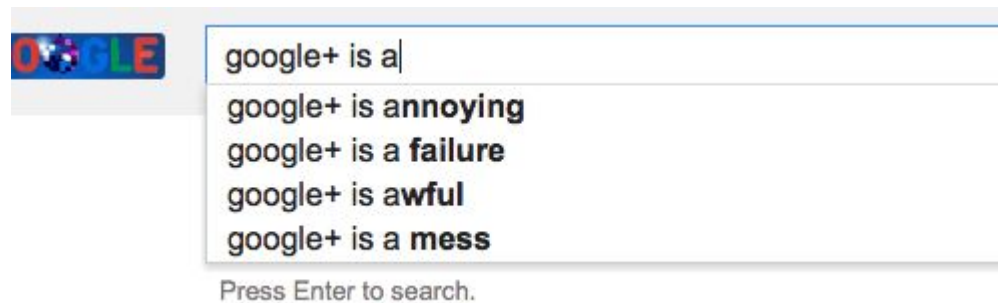
**Intuitive definition** (Wikipedia):

a feature in which an application predicts the rest of a word a user is typing.

**Formal definition** [Gog & all. 2020]:

given a collection **S** of scored strings  
and a partially-completed user query **Q**

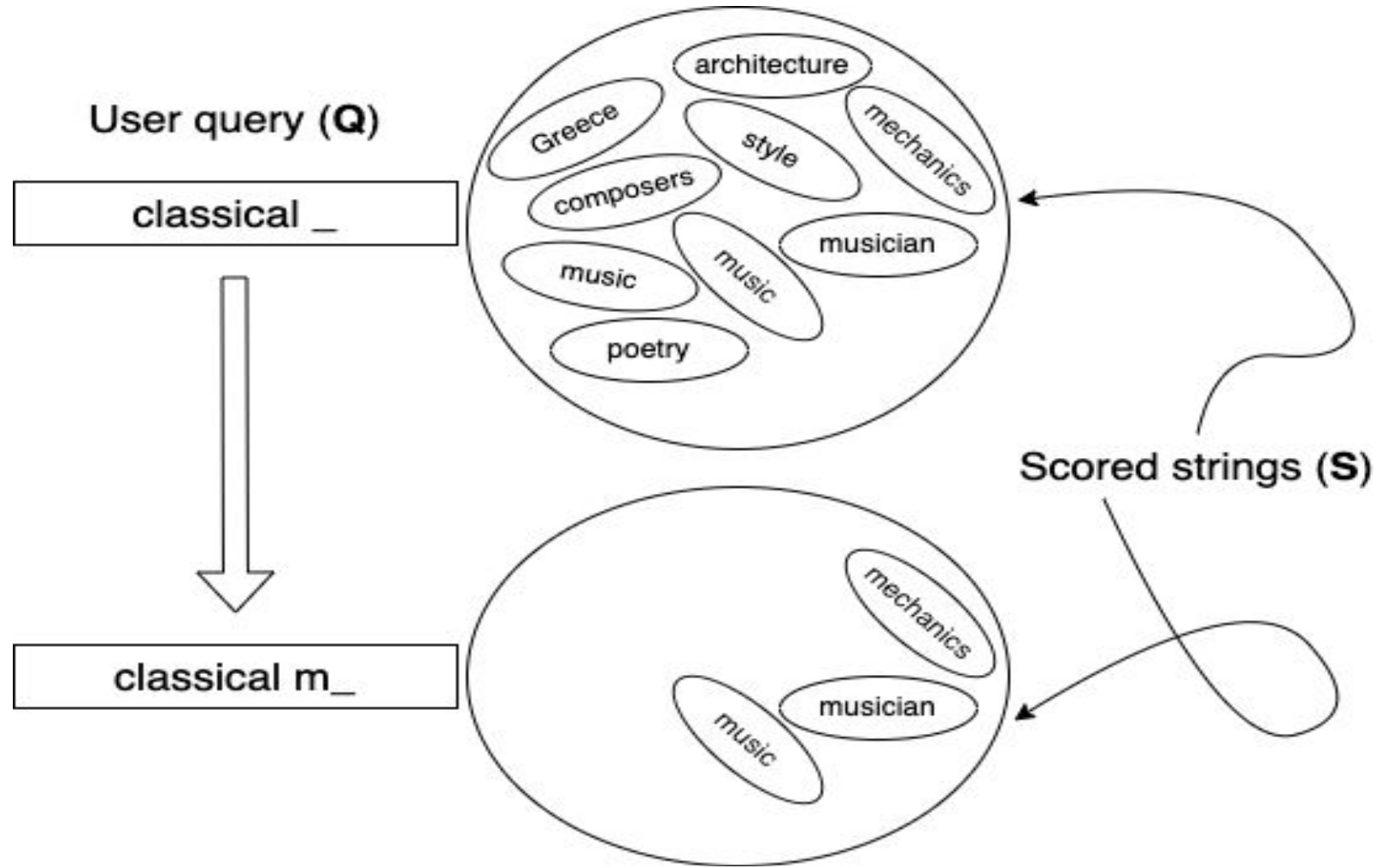
find the top-k scored completions that match **Q** in **S**.



