Robotaba Guitar Tablature Transcription Framework

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Overview

- ☑ Automatic guitar tablature transcription: polyphonic transcription of audio followed by tablature arrangement

- ☑ Several polyphonic transcription and tablature arrangement algorithms exist, but there is no way to easily combine them

- ☑ Web-based guitar tablature transcription framework **Robotaba** facilitates creation of tablature transcription web applications

- ☑ Two **new ground-truth datasets** for polyphonic guitar transcription and tablature arrangement

- ☑ Formal evaluation of an existing polyphonic transcription algorithm and a new guitar tablature arrangement algorithm

Framework Design

- Modular design: use each module independently or in sequence
- Python web application using the Django framework
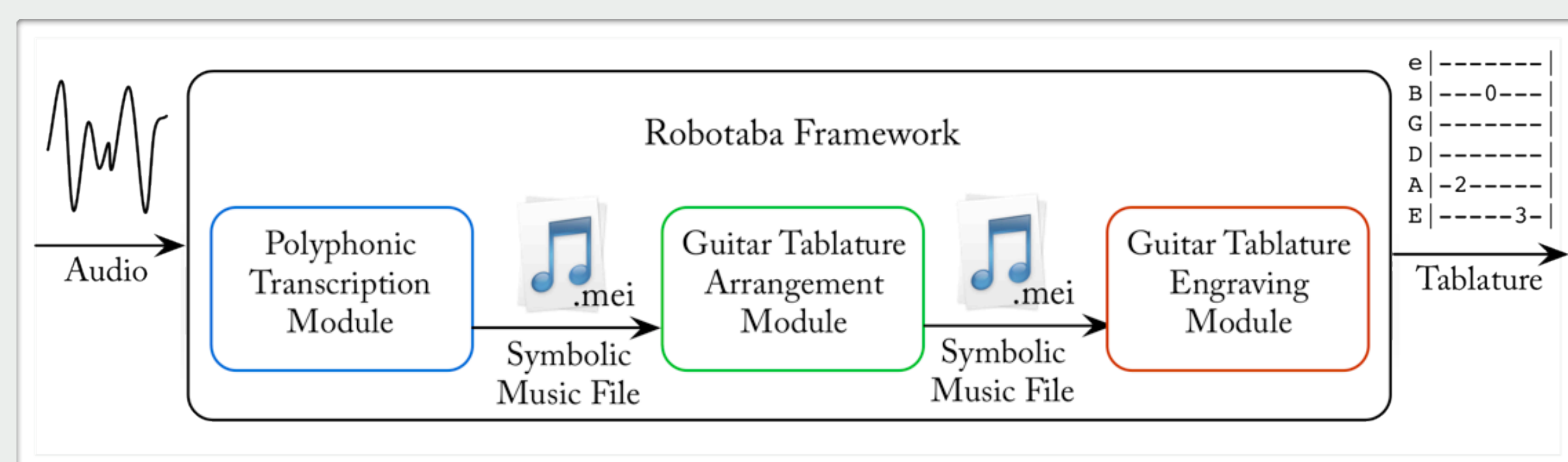
Transcription Web Application

Polyphonic Transcription Algorithm:

- Open-source Python application which implements the polyphonic transcription algorithm by Zhou and Reiss (2008)

Guitar Tablature Arrangement Algorithm:

- Open-source guitar tablature arrangement application **A*Guitar**. Uses the A* pathfinding algorithm to find a shortest path through a directed weighted **graph** of candidate fretboard locations for each note or chord in a music score

