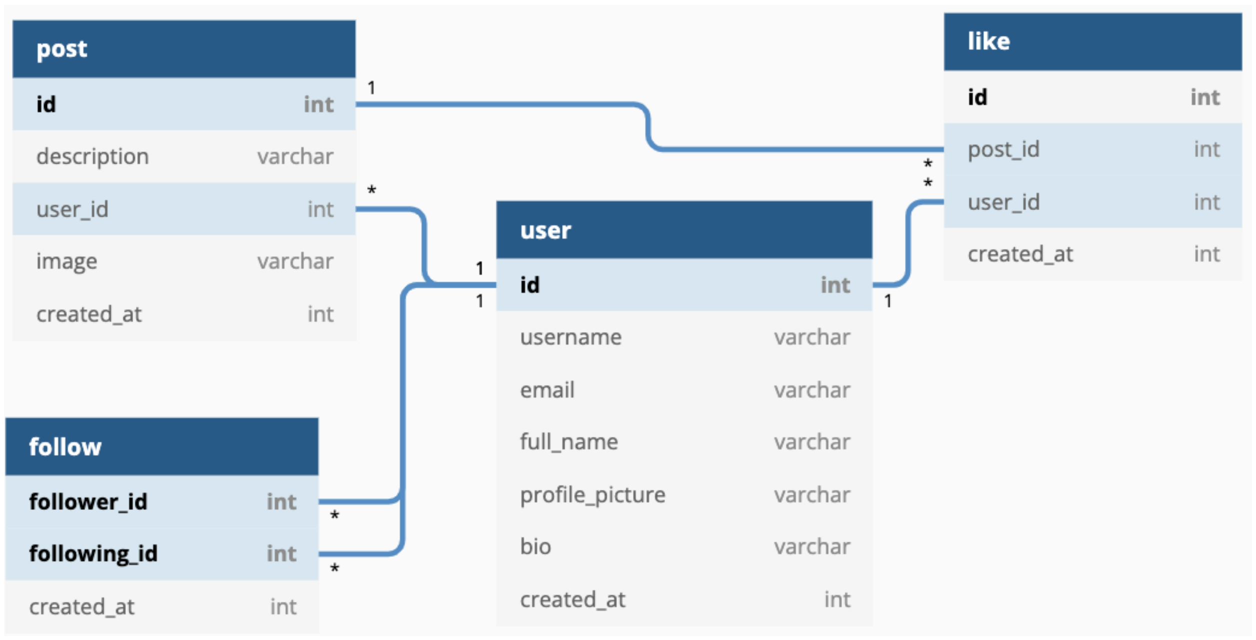
Backend Interview Questions

Imagine we have a social media application. This application has very simple features:

- A user can sign up using a username, email and password.
- Each user has an account containing his username, email, full name, profile picture and bio.
- Each user can follow and unfollow another user, and they can see people who they follow or who follows them.
- Each user can like another user's posts.
- Each user can post a photo which can be seen in his profile in chronological order.

We are using a SQL database to store information. The database diagram is shown below *(For simplicity, authentication information is omitted).*



Note: You don't have to adhere to any language or syntax, just make sure that the execution steps are logically correct. We value that all requirement criteria are satisfied. We don't expect you to create a project from scratch, you only need just provide the code for the function asked in the questions.

Q1 - Day-to-day programming (approx. 15 minutes)
We are implementing a simple function to get information for a list of posts that might be used in arbitrary places for our project. (Think of this like a random post feed on Instagram.) Write a simple function (signature is given below) to get all information for given post ids.

Data structures that should be returned from the function

```
struct User:
   id: int
   username: string
   full_name: string
   profile_picture: string
   followed: boolean  // whether or not requesting user follows


struct Post:
   id: int
   description: string
   owner: User
   image: string
   created_at: int
   liked: boolean  // whether or not requesting user likes
```

Signature

```
def get_posts(user_id: int, post_ids: List[int]) -> List[Post]: // implement
```

Input parameters

user_id	The requesting user id. Use this to determine *liked* field of *struct Post* and *followed* field of *struct User*
post_ids	List of post ids that are requested

Requirements / Assumptions

- Assume given *post_ids* are unique.
- The function should return a list of *struct Post* in the same order as *post_ids*.
- The function should place **null** values for non-existing posts in the resulting list.
- You can only read from a single table in each query (no joins or subqueries are allowed).
- You need to specify the SQL queries explicitly.
- You can use this kind of format for executing SQL queries:

  ```
  db_posts = SELECT * FROM post WHERE id IN post_ids
  ```

Q2 - Algorithmic design (approx. 30 minutes)
Write a *merge_posts* function (signature is given below) which takes in one parameter *list_of_posts* which is a list of post lists (List[List[Post]]), and returns a list of posts (List[Post]). The function should merge each list in *list_of_posts* to a single list.

```
struct Post:
   id: int
   description: string
   image: string
   created_at: int

def merge_posts(list_of_posts: List[List[Post]]) -> List[Post]: // implement
```

Requirements / Assumptions

- You're guaranteed that each element of *list_of_posts* is sorted by *created_at* attribute in ascending order. The posts with the same created_at value in each element of list_of_posts are sorted by their *id* in ascending order.
- The output of *merge_posts* should be sorted by *created_at* attribute in descending order.
- For posts that have the same *created_at* value, they should be ordered by their *id* in descending order.
- The result should contain unique posts i.e *id* attributes of the result list should be unique (you can assume that if two post has same id, all of their attributes are the same)
- Lists are dynamic-sized arrays so you have index-based access in O(1) time.
- **The time complexity of the function should be at worst O(M*N) where M is the size of *list_of_posts* and N is the sum of size of elements in *list_of_posts.* (a time complexity of O(N*logN) won't be accepted)**