MASTER OF URBAN SPATIAL
ANALYTICS (MUSA)

MUSA 500 Spatial Statistics and Data Analysis
This hands-on course will provide an introduction to statistical methods
and will serve as a prequel to ESE502. Topics covered will include
exploratory univariate analysis, correlation and Chi-square analysis, t-
tests and ANOVA. Non-parametric alternatives to the standard tests will
be discussed. OLS regression, including assumptions and diagnostics,
will be covered in detail. Heavy emphasis will be placed on the application
of each method covered. The course will conclude with an introduction
to spatial statistical methods and a brief overview of linear algebra and
matrix notation for OLS and spatial regression. Students will learn to use
JMP-IN, ArcGIS and GeoDa for data analysis.
Taught by: Eugene Brusilovskiy
Course usually offered in fall term
Also Offered As: CPLN 671
Activity: Lecture
1.0 Course Unit

MUSA 503 Modeling Geographical Objects
This course offers a broad and practical introduction to the acquisition,
storage, retrieval, maintenance, use, and presentation of digital
cartographic data with vector-oriented (i.e. drawing-based) geographic
information systems (GIS) for a variety of environmental science,
planning, and management applications. Previous experience in GIS is
not required.
Taught by: Tomlin or O’Neill
Course usually offered in fall term
Also Offered As: CPLN 503
Activity: Lecture
1.0 Course Unit

MUSA 508 Public Policy Analytics
Data scientists convert data into actionable intelligence. While most
private sector data scientists optimize for profit, their public sector
counterparts must address multiple complex bottom lines including
economics, equity, politics, bureaucracy and social cohesion. This course
teaches students how to wrangle government data; how to mine it for
descriptive and predictive intelligence and how to communicate results to
non-technical decision-makers. Broadly, coursework is focused on spatial
analysis and geospatial machine learning and taught 70/30 in R and
ArcGIS. Use cases include home price prediction, forecasting in criminal
justice, land use modeling, transportation modeling and real estate site
suitability. Prerequisites include vector and raster GIS and introductory
statistics.
Taught by: Ken Steif
Course usually offered in fall term
Also Offered As: CPLN 592
Activity: Lecture
1.0 Course Unit

MUSA 509 Geospatial Cloud Computing & Visualization
This course teaches students how to collect, store, wrangle and display
cartographic data in a cloud-based setting. Students will learn a
reproducible approach for pulling spatial data from APIs with emphasis
on PostGIS, Socrata and BigQuery; to wrangle these data in python; and
visualize in various platforms including Seaborn and Carto. Students
will build their own APIs and eventually develop their own introductory
custom web applications. This course is the first in a progression and
leads to the Spring course on Javascript Programming for Planning (a
class on building comprehensive mapping applications.)
Taught by: Andy Eschbacher
Activity: Lecture
1.0 Course Unit

MUSA 550 Geospatial Data Science in Python
This course will provide students with the knowledge and tools to turn
data into meaningful insights, with a focus on real-world case studies in the
urban planning and public policy realm. Focusing on the latest Python
software tools, the course will outline the ‘pipeline’ approach to data
science. It will teach students the tools to gather, visualize, and analyze
datasets, providing the skills to effectively explore large datasets and
transform results into understandable and compelling narratives. The
course is organized into five main sections: Exploratory Data Science;:
Introduction to Geospatial Data Science; Data Ingestion & Big Data;
Geospatial Machine Learning; Data Visualization & Storytelling.
Taught by: Nick Hand
Course usually offered in fall term
Also Offered As: CPLN 672
Activity: Seminar
1.0 Course Unit

MUSA 611 Java Script Programming for Planners and Designers
This course will introduce City Planning, MUSA and design graduate
students to Javascript. Students will learn the logic and syntax of the
Java programming language for use in a simple web application (weeks
1 to 7); as well as how to program database and map-oriented web and
desktop applications using Javascript (weeks 8 to 14). The ‘hands-on’
uses of Javascript in urban planning applications will be emphasized.
Students will hone their programming and applications development
skills through a series of bi-weekly assignments.
Taught by: Faculty
Course usually offered in fall term
Also Offered As: CPLN 692
Activity: Lecture
1.0 Course Unit
MUSA 650 Geospatial Machine Learning in Remote Sensing
Satellite remote sensing is the science of converting raw aerial imagery into actionable intelligence about the built and natural environment. This course will provide students the foundation necessary for the application of machine learning algorithms on satellite imagery. Use cases include building footprint detection, multi-class object detection in cities and land cover/land use classification. The students will learn basic concepts of machine learning, including unsupervised and supervised learning, model selection, feature elimination, cross-validation and performance evaluation. After learning traditional methods and algorithms, the course will focus on recent deep learning methods using convolutional neural networks and their application on semantic image segmentation. Prerequisites include MUSA 508, Geospatial Data Science in Python or equivalent.
Taught by: Dr. Guray Erus
Course usually offered in spring term
Activity: Lecture
1.0 Course Unit

MUSA 795 MUSA SUMMER: INTRODUCTION TO GIS & STATISTICS
The summer GIS Bootcamp prepare students for the intermediate GIS classes that begin in the fall semester. It begins with a discussion of GIS in planning and the social sciences and then moves on to topics related to spatial data, geocoding, projection, vector and raster-based geoprocessing, 3D visualization and more. Each class includes a brief lecture and a walk through involving actual planning related data. Course enrollment is by permit only. Please contact Roslynne Carter (CPLN Dept.) at roslynne@design.upenn.edu.
Taught by: Faculty
Course usually offered summer term only
Activity: Lecture
0.0 Course Units

MUSA 800 MUSA Capstone Project
One-term course offered either term
Activity: Seminar
1.0 Course Unit

MUSA 801 MUSA/Smart Cities Practicum
The purpose of this course is for students to work with city and non-profit clients on data science that convert government data into actionable public policy intelligence. Groups of 2-3 students will work with the client to understand the business process, wrangle data, develop spatial and aspatial analytics and serve these outputs to non-technical decision makers through the medium of data visualization. Students will be mentored by MUSA Faculty and advised by someone from the partnering agency. Prerequisites: students must have a working knowledge of R and experience building both spatial and statistical models including machine-learning models. Prerequisites include MUSA-507/CPLN-590 and either CPLN-505 or MUSA-500. Students must have taken or be enrolled concurrently in MUSA-601 or MUSA-800. Students without these specific prerequisites are asked to contact the instructor. Please contact the instructor for full admission details, no later than November 15, 2018. Interested students are asked to contact the instructor to learn about specific projects and how to apply for the course.
Taught by: Ken Steif
Course usually offered in spring term
Also Offered As: CPLN 790
Prerequisite: (MUSA 507 OR CPLN 590) AND (CPLN 505 OR MUSA 500)
Activity: Seminar
1.0 Course Unit