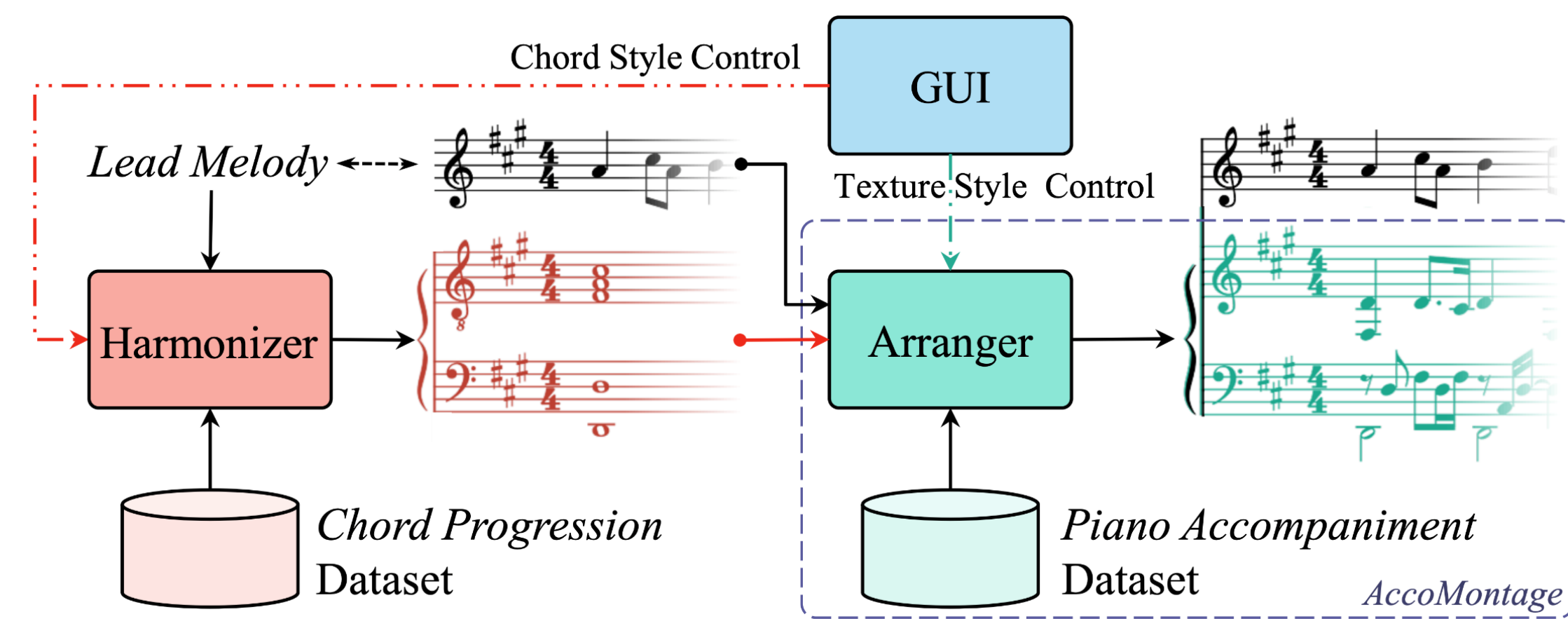


We propose AccoMontage2, a system capable of doing full-length song harmonization and piano arrangement based on a lead melody<sup>1</sup>.

