

New directions in music notation

Initiatives for printed and digital notation

- Extending notational conventions
- Improving digital notation with fonts: SMuFL, Unicode
- Improving digital notation with fonts: Leland (MuseScore)
- Improving existing approaches to notation: Guido MN at GRAME
- Improving optical recognition with AI: Alicante group

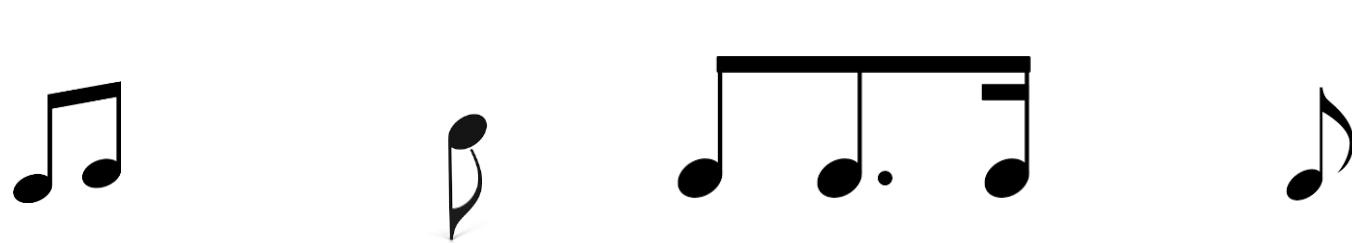
Extending conventions for MN

Organizations promoting new notations

- The Music Notation Project:
<http://musicnotation.org/>
- Communal discussions; special interests; tools
 - Finale
 - Sibelius
 - MuseScore
 - Lilypond
 - VexFlow
 - Belle, Bonne, Sage (github)

Fonts *ad infinitum* (SMuFL)

- Unicode: 128 slots for music characters (c1996)
- Unicode aim: **glyph descriptions**,
not a specific instance (e.g. eighth notes)
- Not related to **semantic meaning**



© daf

SMuFL: A short history

- Original *Sibelius* team released SMuFL (*c*2014); then Ukraine, then US/UK
- Ex-*Sibelius* team hired by Steinberg (DE): notation product = Dorico
- Team leader: Daniel Spreadbury
- SMuFL font a list of 2,000+ symbols available to anyone
- Uses private (virtual) space allocation in Unicode.

SMuFL connections

- Works with proprietary font makers
- Compatible with
 - Finale
 - Sibelius
 - Dorico
 - Verovio
 - MEI



Figure 3. Example of the November 2.0 font.

The “Leland” font for MuseScore

<https://www.youtube.com/watch?v=XGo4PJd1Ihg> (20-minute description)

Uses Open Font License (ofl)

A screenshot of MuseScore software displaying musical notation. The top staff is for Violin, indicated by a treble clef, 2/4 time, and a tempo of 90 BPM. The instruction "Soft, not harsh: molto legato, robotic &" is written above the notes. The bottom staff is for Violoncello, indicated by a bass clef, 2/4 time, and a tempo of 90 BPM. The instruction "Soft, not harsh: molto legato, robotic &" is also present. Both staves show eighth-note patterns with dynamic markings "p". The notation uses the "Leland" font.