+



# Auto-completion



# Musical motive

## Intuitive definition:

the characteristic, small and meaningful part of the melody different.

## Formal definition [Caplin, 2013]:

a collection of several notes constituting the smallest meaningful melodic or rhythmic configuration.



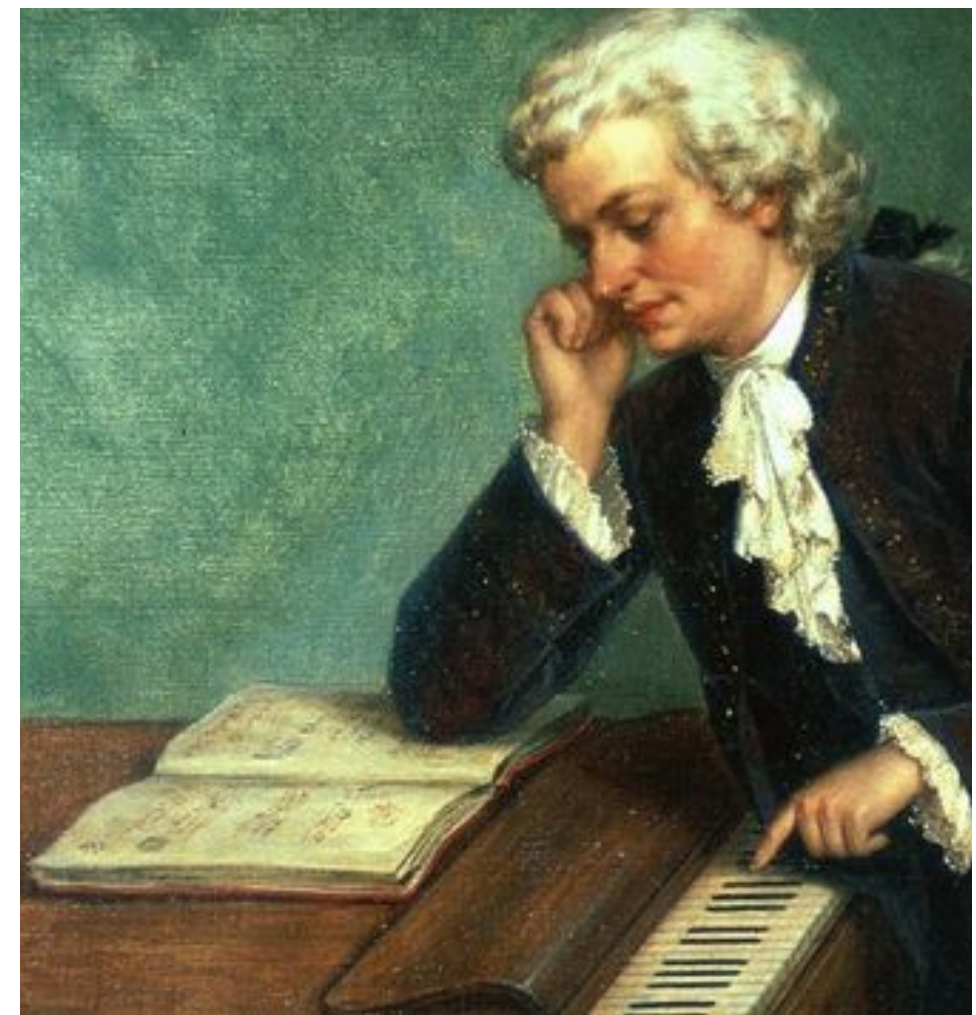
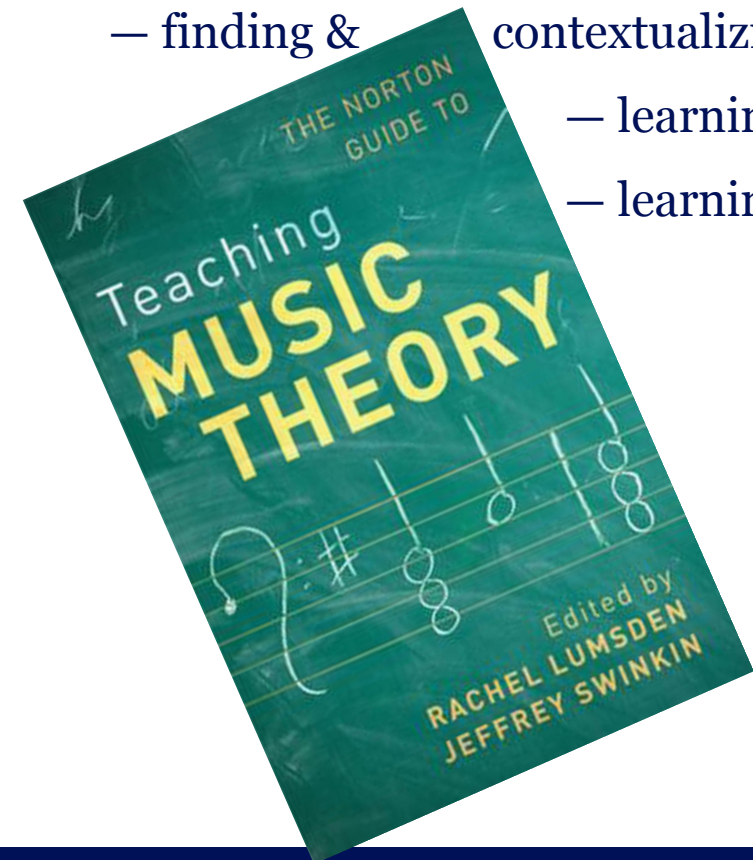
Rudolf Réti's analysis of Beethoven, String Quartet, op. 135, mvt I, mm. 1-17