- Edge weights: biomechanical difficulty of transitioning between notes or chords
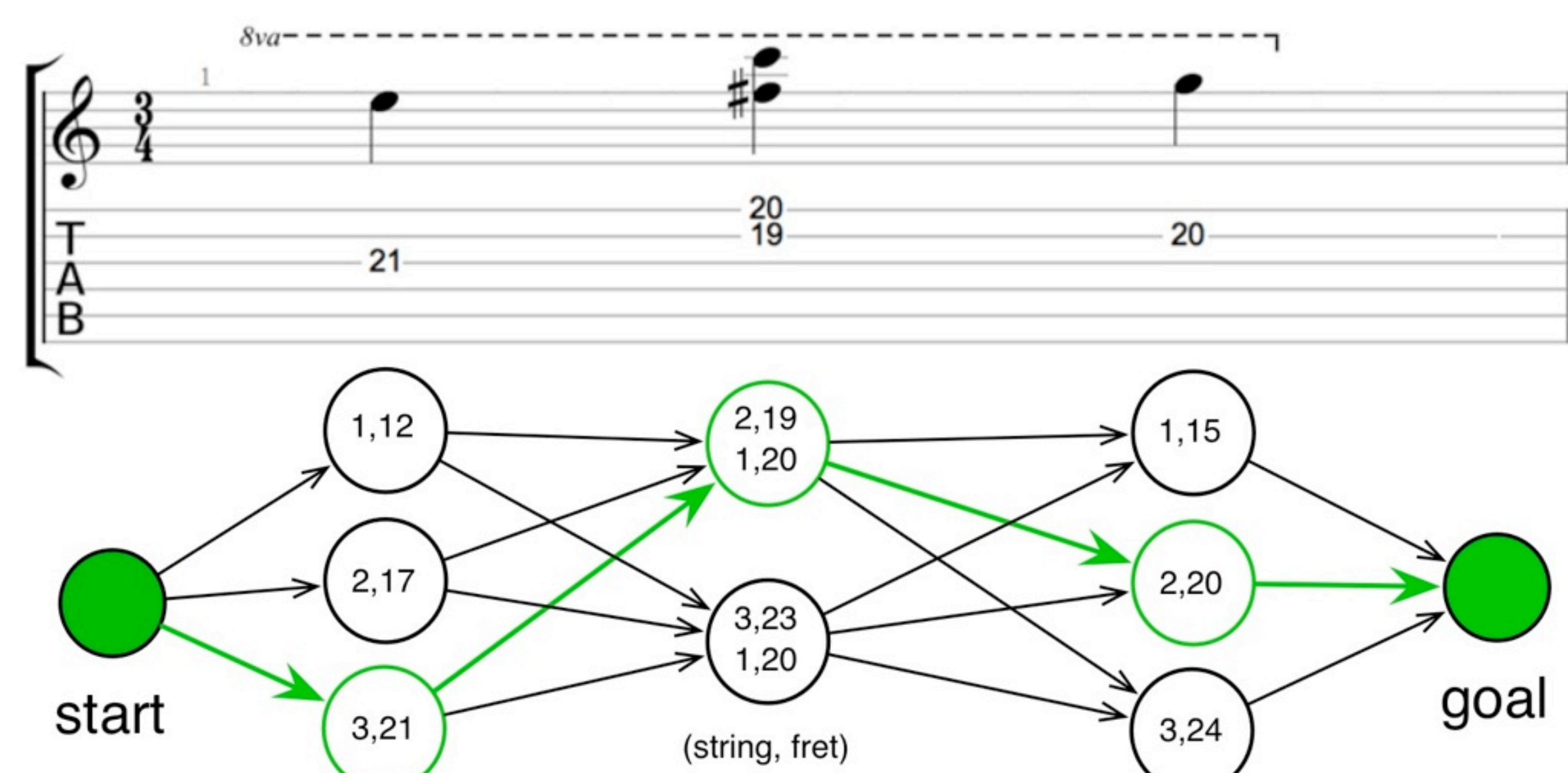
Ground-truth Datasets

- Datasets compiled from manual tablature transcriptions with a 5-star rating on *ultimate-guitar.com*. Selected based on genre, average polyphony, and tempo

- Primarily rock, metal, and derivative genres

Polyphonic transcription dataset:

- Tracks synthesized using a clean and distortion guitar model

- Ground-truth file (note pitch, onset, and offset time) for each audio file generated from symbolic music score

- **Statistics:** 75 isolated guitar tracks; 125,192 note events; 30,914 chords; 112 bpm average tempo

Guitar tablature transcription dataset:

