

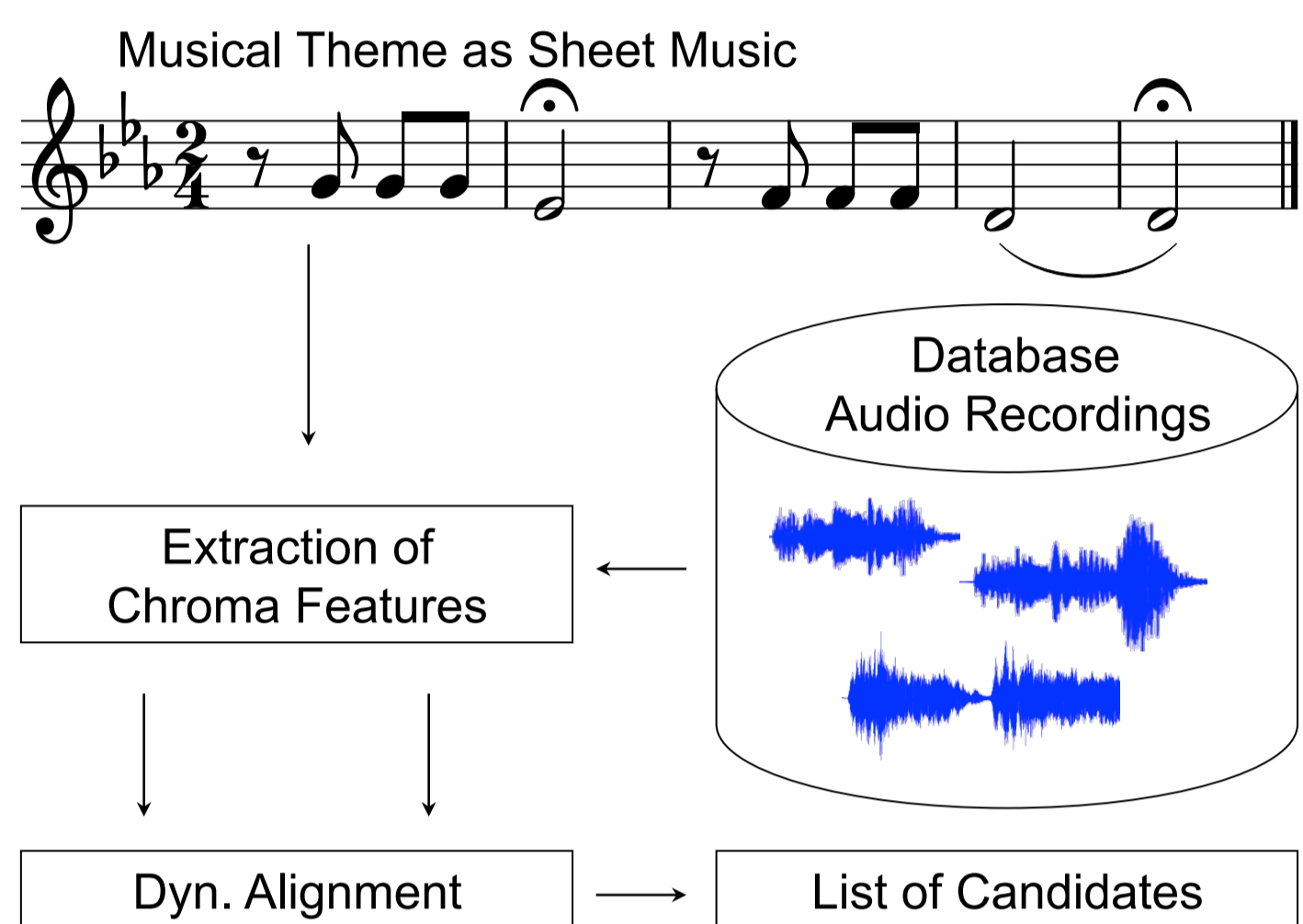
A Graphical User Interface for Understanding Audio Retrieval Results

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Abstract

In 1948, Barlow and Morgenstern released a collection of about 10,000 themes of well-known instrumental pieces from the corpus of Western Classical music [1]. These monophonic themes (usually four bars long) are often the most memorable parts of a piece of music. Using a musical theme as a query, the objective is to identify all related music recordings from a given audio collection. In this demonstration, we show a graphical user interface which we developed to systematically evaluate the matching results. The goal is to identify the challenges of this particular retrieval scenario and gain more insights into the used data.

