1. **What are the names and NetIDs of all your team members? Who is the captain? The captain will have more administrative duties than team members.**
   Marie Yau - mariey3 (captain)
   Daniel Lu - dylu2
   Xuan Luo - xuanluo2

2. **What system have you chosen? Which subtopic(s) under the system? If it is not listed above, how is it related to the class?**
   We have chosen system 3.1 MeTA Toolkit. The subtopic that we are focusing on is to Enhance MeTA and Metapy usability.

3. **Briefly describe any datasets, algorithms or techniques you plan to use**
   Datasets:
   We plan to use a wide variety of public datasets to assess the performance of the enhancement of the model. Examples include:
   - Cranfield Collection
   - The ClueWeb22 Dataset

   Algorithms/techniques:
   We plan to explore parameter tuning techniques including grid search, random search, Bayesian optimization using some machine learning toolkits like scikit-learn or Hyperopt and integrate those toolkits with MeTA scoring functions.

4. **If you are adding a function, how will you demonstrate that it works as expected? If you are improving a function, how will you show your implementation actually works better?**
   We plan to evaluate our program on
   - datasets that it hasn't seen before.
   - 20% of each dataset that was set aside prior to training.

   We will use cross-validation to ensure that the model's performance is not overfitting. We will use benchmarking metrics (precision, recall, F1, MAP, NDCG) to assess the performance.

5. **How will your code communicate with or utilize the system? It is also fine to build your own systems, just please state your plan clearly**
   Our program will use various MeTA scoring functions in order to tune their parameters and recommend the users the best scoring function for their datasets. The addition of code should integrate with system as
   - Creating a wrapper layer of MeTA scoring functions
   - Defining pipeline that the parameter tuning function can use the scoring function as a parameter
   - Define hyperparameters and fit the model (optimization)

6. **Which programming language do you plan to use?**
   Python

7. **Please justify that the workload of your topic is at least 20*N hours, N being the total number of students in your team. You may list the main tasks to be completed, and the estimated time cost for each task.**
   a. Gather and understand datasets - 5h
   b. Research the MeTa scoring functions - 5h
      i. OkapiBM25
      ii. PivotedLength
      iii. JelinekMercer
      iv. DirichletPrior
      v. AbsoluteDiscount
      vi. others
   c. Design - 10h
      - Explore the following hyperparameter tuning methods for each scoring function with the appropriate ranges for each parameter.
        - Grid Search
        - Random Search
      - Explore domain specific tuning
   d. Code implementation - 20h
      - Implement the parameters tuning
      - Implement the best scoring function recommendation to the users
   e. Testing and optimization - 5h
   f. Metrics evaluation - 5h
      i. Apply to all datasets from part (a) and plot graphs of metrics (i.e. NDCG@k) vs parameter value
   g. Documentation and presentation - 10h