Gesture in Automatic Piano Fingering:

Gesture is an untapped dimension in automatic piano fingering systems. Not only does gesture influence fingering decisions, it is a more precise language of piano playing in terms of movement and expression.

Gesture captures movement of the **arm** and orientation of the **wrist**.

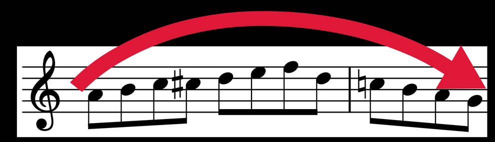
The body is the essential **interface** between mindful intention and physical actualization of the piano's mechanism.[1]
Gestural movement inherently dictates how the fingers will be positioned to facilitate the delivery of weight.

Gesture is an important metric for considerations of cost, loss, reward, etc.

Gesture has a **kinesthetic** correlation with music **notation**.

Embodied music cognition considers gesture central to the realization of music, per the piano's physical characteristics.[2]
The portions of the playing apparatus responsible for sound production follow a somewhat predefined path.

Gesture is part of how pianists conceive of a piece of music.



Gesture is critical to **hand position**, which **governs fingering**.

Physical gestures at the elbow and wrist are consistent at different levels of emotion when playing.[2]

Movement at the upper arm and elbow ultimately dictates positioning of the wrist.

Position, rotation, and deviation of the wrist shapes what is possible at the fingers.

Gesture is a vital factor when determining a piano fingering.

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Informed Expansion of Corpora

Current methods suffer an identical problem: too little data.

Noteworthy Prior Corpora

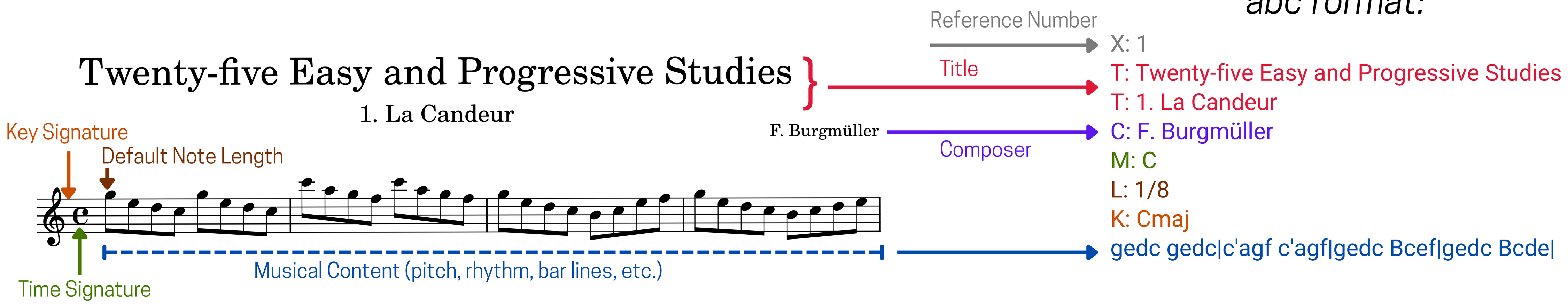
Influential **precedents for encoding fingerings** with musical notation **and structuring training and testing** mechanisms.

PIano fingerinG (PIG) Dataset: Corpus of Western music by prominent classical composers.[3]

<MIDI note> <note-onset> <note-offset> <pitch> <velocity onset> <velocity offset> <hand> <finger number>

Beringer Corpus: Corpus of early-intermediate technical exercises by Beringer/Dunhill.[4]
Layer One Corpus: Corpus of early-intermediate piano sonatinas by Clementi.[4]

abc format: [5]



Introducing New Corpora

01 Honor Precedents

Adhere to establish encoding/formatting conventions to **ensure new data can apply to old methods**.

