Plant Sciences

PLS 481/581
Computational Plant Science

List of Topics

- ✓ Basic concepts and algorithm design
- ✓ Simulating plant growth and pattern formation
- ✓ Introduction to imaging
- ✓ Learn to use supercomputers
- ✓ No prior programming experience expected

4 Units

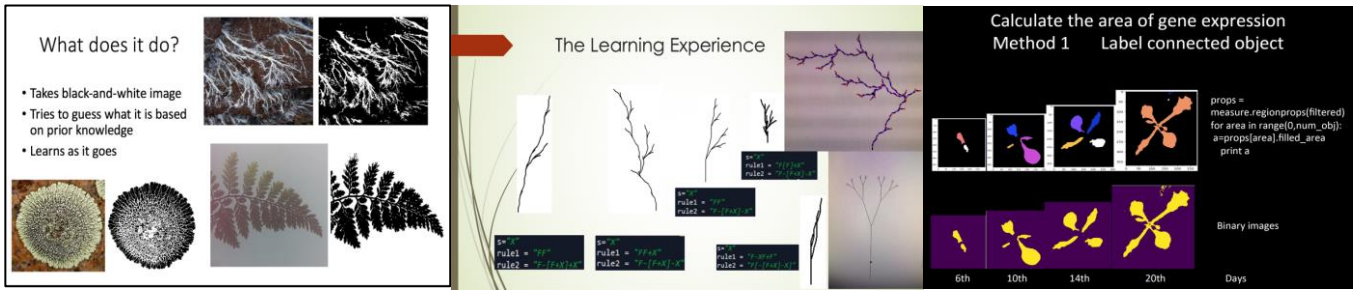
Where & When:

Tue.& Thur. 2:00pm - 3:50 pm

Saguaro Hall, Rm. 114

Instructor:

Alexander Bucksch
bucksch@arizona.edu



Three examples of project presentations. (from left to right) pattern recognition and classification of plant parts, simulation of branching structures in grasses using L-systems, segmentation of the Arabidopsis leaves.

Course objectives or expected learning outcomes for students of the course:

Goal of the course is to become comfortable with programming and basic algorithm development used for plant simulation and imaging.

The course introduces computational techniques to explore plant biology for students that are new to programming or do not regularly program. In doing so, the course introduces basic techniques that allow the simulation of plant growth from the cellular to the organismal level and the imaging analysis of plant morphology.

The first 6 weeks cover basic python programming (for-loop, while-loop, if statement, variables data types, functions and a little bit of object-oriented programming) by extending existing code step-by-step. In doing so, we will learn diffusion limited aggregation as a basic process to grow branches. The course code is commented in a way that students can learn from it. After the first 6 weeks the real fun begins and the class becomes more interest driven. The students will do mini projects depending on their level of programming and needs for their research projects. The class is taught in an active learning setting using only online open-source material.

In the second part of the class, we do 4 weeks of procedural programming, basic data analysis and introduction to image processing and file handling. We finish the course with 3 weeks L-system modeling to generate plant that have a fractal structure and a personal project to be presented during finals week. The final grade is composed of the final presentation and the score of two homework assignments.

Students with backgrounds in areas including math, computer science, statistics, engineering, genetics, biochemistry, chemistry, physics, drug discovery, plant science, ecology, and science education are all encouraged to participate.