# Education

## Quests for :

- interactive tools for music theory ... *which are there but ...*
- independent and individual exploration
- finding & contextualizing musical patterns
- learning from practice
- learning close to music



# Classical piano sonata repertoire

## Why?

- well studied repertoire
- many famous tunes
  - KV 545 C-major “Facile”
  - KV 331 A-major with Variations)
- many textbooks examples
  - KV 333 B-flat major
- encoded ... to ... hu m d r u m

48

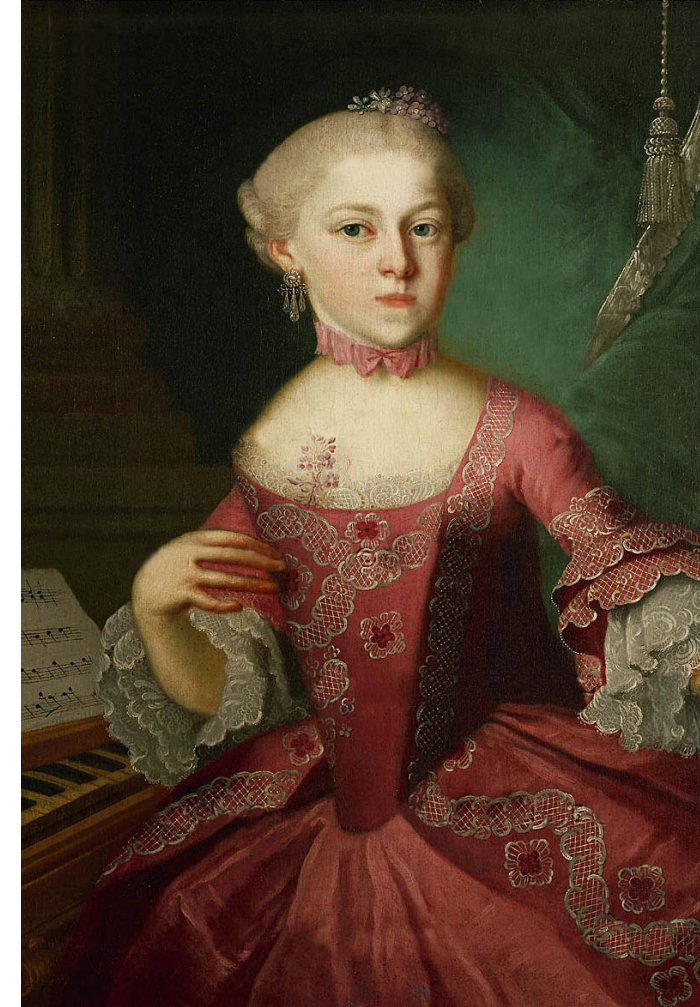
13. Sonate in B  
KV 333 (315<sup>91</sup>)