Font design close-up

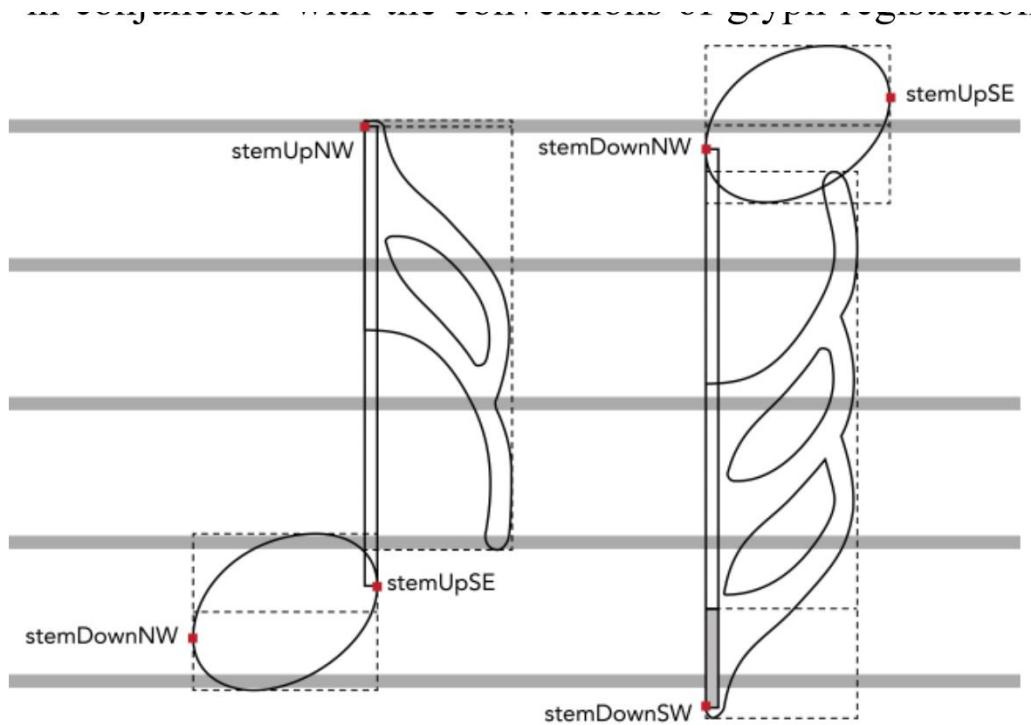


Figure 1 : Diagram illustrating how points defined in font-specific metadata can be used by scoring software.

Guido's new site

The screenshot shows the homepage of the Guido Music Notation website. At the top, there is a blue navigation bar with the following items: "Guido Music Notation" (selected), "Home", "User Guide ▾", "Reference ▾", "Examples ▾", and "About". Below the navigation bar, the main content area has a light blue background with a grid pattern. On the left, there is a sidebar with "Welcome to Guido" and "Guido Music Notation". The main title "Welcome to Guido" is centered above the subtitle "Guido Music Notation". To the right, the text "Dominique Fober et al." is displayed. Below the main title, there is a paragraph about the GUIDO Music Notation, followed by a "The Guido Project" section with links to "Home", "Guido API ▾", "Internals ▾", "References ▾", "Contributing ▾", "Search", and "Previous". A secondary sidebar on the left of this section contains links to "The Guido Project", "Targets", and "History". To the right of the "The Guido Project" section is a large orange header with the text "The Guido Project". Below this header is a musical score with various notes and rests, some of which have numbers above them (e.g., 1, 2, 3, 4, 5). The musical score is rendered in a clear, legible font.

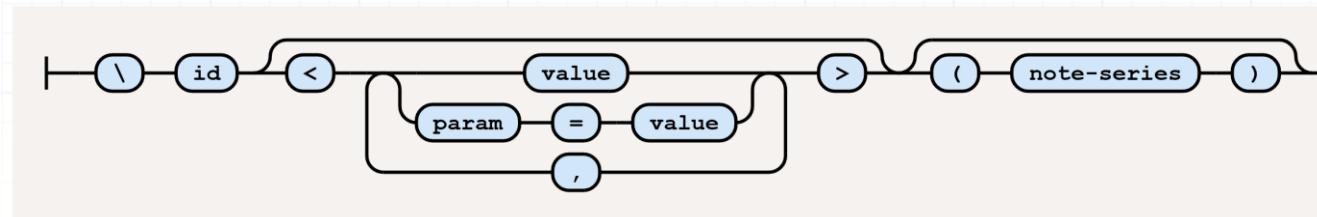
The Guido Project is an open source project hosted on [github](#) that encompasses a music notation rendering engine and various music score utilities. The [Guido Music Notation Format](#) is a purpose formal language for representing score-level music in a platform-independent plain human readable way. The format comes with various software components for music score manipulation. The main of these components is the Guido engine, a library that can be embedded in different platforms and using different programming languages.

