Performance Style Analysis

Craig Stuart Sapp
craigsapp@stanford.edu
19 May 2016
• 2,732 recordings of 49 mazurkas by Frédéric Chopin (1810-1849)
  = Average of 56 performances/mazurka

• 157 performers

• on 209 CDs/records

• 123 hours of music

• Earliest performance from 1902 by Alfred Grünfeld: mazurka 67/4
Basic Problem

89 performances of mazurka 17/4

• How to numerically compare different performances?

Afanassiev 2001
Andsnes 1990
Ashkenazy 1981
Bacha 1998
Barbosa 1983
Beliavsky 2004
Ben-Or 1989
Biret 1990
Blet 2003
Block 1995
Brailowsky 1960
Brunhoff 1963
Casadesus 1930
Chiu 1999
Clidat 1994
Cohen 1997
Coop 1987
Cortot 1951
Csalog 1996
Czerny-Stefanska 1949
Czerny-Stefanska 1949
Czerny-Stefanska 1989
Ezaki 2006
Falvay 1989
Ferenczy 1958
Fiorentino 1990
Flière 1977
Fou 1978
François 1956
Gieseking 1938
Ginzburg 1957
Goldmann 1997
Guller 1956
Hatto 1993
Hatto 2006
Horowitz 1971
Horowitz 1985
Indjic 1988
Kapell 1951
Kiepura 1999
Kilenyi 1937
Kissin 1993
Kitain 1937
Kushner 1990
Lévy 1951
Lear 1994
Lefébure 1950
Lilamand 2001
Luisada 1990
Lushtak 2004
Lypany 1968
Lypany 1990
Magaloff 1977
Magaloff 1977b
Magin 1975
Milkina 1970
Mohovich 1999
Nadelmann 1956
Ohlsson 1999
Olejniczak 1990
Olejniczak 1991
Osinska 1989
Pöntinen 2003
Paderewski 1912
Paderewski 1923
Paderewski 1924
Perahia 1994
Perlemuter 1986
Poblocka 1999
Rangell 2001
Risler 1920
Rosen 1989
Rubinstein 1939
Rubinstein 1952
Rubinstein 1966
Rummel 1943
Shebanova 2002
Simon 1991
Smith 1975
Szpilman 1948
Sztompka 1959
Tanyel 1992
Uninsky 1971
Vardi 1988
Wasowski 1980
Weissenberg 1971
Zecchi 1942
Zecchi 1942b
Performance Extraction

Sonic Visualiser
Audio Editor
http://www.sonicvisualiser.org
(Queen Mary, University of London)

Plugins:

$M_z$ SpectralReflux
$M_z$ HarmonicSpectrogram

http://sv.mazurka.org.uk
(Royal Holloway, University of London)
## Beat Tempo Data

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Correlation Comparisons

(ISMIR 2007)

Yaroshinsky 05
tempo in measures 32-48:

Pearson correlation:
output range: -1.0 to +1.0

\[
\sum_i (x_i - \bar{x})(y_i - \bar{y}) \over \sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}
\]

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<td>Biret 90</td>
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<td>Jonas 47</td>
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<td>Luisada 90</td>
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<td>Magaloff 77</td>
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<td>Rubinstein 66</td>
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<td>Brailowsky 60</td>
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(better matches)

(worse matches)
Sometimes Clear Meaning
Sometimes Unclear Meaning

- Plots have to show some match at all points
  -- not necessarily a good one

- indicates who the nearest neighbor is
- doesn’t indicate how close the nearest neighbor is.
- does not mean he plays 23.6% like Lushtak, 15.5% like Falvay, etc.
Purely Random Matches

- Small color regions, inverted triangles & broken borders = poor matches

Two white-noise sequences
Peeling Back the Layers

- Eventually

noise-like display
Noise Floor Definition
(ISMIR 2008)

- Peel off first half of performances
- Other half defined as “noise floor”

Horowitz 1949 dynamics
Noise Floor Definition (2)