Allegro

Entstanden in Linz, Ende 1783<sup>92</sup>

<sup>91</sup> Zu den unterschiedlichen Lesarten im Autograph und im Erstdruck (Torricella, Wien 1784) sowie zur Dynamik im ersten Satz vgl. Vorwort.  
<sup>92</sup> Zur Neudatierung vgl. Vorwort.

© 1986 by Bärenreiter-Verlag, Kassel



Maria Anna “Nannerl” Mozart, sister of Wolfgang Amadeus

# Product Plan



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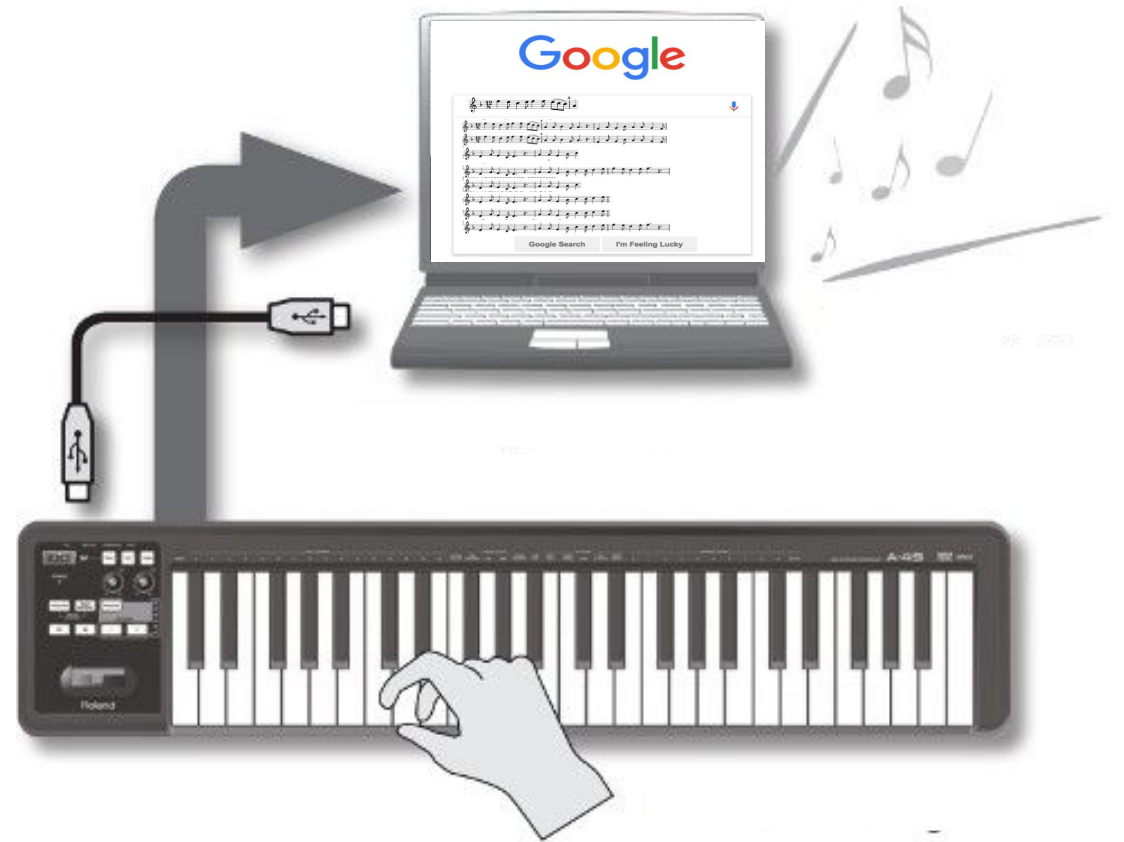


# Idea

User queries a **database** of musical scores using MIDI **keyboard**.

