

DCP4300/URP6931. AI&BE

Lecture 02: Overview & Python Basics

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Reminder & Question: Use Zoom Video Recording?

Part 1. Lecture 02-06 Overview

Overview Lecture 02-06

Lecture 02

Overview & Python
Basics

Lecture 03

Data collection,
processing, and
visualization

Lecture 04

Linear Regression
Models

Lecture 05

Urban Applications

Lecture 06

Connecting: Data +
Model + Applications

Background questions: how many of you learnt python,
data collection & processing, and regression models?



How to think about the knowledge components in this course?

- Analytical Perspectives:
 - Models
 - Recipe
- Urban Applications & Data
 - Ingredients
- Computational Practice
 - Cookers

Q: What does a chef need to learn for cooking?

Data: multiple data structures in cities

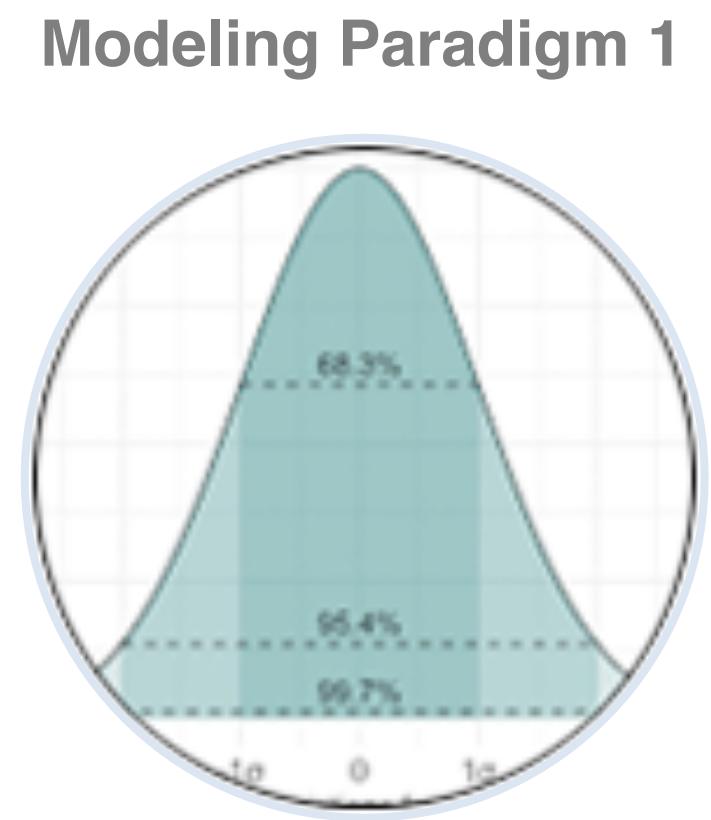


Four basic data structures: **GLIN**

- Uniqueness of cities: connecting **GLIN**
- Uniqueness of deep learning to unify GLIN
(GNN, RNN, CNN, ANN)