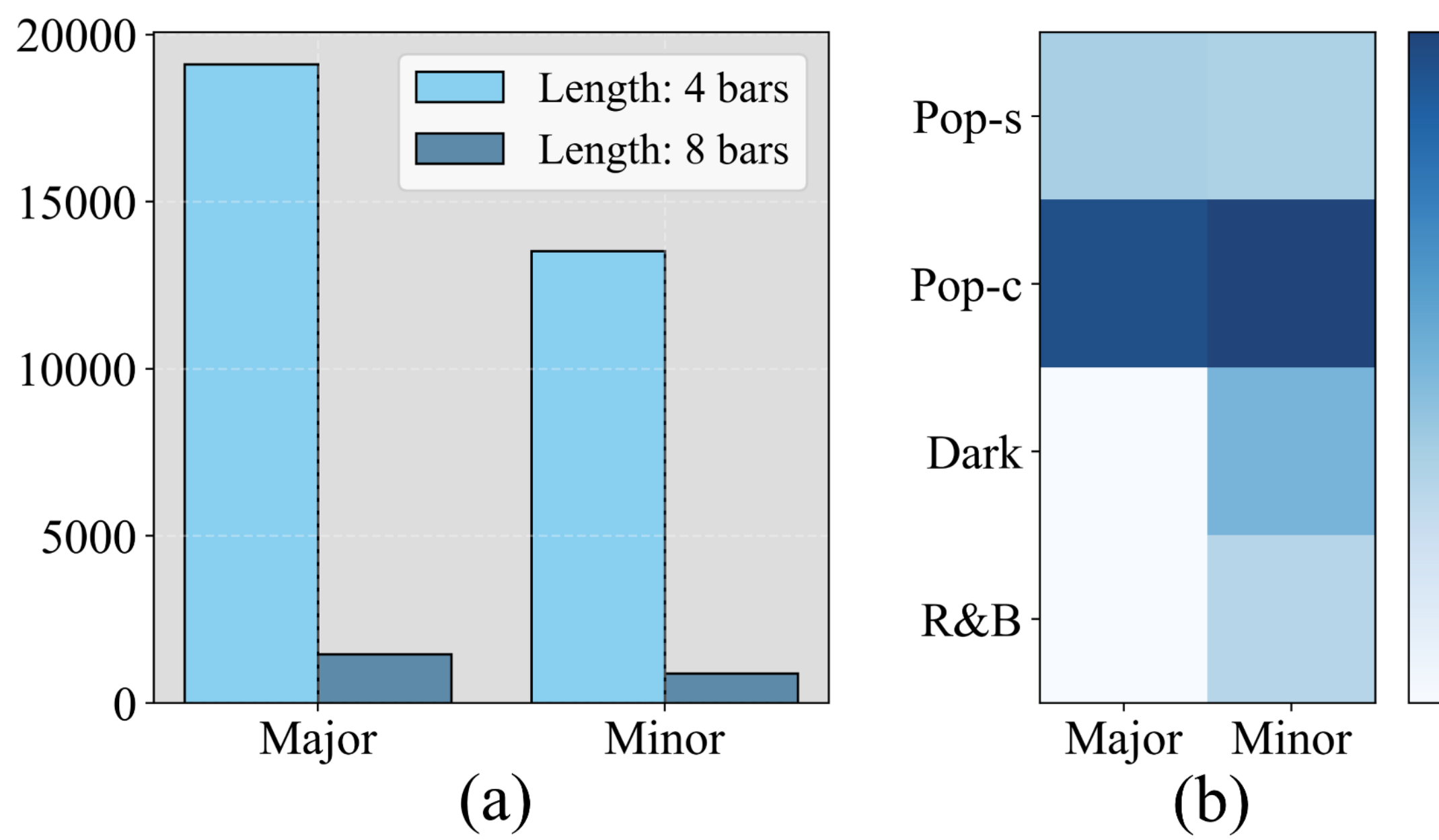
### Methodology

The input of the system is a query lead melody with phrase annotation. The harmonization module will first harmonize the melody. The generated chord progression will be sent into AccoMontage together with the original melody to arrange accompaniment. Lastly, a GUI is provided for users to adjust chord and accompaniment styles<sup>2</sup>.



### Dataset Curation

We create the dataset based on an existing chord progression collection. The final curated dataset contains 5762 pieces of chord progression templates. Each template has a length label, mode label, and a style label. There are four styles in total: Pop-standard, Pop-complex, Dark, and R&B.