The result of the query **displays** on the screen.

...proposed examples may be played out



# Humdrum

## 1. Repository

- databases of scores
- \*\*kern file format
- designed to capture “semantics” of the score notation

## 2. Toolkit

- database query and manipulation
- command-line tools
- designed for statistical analysis

## 3. Verovio Humdrum Viewer

- Verovio browser plugin
- score displayer

VerovioHumdrumViewer Scarlatti, Sonata in C minor, L.10, K.84 ▶

The screenshot displays the Verovio Humdrum Viewer interface. On the left, a list of Humdrum file format tokens is shown, including metadata (COM, CDT, OTL, SCT, OMD), staff definitions, and musical notation. On the right, the corresponding musical score is displayed, featuring a piano (p) and forte (f) dynamic marking, a tempo marking of Allegro (♩ = 152), and a key signature of three flats (B-flat, E-flat, A-flat). The score is presented in a grand staff format, with the piano part in the upper staves and the bass part in the lower staves. The score is labeled L.10 (K.84).

1 !!!COM: Scarlatti, Domenico  
2 !!!CDT: 1685-1757  
3 !!!OTL: Sonata in C minor  
4 !!!SCT: K. 84  
5 !!!SCT: L. 10  
6 !!!OMD: Allegro ([quarter note] = 152)  
7 \*\*kern \*\*kern \*\*kern  
8 \*staff2 \*staff1 \*staff3  
9 \*Icamba \*Icamba \*Icamba  
10 \*I"L.10 (K.84) \*I  
11 \*>[A,A1,A,A2,B,B1,B,B2]  
12 \*>norep[A,A2,B,B2] \*>  
13 \*>A \*>A \*>  
14 \*clefF4 \*clefG2 \*  
15 \*k[b-e-a-] \*k[b-e-a-] \*  
16 \*M3/4 \*M3/4 \*  
17 \*MM152 \*MM152 \*  
18 =1- =1- =1-  
19 4CC 4C| 8r f  
20 . 8c'L .  
21 4r 8e-' .  
22 . 8g' .  
23 4r 8cc' .  
24 . 8ee-'J .  
25 =2 =2 =2  
26 2.r (8gg^L .

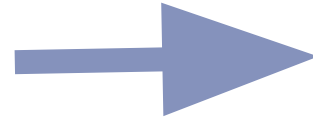
Allegro (♩ = 152)  
L.10 (K.84)  
f  
p



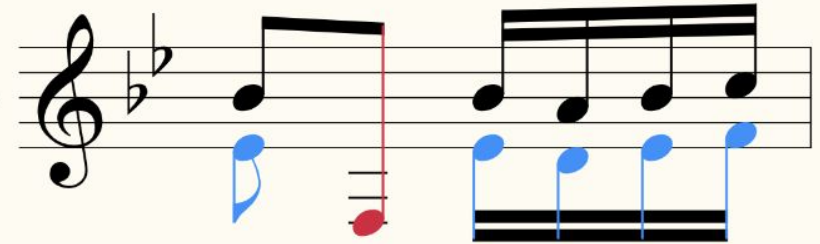
# Humdrum

\*\*kern

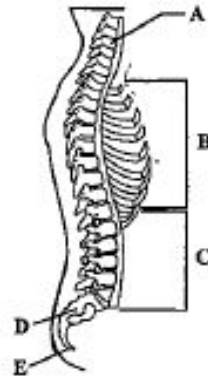
```
1  **kern
2  *staff2
3  *I"Viola d'amore
4  *k[b-e-]
5  *^
6  8b-L      8gZ
7  8GJV      8ryy
8  16b-L     16gLZ
9  16a       16f#Z
10 16b-      16gZ
11 16ccJ     16aJZ
12 *v       *v
13 *
14 =
15 *-
```



Viola d'amore



correl !



