

Locate the researcher

Problem description

Our recruiting team has a new top researcher on their radar, located in London. Unfortunately, they don't know her exact whereabouts but instead they have information from three sources, each of which has inferred her location from a different measurement. Can you tell where best to send the recruiters, and **plot a map of your solution?**

This is what we could extract from the independent sources:

1. The candidate is likely to be close to the Thames. The probability at any point is given by a Gaussian function of its shortest distance to the river. The function peaks at zero and has 95% of its total integral within +/- 2730m.
2. The second source provides a probability distribution centered at the Bank of England. The radial profile of the distribution is log-normal with a mean of 4744m and a mode of 3777m in every direction.
3. A satellite offers further information: With 95% probability she is located within 3160m distance of the satellite path (assuming a normal probability distribution).

You can assume that these probabilities are accurately calibrated. All the extra required data is listed in the **Data** section below.

Instructions

- Please share with us all the code necessary to generate the plot and the final location, together with a short document describing the approach and the results.
- The code should run smoothly and follow best practices:

- Dependencies should be installed automatically or through standard means for the language (e.g. using pip in Python, ideally dockerized or in shared environments such as Google Colab).
- Code should be legible. Think of something you'd be comfortable submitting in a pull request.
- If you're unsure of any step or assumption that you make, please call it out in your solution document. On top of your problem solving skills we want to see how you manage uncertainty (if any!).
- Hint: All the coordinates are pretty close by so the researcher can't be very far. You may want to use that as a way to simplify the way you work with coordinates.

Data

Please make use of the following information:

Earth radius

6371km

Bank of England GPS coordinates

51.514171,-0.088438

The satellite path is the great circle path between coordinates

51.451000,-0.300000

51.560000, 0.000000

River Thames can be approximated as piecewise linear between the following coordinates:

51.489467,-0.236313

51.468045,-0.216379

51.464141,-0.190458

51.473257,-0.179515

51.480661,-0.173850

51.484590,-0.148573

51.483601,-0.137501

51.485793,-0.129604

51.494744,-0.122824

51.508208,-0.118489

51.509330,-0.096431

51.501904,-0.058365

51.508662,-0.043216

51.506098,-0.030727

51.490202,-0.028796

51.485098,-0.007725

51.490683,+0.000215

51.502305,-0.005407

51.506552,+0.005536