

Digital Bootcamp -- Lecture plan

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Monday (2 units)

Setup and Python Recap

- [Hand](#) Setup -- the platform
- [dov00_JupyterLab.ipynb](#) Intro Jupyter lab
- [dov01_RtoPython.ipynb](#) A Recap of basic Python

More Computation

- [dov02_Style.pdf](#) Good programming style right from the start
- [dov03_Codestyle.ipynb](#) Collection of do's and dont's to be filled during the week

Tuesday (3 units)

Linear algebra primer

- [dov04_Linear.pdf](#) The linear model
 - Vectors, matrices, vector spaces
 - Linear models in matrix notation
 - Solving matrix equations
 - Matrix algebra: rank, inverse, determinant, trace, norms
 - A little tensor analysis: matrix derivatives and an alternative OLS derivation
 - Condition of a problem
- [dov04X_Linear.pdf](#) Exercises

Linear algebra with Python

- [dov05_Linalg.ipynb](#)
 - Intro to working with matrices
 - Scipy – linear algebra in Python
 - Numpy – numerics in Python
- [dov06_Algorithms.pdf](#) From theory to program
 - Translating algorithms into Python
 - Good and bad algorithms (convergence, precision)
 - Floating point representation, precision, errors (analytic and numeric)
 - Standard algorithms in linear algebra (Gauss, LU, ... – time permitting)

Linear models with Python

- [dov07_Linmodel.ipynb](#)
 - Intro to working with linear models

Wednesday (2 units)

Data theory

- `dov08_Data.pdf`
 - Random variables
 - Data types, relationships
 - Data toolchain explained
 - A few useful datasets: stocks, interest rates, exchange rates, macro economics

Data toolchain in Python

- `dov09_DataTools.ipynb`
 - Pandas – managing data in Python
 - Data toolchain: extract, transform, load, merge, filter
 - How to access sample data sets

Thursday (3 units)

Visualisation theory

- `dov10_Dataviz.pdf`
 - Vis foundations: perception, design, color, grammar of graphics

Data visualisation with Python

- `dov11_Plotting.ipynb`
 - Plotting data: statistical and exploratory plots, scatterplots and convex hulls

Concept visualisation with Python

- `dov12_Concepviz.ipynb`
 - Plotting concepts I: functions, inequalities, levels and contours
 - Plotting concepts II: Vectors and planes, projections, matrices and linear maps

Friday (2 units)

A first glance at optimization

- `dov13_Optimization.pdf`
- The canonical optimization problem
- Convex and nonconvex optimization
- The CVXOPT language

A first glance at optimization with Python

- `dov14_Cvxopt.ipynb`
- Inside Python modules: setting up and using CVXOPT, CVXPY and CPLEX