**Goal**

In this first step of the project, you will create an entity-relationship model (E-R diagram) to describe the data for the application domain described below. The description includes all the main concepts that you will need to model.

Anteater Recreation Center (ARC) is a recreation center with a variety of spaces and equipment. It has a front desk, a cardio room, a weight room, a swimming pool, a yoga studio, and a basketball court. All the spaces have a maximum capacity listed. The cardio room has treadmills, ellipticals, and stair climbers. The weight room has weight machines and free weights.. Each of the above equipment -- weight machine, weights, hoop, blackboard, treadmill, elliptical, stair climber has a unique equipment id, which is an integer. Also, each equipment can be either in-use or is available. If the equipment is in use, it has one person listed as a user. Besides the above spaces listed, all other spaces in ARC are known as "other".

Each person in the system has an associated unique id, name, date of birth and gender. People in ARC can either be members or employees. Employees can also be members of ARC though they are not required to be. Members can be either students, faculty, alumni, or staff, or family of another member. Students, themselves can be either graduate or undergraduate students. This information is associated with each member. Also, associated with each member is a unique membership id, address, department, and list of enrollments in activities that are held at ARC (discussed later in the description). Further, credit card information is stored for all members other than students. Employees can either be student employees or staff. Each employee has an employee id number, and a schedule when they are at ARC. The employees are either designated as trainers or desk employees. For trainers we further store information about their credentials. All employees are paid at a hourly rate -- the rate of different employees can be different.

All visitors to the ARC (both members and employees) swipe in their card to enter the ARC premises. The entry times are logged into a timekeeping system. The exit times of all the employees are also logged.

ARC has 2 kinds of sensors that monitor the facility . Location sensors track the location of people within ARC. Equipment usage sensors track when people are using equipment. There are no other kinds of sensors. A location sensor cannot also serve as an equipment sensor and vice-versa. Only members of ARC can use equipment at ARC.

To illustrate how the sensor system in ARC work, consider the following example of a day at the ARC. A graduate student named John enters ARC at 2pm - his original location

observed by the sensor is “front-desk” at 2pm. He then moves through corridors after checking in at 2:01pm. Since the corridor is not explicitly identified by a name, the system marks John at the location “other” at 2:01. He enters the “weight room” at say 2:03pm for a workout. This causes the location sensor to trigger an event that John entered the weight room at 2:03 . Let us assume that John uses a weight machine W sometime after entering the weight room. The equipment usage sensor will detect then John starts using the weight machine W and sends a signal to the ARC’s computer system. Likewise, when later, John starts using a free weight W’ , the equipment sensing system will raise a trigger about W’ being used by John. When John leaves the weight room, the location sensor will update his location to the new location where he moved to. Finally, when John leaves ARC, the location sensor will determine that John is now outside the building.