Improving durability, robustness

Guido MN—Grame-CNCM

<https://guido.grame.fr/>

Re-write of Guido original documentation: <https://guidodoc.grame.fr/>



Tag diagram

Guido example: Mozart Clarinet Quintet

(central example on *Beyond Midi; first example in Guido doc.*)

```
{  
    % first voice, clarinet in A  
    \pageFormat<w=25cm, h=38cm, tm=4  
    \title<"Clarinet Quintet"> \cc  
    \systemFormat<dx=2cm> \barF  
  
    \instr<"Clarinet in A", transp=  
    \clef<"g"> \key<"A"> \meter<"  
    \i<"p", dy=-1> \sl( a1/8 c#2 |  
    % measure 1, voice 1  
    e c# a/4 ) \sl( e/8 c#  
    % measure 2, voice 1  
    h1 d2 f#/4) \sl<"up">( d/8 h  
    % measure 3, voice 1  
    \bm( a g# c#2 h1 e2 d ) )  
    % measure 4, voice 1  
    \sl( h#1/4 c#2 ) \sl( a1/8 c#2 |
```

Clarinet Quintet

Mozart, K. 581

Clarinet in A

Violino I

Violino II

Viola

Cello

User Guide: Tags and nested tags
<https://guidodoc.grame.fr/guide/tags/>

Interchange codes in the marketplace: MusicXML -- Hal Leonard

The Lark in the Morning

arr Joachim Beyer

Irish Folk Hal Leonard (Publisher)

A musical score for three instruments: Flöte, Gitarre, and Violoncello. The score is in 6/8 time with a key signature of two sharps. The tempo is marked as $\text{♩} = 100$. The Flöte part starts with a dotted half note followed by eighth-note pairs. The Gitarre part features eighth-note chords with dynamic *mp*. The Violoncello part consists of sustained notes. The score includes lyrics "D G D A" above the notes.

Flöte

Gitarre

Violoncello

$\text{♩} = 100$

D G D A

mp

mp

MuseScore's sharing site

- Small monthly fee
- User-built repertoires (dubious copyright credentials)

Autumn Leaves

The musical score consists of two staves. The top staff is labeled "TENOR LEAD" and the bottom staff is labeled "BARI BASS". Both staves are in common time (indicated by "4") and major key (indicated by a single sharp sign). The music features eighth and sixteenth note patterns. The lyrics "When autumn leaves begin to fall" are written below the notes. The score is set against a light orange background.

TENOR LEAD

BARI BASS

When autumn leaves begin to fall
when autumn leaves begin to fall

Interchange codes in the marketplace: MEI--Bärenreiter GmbH

First “work” produced using MEI data markup (2014)

The screenshot shows a product page for 'Prima la musica e poi le parole' by Antonio Salieri. On the left, there's a dark blue thumbnail of the score, featuring the 'opera' logo and a 'BEST EDITION' badge. Below it is a 'Zurück' button. The main content area includes the author's name, the title in bold, and a brief description: 'Divertimento teatrale in einem Akt. Operetta für vier Stimmen'. Technical details like Editionsnummer (BA 8811), ISMN (9790006539840), and a link to 'Ausführliche Produktdetails' are listed. The right side shows the price (427,00 € inkl. USt.), a note about discounts for continuing purchases, and delivery information ('lieferbar'). It also shows the number of copies (1) and buttons to add the item to the shopping cart or wishlist.