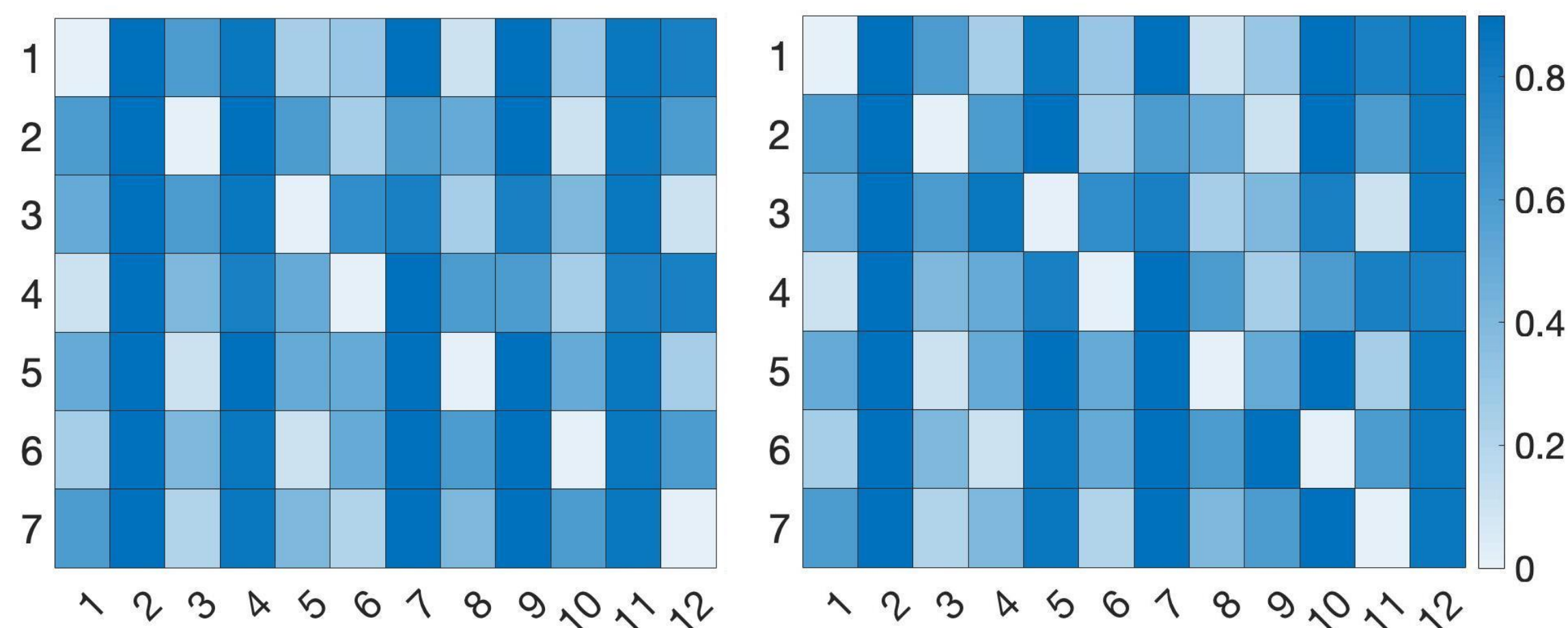


A statistic of the dataset

### Harmonization Module

We use the DP algorithm to optimize a multi-level loss function consisting of three terms.

**Micro-level Loss.** The micro-level loss  $L_{mic}$  computes the level of dissonance between a melody phrase and candidate progressions note by note.



Heatmap of micro-level loss indicating note-wise melody-chord dissonance

**Meso-level Loss.** The meso-level loss  $L_{mes}$  considers the integrity of a candidate.

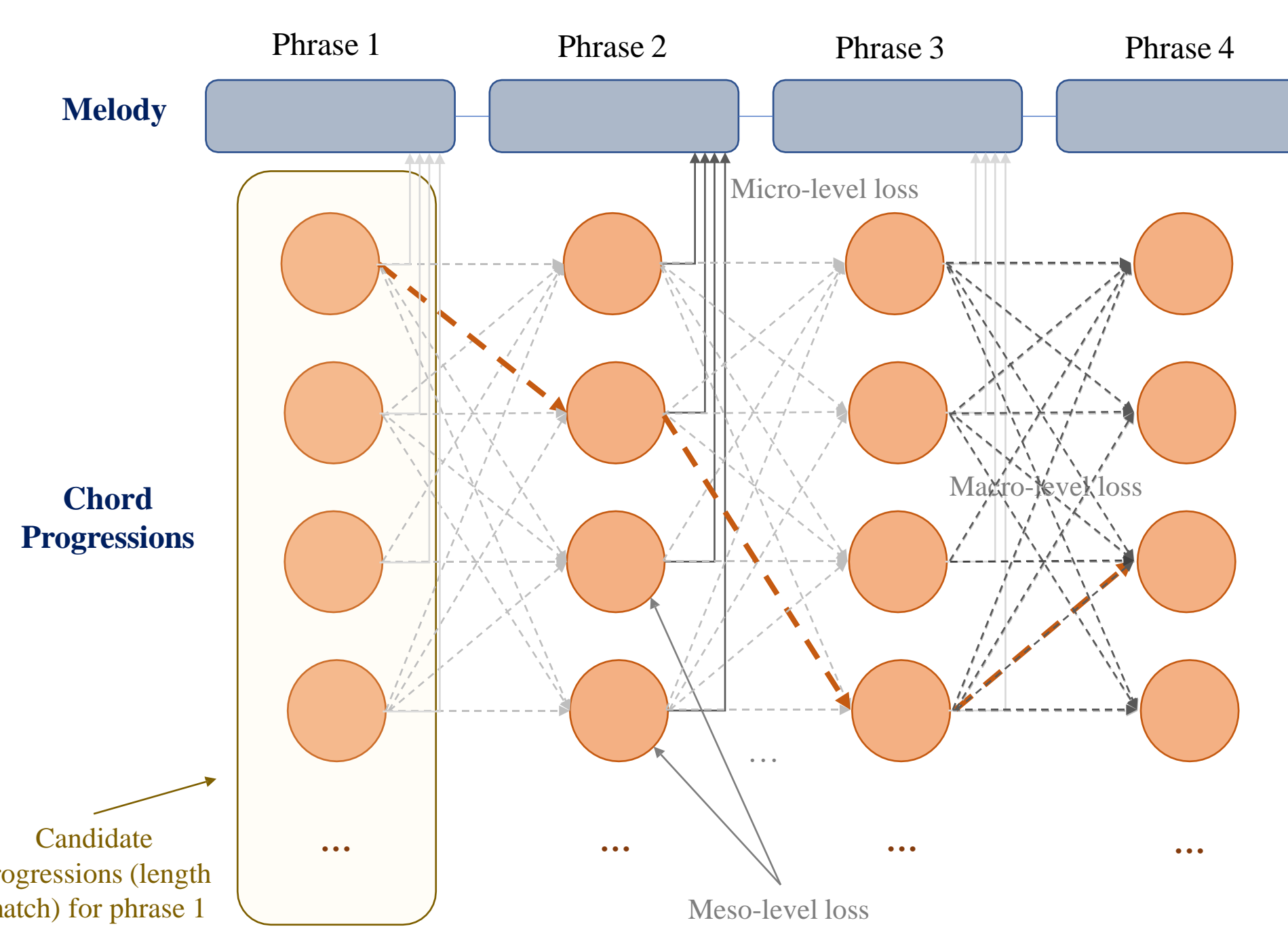
**Macro-level Loss.** The macro-level loss  $L_{mac}$  computes how well the candidate phrases connect with each other.

