1. **BLEU Score:**

   - As the beam size increases, the BLEU score generally improves, reaching higher values with larger beam sizes. This is because a larger beam size allows the model to consider more candidate sequences, potentially finding more accurate translations.

   - However, after a certain point (in our case, it's beam size 5), the improvement in BLEU score diminishes. This indicates that beyond a certain beam size, the marginal gain in translation quality becomes minimal.

2. **Processing Time:**

   - The processing time increases significantly with larger beam sizes. This is due to the computational complexity of maintaining and evaluating more candidate sequences during the translation process.

   - When the beam size is 1, the time is unexpectedly longer than when the beam size is 2. Possible reason could be that the search space becomes larger when the beam size is 1, leading to an increase in time.

Personal Take on Optimal Beam Size

Given the trade-offs between BLEU score and processing time, the choice of beam size should balance translation quality with efficiency. Here are the considerations for selecting an optimal beam size:

- **Efficiency:** For applications requiring real-time or near-real-time translations, a smaller beam size might be preferable to ensure quick response times, even if it means a slight reduction in translation quality.

- **Quality:** For applications where translation accuracy is paramount, and processing time is less of a concern (e.g., offline translation of large documents), a larger beam size might be beneficial.

Based on the observed trends, beam size 5 is the optimal choice. But in the future, we think 3-5 are all very good choices for beam size.