# Study Project Work Package Overview: Vipra

This work package comprises three tasks of increasing complexity. You can choose to complete one, two, or all three tasks, depending on your desired grade improvement. Completing at least one task very proficiently is required to pass. Best try to aim to do task 1 and task 2. However, undertaking all tasks can enhance your chances of still achieving a very good grade.
The primary goal of the work package is to develop a more engaging and creative environment within MuJoCo and document the process in an instructional article. This will involve working with the Blueprint Framework and creating assets using Blender for MuJoCo simulations.

### Task 1 — HFields for MuJoCo

The idea here is to create an environment with an interesting surface shape using HFields in Blueprints for MuJoCo.

1. Have a look at the following article: https://medium.com/@travall/procedural-2d-island-generation-noise-functions-13976bddeaf9
2. Make yourself familiar with Blueprints, there is a guide attached with the files for this task (you can also ask your peers e.g. in the Slack study project channel for help)
3. Define a function that generates a Height map similar to the one in the article. The heightmap must be a numpy array of sizes X and Y where X and Y are arguments to the function. def island(X: int, Y: int) -> np.ndarray: ... return height_map
4. See whether you can find some methods online on how to make the map more realistic. Maybe introduce some additional arguments to the function for controlling the roughness of the terrain.

### Task 2 — Basic Objects from Blender for MuJoCo

The idea here is to create additional objects that can be placed into a more interesting and creative MuJoCo environment.

1. Make yourself familiar with 3D modelling in Blender. There are many good tutorials online that will give you a hands on introduction. Textures, Lighting, Animation and everything that is not related to basic sculpting can be ignored. (There is also a new student in the study project who has experience with Blender and may help you)
2. Next model the following objects in Blender and save them as stl files. They will later be used as building blocks for Mujoco Environments. You don't have to add a lot of details, just the basic shape suffices (would even be preferable).
3. Some examples could be
    - different Rocks (large boulders, flat stones...)
    - Acorn (single seed)
    - Apple
    - Leafs, e.g. Birch, Willow, Chestnut. Oak, Maple

Please DO NOT just scrap files from the internet and hand them in. Those files typically vary heavily in their scale, level of detail and open source status, which makes them unusable for our purposes. Files from the internet will also have different file signatures.
Put your objects together with the height map into one environment for demonstration. You can include screenshots to your instructional article.

### Task 3 — Complex Object Configuration

This task would be about making more complex objects, e.g. implementing plants with L-Systems. This is a bonus task and we can discuss it in more detail if you still want to do it after you have finished Task 1 and Task 2.