

Powell's Conjugate Direction Method User Manual

1) Installation: Download Mathematica

- Installation requires a license
- I recommend downloading Wolfram Player (<https://www.wolfram.com/player/>)
 - Allows you to view Mathematica Notebooks
 - I did not include a .cdf file which allows you to interact with the file in Wolfram Player but it could be provided

2) Running Program:

- The program is a Mathematica notebook thus you must evaluate each cell in order from top to bottom
- Evaluate the sections: "Necessary preliminaries", "Initialize Powell's Conjugate Direction Method", "One iteration of Powell's Conjugate Direction Method", "Print Method"
- **Commands:**
 - `pcdmininit[{x1, x2, ..., xn}, n]` – Initializes the variables for PCDM. The first argument is the starting point for the algorithm. Make sure that it has the same number of variables as the function. The second argument is the dimensions of the objective function.
 - `pcdm` – Runs one iteration of the PCDM algorithm and calls `pcdmprint`
 - `pcdmprint` – Prints the current iteration, the new estimate of the minimizer, and the direction vectors.
- Now you can perform PCDM either on the 2 functions defined in the program or your own

- **First, running the functions defined in the program:**
 - Evaluate “Define Function 1” and “Running pcdm on Function 1” line by line.
 - Evaluate “Results for Function 1” to see 3D plot of points found at each iteration of pcdm
 - Evaluate “Define Function 2” and “Running pcdm on Function 2” line by line
 - You can also insert more “pcdm” commands to see what happens to the direction vectors
- **Running your own functions:**
 - Copy “Define Function 1” into a new cell but change what f is equal to
 - Must use Wolfram Mathematica syntax
 - If you want a higher dimension function, add x_4, x_5, \dots , up to x_n where n is the dimensions of your function
 - When running pcdm_{init}, insert the starting point and size you want in form:
`pcdminit[{x1, x2, ..., xn}, n]`
 - type pcdm then evaluate the cell to run 1 iteration of PCDM
 - Stop when you have the same point as the last iteration, one of the direction vectors equals the zero vector, or you’ve run k iterations