Retrieval Scenario

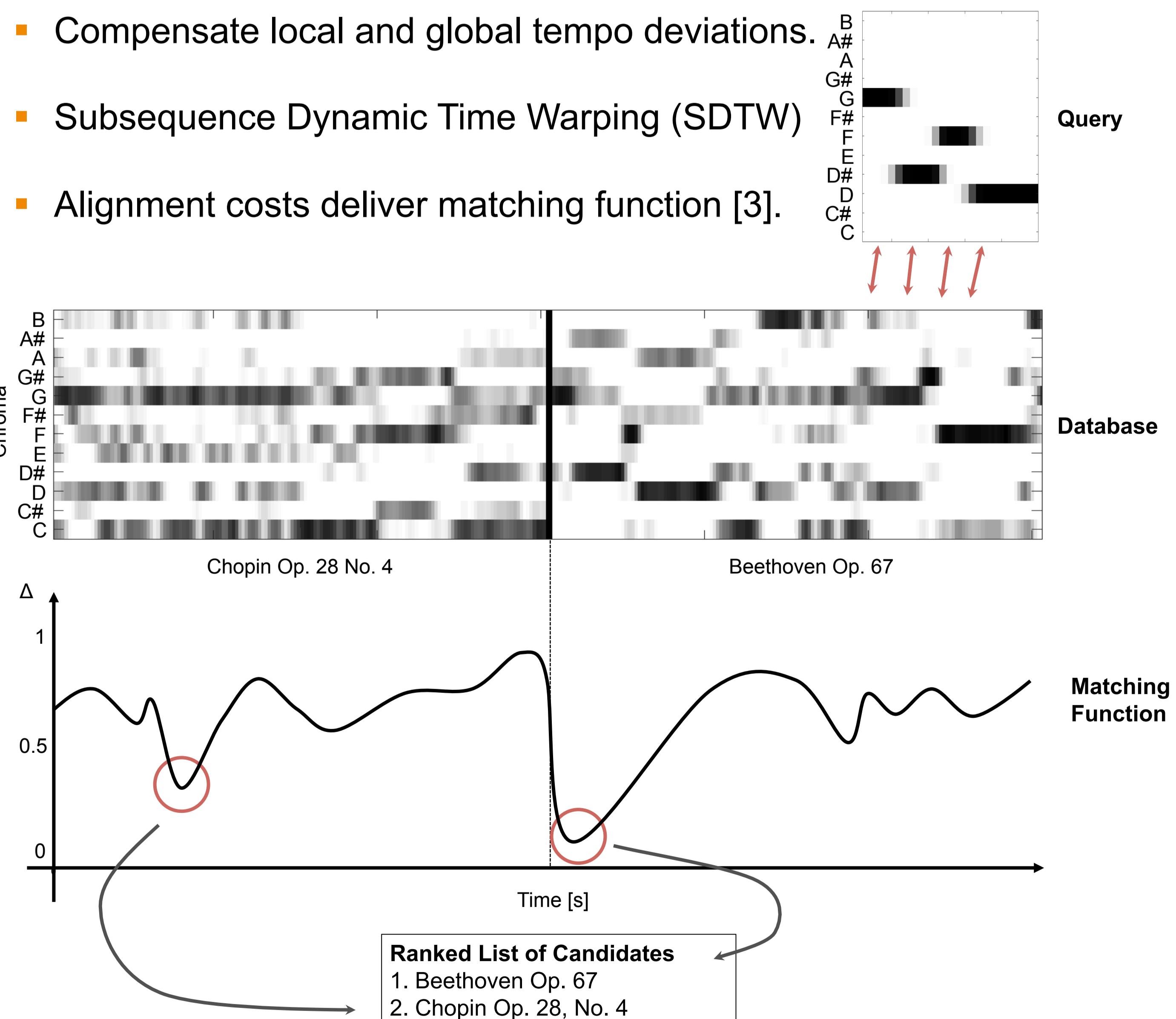


- Music collection with Western Classical Music.
- Monophonic queries, four bars long [2].
- **Task:** Automatically retrieve documents from a music database that are similar to the monophonic query.

