



同济大学交通运输工程学院  
COLLEGE OF TRANSPORTATION ENGINEERING  
TONGJI UNIVERSITY

# 运输经济学

## 大作业1：共享单车出行分析与预测

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# 几个基本概念



- 边际效应 (marginal utility)
  - 每新增 (或减少) 一个单位的商品或服务, 它对商品或服务的收益增加 (或减少) 的效用
- 弹性 (elasticity)
  - 计量一个变量的改变将在多大程度上影响其他变量
- 需求预测
- .....

经济预测的唯一功能就是让占星术看起来更靠谱。  
——埃兹拉·所罗门；约翰·加尔布拉斯

*The only function of economic forecasting is to make  
astrology look respectable*

Kenneth Galbraith

Kenneth Button



# 背景：共享单车



## ➤2017年：

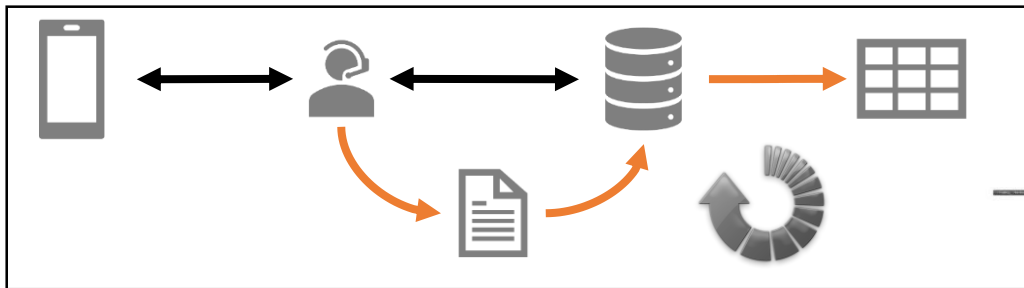
- 在全球1328个城市中，有桩共享单车总共约134万辆。
- 仅上海，无桩共享单车投放量约为178万辆。全国共投放至少2000万辆共享单车。
- ofo、mobike等陆续进入新加坡市场



# 背景：数据获取



- 通过共享单车APP获取空闲车辆ID、经纬度坐标，得到共享单车的投放总量
- 通过多个服务器进行查询，记录区域内所有车辆的GPS位移信息，推断出共享单车的使用情况
- 此外，还采集到交通基础设施、城市建成环境、天气等数据