# MIDI keyboard

Akai MPK mini mk3



# MIDI keyboard (for now?)

Akai MPK mini mk3

Pressure-sensitive  
pads

“Endless”  
encoders

Joystick



Velocity-sensitive  
Mini Keybed

# MIDI keyboard (...issues)

Akai MPK mini mk3

Pressure-sensitive  
pads

Keyboard behaviour controller

“Endless”  
encoders

Joystick

Arpeggiator  
section

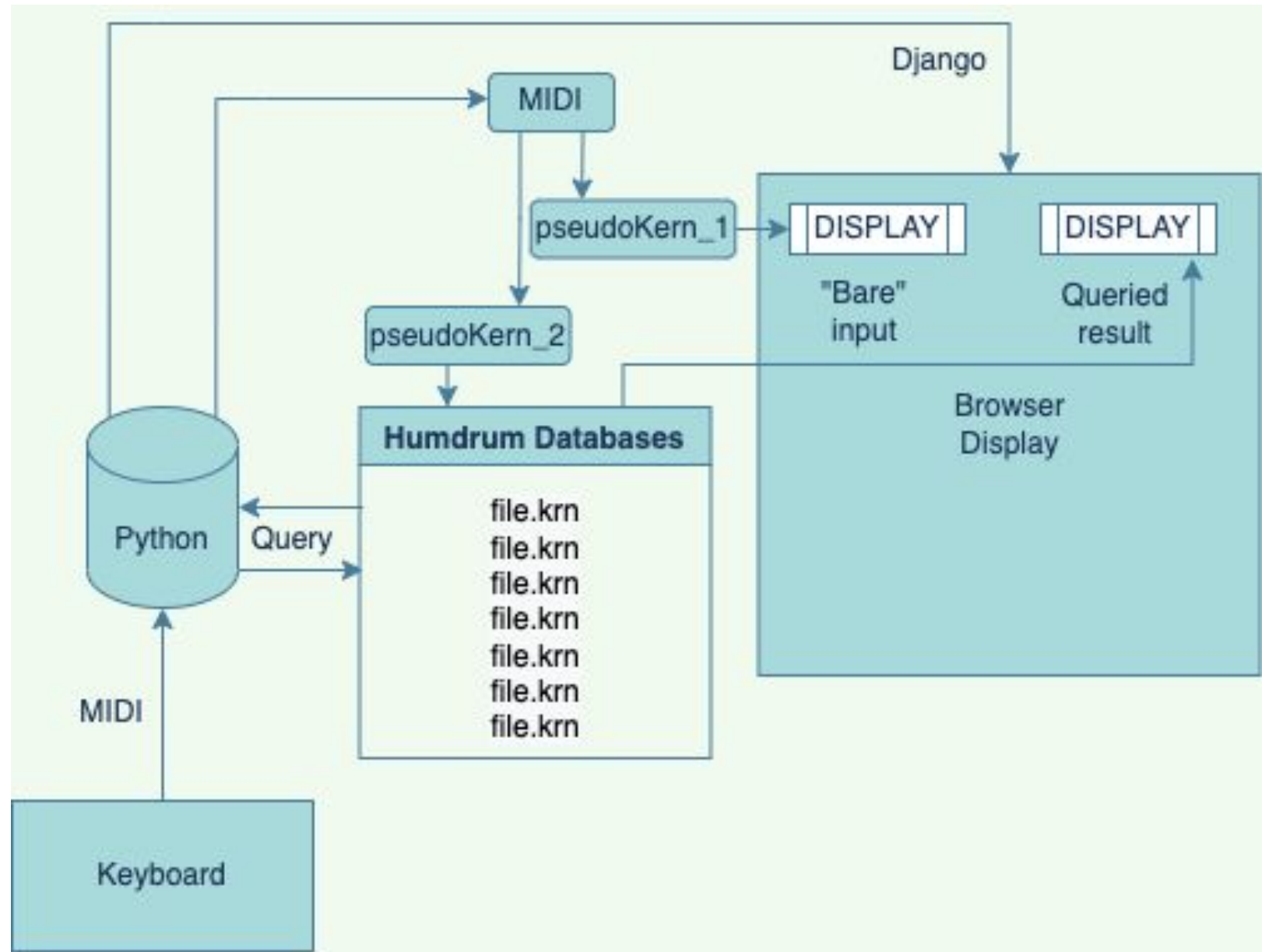


Velocity-sensitive  
Mini Keybed

# Backend

## Key components:

- Hardware controller (keyboard)
- Humdrum Database/Toolkit
- Verovio browser plugin (display)
- Python & Bash scripts



# User Analysis



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# User Analysis

## Persona:

Eva is a doctor of medical sciences. When she was a child, her father encouraged her to take piano lessons. Due to the school and other additional exercises, she attended those lessons intermittently and soon abandoned the idea. Now, when she is in her mid-thirties and her career has significantly flourished, she decided to give the second chance to the opportunity she had missed as a child. She needs some advice on how to begin again her adventure with the classical piano repertoire.