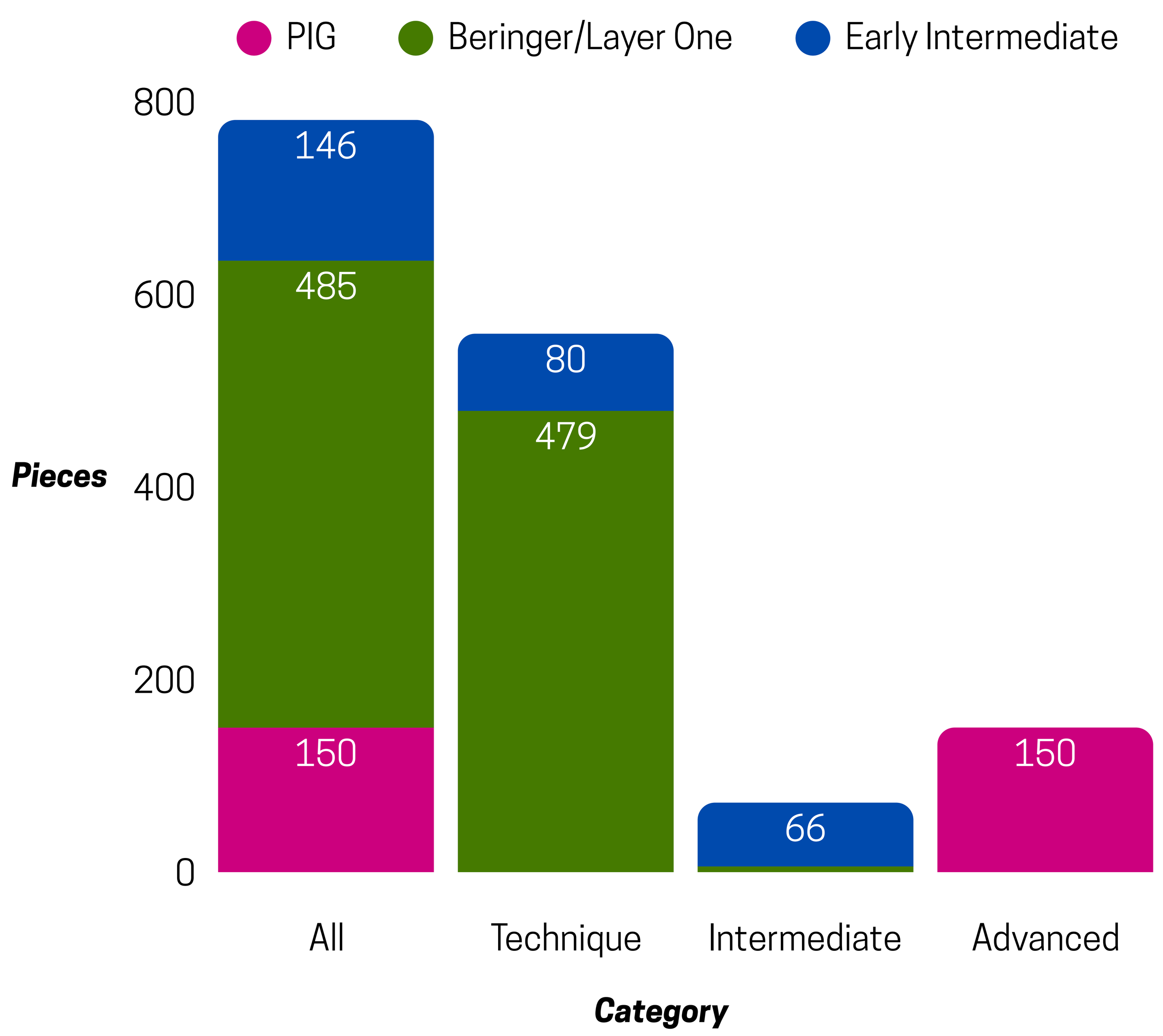
02 Complement Scaffolded Framework

Provide **new avenues for** testing a critical prior notion of **scaffolded learning:**[4]

1. **Train with** musical data that inherently has **very few fingering possibilities** (e.g., technique exercises).
2. **Test with** musical data that provides **slightly more fingering possibilities** (e.g., early-intermediate repertoire).

03 Promote Gesture

Curate repertoire such that it aligns with pedagogical materials commonly chosen **for teaching gestural playing**.



At the early-intermediate level, pupils undertake conscious application of gesture. Introducing associated corpora extends existing automatic fingering methods while facilitating new considerations of gesture.

REFERENCES

1. Iazzetta, F. (2000). Meaning in musical gesture. In Trends in gestural control of music (p. 259-268).
2. Thompson, M. R., & Luck, G. (2012). Exploring relationships between pianists' body movements, their expressive intentions, and structural elements of the music. Musicae Scientiae, 16(1), 19–40.
3. Nakamura, E., Saito, Y., & Yoshii, K. (2020). Statistical learning and estimation of piano fingering. *Information Sciences*, *517*, 68–85.
4. Randolph, D., Di Eugenio, B., & Badgerow, J. (2023, June 14). Modeling Piano Fingering Decisions with Conditional Random Fields. *Proceedings of the 20th Sound and Music Computing Conference.* Sound and Music Computing Conference (SMC), Stockholm, Sweden.
5. Walshaw, C. (2023, August 18). The abc standard. https://abcnotation.com/wiki/abc:standard:v2.1