Optimization Algorithms (ACM 41030)
Bonus Assignment

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Trust-Region Methods

Instructions:

- This is a graded **bonus** assignment.
- Worth a maximum of 2.5%.
- To be completed individually.
- Web resources can be used. Give credit to the source if web resources are used.
- Large-language models (LLMs) can be used – see below for details.
- The format of the completed assignment should be a 1-2 page report, **in Latex**. In addition, a printout of the codes (fully commented) should be included in an appendix.
- The submission is by hardcopy, hardcopies to be submitted to the lecturer in class on the same date as the midterm test (Tuesday 1st April).
- Because this is a bonus assignment, there is no guarantee of feedback by any particular date.

Guidelines on use of LLMs:

- LLMs can be used for code debugging, first draft of report, etc.
- If using LLMs, you should include a statement at the end of the report outlining how they were used.
- Whatever you use for writing the code, there should be some validation of the result:
  - The analytical minimum is known – is the code converging to the analytical minimum?
  - Dogleg should have similar performance to Newton and Quasi-Newton – how many iterations is your code taking before convergence is reached?
- Ideally you would do a good amount of the work yourself – just to learn what is going on. You don't want to end up like Mr Wojack (Figure 1).

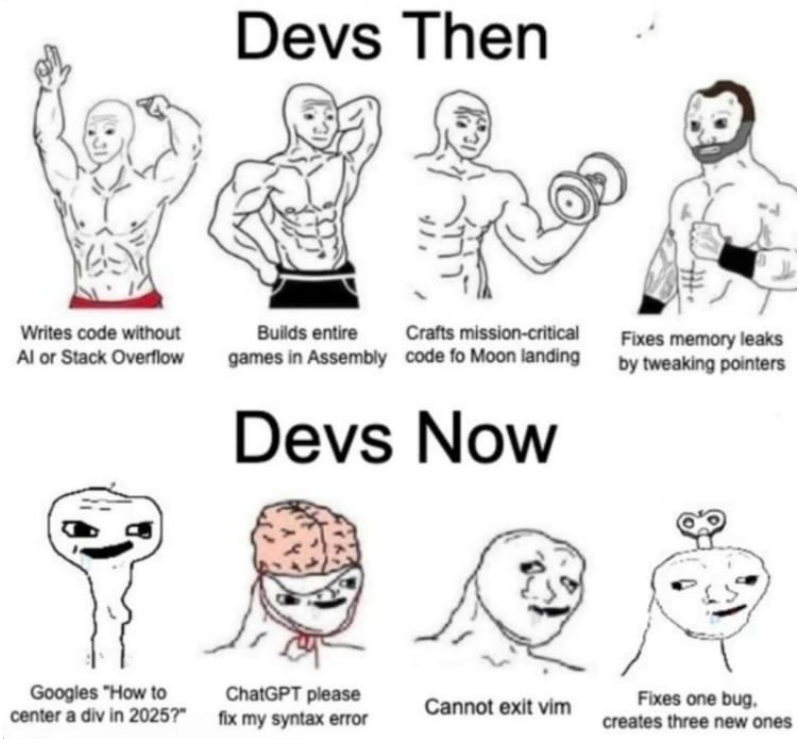

Figure 1: Mr Wojack, internet meme

The question:

Complete Question 2 on Exercises #3, that is:

> 2. Write a code (in whatever programming langauge) that uses the Trust-Region method (Dogleg method) to solve the Rosenbrock problem
>
> $$f = 10(x_2 - x_1^2)^2 + (1 - x_1)^2.$$

The results should be written up in the form of a one-page report (modelled on the computational exercises to date). For maximum marks, the report should describe the convergence of the method and include a contour plot showing the trajectory of the iterative method as it converges to the solution. Include codes (fully commented) in an appendix.