Salieri, Antonio
Prima la musica e poi le parole
Divertimento teatrale in einem Akt. Operetta für vier Stimmen

Editionsnummer BA 8811
ISMN 9790006539840

Ausführliche Produktdetails

Band / Reihe OPERA - Spektrum des europäischen
Musiktheaters in Einzelausgaben 1

Herausgeber Betzwieser, Thomas / La Salvia, Adrian
Sprache(n) des Werkes Italienisch
Sprache(n) des Textteils Englisch, Deutsch, Italienisch
Produktart Werkausgabe, Partitur, Kritischer Bericht,
Datenträger (USB-Karte), Urtextausgabe

427,00 €
inkl. USt. ⓘ
Preisermäßigung bei
Fortsetzungsbezug

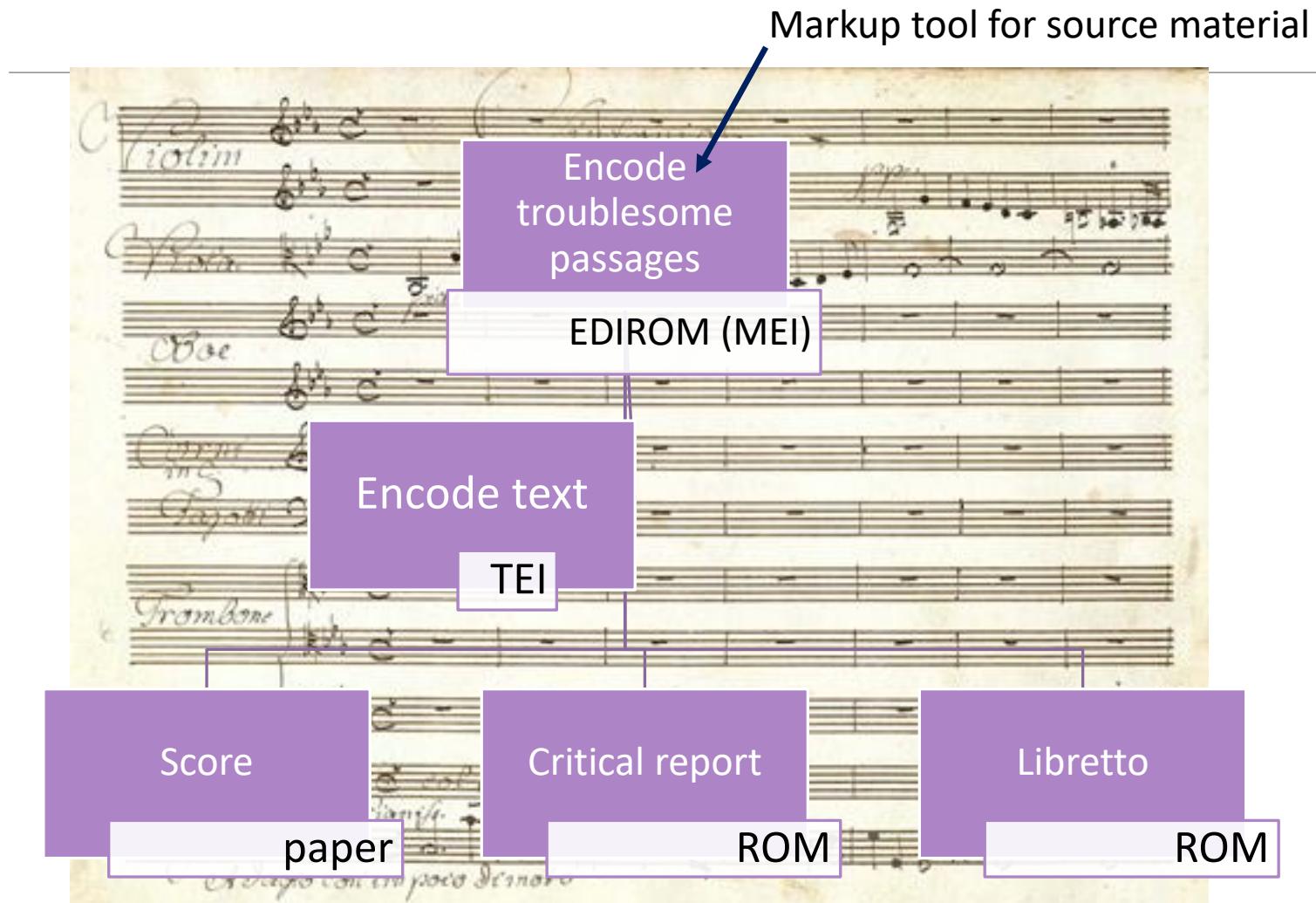
lieferbar ⓘ
Exemplare 1

In den Warenkorb

Auf die Merkliste

Salieri: *Prima la musica e poi le parole*

MEI-to-user workflow (DE): Critical editions



Improving presentation and documentation

https://wiki.ccarh.org/wiki/Musescore_Supplement

The image shows two staves of musical notation for piano. The top staff begins at measure 5, featuring a treble clef, a bass clef, and a key signature of one sharp. It includes dynamic markings like a forte symbol and a piano symbol, and performance