

# University of Rochester Multi-modal Music Performance (URMP) Dataset

Last Updated: April 2018

## 1. HOW TO CITE URMP DATASET?

If you find the URMP dataset useful, please cite the following reference:

Bochen Li\*, Xinzhao Liu\*, Karthik Dinesh, Zhiyao Duan, Gaurav Sharma, "Creating a multi-track classical music performance dataset for multi-modal music analysis: Challenges, insights, and applications", *IEEE Transactions on Multimedia*, 2018. (\* equal contribution)  
(Contact [bochen.li@rochester.edu](mailto:bochen.li@rochester.edu) for updated information.)

## 2. REGISTRATION

If you plan to download this dataset, we would appreciate it much if you could fill out the Google form at the following link. This will help us understand the usage and impacts of this dataset. Your feedback will also help us improve in a future extension of this dataset.

<https://goo.gl/forms/EMDAIJsyiNmRNz7x1>

## 3. MAIN FEATURES OF URMP DATASET

We introduce a dataset for facilitating audio-visual analysis of musical performances. The dataset comprises a number of simple multi-instrument musical pieces assembled from coordinated but separately recorded performances of individual tracks. For each piece, we provide the musical score in MIDI format, the high-quality individual instrument audio recordings and the videos of the assembled pieces. We anticipate that the dataset will be useful for multi-modal information retrieval techniques such as music source separation, transcription, performance analysis and also serve as ground-truth for evaluating performances.

## 4. DETAILED CONTENT

There are 44 pieces included in the dataset, corresponding to the 44 subfolders. Each subfolder contains the video and audio for the piece, audio recordings for each player track, the original scores in MIDI and PDF formats, and the (audio) frame-level pitch trajectories and note-level transcriptions for each track. The audio frames correspond to temporal windows of 46ms with a 10ms hop interval between successive frames.

### 4.1. Folder Structure

Naming convention:

- *N\_piece\_instrument* Folder name
  - *AuMix\_N\_piece\_instrument.wav* Audio recording for the piece (mixed from individual recordings)
  - *AuSep\_n\_instrument\_N\_piece.wav* Audio recording for track *n*
  - *F0s\_n\_instrument\_N\_piece.txt* Ground-truth pitch annotations on each frame for audio track *n*
  - *Notes\_n\_instrument\_N\_piece.txt* Ground-truth annotations on each played note for audio track *n*
  - *Sco\_N\_piece\_instrument.mid* MIDI score
  - *Sco\_N\_piece\_instrument.pdf* Sheet music
  - *Vid\_N\_piece\_instrument.mp4* Video recording for the piece (assembled from individual recordings)

*N*: The index number of each piece

<i>piece</i> :	The distinct abbreviation for each piece name (see Table. 1)
<i>instrument</i> :	The abbreviation of instrument names performed in the file (see Table. 2). Multiple instruments are split with underline and ordered by track number.
<i>n</i> :	The individual track number
<i>F0s</i> :	The fundamental frequency of the pitch

As an example, the folder for the first piece has the following attributes/files:

- 01\_Jupiter\_vn\_vc: Folder name
  - AuMix\_01\_Jupiter\_vn\_vc.wav: Audio recording for the piece (assembled from individual recordings)
  - AuSep\_1\_vn\_01\_Jupiter.wav: Audio recording of track 1
  - AuSep\_2\_vc\_01\_Jupiter.wav: Audio recording of track 2
  - F0s\_1\_vn\_01\_Jupiter.txt: Ground-truth pitch annotations on each frame for audio track 1
  - F0s\_2\_vc\_01\_Jupiter.txt: Ground-truth pitch annotations on each frame for audio track 2
  - Notes\_1\_vn\_01\_Jupiter.txt: Ground-truth annotations on each played note for audio track 1
  - Notes\_2\_vc\_01\_Jupiter.txt: Ground-truth annotations on each played note for audio track 2
  - Sco\_01\_Jupiter\_vn\_vc.mid: MIDI score
  - Sco\_01\_Jupiter\_vn\_vc.pdf: Sheet music
  - Vid\_01\_Jupiter\_vn\_vc.mp4: Video recording for the piece (assembled from individual recordings)

## 4.2. File Descriptions

### Score

We provide the musical score in two formats: MIDI score (.mid) for machine-readable input and sheet music (.pdf) for human reading. The sheet music is directly generated from the MIDI score using *Sibelius 7.5* with minor adjustment (clef, key set, note spelling, etc.) for display purposes. The score tracks are arranged in the same order as in the sheet music.

### Audio

The audio files are in WAV format with a sampling rate of 48 KHz and bit depth of 24 bits, mono channel. The audio mixture is the direct sum of the individual audio tracks **without additional individual gains**. Individual track numbers are ordered following the score track order.

### Video

The video files are 1080P (1920x1080), with a frame rate of 29.97fps, in MP4 format encoded with an H264 codec. The embedded audio is the same as (and synchronized with) the audio mixtures, and compressed into AAC format. Players are rendered horizontally, from left to right, following the order of track numbers. Compared to the embedded audio, the separate audio file provided for a piece retains a higher quality.

### Annotations

All of the ground-truth annotations are provided as ASCII delimited text.

Frame-level ground-truth pitch annotations are labeled on audio frames that correspond to 46ms long temporal windows with a hop interval of 10ms between successive frames. In the annotation text files, the first column is the frame central time (in seconds) and the second column is the fundamental frequency (in Hz). Silent frames are indicated by 0. The dimensionality of the data equals  $Frame\ Number \times 2$ .