Remove better matches:

Horowitz 1949 dynamics

Horowitz’s noise-floor
Reintroduce Better Matches

Rachmaninoff’s correlations exceed noise-floor in 74% of sub-sequences.
Overlay Other Performers with "Noise"
Non-Overlapped Similarity

Horowitz 1949 dynamics

74%  S_3  64%  Rachmaninoff | Horowitz  Zak | Horowitz
Asymmetric Matches

- Luisada often a nearest neighbor of Brailowsky
- but Brailowsky never a nearest neighbor of Luisada…

\[ S_3 = 0.82 \quad S_3 = 0.17 \]
Rough Performance Map Schematic

Luisada

Brailowsky

Average

Biret

(Other performers)
Distant Neighbor Suppression

\[ S_3 = A \Rightarrow B \text{ measurement} \]
\[ S_{3r} = A \Leftarrow B \text{ measurement} \]
\[ S_4 = \sqrt{S_3 \cdot S_{3r}} \]

Forward = 74% (Rachmaninoff|Horowitz)
Reverse = 77% (Horowitz|Rachmaninoff)
Mean = 75%

Forward = 64%
Reverse = 57%
Mean = 60%
Evaluation

• Arthur Rubinstein – 3 performances for each mazurka:

1939  
1952  
1966

→ also, more variable between performances than other pianists

• How well can 2 of his performances be identified with the third?

**Query**: Rubinstein 1952 (smoothed tempo)

1: Rubinstein 1939
2: Rubinstein 1966
0.59 Tomsic 1995
0.56 Falvay 1989

Average rank: **1.5**

**Query**: Rubinstein 1952 (full dynamics)

1: Rubinstein 1966
0.62 Milkina 1970
0.60 Csalog 1996
0.60 Kissin 1993
0.56 Fou 1978
0.56 Cohen 1997
0.56 Rubinstein 1939

Average rank: **4.0**
Results by Composition
(using Rubinstein performances)

Average Rankings for Different Similarity Metrics

- 0-Rank
- 3-Rank
- 4-Rank

Mazurka Number

<table>
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<th>Mazurka Number</th>
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Results by Feature
(using Rubinstein performances)

Average Rankings by Musical Feature

Musical Features

tempo
smoothed tempo
residual tempo
(dynamics)
composite of tempo & dynamics
Avg.

0-Rank
3-Rank
4-Rank

Average Rank to Same Performer

1.5 2.5 3.5 4.5 5.5

*
Performance Map (using $S_4$)
Performance Map Interpretation

[Graph with various regions and labels such as Russian, Polish, Hungarian, and Southern Europe (Paderewski)]
1. Hatto Hoax
2003-2006: ~100 CDs covering a wide range of classical piano repertoire.

TOP CDs OF 2005
Richard Dyer, Boston Globe:

10. Brahms: Piano Music. Joyce Hatto, piano Concert Artist/Fidelio Recordings. **Hatto, a British pianist now in her mid-70s, was my great discovery of 2005.** Although illness has kept her off the concert platform for decades, she has made well over 100 CDs surveying virtually the major piano repertoire. None of the 50 or so I have heard is disappointing, and the best join the company of the best piano record ever made. A particular favorite is this Brahms volume that includes the "Paganini" Variations.

(Matti Raekallio)

January 2006, *Gramophone*, Jeremy Nicholas:

“the world’s unrivaled authority on classical music since 1923”

2007:
- 80 CDs identified in whole or part from other commercial CDs
- 90 pianists represented on Hatto CDs.

http://www.farhanmalik.com/hatto/main.html

*Best overview:*
Sept. 17, 2007 issue of the *New Yorker*

William Barrington-Coupe

- Hatto’s Husband
- In recording industry since 1950’s (Saga/Lyrique/Delta/Triumph labels)
- Concert Artist/Fidelio Recordings
  [http://concertartistrecordings.com](http://concertartistrecordings.com)

“Barry”
Mazurka 17/4 Correlation
http://mazurka.org.uk/ana/pcor/mazurka17-4
Hatto / Indjic

Two different performances from two different performers on two different record labels from two different countries…

Calliope 3321

Concert Artist 20012

(0.7% slower)
Hatto Mazurka Cassette

• Hatto mazurka performances released on 3 Cassettes in 1993.
  (Fidelio FED4-TC-0116/8)

• Ernst Lumpe sent copy of cassettes to Christopher Howell (May 2007), and turns out they are also Indjic’s 1988 performances.