instructions such as '3' over a grace note and 'poco rit.' over a series of eighth notes. The bottom staff begins at measure 9, with a treble clef and a key signature of one sharp. It features dynamic markings like 'molto' and 'f', and performance instructions like 'quasi trillo' over a sixteenth-note pattern and 'a tempo' over a series of eighth notes. Measures 10 and 11 show more complex patterns with 'dim.' and 'poco rit.' markings.

Bartok: The Peacock

Example by Christina Kim

Use of AI in OMR development

Jorge Calvo-Zaragosa, Jan Hajič, jr., Alexander Pacha

- Reconceptualization
- Introduction of neural nets (NN)
- Goal: end-to-end applications for specific notational types (CMN, monophony, mensural music, keyboard)
 - **Musical semantics**
 - **Musical notation**

Calvo-Zaragoza, Hajič, Pacha: “Inputs” and “outputs” unclear

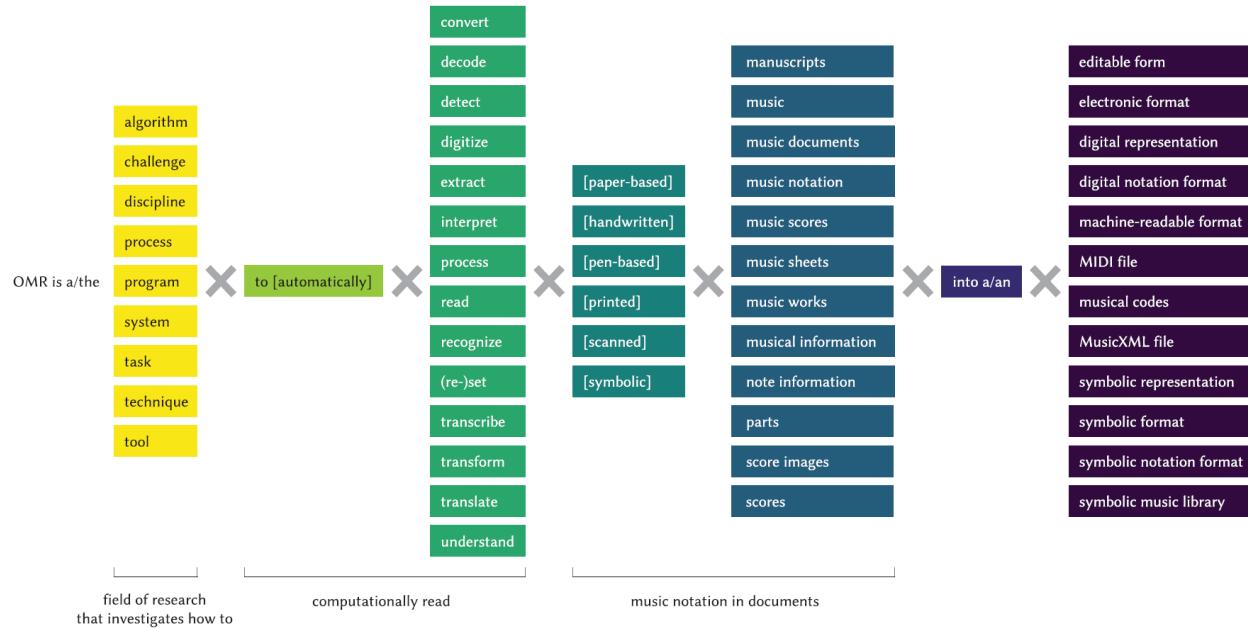


Fig. 1. How OMR tends to be defined or described and how our proposed definition relates to it. For example: “OMR is the challenge of (automatically) converting (handwritten) scores into a digital representation.”

