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
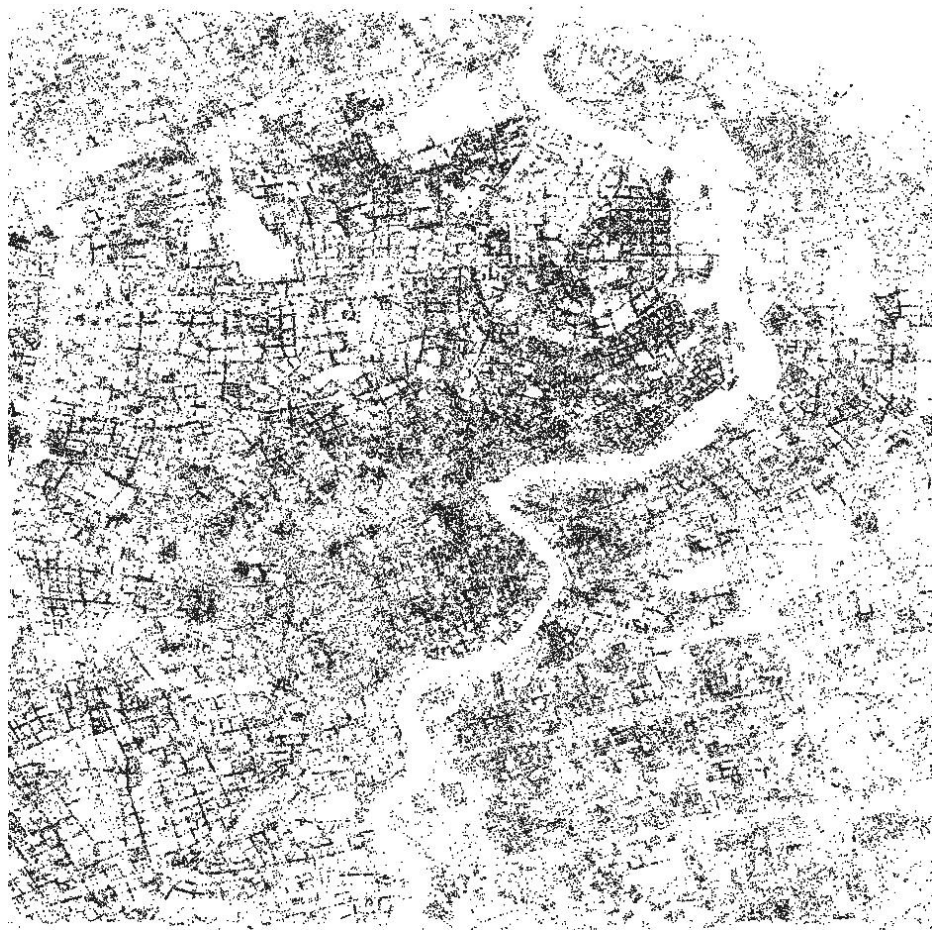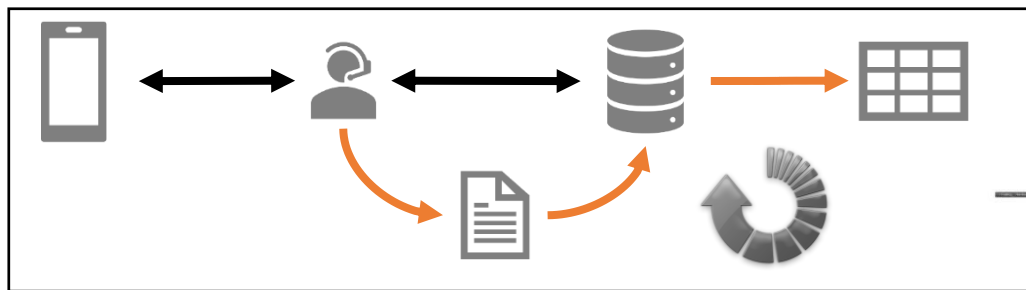
Kenneth Galbraith