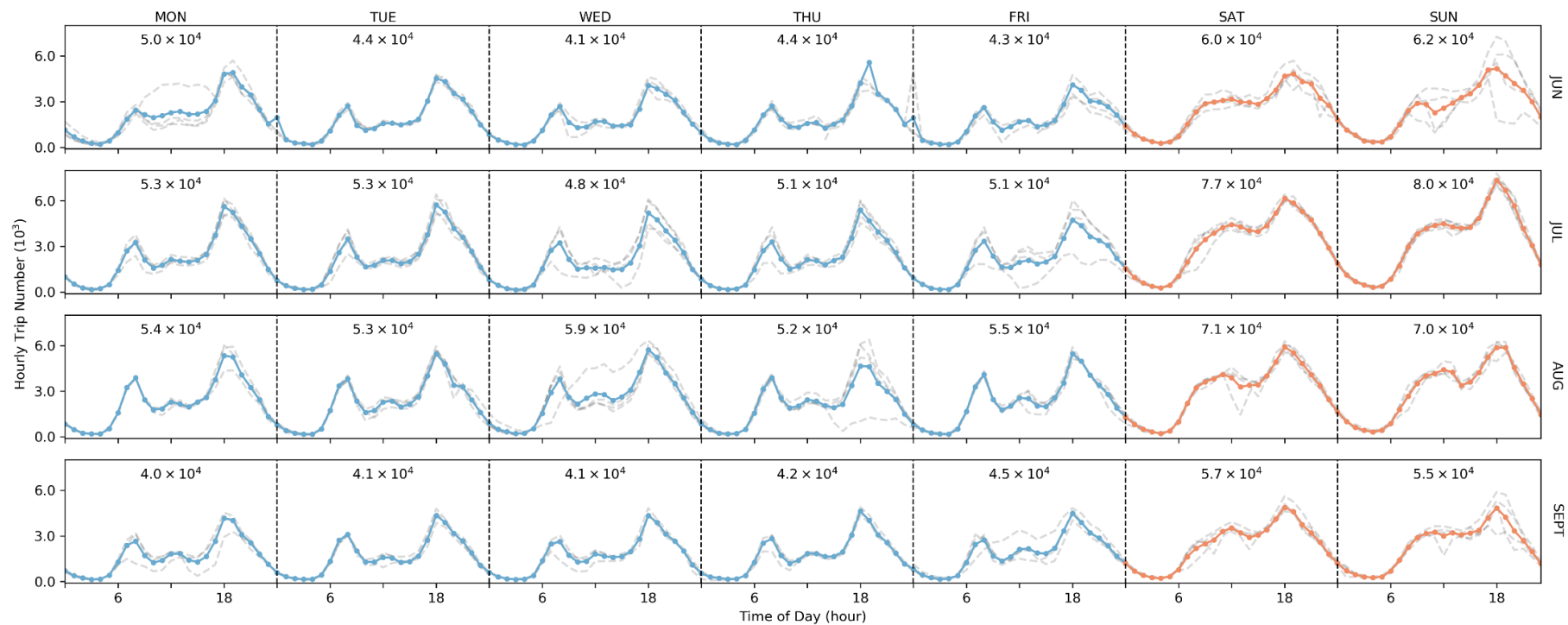


# 背景：数据时段



➤ 2017年6月至2017年9月

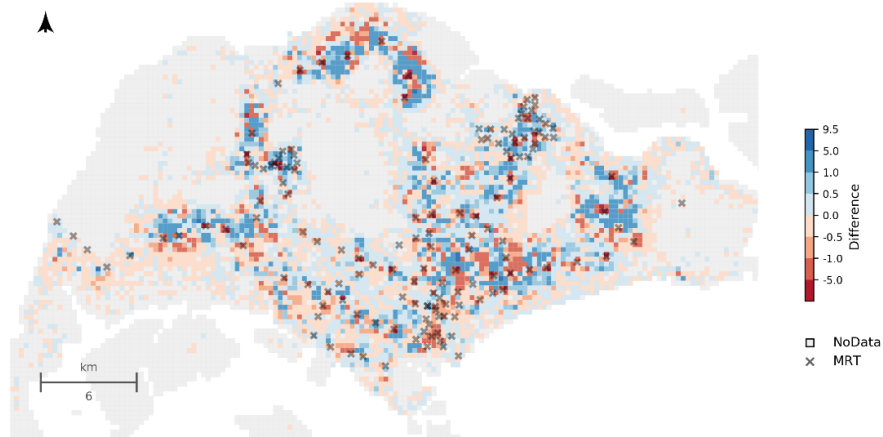
➤ 工作日早高峰与晚高峰



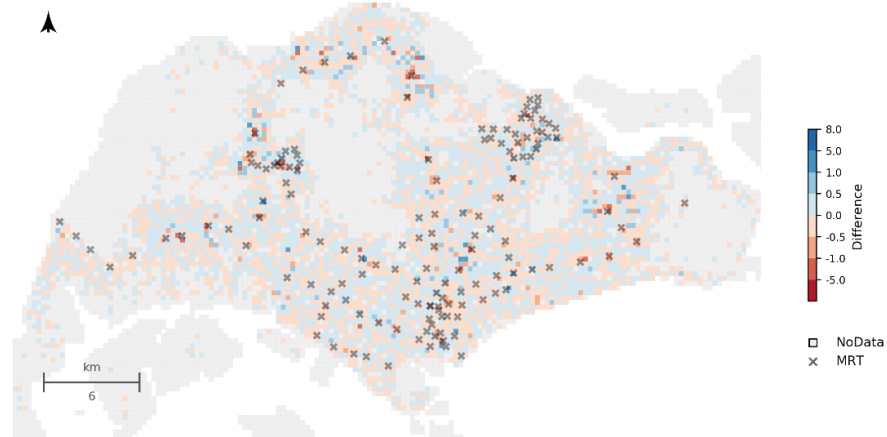
# 背景：空间分布



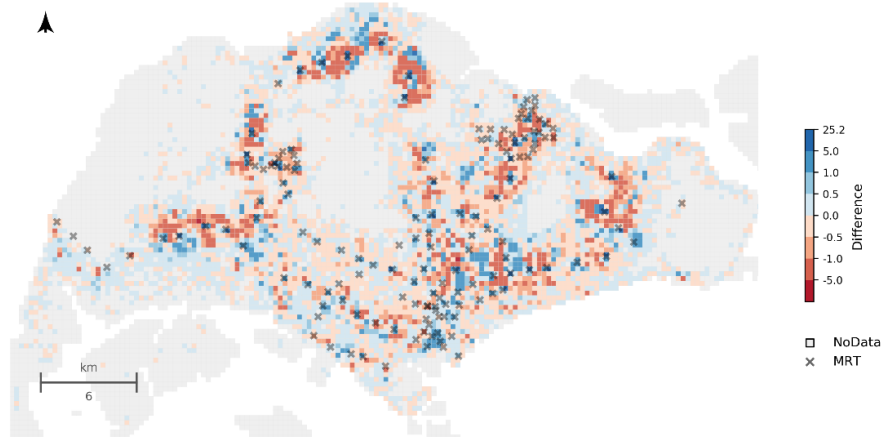
(A) Weekday 7 a.m. to 10 a.m.



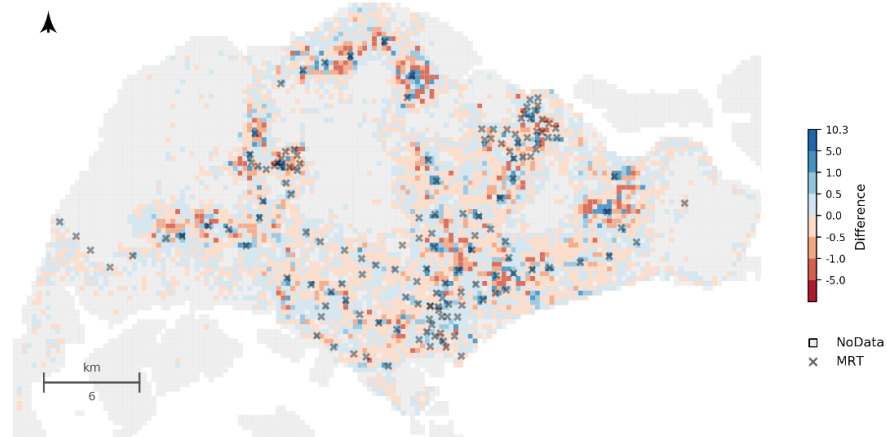
(B) Weekday 11 a.m. to 2 p.m.



(C) Weekday 5 p.m. to 8 p.m.



(D) Weekday 9 p.m. to 12 a.m.



## ➤定量研究

- 研究OD对的共享单车O点投放量与OD对间骑行数量的关系，理解边际效应递减的规律；
- 结合投放量、交通基础设施、城市建成环境等因素，对共享单车骑行需求进行分析；
- 估算这些因素对共享单车使用需求的弹性影响。

## ➤定性讨论

- 结合自己的理解，讨论共享单车这一运营模式是否可持续。



# 数据文件



- 8个CSV数据文件
- 每位同学使用的数据文件为：
- mod(学号,8).csv



0.csv



1.csv



2.csv



3.csv



4.csv



5.csv



6.csv



7.csv

```
ori,dst,dist_km,fsize_m6_wd_am,trip_m6_wd_am,community_m6,mrt_km_o,entro_o,cycle_km_o,far_hdb_o,far_priv_o,fa
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255,74,0.83,0.136363636,0.0,3.14,0.356207187,0.0,0.0,0.3.64,0.0,0.0,0
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1339,79,2.82,40.36363636,0.0,0.71,0.728743496,0.87,2.244351313,0.0,3.06,0.0,0.0,5.25E-02
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617.80,1.63,9.909090909,0.0,1.85,0.0,0.0,0.223868247,3.19,0.0,0.0,0
```