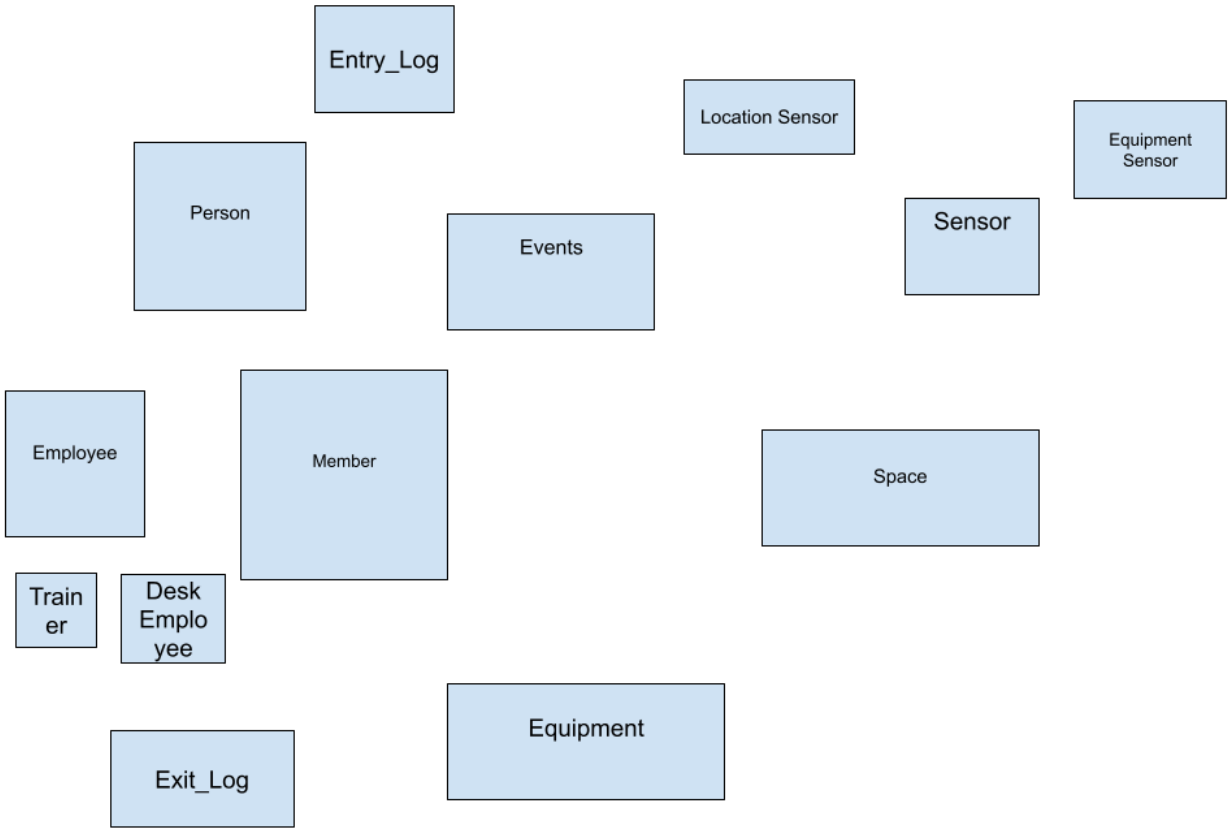
ARC organizes events such as yoga classes. Events occur at a given location in ARC and have a maximum capacity, a starting time and an end time. The capacity of the event must be less than or equal to the maximum occupancy of the location where the event is organized. Example of an event is a Yoga class which may occur at the yoga studio. Members of ARC can register for ARC events. For instance, an undergraduate student named Mary may be taking a yoga class in the yoga studio. Same as with the case of John, when Mary enters the yoga room for her yoga class, the system will send a signal to the ARC's computer system, which records her location and the time.

At the front desk, a staff member named Jane checks the membership status of people when they enter the ARC. Jane has an associated schedule when she arrives and when she leaves. Her location will be detected similar to that of members as she goes through different parts of ARC. Note that Jane, in the example, is a non-member but she is an employee of ARC. In general, as mentioned above, employees can also be members.

Mr. Jones visits ARC to play basketball. He is a member who is also an alumni. The location sensor detects him and sends a signal to the ARC's computer system, which records his location and the time.

These are just a few examples of the many people who could be at ARC on any given day. The sensor readings from ARC can be used to track the usage of the facility, the activities of its members and workers, and the attendance at its events. The data can be used to determine who uses what facilities/equipment, when and how often. Such information is vital for several purposes such as determining a maintenance schedule for equipment, increasing/decreasing frequency of events, understanding who uses ARC at what times of the day, and how well are different areas of ARC utilized, etc.

**Create an ER diagram modeling the concepts in the above description. To help you in the task, we have provided a template below. All the entities listed in the template should be in your design. Also, none of the entities in the template are marked as weak; if you wish to change that, you may. You will need to specify two things: (a) for each entity set identified, you will need to specify all the attributes, including their keys (b) define all relationships, make sure to mark all constraints on entities and relationships (key constraints for entities, and cardinality and participation constraints for relationships).**
**Note that the description above specifies several constraints. Your ER design should try to model most of the constraints specified in the description above. If you find some constraint that you cannot model in the ER diagram, please specify as a comment.**




## Submission

1. Please submit a pdf file with your answers to Problem 1. The name of the pdf file should be the last names of each team member placed together. For example if Edgar Codd, Donald Chamberlin were teammates, they would submit: *codd_chamberlin_assignment1.pdf.* Be sure to also identify all the team members in the pdf file (**name** and **student ID**).
2. Upload the pdf to **Gradescope**. Only one submission is required per team - make sure to associate the submission with both members of the group on Gradescope. Instructions for this are specified below.
3. Instructions to submit as a group on Gradescope:
    a. Submit the assignment on gradescope as a solo submission.
    b. Open the submission, click “View or edit group” near your name at the top right of the webpage.
    c. Type in the other group member’s name or email under “Add Student”.
    d. Click on your teammate’s name and click “Add”.

    Once the other member has been added, they should also be able to view the same submission on Gradescope.