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

- 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
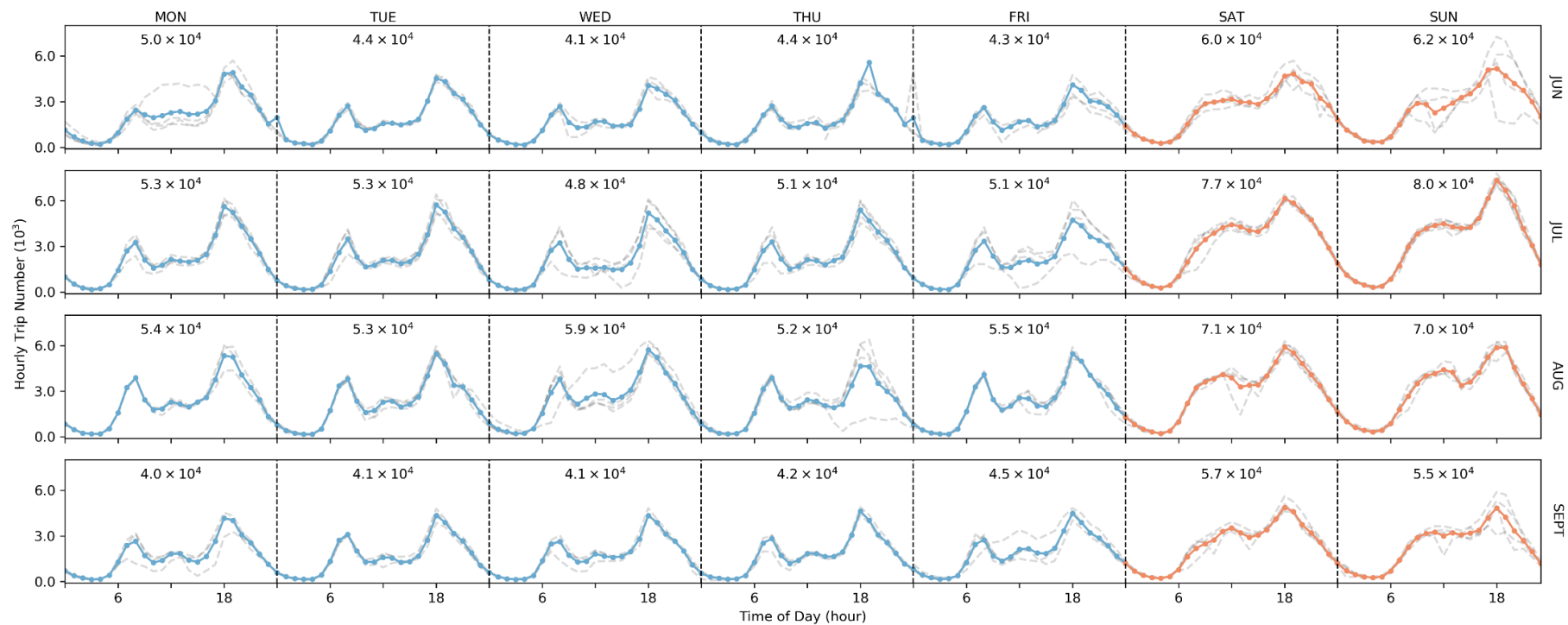- 通过多个服务器进行查询，记录区域内所有车辆的GPS位移信息，推断出共享单车的使用情况
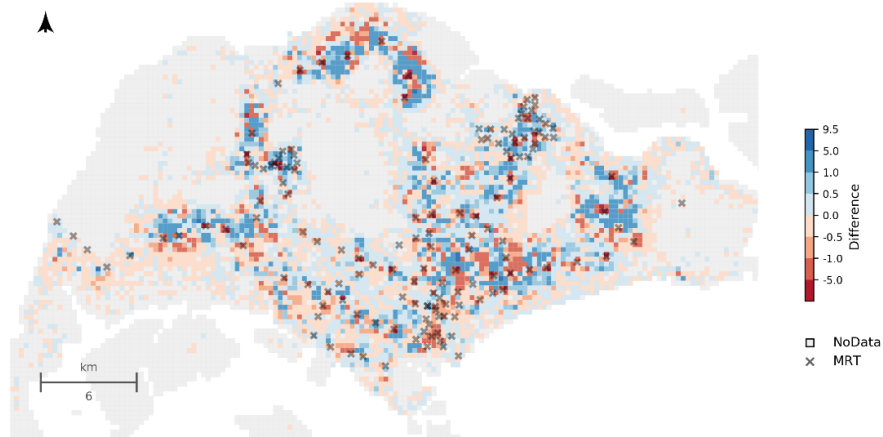- 此外，还采集到交通基础设施、城市建成环境、天气等数据

