

Using an App for Real-Time Measurement of Transit Rider Satisfaction

Christopher Antoun, Assistant Research Professor

Vanessa Frías-Martínez, Associate Professor

Saad Mohammad Abrar, PhD Student

Naman Awasthi, PhD Student

Anthony Garove, PhD Student

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COLLEGE OF
INFORMATION
STUDIES



JOINT PROGRAM
IN SURVEY
METHODOLOGY

Acknowledgements

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Agenda

- Project overview
- Recruiting participants
- Preliminary results
- Discussion

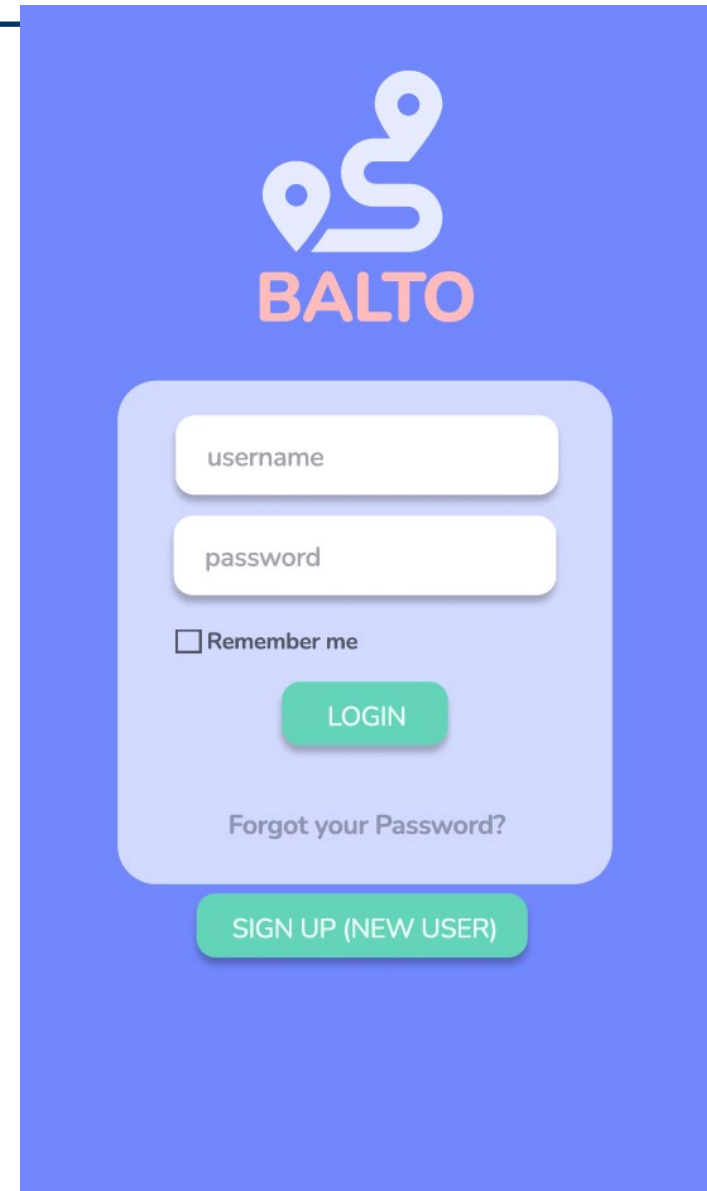
PROJECT OVERVIEW

BALTO (Be an Advocate for public TransportatiOn)

- Objective
 - Identify the challenges typical of complex public transit trips often endured by low-income urban families
- Target population
 - Baltimore City residents living in lower-income neighborhoods
- Approach
 - Develop a smartphone app to collect door-to-door transit information
 - Passively collects geolocation data (during trips)
 - Administers surveys about the trips

Participation Steps

- Download app and register
- Prior to going on a trip:
 - Enter route information (type of transit, transfers, destination)
 - Press “start trip”
- During a trip:
 - Answer a survey(s) via the app
- At the end of the trip
 - Press “finish”
- Repeat for each trip



The image shows a screenshot of the BALTO app's login interface. At the top, there is a logo consisting of a stylized white figure with a location pin on its head, above the word "BALTO" in orange capital letters. Below the logo is a light blue rounded rectangle containing the login form. The form has two white input fields: the first is labeled "username" and the second is labeled "password". Below these fields is a checkbox labeled "Remember me". A green rounded button with the text "LOGIN" is positioned below the checkbox. Underneath the button is a link that says "Forgot your Password?". At the bottom of the light blue rectangle is a green rounded button with the text "SIGN UP (NEW USER)".