Models: Primary Modeling Paradigms

Urban Statistical Analysis



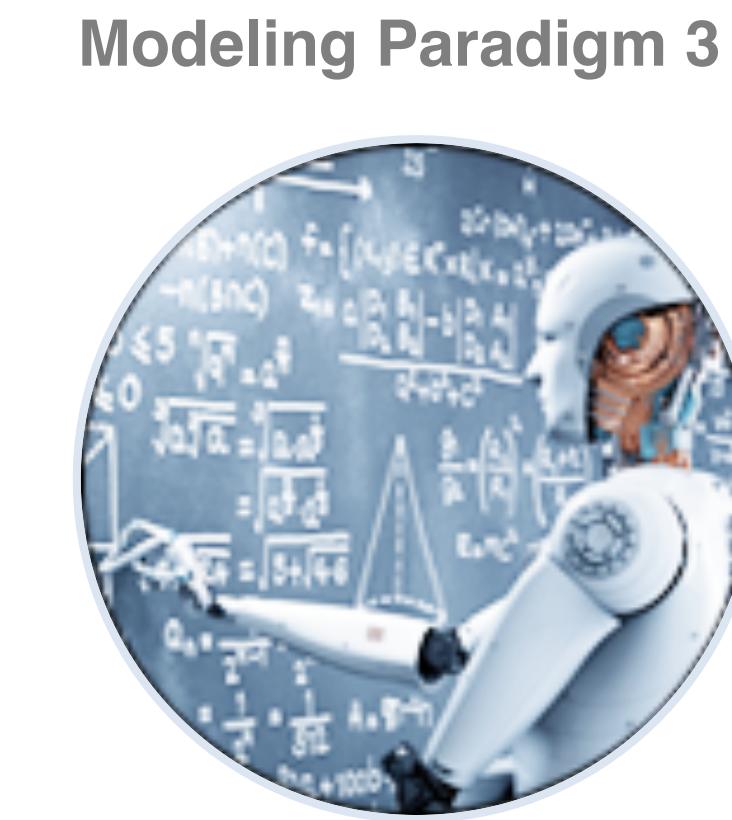
IID data – Linear & logistic regressions – applications to economic and travel analysis – critiques to regressions

Urban Network Analysis



Graph data (nodes & edges) – Network representations – spatial graphs – centrality metrics – power-law distributions – applications to mobility & spatial networks

Machine Learning in Cities



GLIN data – supervised learning – unsupervised learning – deep learning (images & graph)

