# Melody → String Arrangement with Rule-guided Seq2Seq Transformer

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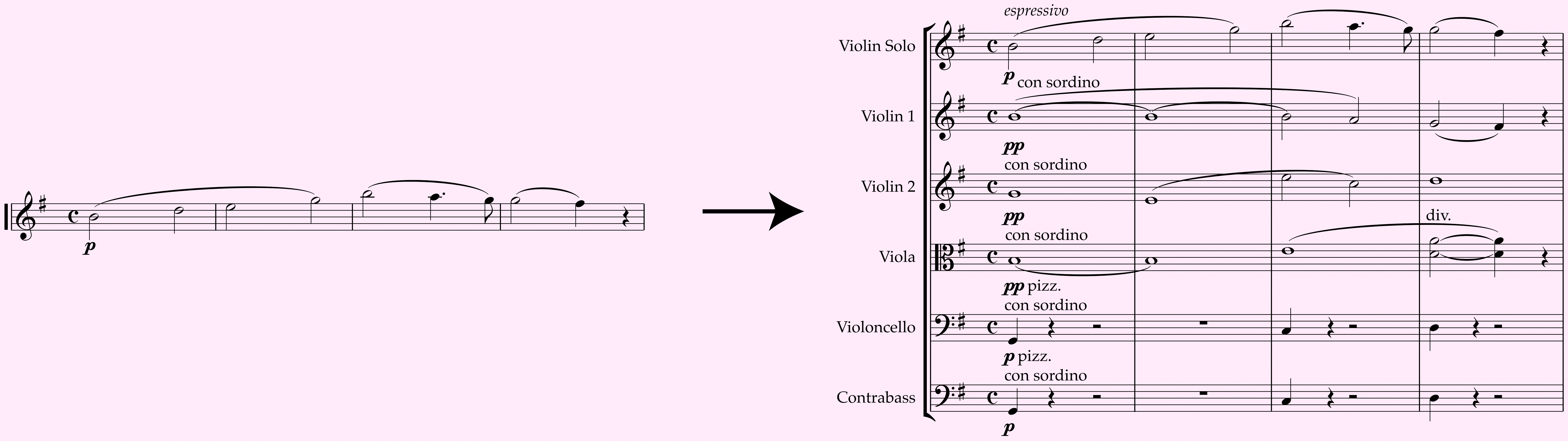

**I want to use a Transformer Model to create an algorithm that takes a monophonic melody as input, and renders a multi-track string arrangement as output.**

- Core challenge: Joint modelling of vertical harmony (**voicing**) + instrument-idiomatic, horizontal smooth lines (**voice-leading**).

- Melody instrument should be Violin, with the rest of the parts playing accompaniment. So called *divisi* can be used to split up into further sub-parts: {vln1a, vln1b, vln2a, vln2b, ...}

# Data & Modelling

- **Dataset: PDMX** (large-scale public-domain MusicXML)
  Train on *broad polyphonic textures* (strings, winds, choir, piano) to maximize data.

- **Supervision**: Extract **melody** = **top-line.** Remaining voices become **accompaniment.**
  Optionally allow ***divisi***/**doublings.**

- **Neural model**: Transformer encoder–decoder (Seq2Seq)
  Transformer takes one sequence as input (the melody) and generates another sequence as output (the arrangement). The encoder-decoder structure reads and summarizes the melody into an internal representation, and generates the accompaniment step by step.

- **Must have-constraints:** instrument ranges, no voice crossing, avoid impossible jumps.

- **Nice-to-haves**: penalize awkward leaps; reward things like open strings on long notes or strong beats.
  The idea is that even if the model learns "general polyphony" from lots of data, the final output is guided toward something that is idiomatic and playable for strings.

# Evaluation and Timeline

- **Evaluation:** voice-leading metrics (leaps/range/crossing) + string-idiomaticity (open-string rate, low-register density) + qualitative MIDI/score examples. **Visual inspection by musicians.**
- **Timeline:**
  - **Feb:** Data inspection, parsing + filtering (strings / top-line extraction), dataset pipeline
  - **Mar:** baseline + metrics pipeline
  - **Apr:** Transformer training
  - **May:** Additional constrained decoding + evaluation/ablations
  - **Jun:** write-up + demos