背景：数据时段
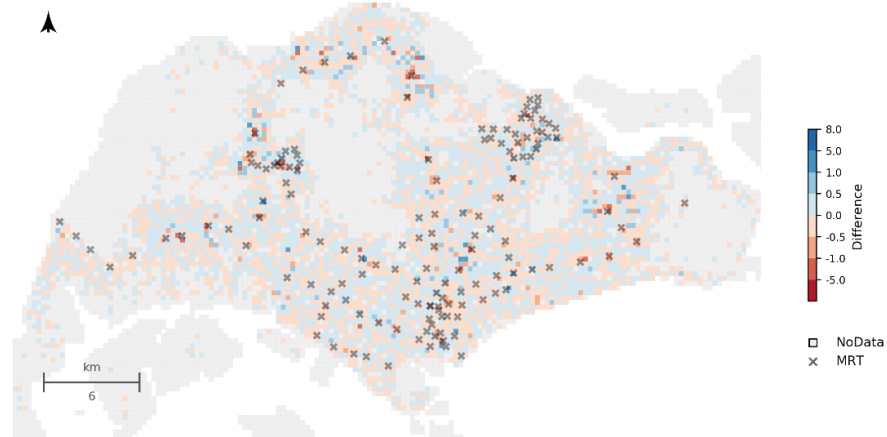
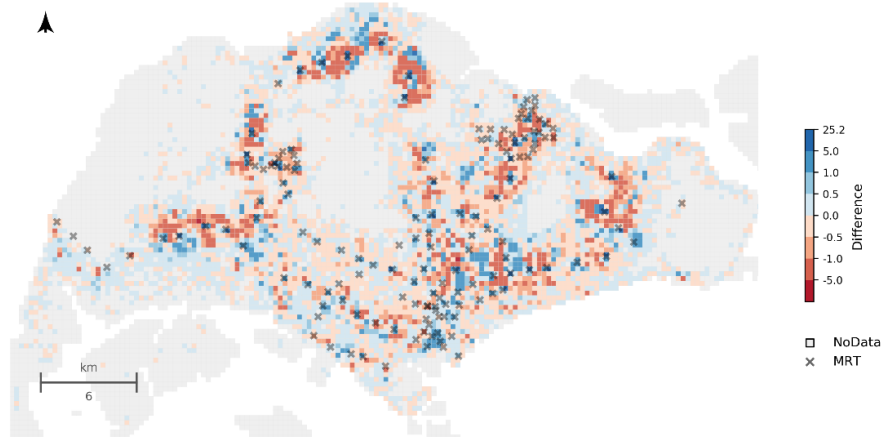➢ 2017年6月至2017年9月
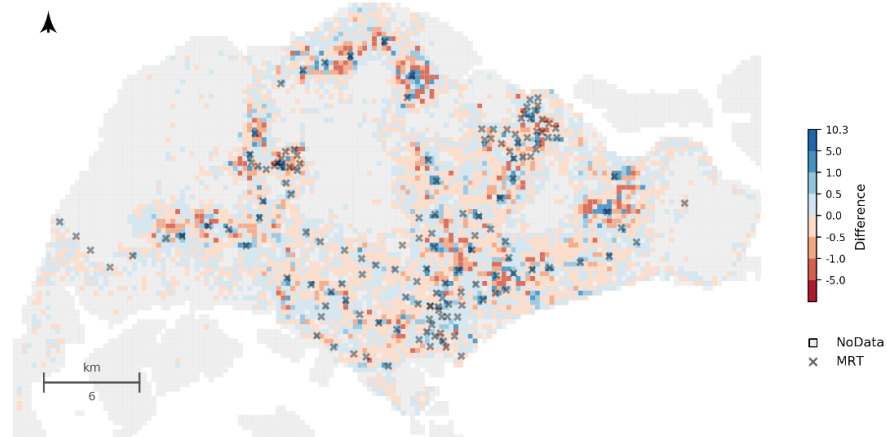
➢ 工作日早高峰与晚高峰

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.

工作目标

- 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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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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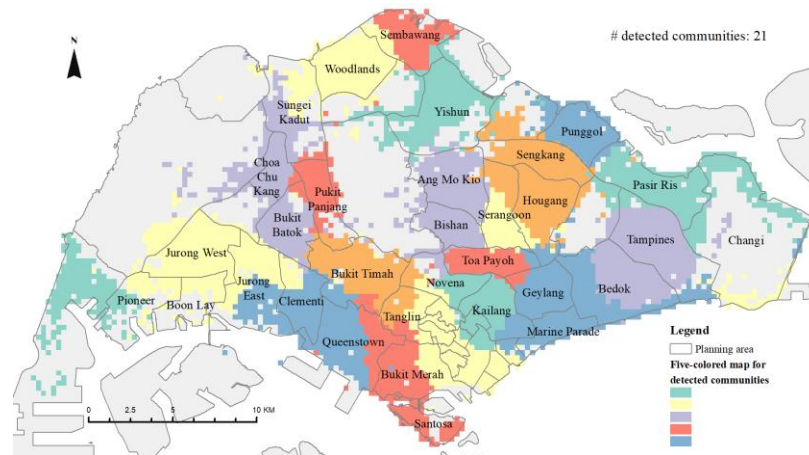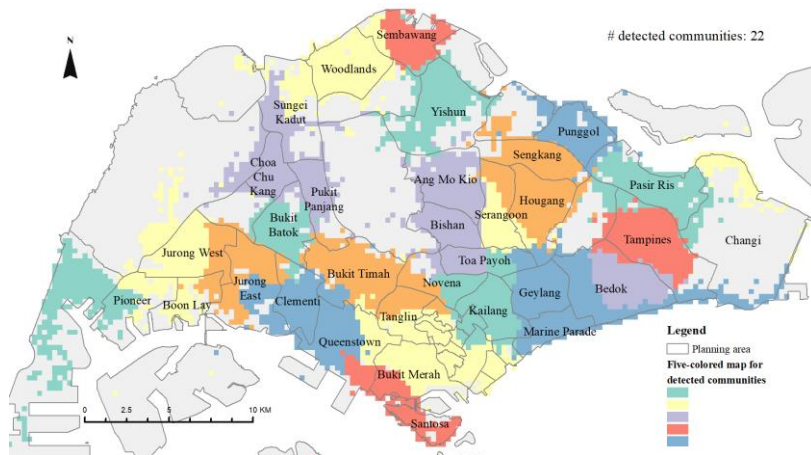
Shapefile地图（供参考）