Logic in data structures vs. modeling paradigms

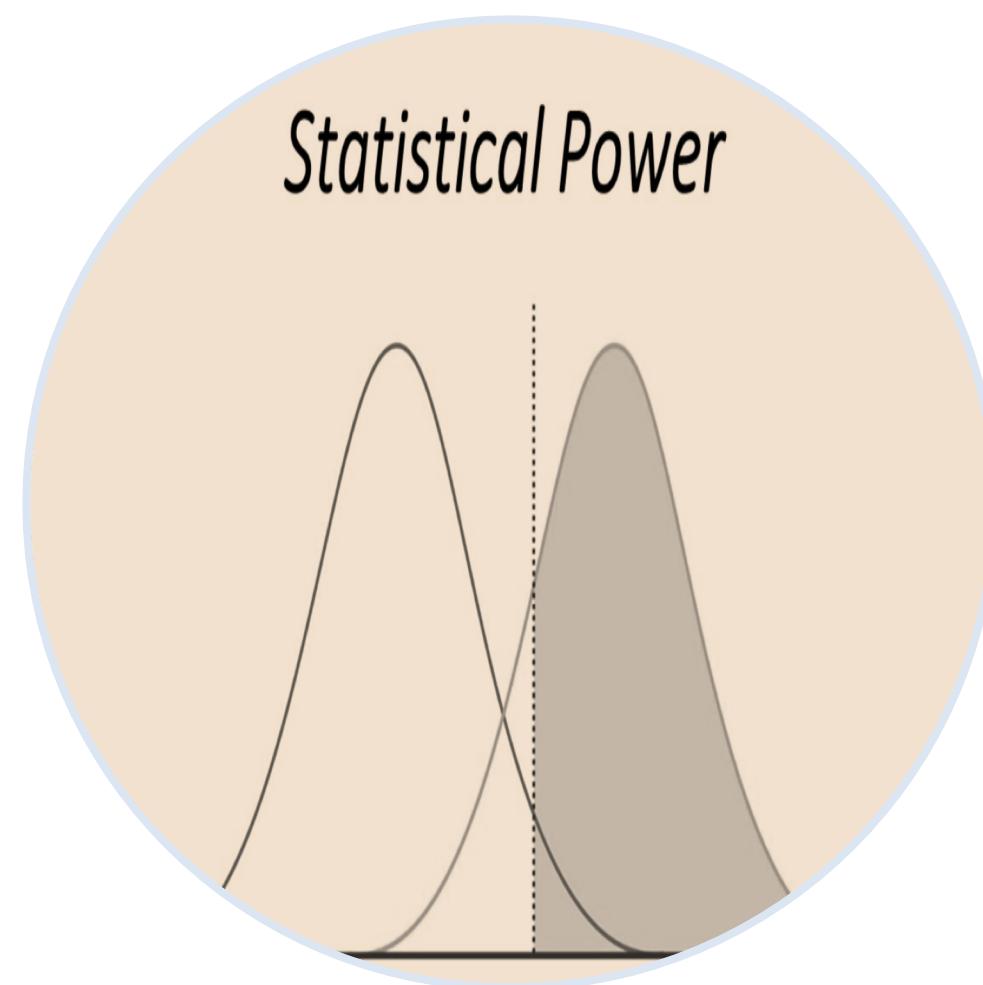
More complex modeling paradigms

	1970s - Urban Statistical Analysis	1990s - Urban Network Analysis	2010s - Machine Learning in Cities
More complex data structures (GLIN) ↓			
Numbers	✓	✓	✓
Graphs	✗	✓	✓
Images	✗	✗	✓
Languages	✗	✗	✓

Urban Applications

Equity

The racial majority groups have higher income than the minority groups.



- Formalize
- Statistics tradition - Regressions
- Generalize
- Significance – Test - Confounding

Segregation

The high income groups are spatially segregated.



- Formalize
- Network tradition – Spatial networks
- Generalize
- Nodes & edges – Spatial cluster – Community detection

Design

The urban designers/planners can create new landscapes to improve accessibility.



- Formalize
- Machine learning – Generative models
- Generalize
- Latent space – Conditional GAN

Learning goals of Lecture 02-06 in the AI&BE course

Answering a simple research question by integrating data,
models, and an urban application

NOTES

1. Limiting the scope to only census data, linear regressions, and simple urban applications because of the nature of this course.
2. You could take the Intermediate Urban Analytics (Spring 2024) to learn more complex models.
3. Even the “simple” integration is not simple. You need to learn some Python concurrently with this course to handle the coding tasks.

Even simple approaches can resolve complex questions...

Debate 1: What attract people to Florida?

A: it is the beach.

B: it is the job opportunity.

Who. Governor, local government, transport agencies, and local business.

Question: How do you address this debate? Which one do you support?

Even simple approaches can resolve complex questions ...

Debate 2: Does a new public transit line support economic development?

A: PT can increase the economic welfare of the neighborhood.

B: Probably not, because Florida is dominated by automobile.

Who. Department of economic development, transit agencies, developers, etc.

Question: How do you address this debate? Which one do you support?

Even simple approaches can resolve complex questions ...

Debate 3: Will people use the new energy-efficient vehicle?

A: It is highly likely because it saves the energy cost.

B: Probably not, because it is really expensive.

Who. Automobile industry (e.g., Tesla), department of energy, department of transportation and local government agents.

Question: How do you address this debate? Which one do you support?

Even simple approaches can resolve complex questions ...

Debate 4: Do the existing zoning codes mitigate economic opportunities?

A: The old-fashioned zoning codes limit the economic development

B: The zoning codes create positive externality and thus improve economic outcomes.

Who. Department of Housing and Economic Development, developers, etc.

Question: How do you address this debate? Which one do you support?

You will be able to address all four (and many other) debates after the five lectures!

Part 2. Python Basics

Strongly suggesting you to take **Practicum AI** concurrently

Practicum AI

Link: <https://calendar.hr.ufl.edu/event/practicum-ai/all/>

Four lectures on September 6, 13, 20, and 27.

Lecture 1. Getting started

Lecture 2. Computing for AI (Github & Colab)

Lecture 3. Python for AI (Pandas, etc.)

Lecture 4. Deep learning foundations