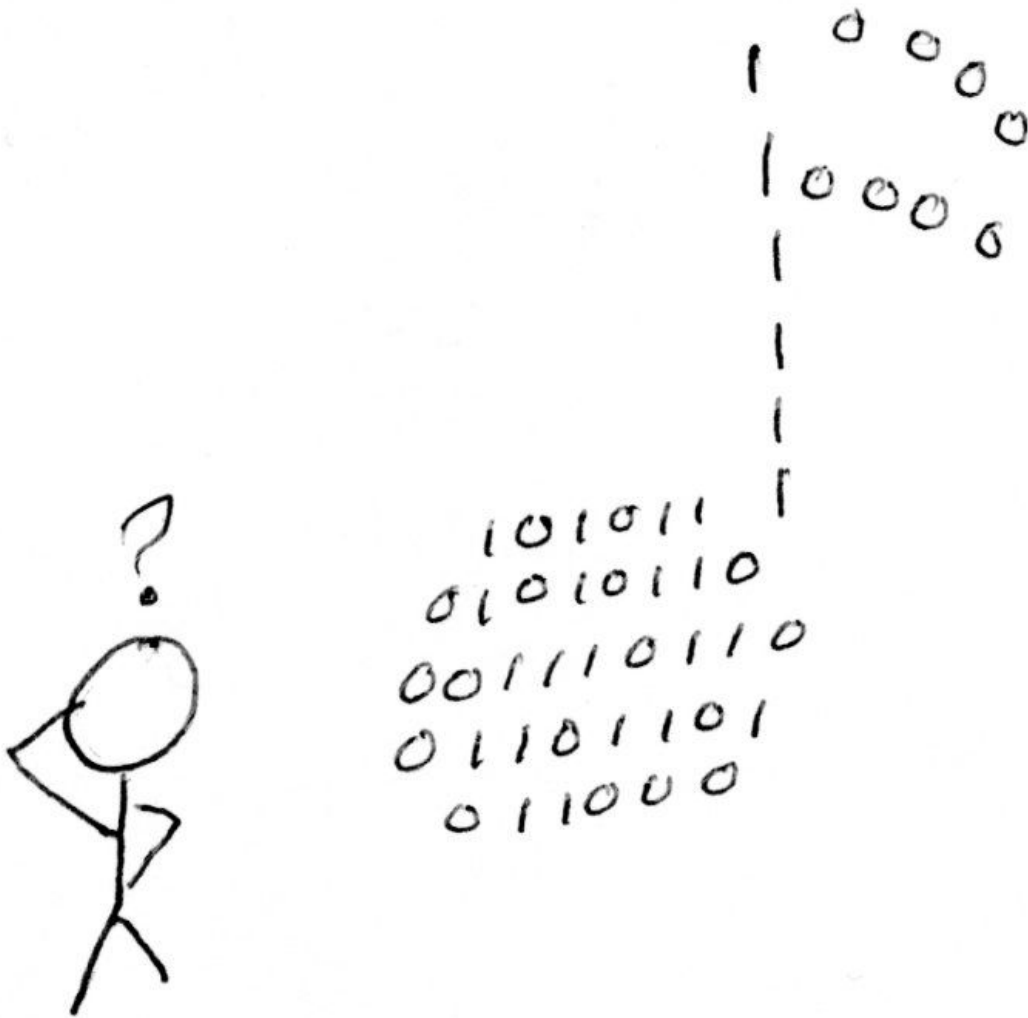




# User Analysis

Considering varying degrees of musical background knowledge:

- Will users intuitively understand the behaviour and interaction flow with our software only on the basis of program's perceived affordances?
- Can people with a background in music find a musical score of their choice using our program?
  - What is the speed of task performance?
  - What is the error rate?
- Do the users without a background in music find the software entertaining to the degree that they would like to interact with in the future?
- How long does it take for a user to learn the midi enabled navigation shortcuts?



