Computational Methods for Economics| ECP77594

Year	1
ECTS Credits	5
Pre-Requisite	Nil
Semester	2
Module Leader and Lecturer	Professor Jian Cao
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Module Outline:

This module provides students with an introduction to the use of computational methods for solving economic problems. Part of the module will focus on properly setting up an appropriate environment to best leverage modern methods while producing reproducible and reusable code. We will then study various numerical methods that are commonly used in economic modeling and apply them to specific problems.

Module Learning Outcomes:

Upon completing this module students should be able to:

· **Environment & Workflow:**

Configure GitHub, Jupyter pipelines for reproducible analysis

· **Missing Data Methods:**

Implement appropriate methods to handle various missing data types.

· **Simulation & Monte Carlo:**

Design custom data-generating processes for robust simulation

· **Machine Learning for Causal Inference:**

Estimate heterogeneous treatment effects using machine learning frameworks.

· **High-Dimensional Estimation:**

Fit and interpret penalized regressions with post-selection inference.

Assessment:

- 30% continuous assessment
- 70% exam

Module Content:

Computational methods are used across every field of economics. This module serves as an introduction to some commonly used methods in Computational Economics. The primary aim is to equip students with the fundamentals needed for a wide range of applications. We will begin with some basics about programming fundamentals and setting up a python environment. We will then study some important numerical methods used in quantitative economics and put them to use simulating economic models.

1. Reproducible Research & Workflows

2. Theory & Practice of Missing-Data Methods

3. Monte Carlo Simulation & Bootstrap

4. Machine-Learning Tools for Causal Analysis

5. Penalized Regression & Large-Scale Computation

Recommended Reading List:

Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. The elements of statistical learning, Second Edition. Springer, 2009.

Van Buuren, Stef, and Stef Van Buuren. Flexible imputation of missing data. CRC press, 2012.