BALTO App

Add New Trip



Label your trip

1 I will get to the stop...



2 Trip Details.

Please select the public transit you will be taking and the stop where you will get off. If your trip has transfers, enter that information for each trip leg.

I will be taking...

I am getting off at...

ADD TRANSFERS

Add New Trip



HANNOVER ST & WATERVIEW

MDOT - CityLink SILVER CURTIS BAY

CHARLES ST & PENN

ADD TRANSFERS

3 I will go to my final destination...



START TRIP

SAVE TRIP

Trips



ADD NEW TRIP

Work

VIEW TRIP DETAILS

BALTO



Trip Ongoing

Trip Controls

FINISH

CANCEL

PAUSE

REROUTE

Surveys



71

00:01:15

SURVEY

Trip Started: 2:00pm | Work

BALTO Surveys

Survey ? ☾ ↗

This survey is about your current ride on Bus 71

Your opinions are highly valued and will help Baltimore City improve the transportation services offered to you. All of your responses are confidential.

Overall, how satisfied or unsatisfied are you with the service of your current ride?

1 = Very unsatisfied

2

3

4

5

6

7

8

9

10 = Very Satisfied

Home Bus Map Notifications

Survey ? ☾ ↗

How satisfied or unsatisfied are you with each of the following aspects of the ride?

Reliability (bus or rail arrived on time):

Very unsatisfied

Unsatisfied

Neither satisfied nor unsatisfied

Satisfied

Very Satisfied

Speed of ride from start to finish:

Very unsatisfied

Unsatisfied

Neither satisfied nor unsatisfied

Satisfied

Very Satisfied

Home Bus Map Notifications

- Administered for each trip segment
- Questionnaire
 - 1 overall satisfaction rating (10-point scale)
 - 7 trip attribute ratings (5-point scales)
 - 1 open item (“anything else...?”)

Design Challenges

- Length of data collection period
 - Tradeoff between user burden and data quantity...
- How to structure incentive payment (when some participants complete more surveys and participate for longer than others)
 - fixed payment, per survey, per day of participation...
- When to trigger surveys
 - during trip, immediately after each trip, end of day...

Decided to ask participants to record trips of two weeks

Designed an experiment to test these different approaches.

2 x 2 Factorial Design

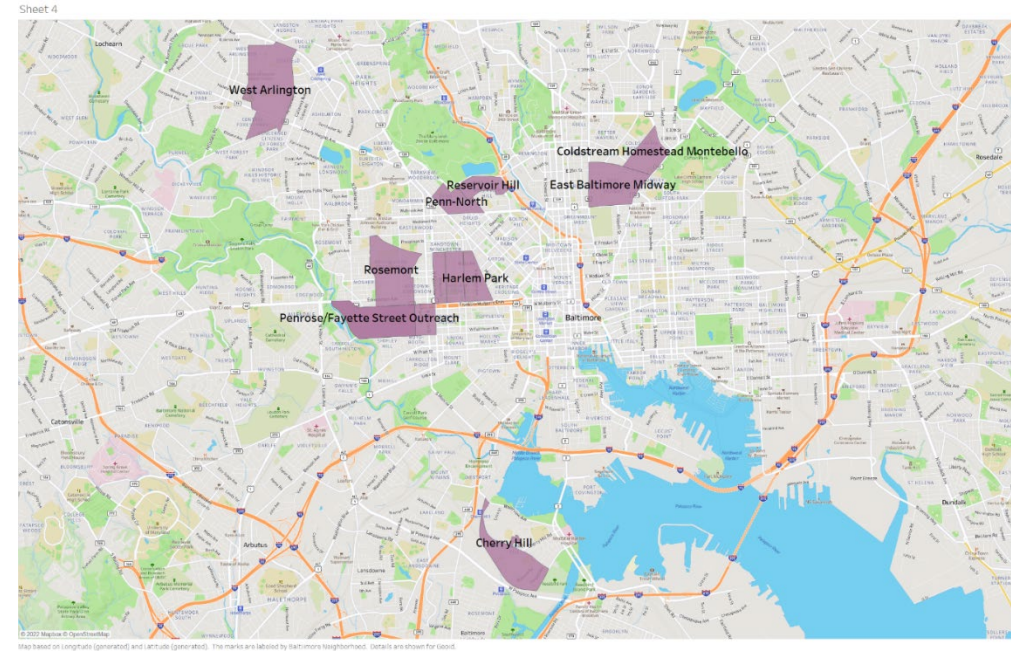
- **Factor 1: Incentive payment**
 - A. **\$2 for each survey** completed on time (Max: \$56 for the whole study period)
 - B. **\$4 per day** with at least one survey completed on time (Max: \$56 for the whole study period)
- **Factor 2: Timing of surveys**
 - A. **In-trip**: survey invitation is sent at the time when a participant is taking a trip, approximately three stops before the pre-declared stop is reached*
 - B. **End-of-trip**: survey invitation is sent immediately after a participant completes a trip