Challenges

- **Cross-Modality:** Symbolic sheet music (or MIDI) vs. acoustic audio recordings
- **Tuning:** The tuning of the instruments, ensembles, and orchestras may differ from the standard tuning.
- **Transposition:** Key may deviate from sheet music.
- **Tempo:** Local and global tempo deviations.
- **Polyphony:** Monophonic query vs. polyphonic database.

Retrieval Technique



Graphical User Interface

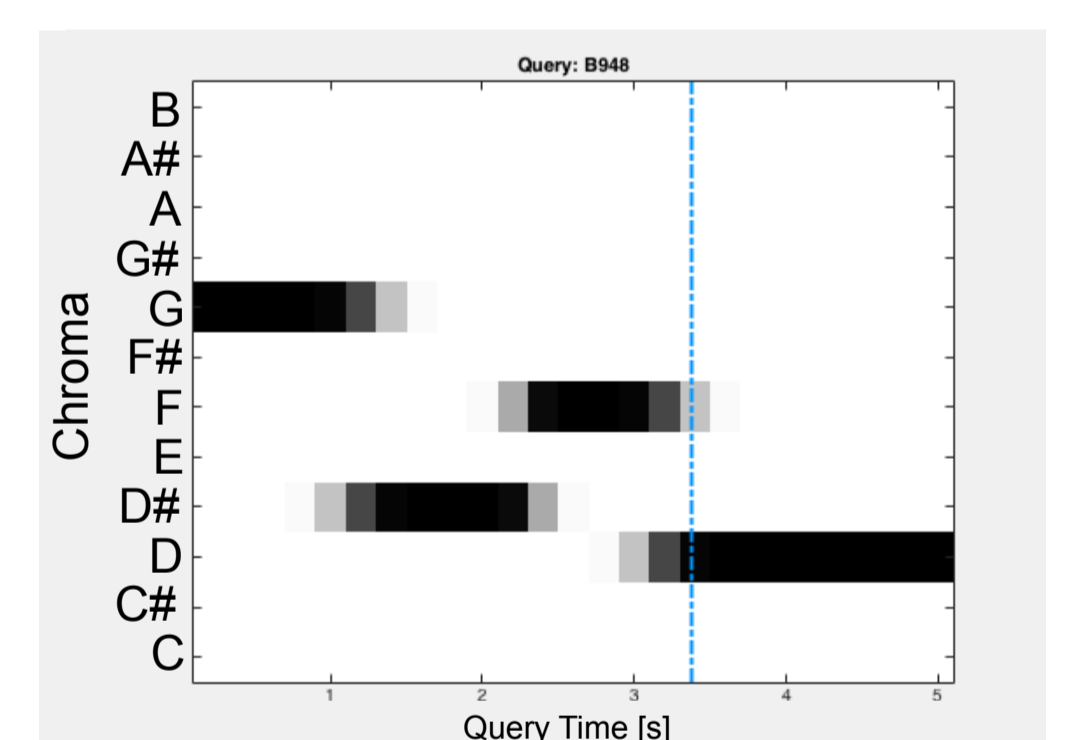
	D ₁ Bach BWV 846	D ₂ Bach BWV 1041	D ₃ Beethoven Op. 2	D ₄ Beethoven Op. 11	D ₅ Beethoven Op. 13	D ₆ Beethoven Op. 67
Q ₁ : B301	1	9	12	13	8	11
Q ₂ : B83	13	1	10	3	8	9
Q ₃ : B689	11	12	1	5	2	3
Q ₄ : B690	5	12	1	10	2	8
Q ₅ : B1031	9	11	7	1	4	2
Q ₆ : B728	14	12	5	10	2	1
Q ₇ : B729	12	5	3	8	1	2
Q ₈ : B730	3	13	7	5	1	9
Q ₉ : B948	12	9	6	5	2	1
Q ₁₀ : B949	12	13	4	3	6	1

