Fall 2022

COMP2411 Tutorial No. 1:

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1. Consider a two-dimensional integer array of size *n*m*; the array is to be used in your favorite programming language. Illustrate the difference between
   a) the three levels of data abstraction, and
   b) a scheme and instances.

Answer: Let *tgrid* be a two-dimensional integer array of size $n \times m$.

a. The *physical level* would simply be $n \times m$ (probably consecutive) storage locations of whatever size is specified by the implementation (e.g. 32 bits each).

   The *conceptual level* is a grid of boxes, each possibly containing an integer, which is *n* boxes high by *m* boxes wide.

   There are $2^{n \times m}$ possible views (*external level*). For example, a view might be the entire array, or all *n* rows but only columns 1 through *i*.

b. Consider the following Pascal declarations:

```
type tgrid = array[1..n, 1..m] of integer;
var vgrid1, vgrid2 : tgrid
```

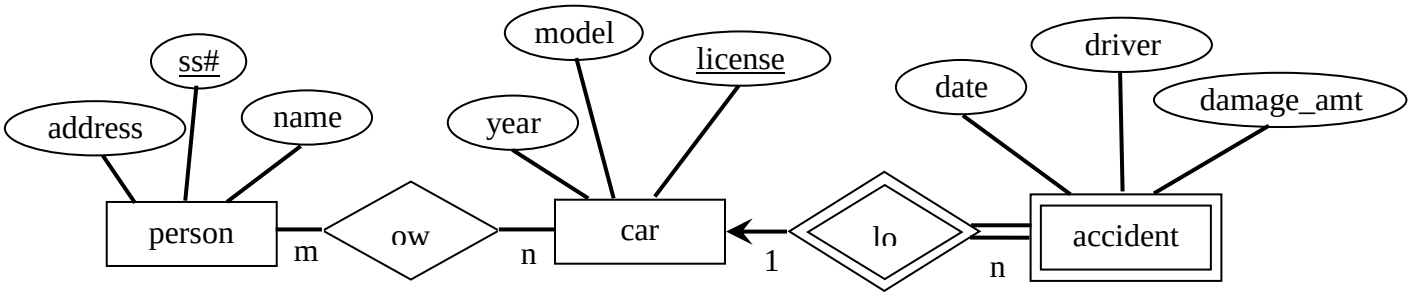
   Then *tgrid* is a schema, whereas the values of variables *vgrid1* and *vgrid2* are instances.

   To illustrate further, consider the schema `array[1..2, 1..2]` of integer. Two instances of this scheme are:

123	456
789	258

987	654
321	741

2. Construct an ER diagram for a car insurance company with a set of customers, each of whom owns a number of cars. Each car has a number of recorded accidents associated with it.



3. Construct an ER diagram for a hospital with a set of patients and a set of medical doctors. A log of the various conducted tests is associated with each patient.