*circular *geofences* were setup around the transit stops, making it possible to determine if a participant is at (or near) a particular stop

RECRUITMENT

“Asynchronous” recruitment

- Focused on 9 lower-income neighborhoods (*census tracts*) in different parts of the city
- Address-Based Sampling
 - Stratified random sample of 2,800 addresses from households flagged to have at least one Android device (*M-S-G*)
 - ~40% cell phone match rate; of these matches, ~50% flagged as Android



Invitation Materials

- Invitations sent in September 2023
- Initial mailing consisted of:
 - Short “formal” invitation letter
 - 2-page information sheet
 - \$2 incentive in the envelope
- Two postcard reminders



Dear Resident:

We are seeking participants for a **paid** research study. Your participation will help researchers develop a smartphone app that will be used to **improve public transportation** in Baltimore City.

We are enclosing **\$2 in cash** with this letter, and when you participate in the study you can **earn up to \$56** in Amazon gift cards. The \$2 is yours to keep as a thank-you for reading this letter.

Our ask is that you **download a smartphone app** called BALTO, use it to enter information about your trips on public transit, and answer a brief survey about the quality of each trip in the app.

Our requirements are that you are at least 18 years of age, ride public buses or trains in Baltimore City, and use an Android phone.

Please read over the **information sheet** in this envelope for instructions about how to get started using the app!

Your participation is voluntary, of course, and is critical for the success of the study. You might find the app to be interesting and easy-to-use. We respect your privacy and your personal information. The information you provide will be strictly confidential.

We appreciate your help!

Sincerely,

Vanessa Frias-Martinez
Vanessa Frias-Martinez, Ph.D.



BE AN ADVOCATE
FOR PUBLIC
TRANSPORTATION

QUESTIONS?

If you have any questions about participating in the BALTO Android App Research study, please visit our website or reach out to us.

<https://balto.umd.edu/faq> | balto@umd.edu | 240-582-4946



TO DOWNLOAD THE BALTO ANDROID APP
SCAN THE QR CODE
 or visit www.balto.umd.edu/signup



What do I have to do?

DOWNLOAD THE APP

Scan the QR code using your phone's camera or visit www.balto.umd.edu/signup to install the app on your Android device.

LOG YOUR TRIPS

Every time you use public transportation for the next two weeks, take your phone with you, log the trip.

COMPLETE SURVEY

Complete a few short surveys to tell us about your experience!

CREATE YOUR ACCOUNT

SIGN UP (NEW USER)

Press the sign up button and complete the informed consent page and user registration form. Then **enter a valid email address** to use as your username and create a password. We will use this email to send you a gift card at the end of the study.

ENTER THE CODE BELOW

XXXX-XXXX

Enter this code when asked for the "Sign-Up Code" during registration and press "Sign Up".