ACM Reference format:

Jorge Calvo-Zaragoza, Jan Hajič Jr., and Alexander Pacha. 2020. Understanding Optical Music Recognition. *ACM Comput. Surv.* 53, 4, Article 77 (July 2020), 35 pages.

<https://doi.org/10.1145/3397499>

Same notes, different levels of legibility/semantics/comprehension

M. M. $\text{♩} = 108$

(a)

(b)

Four categories of “structural complexity”



(a) Monophonic



(b) Homophonic



(c) Polyphonic



(d) Pianoform

“Pianoform” semantics

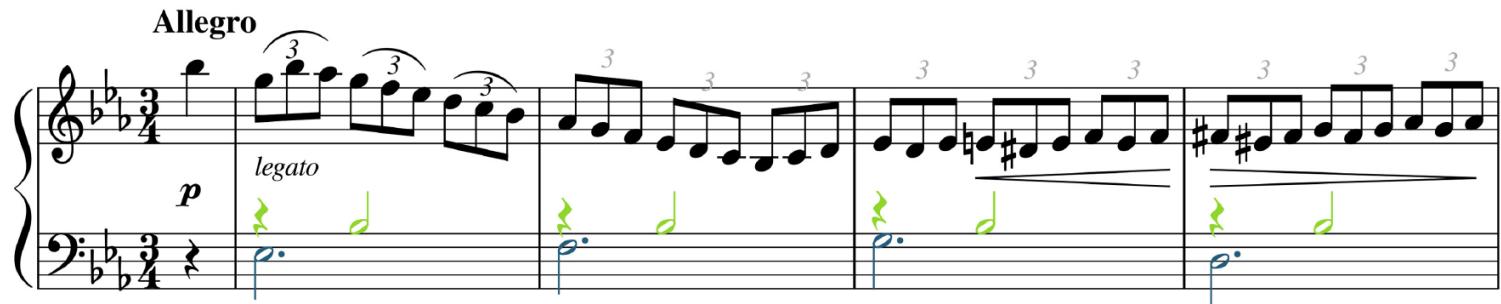
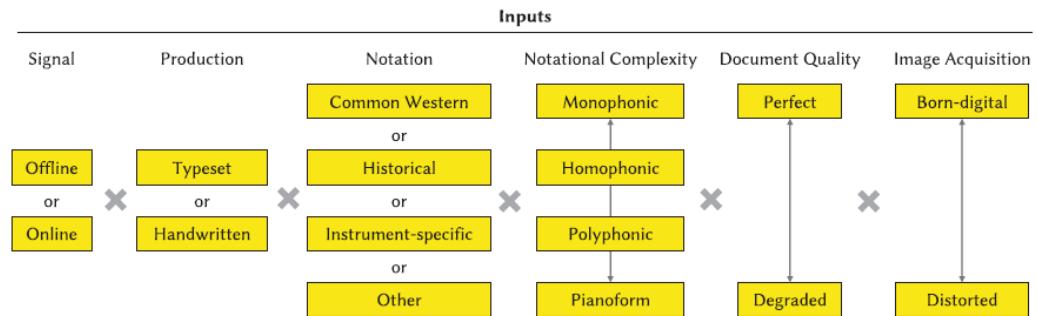


Fig. 14. Beginning of Franz Schubert, Impromptu D. 899, No. 2. The triplet marks starting in the second measure of the top staff are typically omitted in printed editions (here depicted in gray for visualization). The two distinct voices in the bottom staff are color-coded in green and blue.

A clearer model



Understanding Optical Music Recognition

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