

# Damir Nabiullin B20-03. Assignment 2.

## Code Structure:

- Class ChordGenerator – class that helps to generate chords according to tonic and mode.
- Class MidiGenerator – class that works with midi files (read input file/create output file).
- Class Chord – represents chord, makes inversions, and checks dissonance.
- Class Chromosome – represents chromosome in genetic algorithm. It has it's own genes (in my case genes = chords) which can be mutated. Moreover, two chromosome can be crossover (it will generate two new chromosomes).
- Class GeneticAlgorithm – class that represents the whole genetic algorithm.

## How Code Works:

When you print the correct file name, this file will be opened by MidiGenerator. MidiGenerator will get all data about tempo, tonic, mode and etc. This data we put into the ChordGenerator to generate good chords for our accompaniment. Moreover, ChordGenerator will generate chords only one or two tones below from the initial melody. When all generators were created, GeneticAlgorithm is created in the code. We put all needed data about melody such as tonic, mode, ticks and etc., and put ChordGenerator make manipulations with chords in mutation. When all needed classes are created, algorithm starts work.

## Algorithm flow:

When algorithm got/generated initial population, it starts to work. Genetic algorithm has some number of iterations and probability of mutation. On each iteration algorithm makes random number of crossovers between random chromosomes in the population and make random number of mutations according to probability. When all iterations are done – algorithm calculates fitness for all chromosomes and returns sorted chromosomes (in the end we have the best one).

In the main file I run the GeneticAlgorithm several times (I called this value as epoch). At the first time, algorithm generates random initial population. At the next time, I put to algorithm the best results from previous run and some number of random initial population.

After all epochs, we get the best chromosome from all epochs and iterations. From this chromosome we receive chords. This chords are used to create accompaniment in the output file.