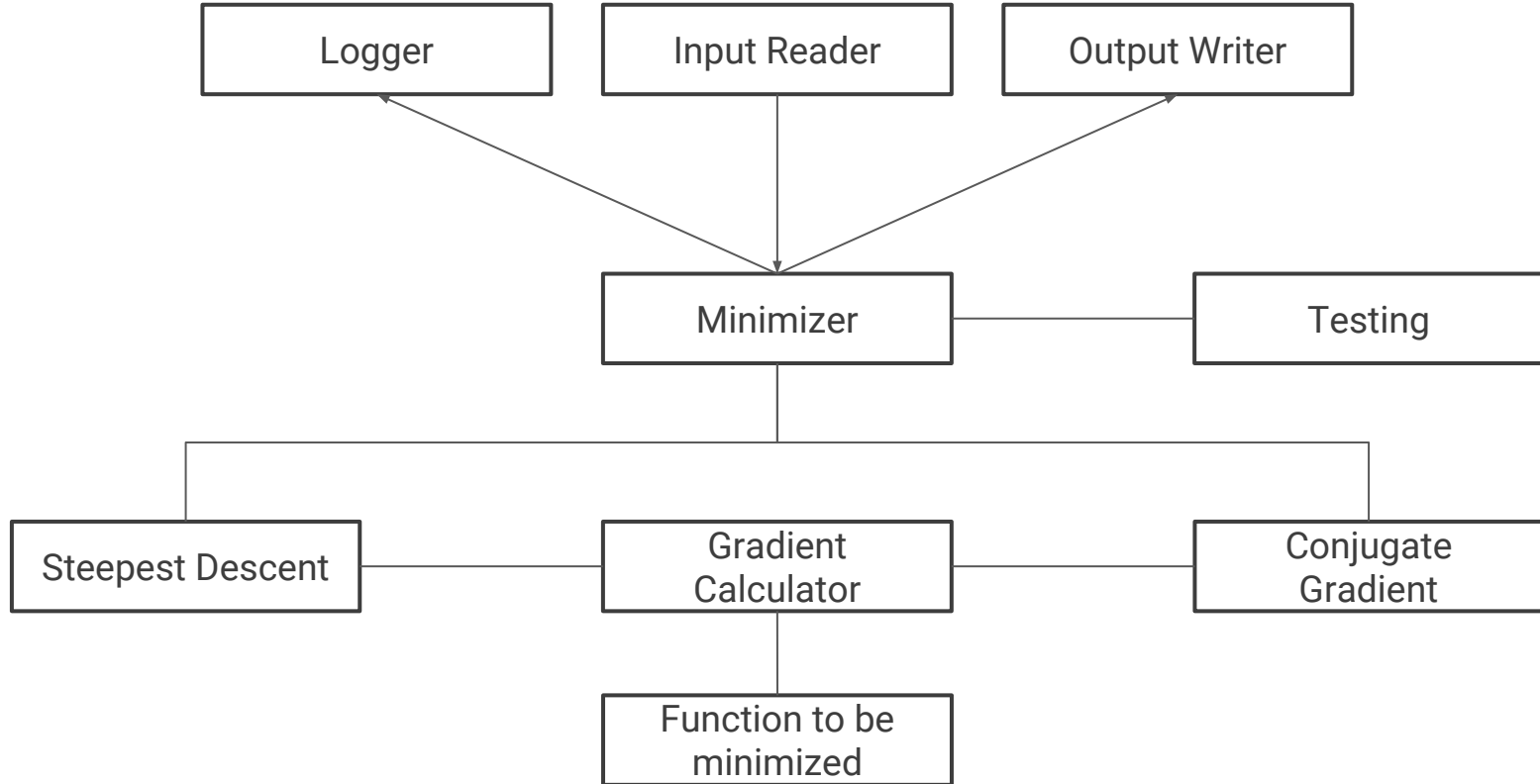# Structure of the Minimization program

Numerical Minimization of Multi Dimensional Functions

- The input reader reads the first user input (program selection and parameters) and initializes the Minimizer as such.
- The Minimizer is the main program which calls other code according to the user's input
- The two minimization algorithms may be called given the user's input
- The algorithms call the gradient calculator once each iteration and store the previous gradient and vector of x values
- The location of the minimum, the number of iterations and the elapsed time will be returned. Additionally a report for each iteration may be requested

Conjugate Gradient optimization

- Finding the direction of each next iteration in the Conjugate Gradient method will not be performed by Gram-Schmidt Orthogonalization.
- Instead the 'alpha-beta method' will be used as defined by:
    - R. H. Refsnæs, A Brief Introduction to the Conjugate Gradient Method, 2009
- Employing this method circumvents the need for saving the variable vectors of each iteration

Optional future implementations

- Implement lapack for optimized matrix multiplication
- Implement maximization
- Reading functions from user input or textfiles
- Converting code to callable routine for implementation in other programs
- Estimating likely local minima (on a definable finite grid?) before optimization
    - Perform minimization on each to find (pseudo) global minimum
- Implement a preconditioning method for efficiency