## Introduction

This package of scripts and functions builds a planar optimal geometry and modifies to be manufacturable with additive methods. A full description is available in the publication:  
***Optimal topology for additive manufacture: A method for enabling additive manufacture of support-free optimal structures*** *[Int J. Materials and Design 63 (2014) 678–690]*

## Scripts & Functions Include:

### Topology Optimisation & AM Orientation

* *topmain.m :* Main code (THIS IS RAN TO OBTAIN RESULTS)
* *top88.m:* 88 Line topology optimisation code
* *top.m:* 99 Line topology optimisation code by Ole Sigmund with update
* *topCantiDist.m:* 99 Line topology by Ole Sigmund
* *smoothedge.m:* Defines constrained and loaded edges from a cell array of checkered

boundaries and return a cell array with smoothed boundaries, except for

constrained and loaded ones.

* *rotopt.m:* This function takes user defined inputs for initial, step & final orientation and rotates part to be manufactured, which then allows user to see optimal orientation for minimal support structure during additive manufacture.
* *nodes.*m: This function is used to create boundary node coordinate from a binary matrix input starting from the south west corner of the ‘2D Planar Grid’.
* *igesout.m*: .igs Converter for points, lines and Nurbs curves and surfaces
* *gcolor.m:* Function creates gradient plots for structure based on user defined feasible angle of manufacture
* *ConvertToBinary.m:* Converts a full matrix of elements into a binary matrix, by comparing every value with user given threshold and print a grayscale colour map of the binary matrix.
* *Comma2point.m:* replaces all occurrences of comma (",") with point (".") in a text-file.
* *Buildextsupport.m:* This function builds support structures for external boundaries.

### Additional functions:

All other code comes from ‘addaxis’ by Harry Lee available on Mathworks File Exchange, link : (<https://au.mathworks.com/matlabcentral/fileexchange/9016-addaxis> )  
It is used to add multiple axis to a plot.

## Instructions

All that is required is running the *topmain.m* script; user will be prompted to input variables such as number of elements in the x & y direction, volume fraction etc.