* Introduction to logics

Phone frame

Reference frame

Vehicle frame

* Introduction to the motion and location datasets
  + **Z\_PK** is the primary key (unique identifier) for the entity, **Z\_ENT** is the entity ID (every entity of a particular type has the same entity ID), and **Z\_OPT** indicates the number of times an entity has been changed (starting with **1**when it is initially added to the database). <https://www.iphonelife.com/blog/31369/unleash-your-inner-app-developer-core-data-behind-scenes>
  + The heading of a user’s device is its current orientation relative to magnetic or true north. Devices with GPS can report course information, which represents the direction in which the device is moving. <https://developer.apple.com/documentation/corelocation/getting_heading_and_course_information>
  + Rotational speed (or speed of revolution) of an object rotating around an axis is the number of turns of the object divided by time, specified as revolutions per minute (rpm), cycles per second (cps), radians per second (rad/s), etc.. <https://www.google.com/search?q=ROTATIONRATEX&rlz=1C1GGRV_enUS758US758&oq=ROTATIONRATEX&aqs=chrome..69i57j0l6.943j0j7&sourceid=chrome&ie=UTF-8>
* Introduction to the frame conversions and assumptions
  + Quaternion
  + Z course interpolation
  + Vertical Z is not considered (civil engineers may be interested in vertical Z)
  + x\_new = x \* cos(theta) – y \* sin(theta)
  + y\_new = x \* sin(theta) + y \* sin(theta)
* Introduction to Python code and plots
* Some thoughts:
  + Why the deceleration is positive on vehicle axis (misunderstanding of the data)?
  + How to identify cornering behaviors (we know speed and accelerations)?
  + How to define risky driving behaviors?
  + What are the objectives of this study? Starting from a simple question?
* Action items
  + Have better understanding of the data, and test the cell phone (more people and give a log of their driving
  + Dig into more literature