Finally, we use DP to integrate the three levels of losses and search for the optimal chord progressions which minimize the total loss  $L_{total}^i$  at  $i = p$ .

$$L_{total}^i = \beta(1 - L_{mic}^{i,s}) + (1 - \beta)(1 - L_{mes}^{i,s}) + \max\{L_{total}^{i-1,t} + \alpha(1 - L_{mac}^{i,s})\}$$

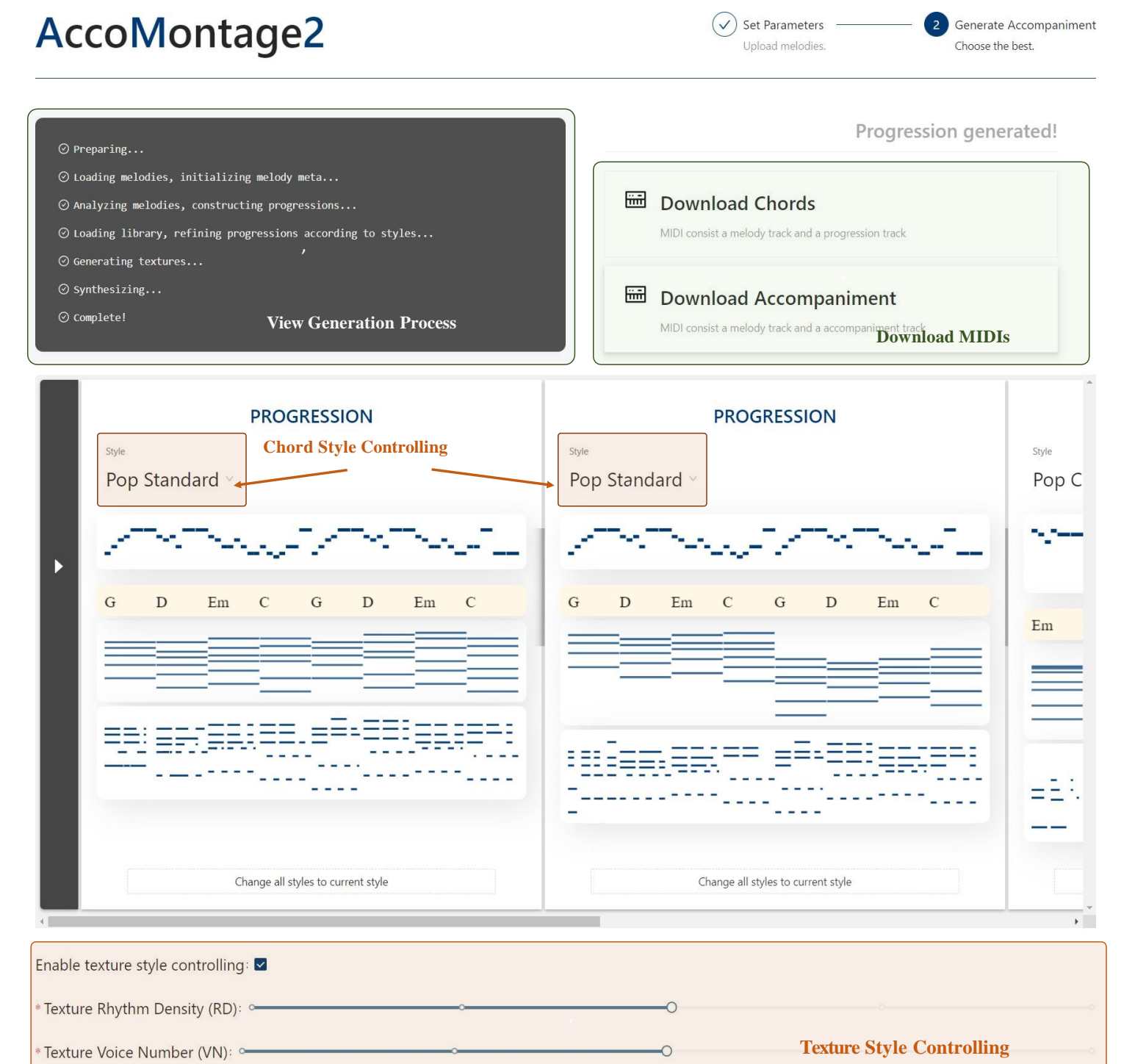
where  $\alpha, \beta$  are parameters that we can tune between 0 and 1.