# Shapefile地图 (供参考)

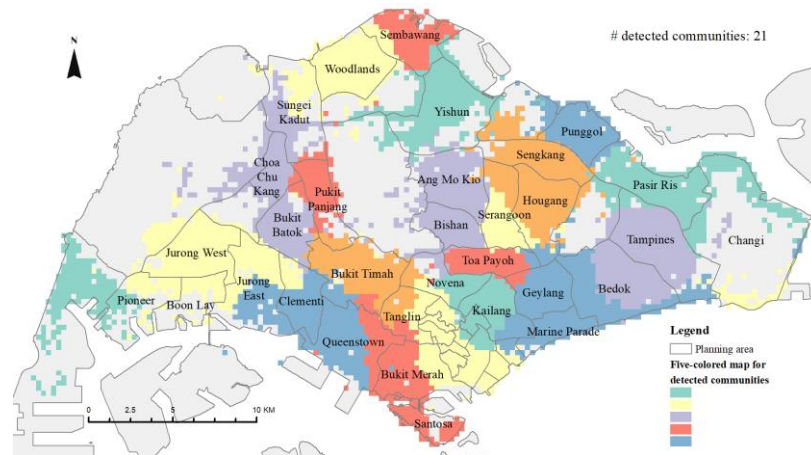
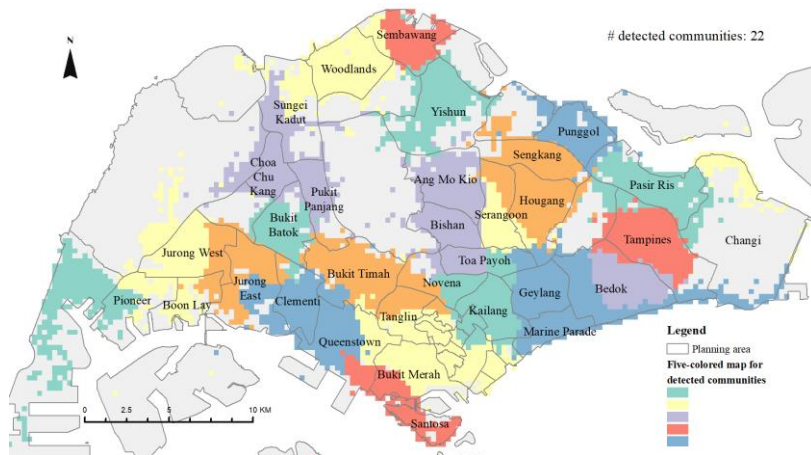
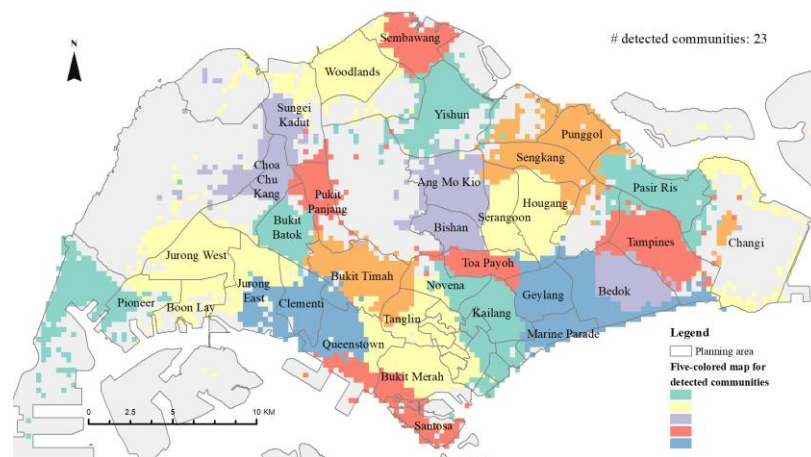
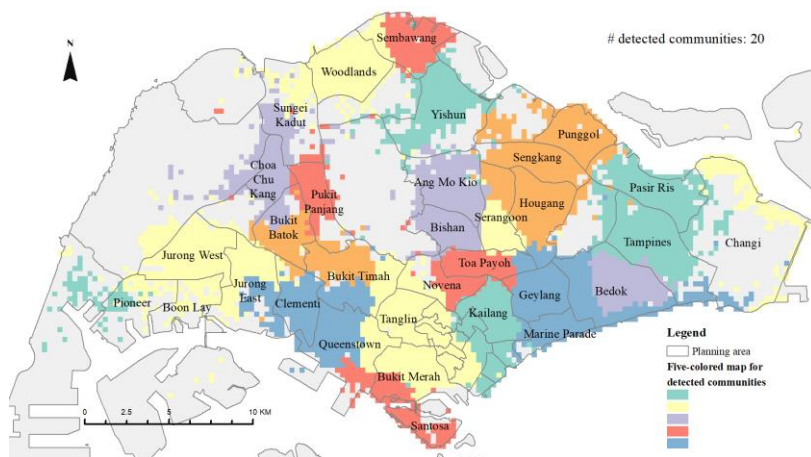