- Excerpts selected from 75 manual transcriptions from *ultimate-guitar.com*

- **Statistics:** 75 MEI and MusicXML files; 4,845 notes; 1,143 chords
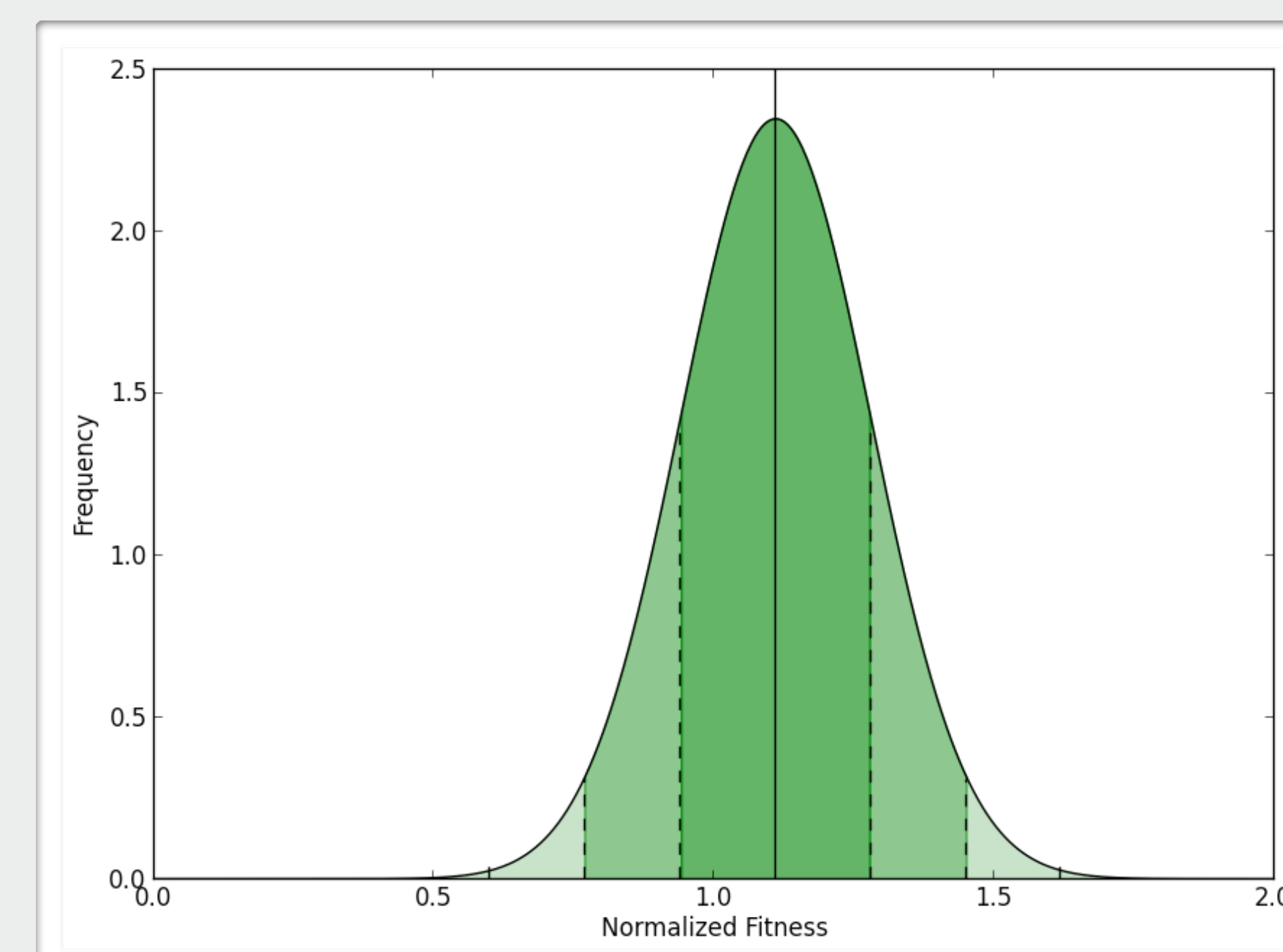
Polyphonic Transcription Evaluation

- MIREX multi-F0 estimation and note tracking evaluation procedure

- Note correctly transcribed if F0 is within 50 cents of the ground-truth note's pitch and onset time within 50-milliseconds. Offset time disregarded

	Precision	Recall	f-measure
Clean Guitar	0.71	0.42	0.50
Clean Guitar Ignore octave errors	0.75	0.45	0.53
Distortion Guitar	0.48	0.36	0.39
Distortion Guitar Ignore octave errors	0.56	0.42	0.46
MIREX 2008	0.74	0.78	0.76

Guitar Tablature Arrangement Evaluation

- Analyze distribution of fitness values for generated tablature arrangements

- Fitness: reciprocal of the sum of weights along the shortest path through the graph, normalized with respect to the ground truth

$$f = \frac{1}{f_{GT}\left(1 + \sum_{i=1}^{N} w_i\right)}$$

$$N\left(\hat{\mu} = 1.11, \hat{\sigma} = 0.17\right)$$