Harmonization and accompaniment arrangement results. (I) is based on Pop-standard and a sparse texture style, (II) is based on Pop-complex and a dense texture style. Chords generated are shown on the top of each track.



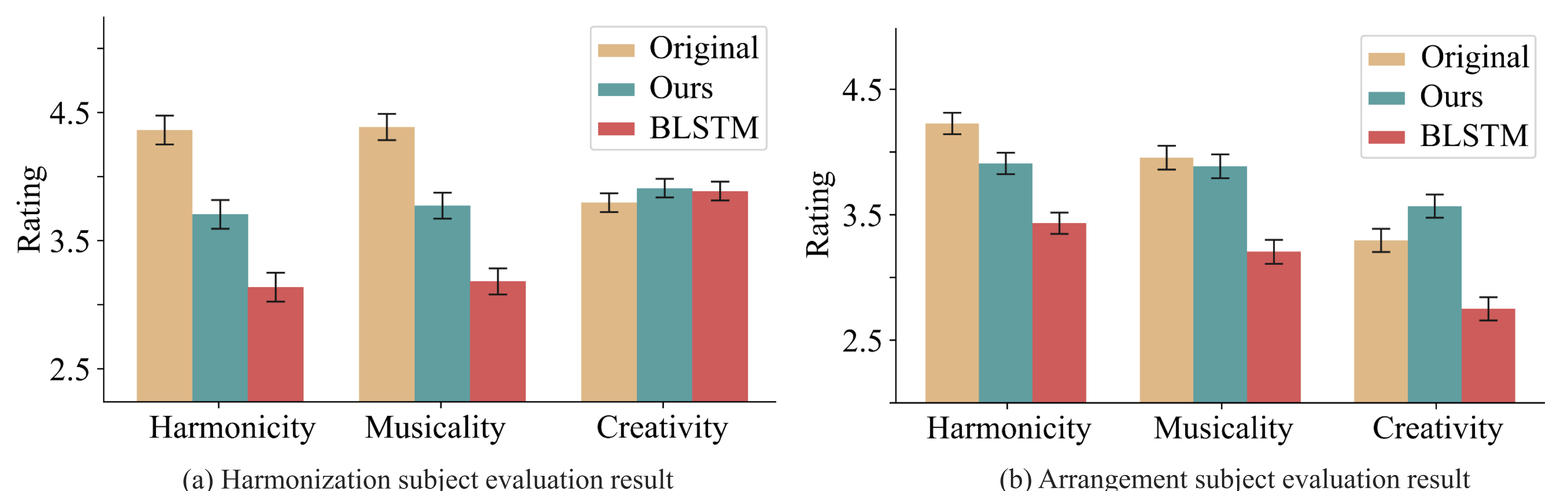
An illustration of the DP algorithm that minimizes the multi-level loss function

### AccoMontage2



A screenshot of the GUI

### Evaluation



We conduct two comparative experiments to validate our AccoMontage2 system, one for harmonization and the other for accompaniment arrangement.

<sup>1</sup>Codes and dataset at <https://github.com/billyblu2000/accomontage2>.

<sup>2</sup>Online GUI link at <https://billyyi.top/accomontage2>.