- ori: O点土地块ID, 对应shapefile地图数据的id
- dst: D点土地块ID, 对应shapefile地图数据的id
- dist\_km: OD之间的路网距离
- fsize\_mX\_wd\_am/pm: X月份工作日早高峰(am)或晚高峰(pm)期间O点平均单车投放数量
- trip\_mX\_wd\_am/pm: X月份工作日早高峰(am)或晚高峰(pm)期间OD对间的平均骑行数

# 数据解释



➤ community\_mX: X月份该OD对是否在一个复杂网络社区中



- mrt\_km\_o: O点距离最近地铁站的距离 (KM)
- entro\_o: O点的香侖熵 (计算方法见论文)
- cycle\_km\_o: O点土地块自行车道长度 (KM)
- far\_hdb\_o: O点土地块公有住宅建筑的容积率
- far\_priv\_o: O点土地块土地块私有住宅建筑的容积率
- far\_comm\_o: O点土地块土地块商业建筑的容积率

- mrt\_km\_d: D点距离最近地铁站的距离 (KM)
- entro\_d: D点的香侖熵
- cycle\_km\_d: D点土地块自行车道长度 (KM)
- far\_hdb\_d: D点土地块公有住宅建筑的容积率
- far\_priv\_d: D点土地块土地块私有住宅建筑的容积率
- far\_comm\_d: D点土地块土地块商业建筑的容积率



- 对mod(学号,8).csv的数据进行分析:
- 需求变化的描述性分析
  - 该时间段内共享单车骑行量的整体规律
- 共享单车投放量与使用量的关系
  - 分析共享单车投放量与使用量的关系
  - 拟合共享单车使用量随投放量增加的边际效应变化函数,结合所学的运输经济学知识,并加以讨论

## ➤ 建立需求分析的数学模型

- 结合投放量、交通基础设施、城市建成环境等因素，建立关于共享单车使用需求的数学模型
- 估算这些因素对共享单车使用需求的弹性影响

## ➤ 建立需求预测模型（选做）

- 分析全部四个月的早高峰或晚高峰的数据（4个csv数据），建立该时段内的共享单车出行需求预测模型

## ➤ 讨论与思考

- 根据以上工作，结合自己的理解与课上所学知识，讨论共享单车这一运营模式是否可持续



# 提示：0的处理

- 综合判断0骑行的OD对
- 即trip\_mX\_wd\_am/pm=0的数据
- 可能是不适合骑单车的OD，需要筛除
- 可能只是这个时间段内没有骑行，不需要筛除
- 报告中需阐明数据筛选的理由

# 报告内容要求



1. 报告概述：工作目标，工作内容和技術路线；
2. 数据情况简介与描述性分析；
3. 共享单车出行量随投放量的边际效应变化规律；
4. 共享单车出行影响因素分析；
5. 共享单车出行需求预测（选做）；
6. 结果分析；
7. 讨论与思考。

# 报告内容要求



- 以上仅是报告中需要有的内容
- 报告结构组织、侧重点大家可自由发挥
- 应做到图文并茂
- 不能是数据的简单堆砌，多一些文字分析

# 报告内容要求



## ➤ 严禁抄袭

➤ 抄袭者与被抄袭者该次作业或报告都以0分处理



# 报告撰写要求



- **最后一节课上课时带来，计10分**
- 封面页注明作业标题、姓名、学号
- **不许超过16页（封面1+正文15）超一页扣一分**
- 双面打印（8张纸）
  
- 默认页边距、小四（12号）、1.5倍行距
- 宋体（英文、数字可以是Times New Roman或其他衬线字体）

- Shen, Y., Zhang, X. and Zhao, J., 2018. Understanding the usage of dockless bike sharing in Singapore. *International Journal of Sustainable Transportation*, 12(9), pp.686-700. **(ESI 0.1%)**
- Xu, Y., Chen, D., Zhang, X., Tu, W., Chen, Y., Shen, Y. and Ratti, C., 2019. Unravel the landscape and pulses of cycling activities from a dockless bike-sharing system. *Computers, Environment and Urban Systems*, 75, pp.184-203. **(ESI 0.1%)**
- Shen, Y., Zhang, X. and Zhao, J., forthcoming. The mobility patterns of dockless bike sharing: A four-month study in Singapore. *Transportation Research Part D: Transport and Environment* (under minor revision)
- Li, X., Shen, Y., Xie, C., Zhang, X. and Fu, H., forthcoming. Assessing the influential factors on relocation of shared bikes. Working paper.