URP 6931. Introduction to Urban Analytics

Lecture 10: mid-term presentation and review session

Instructor: Shenhao Wang
Assistant Professor, Director of Urban AI Lab
Department of Urban and Regional Planning
University of Florida

Review session 1

- Two review sessions
- Review session 2 will happen in our last class

Urban Applications

$$X \rightarrow Y$$

What attract people to Florida?

Who. Governor, local government, transport agencies, and local business.
A: it is the beach.
B: it is the job opportunity.
Question: Which one do you support? And how is the question related to the class? e.g. X&Y

Y: migration (e.g. population change); X: beach, jobs, etc.
Stats

- Lec02. Choose the right y: Δpop = population (2023) - population (2020). It is continuous.
- Lec03. $\Delta pop \sim beaches$
- Lec04. $\Delta pop \sim beaches + job + others$

You already addressed the debate between A&B. But we can do better.
Graph

- Lec06. Visualize Δpop on a map
- Lec07. $\Delta pop \sim beaches + job + spillover\ effects$

Sometimes, you only want to get an accurate prediction.
ML

- Lec08. Predict Δpop with supervised learning
- Lec09. Automatically predicting Δpop with a high predictive performance.

You can also use the scripts from your labs to complete the analysis above.

Does a new public transit line support economic development?

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

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

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

Question: Which one do you support? And how is the question related to the class? e.g. X&Y

Y: economic outcomes (e.g. income); X: existing transit lines, etc.

Stats

- Lec02. Choose the right y: $income$. It is a continuous variable.
- Lec03. $income \sim transit$
- Lec04. $income \sim transit + automobile + \ others$

Graph

- Lec06. Visualize $income$ and $transit\ lines$ on a map
- Lec07. $income \sim transit + automobile + \ others + spillover\ effects\ of\ transit$

ML

- Lec08. Predict $income$ for a new transit line with supervised learning
- Lec09. Automatically predicting future $income$ with a high predictive performance.

Do the public transit lines serve the low-income people?

Question: How is the problem related to the class? e.g. X&Y

A: Three problem sets

Y: transit ridership X: income

Stats

- Lec02. Choose the right y: $transit\ ridership$. It is a continuous variable.
- Lec03. $transit\ ridership \sim income$
- Lec04. $transit\ ridership \sim income\ +\ other\ controls$

Graph

- Lec06. Visualize $transit\ ridership$ on a map.
- Lec07. $y \sim income\ +\ other\ controls + social/spatial\ network\ effects$

ML

- Lec08. Predict $transit\ ridership$ with supervised learning
- Lec09. Automatically predicting future $transit\ ridership$ with a high predictive performance

Will people use the new energy-efficient vehicle?

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

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

B: Probably not, because it is really expensive

Question: Which one do you support? And how is the question related to the class? e.g. X&Y

Y: adoption X: attributes of energy-efficient vehicles

Stats

- Lec02. Choose the right y: $adoption\ of\ the\ vehicle$. It is a discrete variable.
- Lec05. $y \sim price$; $y \sim price + energy\ saving$; $y \sim price + energy\ saving + controls$

Graph

- Lec06. Visualize $adoption\ of\ the\ vehicle$ on a map.
- Lec07. $y \sim price + energy\ saving + \ others + social\ network\ effects$

ML: classification task

- Lec08. Predict $adoption\ of\ the\ vehicle$ with supervised learning
- Lec09. Automatically predicting future market share of this energy-efficient vehicle with a high predictive performance

Do the existing zoning codes mitigate economic opportunities?

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

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

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

Question: Which one do you support? And how is the question related to the class? e.g. X&Y

Y: change of income X: zoning codes.

Stats

- Lec02. Choose the right y: $\Delta income$ = income (2023) - income (2020). It is continuous.
- Lec03. $\Delta income \sim zoning\ codes$
- Lec04. $\Delta income \sim zoning\ codes\ +\ other\ controls$

Graph

- Lec06. Visualize $\Delta income$ on a map.
- Lec07. $\Delta income \sim zoning\ codes + spillover\ effects\ across\ communities$

ML

- Lec08. Predict $\Delta income$ with supervised learning
- Lec09. Automatically predicting future economic changes with a high predictive performance

Who will pay for the property tax?

Who. City government.

Question: How is the question related to the class?

A: all our lab sessions.

Y: property values X: socioeconomic variables of people

Stats

- Lec02. Choose the right y: $property\ values$. It is a continuous variable.
- Lec03. $property\ values \sim income$
- Lec04. $property\ values \sim income\ + other\ socioeconomic\ controls$

Graph

- Lec06. Visualize $property\ values$ on a map.
- Lec07. $y \sim income + \ others + neighborhood\ spillover\ effects$

ML: classification task

- Lec08. Predict $property\ values$ with supervised learning
- Lec09. Automatically predicting future property tax with a high predictive performance

Should we do …?

- Should we build this architecture?
- Should we build this road?
- Should we develop this transit line?
- Should we change the bus schedules?
- Should we change the zoning codes?
- …

Where are the X and Y?

Such “should” questions can be translated into “why” questions with X&Y structure:

- Architecture -> more/less usage?
- roads -> more/less ridership?
- Transit line -> more/less traveling time?
- Bus schedules -> more/less waiting time?
- Zoning codes -> more/less economic opportunities?
- …

What are the X and Y in your course projects?

An extra assignment (optional)

Think of THREE practical questions and translate them into the $X \rightarrow Y$ structure

Grading bonus: one grade level up

Submission: three ppt slides

Content: different from all the previous slides & lab sessions & Psets

Deadline: April 18

Practical Question

Who will ask this question in urban planning?
What is a typical debate regarding this question?

What are the Y and X?
Stats
- Lec02.
- Lec03.
- Lec04.
- or Lec05.

Graph
- Lec06.
- Lec07.

ML
- Lec08.
- Lec09.

Summary Lecture 01

Urban analytics formalize and generalize traditional planning approaches and your intuition.

Intuition: A vs. B.

Formalize: regression framework: X -> Y

Generalize: two assumptions; statistical tests; spatial structures; predictions.

Broad applications: (nearly) any urban application can be translated into the $X \rightarrow Y$ structure, which can be tackled with the urban analytical framework you have learnt.