a.Marketing's main success metric is total margin (revenue - cost) and they want to maximize it. Given the information you have in the dataset, how would you use it to make recommendations in order to optimize the performance of their campaigns? There is no specific answer expected here and you can make any assumptions you think are necessary.

Answer

	service_name text	cost numeric	revenue numeric	profit numeric	profit_per_unit_cost numeric
1	Interior painting	345880.85	620961.98	275081.13	0.79530604252880724677
2	Replace or renovate roof	140671.07	260143.65	119472.58	0.84930455139070172709
3	House renovation	49842.65	97541.39	47698.74	0.95698643631508356799
4	Install or replace airconditioni...	16789.41	45095.92	28306.51	1.6859740753248625
5	Install or replace heating syst...	11465.76	35640.95	24175.19	2.1084681695761990

1. Return on **Install or replace heating systems is highest** per unit(USD/Euro).So companies can invest more on this service. (Just for Example)
2. Return on **Interior painting** is minimum per unit(USD/Euro). So this service needs optimization.(Need to find out cities or other reasons why its return per unit is so less.) (Just for Example)

3. I would drill down its cost and revenue per unit (Service/City/Region) and then would make recommendations.
4. Based on regions advertisement can be costly , depending on those factors also we can change or learn recommendations.
5. If required we may need detailed data for this analysis.

b.What other information/data would you like to have in order to improve SEM campaigns' performance? Could be internal to the company, external or both.

It would be good to have external system information related to analysis but only if we can trust it or there should be a reason and a way to trust it. Mostly I will rely on the organization's internal data.

If external data is trusted and there is a mechanism to trust it then external data can be used.

c.**If you are to productionize the model that forecasts the demand:**

i. **How often would you choose to train the model?**

It depends on how often we are getting data and the volume of data also and it will depend on how often marketing teams need our forecast.

Ideally a marketing team works on targets like weekly or monthly. So most likely weekly model training would work.

ii. **Briefly define the technology stack you would choose for the end-to-end automated solution.**

I would use cloud (AWS/Google/IBM) to deploy solutions.

In case of AWS, i will use

1. EC2
2. PyTorch (If we decide to use Neural Network and if data is huge)
3. Django /Flask
4. Django Rest API
5. AWS Load Balancer (So that we don't need to worry about IP and will have a fixed domain name)
6. AWS -Auto Scaling
7. SageMaker (can do auto scaling and deploy it on EC2 but i need to learn it)

iii. **What information do you need from Marketing to ensure the adoption of your solution?**

Data similar to given in case study would work. Apart from that i can have IP addresses, Client Details , Region, Geo, Longatitute , Latitude for detailed analysis of data. So that cost can come down or revenue can be increased by region apart from city and service.

iv. **If Marketing uses your predictions to set up campaigns, what business metrics would you use to evaluate the online performance of your model?**

I would use ROI (return on investment),Profit(Cost-Revenue) as the most important metrics. Apart from profit and roiI will also use volume , volume per service/city. So that I can decrease the cost of services based on region also and scale services wherever required.