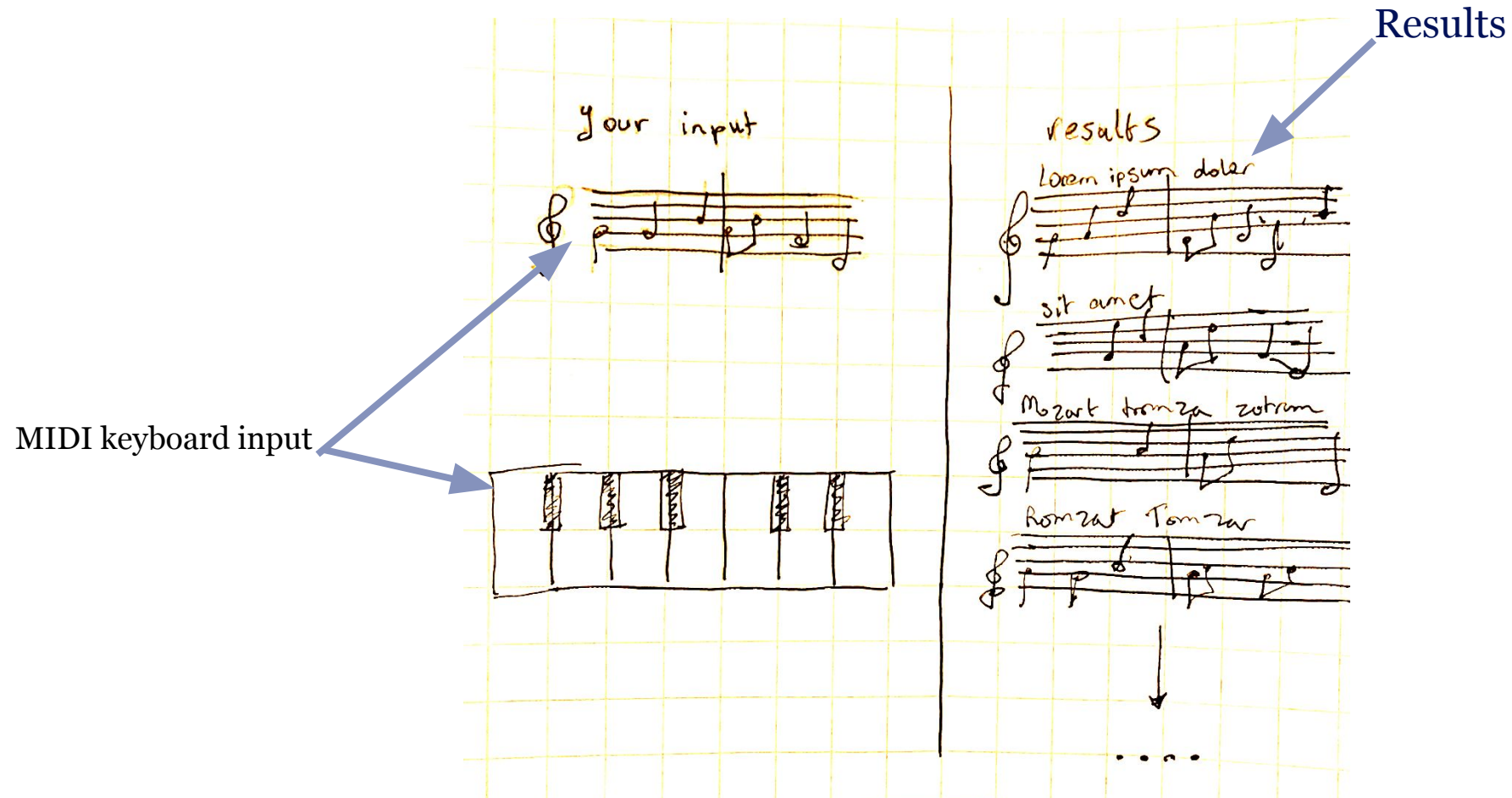


# Design



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# Design



# Questions? Comments (or name suggestions?)

we were thinking of a Mozart anagram..

Tromza  
Maztor  
Trazom  
Mazort



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