



Music Performance Analysis

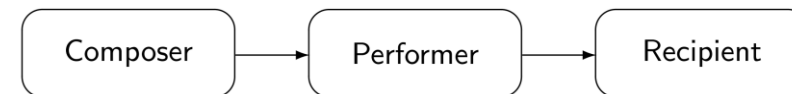
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music performance

- music exists only with **performance**

- performance realizes acoustic rendition of musical ideas
- each rendition is unique
- score information is interpreted, modified, added to, or dismissed
- adds “expressivity”



performance parameters

category	score representation/idea	performance
tempo & timing	explicitly defined rhythmic content	tempo, micro-timing, ...
dynamics	basic dynamics instructions	accents, ...
pitch	explicitly defined pitches	vibrato, intonation, ...
timbre	implicitly defined (instrumentation)	playing techniques, ...



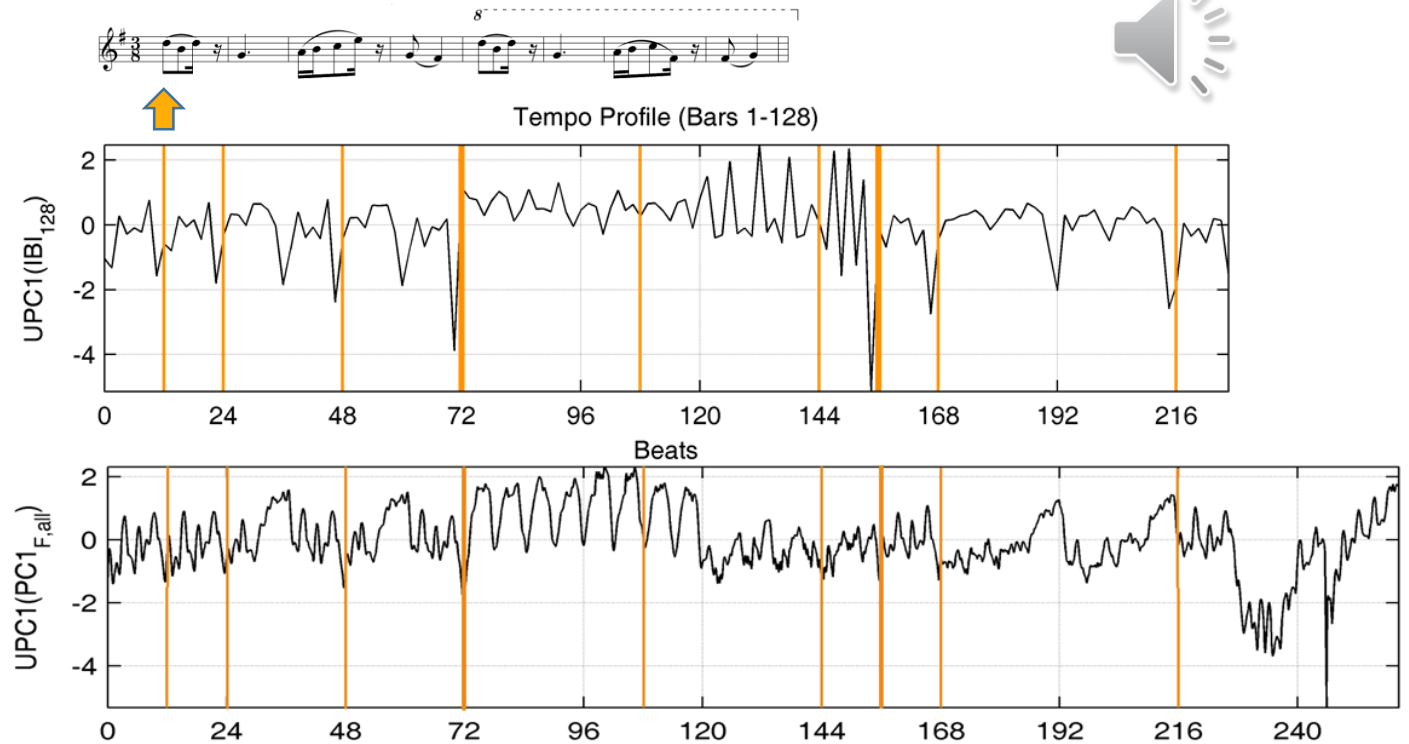
music performance analysis

- by analyzing the music performance, we learn about
 - the **performance**:
 - general performance characteristics
 - notable stylistic differences (over time, between artists, ...)
 - the **performer**:
 - mapping of intent and projected emotion to measurable parameters
 - the **listener**:
 - what is perceived as (appropriate level of) expressiveness
 - how can different performance parameters impact the listener
 - How is aesthetic perception shaped by performance parameters



insights 1/2: performance and structure

- close relation between **tempo/dynamics and structure**:
 - ritardandi at phrase boundaries
 - tempo changes at structural boundaries
 - repetitions very similar
- performance sounds unnatural without these general trends
- no clear relation to timbre



insights 2/2: performance perception

- perceptual relevance of “expressive” performance characteristics:
 - *dynamics* highest impact on ratings of *emotional expression*
 - expressive *timing* best predicts ratings of *musical tension*
 - *sharpened intonation* at phrase climax contributes to *perceived excitement*
- measured \neq perceived
 - e.g., measurable difference between “normative” and “expressive” performance does not necessarily lead to *perception of expressivity*
 - e.g., no correlation between measured and perceived vibrato onsets



challenges

■ observations

- style dependent, lacking research beyond western classical music
- data is manually annotated in most cases
- most research
 - focused on piano and voice
 - descriptive and explorative

1. **datasets small, not general**

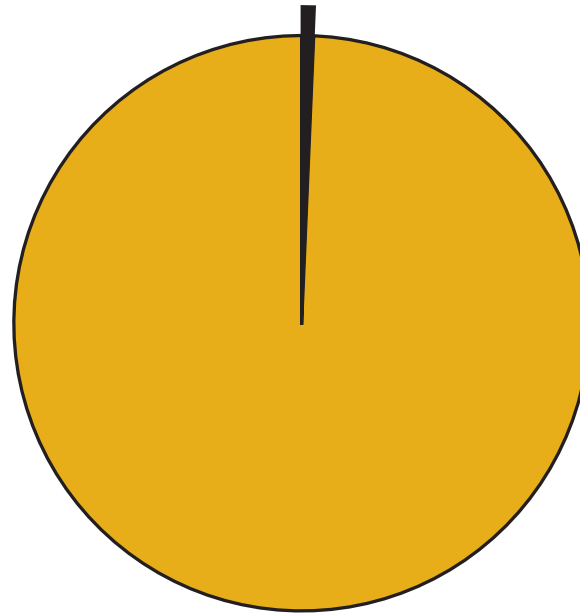
- automatic tools not reliable enough?
- generality: instrument specific, performers, listeners

2. **unknown mapping of performance parameters to perception**

- isolation of parameter meaning tricky
- hard to define expressivity, hard to control variables

music performance analysis @ISMIR

of papers with "Music Performance" in title: < 1%



other papers

opportunities

- understanding why current MIR systems are of limited use to music psychologists and performance researchers
 - wrong measures of success?
 - miscommunication of system capabilities?
- score-based and performance-based information should be disentangled
 - lack of separation of core musical ideas and performance characteristics impedes differentiation of relevant and irrelevant information (example: music emotion recognition)
- cross-disciplinary approaches and methodologies can help
 - enabling larger scale perceptual studies with music data
 - interpretability of data
 - better understanding of music and its perception
 - better systems for music analysis and music generation

thank you.