CapMetro Bus Bunching

Statement of Work

# Project Team

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| **Project Role** | **Organization** | **Contact** | **Email** |
| GIS Manager | ACC | Brian Reynolds | Brian.reynolds2@g.austincc.edu |
| Project Manager | ACC | Stephanie Long | Stephanie.Long@austincc.edu |

# Project Description

Public transit systems are essential to the modern city. The robustness of a given public transit network is key to its success. A robust public transit network manages both passenger flow and vehicle patterns successfully at high orders of efficiency. Austin recently joined the top ten cities by population in 2022 with over 1 million people currently living here. With a 27.54% increase in population in the last decade, Austin is one of the fastest growing major cities in the United States. A growing city needs to have these management systems not only to adjust for changes in population, but also to indicate when and how to adjust. A growing population changes much about the metropolitan ecosystem in which public transit operates. Navigating and responding to these changes is necessary to maintain a smooth and effective public transit network.

Part of this management system monitors bus punctuality. When multiple buses are on the same route, a bus that is too early, or too late, can compound into a problem called bus bunching or clumping. This occurs when two or more transit vehicles running the same route are arriving at the same stops in tandem. Not only can this result in one bus running the route empty for quite a while, but also causes passengers to have to wait between buses for a longer period.

CapMetro Austin requires analysis tools for vehicle location monitoring systems that can be regularly updated to determine incidents of bus bunching and potential causes. Preventing bus bunching keeps customers from waiting long periods at stops between bus arrivals and keeps buses at operating capacities.

Buses on the street

Description automatically generated with medium confidence

### Figure 1: Bus Bunching in NYC. Photo: Travis Eby/Twitter

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## Duration

The project is expected to take from 07/05/2022 – 08/08/2022

## Type and Value

The CapMetro Bus Bunching Project is a project for Austin Community College.

## Project Area

The project area includes the operating area for all 76 public transit vehicle routes and includes portions of the Austin West and Austin East 7.5-minute quadrangles where urban roadways are designated.

## Project Goal

The CapMetro Bus Bunching Project will provide insight on bus bunching patterns by presenting bunching incidents over the last four months.

## Measures

Project deliverables will be measured according to the following milestones:

* Interim Deliverable - First draft of Data Management Plan, Statement of Work, Presentation and Project Summary Report, and ZIP of project data
* Final Deliverable includes:
  1. A finalized file geodatabase with metadata
  2. A web map.

The Final Deliverables listed above will be submitted as a WinZip archive named YYYY-MM-DD\_Project\_Name.zip to be submitted to the instructor by the due date.

## Project Scope

The project scope consists of the following summary tasks:

1. Collect and Assimilate Data
2. Analyze Data
3. Create Deliverables

Each summary task is described below.

# 1. Collect and Assimilate Data

A short paragraph describing what will be performed in this summary task.

## 1A. Create ArcGIS Pro Project Folder

Folder will be organized with a *00\_Source\_Data* folder for incoming source data from CapMetro. *01\_New\_Data­* will be used to contain any files generated through processing, generalizing or analysis of the source data. *py* will contain scripts and jupyter notebooks used to explore, transform and analyze data. A *Deliverables* folder will contain the interim and final deliverables for the project. ArcGIS Files and folders will be contained in the root project directory.

### File Organization

## 1B. Collect the Data

[Roadway inventory](https://gis-txdot.opendata.arcgis.com/datasets/843ebe994c114961a855ec76ddcde086_0/explore?location=30.976311%2C-100.081515%2C6.60) data will be acquired from TXDOT for this project. [Bus stop and route location](https://data.texas.gov/Transportation/Capital-Metro-Shapefiles-JUNE-2022/mmk5-9ew5), and transit vehicle location information will be collected from CapMetro. [Traffic counts](https://data.austintexas.gov/Transportation-and-Mobility/Traffic-Count-Study-Area/cqdh-farx) and [designated urban roadway area](https://data.austintexas.gov/Locations-and-Maps/Urban-Roadways/73nu-3qnt) will be collected from City of Austin.

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## 1C. Assimilate Data

Data will be interred into the geodatabase and organized into feature datasets for base data and analysis results.

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# 2. Analyze Data

Bus routes will be inspected for clumping in two processes and compared to traffic count data for the same location. We will first explore clumping through vehicle location timestamps to denote points that are close together in time and space. Then we will explore clumping through the previous vehicle’s relative timestamp (previousvehicleschadhsecs). Once we find out where the clumping is occurring, we can compare the mean traffic count for that location at that time or day to adjust or evaluate the data with respect to local traffic at the time.

# 3. Create Deliverables

The Project Manager has requested the following deliverables in support of this project:

1. A finalized file geodatabase with metadata
2. An interactive web map