数据解释
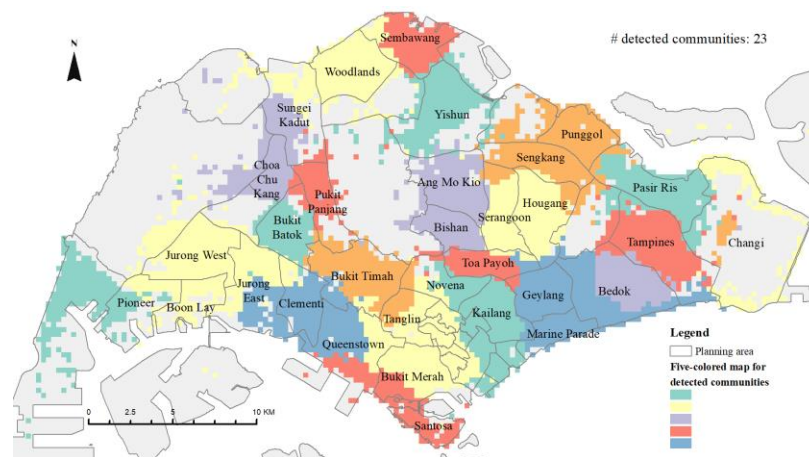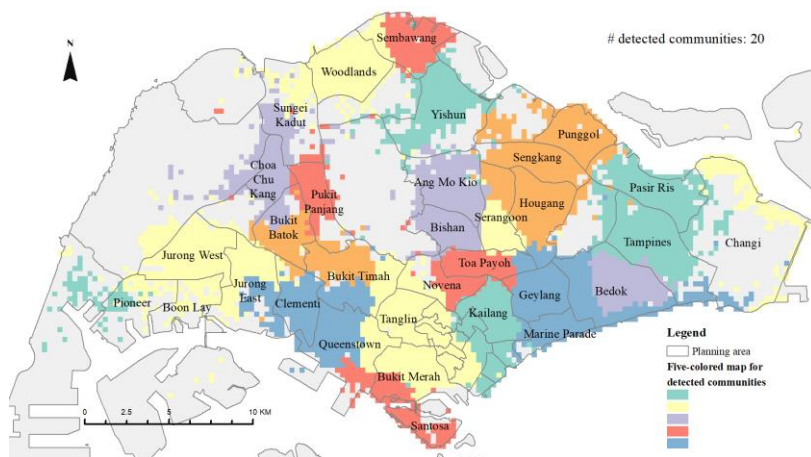
- ori：O点土地块ID，对应shapefile地图数据的id
- dst：D点土地块ID，对应shapefile地图数据的id
- dist_km：OD之间的路网距离
- fsize_mX_wd_am/pm：X月份工作日早高峰(am)或晚高峰(pm)期间O点平均单车投放数量
- trip_mX_wd_am/pm：X月份工作日工作日早高峰(am)或晚高峰(pm)期间OD对间的平均骑行数

数据解释

➤ community_mX：X月份该OD对是否在同一个复杂网络社区中

数据解释

- mrt_km_o：O点距离最近地铁站的距离（KM）
- entro_o：O点的香侬熵（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

数据解释

➢mrt_km_d：D点距离最近地铁站的距离（KM）

➢entro_d：D点的香侬熵

➢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

工作流程

➢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

    ➢ 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，工作内容和技术路线；
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；
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

➢ **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）

参考文献

➢ 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.