1 Class Description

The Truss class can be used to calculate beam forces in a statically determined truss. The constructor takes two directories as input, one for the joints data file and one for the beams data file, which have to be formatted similarly as the example files. The constructor reads the data from both files using the `read_beams` and `read_joints` methods and saves them in a `_joints` and `_beams` dictionary, respectively.
Then, the `statical_determinancy` method checks if the method of joints can be used to calculate the beam forces in the truss and raises a RuntimeError if this is not the case.
Lastly, the `calculate_forces` method is invoked, which creates a sparse csr matrix in order to save the coefficients of the beam forces and reaction forces that appear when considering the static equilibrium at each joint. When the resulting matrix is singular, the method raises a RuntimeError as the truss is possibly unstable. If this is not the case, the linear equation system is solved with a sparse solver and the beam and reaction forces are saved in a `_forces` array. When the print function is called on a Truss object, the calculated beam forces are listed.

2 Exemplary Usage

The main.py file can be used print the beam forces of a truss in the following fashion:

```
$ python3 main.py cme211-hw4-files/truss1/joints.dat
cme211-hw4-files/truss1/beams.dat
Beam    Force
-----------------
1        0.000
2       -1.000
3        0.000
4       -1.000
5        0.000
6        0.000
7       -0.000
8       -1.414
```

If an optional third directory is specified, the truss geometry is plotted and saved in this directory.
Time spent 6 hours.