Main window

- Lists queries (left column) and database documents (top row).
- Retrieval results are shown as a grid of boxes.
- Ground truth annotations are indicated by green backgrounds.

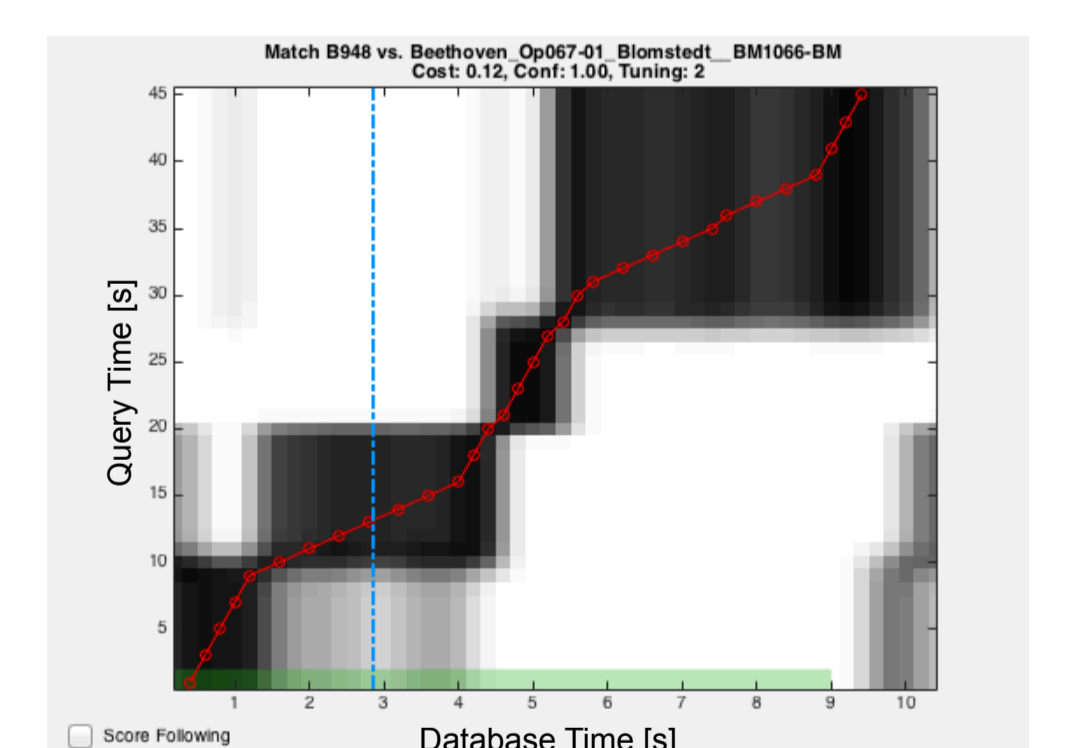
Query window

- Chroma feature representation of the monophonic query.
- Provides functionality to play back a synthesized version of the query.



Retrieval result

- Visualizes cost matrix of the best matching segment in the audio recording.
- Warping path from SDTW is shown in red.



Literature

- [1] Barlow, H. & Morgenstern, S.: A Dictionary of Musical Themes. Revised Edition, 3. Ed. Crown Publishers, Inc. (1975).
- [2] Schwartz, J. T. & Schwartz, D. (2008): The Electronic Dictionary of Musical Themes. <http://www.multimedialibrary.com/barlow/>
- [3] Müller, M: Fundamentals of Music Processing. Springer Verlag, 2015. <http://www.music-processing.de>