• Slight differences between the CD / cassette releases, such as:
  
  Mazurka 7/2 in A minor:
  • 1988 Indjic: bars 1-16 not repeated
  • 1993 Hatto: bars 1-16 repeated
  • 2005 Hatto: bars 1-16 not repeated

• Concert Artist mischief occurring since at least 1993, not 2002…
Beat-Event Timing Differences

Hatto beat location times: 0.853, 1.475, 2.049, 2.647, 3.278, etc.
Indjic beat location times: 0.588, 1.208, 1.788, 2.408, 3.018, etc.

Hatto / Indjic beat time deviations

Remove 0.7% timeshift
2. Fiorentino Fakes
Mazurka 17/4 Correlations

http://mazurka.org.uk/ana/pcor/mazurka17-4
Also mazurkas 7/1, 7/3, 7/4, 24/4, 30/4 match between two CDs…

"I faked my wife's recordings to please her"
AudioDB

• Developed by Michael Casey @ Goldsmiths College, University of London (now at Dartmouth College, Vermont).

• http://omras2.doc.gold.ac.uk/software/audiodb

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Fiorentino Ghost Performers

Sergio Fiorentino

Mazurka 6/2
Mazurka 7/1
Mazurka 7/2
Mazurka 7/3
Mazurka 7/4
Mazurka 7/5
Mazurka 17/2
Mazurka 17/4
Mazurka 24/1
Mazurka 24/2
Mazurka 24/3
Mazurka 24/4
Mazurka 30/1
Mazurka 30/2
Mazurka 30/3
Mazurka 30/4
Mazurka 33/1
Mazurka 33/3
Mazurka 33/4
Mazurka 50/2
Mazurka 50/3
Mazurka 56/3
Mazurka 59/1
Mazurka 59/2
Mazurka 59/3
Mazurka 63/2

Janusz Olejniczak
Naïve/OPUS 111: OP20002 (1991)

Idil Biret
Naxos 8.550358 (1990)

Anna Malikova
3. Questionable Cortot
Performance Features

• Visualizations not intended to find exact matches
• Designed for finding similar performances

Such as different performances by same pianist:

See: http://mazurka.org.uk/ana/pcor-perf
# Same Performer Identification

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Fou 1978 30/2 tempo curve

Fou 2005 30/2 tempo curve
Cortot Mazurkas

http://www.idilbiret.org/ENG/IBe13.htm

“A most important happening during this period [c1990] was the discovery in succession of some extraordinary Chopin recordings Biret had not known about by three great pianists; performances which greatly inspired her. First came the complete 51 Mazurkas by Alfred Cortot on three cassettes bought privately in the UK. These were recorded by Cortot in the late 1950s and never released for unknown reasons.”
Cortot Mazurka Performances

Concert Artists CD 91802 (2005)

Complete (51) mazurka performances

Sony Classical S3K89698 (2005)

Partial performances of 5 mazurkas: 24/1, 24/2, 24/4, 30/1, 30/2
# Cortot Similarity Ranks

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(36 performances of mazurka 30/2 used in comparison)
Summary

Concert Artist Hatto recordings
at least 80% fakes starting by 1993.

Concert Artist Fiorentino mazurka recordings --
All CA issues of Fiorentino after 1998 are now suspect.

Lots of smoke surrounding Concert Artist’s Cortot mazurka recordings –
“real” performer not yet identified.