Note level ground-truth annotations list the note onset time (in seconds), note pitch (in Hz), and note duration time (in seconds) for each played note, which are arranged as the first, second and third columns, respectively, in the text file. The dimensionality of the data equals  $Note\ Number \times 3$ .

### 4.3. Piece List

No.	Distinct Abbreviation	Full Piece Name	Type	Duration (mm:ss)	Instrumentations
01	Jupiter	Jupiter	Duet	01:03	Vn. Vc.
02	Sonata	Sonata	Duet	00:46	Vn. Vn.
03	Dance	Dance of the Sugar Plum Fairy	Duet	01:37	Fl. Cl.
04	Allegro	Allegro for Musical Clock	Duet	02:37	Fl. Fl.
05	Entertainer	The Entertainer	Duet	01:27	Tpt. Tpt.
06	Entertainer	The Entertainer	Duet	01:28	Sax. Sax.
07	GString	Air on the G string	Duet	04:30	Tpt. Tbn.
08	Spring	Spring from the Four Seasons	Duet	00:35	Fl. Vn.
09	Jesus	Jesus Bleibet Meine Freude	Duet	03:19	Tpt. Vn.
10	March	March from Occasional Oratorio	Duet	01:43	Tpt. Sax.
11	Maria	Ave Maria	Duet	01:44	Ob. Vc.
12	Spring	Spring from the Four Seasons	Trio	02:11	Vn. Vn. Vc.
13	Hark	Hark the herald angels sing	Trio	00:47	Vn. Vn. Va.
14	Waltz	Waltz from sleeping Beauty	Trio	01:33	Fl. Fl. Cl.
15	Surprise	Theme from Surprise Symphony	Trio	00:53	Tpt. Tpt. Tbn.
16	Surprise	Theme from Surprise Symphony	Trio	00:53	Tpt. Tpt. Sax.
17	Nocturne	Nocturne	Trio	01:36	Vn. Fl. Cl.
18	Nocturne	Nocturne	Trio	01:36	Vn. Fl. Tpt.
19	Pavane	Pavane	Trio	02:13	Cl. Vn. Vc.
20	Pavane	Pavane	Trio	02:13	Tpt. Vn. Vc.
21	Rejouissance	La Rejouissance	Trio	01:16	Cl. Tbn. Tba.
22	Rejouissance	La Rejouissance	Trio	01:16	Sax. Tbn. Tba.
23	Rejouissance	La Rejouissance	Trio	01:16	Cl. Sax. Tba.
24	Pirates	Pirates of the Aegean	Quartet	00:50	Vn. Vn. Va. Vc.
25	Pirates	Pirates of the Aegean	Quartet	00:50	Vn. Vn. Va. Sax.
26	King	In the Hall of the Mountain King	Quartet	01:25	Vn. Vn. Va. Vc.
27	King	In the Hall of the Mountain King	Quartet	01:25	Vn. Vn. Va. Sax.
28	Fugue	The Art of the Fugue	Quartet	02:55	Fl. Ob. Cl. Bn.
29	Fugue	The Art of the Fugue	Quartet	02:52	Fl. Fl. Ob. Cl.
30	Fugue	The Art of the Fugue	Quartet	02:52	Fl. Fl. Ob. Sax.
31	Slavonic	Slavonic Dance	Quartet	01:22	Tpt. Tpt. Hn. Tbn.
32	Fugue	The Art of the Fugue	Quartet	02:54	Vn. Vn. Va. Vc.
33	Elise	Fur Elise	Quartet	00:48	Tpt. Tpt. Hn. Tbn.
34	Fugue	The Art of the Fugue	Quartet	02:54	Tpt. Tpt. Hn. Tbn.
35	Rondeau	Rondeau from Abdelazer	Quartet	02:08	Vn. Vn. Va. Db.
36	Rondeau	Rondeau from Abdelazer	Quartet	02:08	Vn. Vn. Va. Vc.
37	Rondeau	Rondeau from Abdelazer	Quartet	02:08	Fl. Vn. Va. Cl.
38	Jerusalem	Jerusalem	Quintet	01:59	Vn. Vn. Va. Vc. Db.
39	Jerusalem	Jerusalem	Quintet	01:59	Vn. Vn. Va. Sax. Db.
40	Miserere	Miserere Mei Deus	Quintet	00:40	Fl. Fl. Ob. Cl. Bn.
41	Miserere	Miserere Mei Deus	Quintet	00:40	Fl. Fl. Ob. Sax. Bn.
42	Arioso	Arioso	Quintet	04:15	Tpt. Tpt. Hn. Tbn. Tba.
43	Chorale	Chorale	Quintet	00:53	Tpt. Tpt. Hn. Tbn. Tba.
44	K515	String Quintet K515	Quintet	03:45	Vn. Vn. Va. Va. Db.

Table. 1 List of pieces and associated metadata (type, duration, instruments).

Vn.	Violin
Va.	Viola
Vc.	Cello
Db.	Double Bass
Fl.	Flute
Ob.	Oboe
Cl.	Clarinet
Sax.	Saxophone
Bn.	Bassoon
Tpt.	Trumpet
Hn.	Horn
Tbn.	Trombone
Tba.	Tuba

Table. 2 Instrument abbreviations used in Table 1.