COMPLETE YOUR REGISTRATION

Verify your email address. Then, click on the **LOGIN** button and allow the **BALTO App** to use your location data. Make sure you select the highest permission available (the top option in the list) when providing location permissions. Otherwise, the app will not work. **Be assured that we take your privacy very seriously and that we only collect location data when you share a trip with us.**

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LOG YOUR TRIPS FOR TWO WEEKS:

Every time you use public transportation for the next two weeks, take your phone with you, log your trip and complete a few short surveys following steps 1 through 6:

1. ADD A NEW TRIP

Press at the bottom of the screen. Select **ADD NEW TRIP**. If you have prior trips saved, just press the button and you will be ready to go.

2. NAME YOUR TRIP

Give the trip a meaningful name (for example, "Mondawmin Mall" or "Grocery Store"). Then **select how you will get to the bus stop or train/rail station**. Options include walking, scooter or bike share, car, or wheelchair.

3. SHARE YOUR ROUTE

Press the **I WILL BE TAKING...** button and select if you will be taking the Bus, Light Rail, MARC train, or Metro. Then, press the **I AM GETTING OFF AT** button and select the stop where you will get off the bus or train.

4. ADD TRANSFERS

If you need to make any transfers to reach your final destination, select **ADD TRANSFERS** and repeat step 3. Then select how you will reach your final destination: walking, bike or scooter share, car, or wheelchair.

5. START YOUR TRIP

The app does not automatically log your trips. You must press **START TRIP** when you are ready to start your trip. Once you reach your final destination (such as your home, your work or a store), press the **FINISH** button on the main screen. If you want to save your trip details for later, press **SAVE TRIP**, press once you are ready to start your trip.

6. COMPLETE SURVEY

Short surveys about your trip will appear in the app **TEXT FILL B1: "while you are aboard" OR TEXT FILL B2: "at the end of the trip, after you press the FINISH button"**. Press the **SURVEY BUTTON** and share your feedback about the trip.

PAYMENT

1. You will earn **TEXT FILL A1: "\$2 for each survey completed on time" OR TEXT FILL A2: \$4 per day with a survey completed on time**, with a maximum potential earning of \$56. Surveys must be completed within 30 minutes after they are launched in the app to be considered on time. The surveys will disappear from the app after 30 minutes.

2. After participating in the study for two weeks, you will receive an email with a link to a short web survey about your experience using the BALTO app.

3. Once you complete the survey, you will receive an Amazon Gift Card Code via email within one week for the dollar amount you earned.

“In-person” recruitment

- “In-person” recruitment
 - In October-December 2023, participant recruitment was done by distributing fliers at 11 tabling events
 - Effort was led by “The Central Maryland Transportation Alliance”, a non-academic partner
 - Number of flyers distributed = 116

PRELIMINARY RESULTS

Participation – Number of Participants

- Step 1: app download and registration
 - n = 105
- Step 2: record trips on public transit
 - n = 24 (after removing illegitimate trips*)
- Step 3: answer one or more surveys
 - n = 19
 - In-trip/\$2: n = 7; In-trip/\$4: n = 6; End-of-trip/\$2: n = 3; End-of-trip/\$4: n = 3

Overall participation rate < 1%

Participation rate conditional on downloading the app = 18%

*trip was initiated, but it was not taken according to geolocation data

Participation – Number of Events

- Trips
 - n = 230
- Trip segments (each of which triggers a survey)
 - n = 282
- Completed surveys
 - n = 210

Response rate = 74%

Trip Level Information

- Survey responses
- Passive measurement
 - Origin, destination (based on geolocation data)
 - Time of day
 - Timing data at level of transit stop

Opportunities for different types of analysis. For example, trip duration or trip satisfaction by origin, destination, time of day, etc.

Response Quality

- Correlation between mean attribute score and overall rating
 - 0.74
- Straightlining on 7 trip attribute questions
 - 80/210 (38%)
- Surveys with open responses (not counting “no” or “na”)
 - 25/210 (12%)

Expanding Participation Recruitment

- *Snowball sampling* – \$10 incentive for participants who recruit a future participant
- Advertisements on buses/trains



Tell us about your experience using public transportation in Baltimore and earn up to \$56 in Amazon Gift Cards. Must be 18 years of age and use an Android phone to be eligible.



DISCUSSION

Benefits and Challenges

- Nonparticipation
 - Challenge of getting individuals to download app, and of getting those individuals to use that app to record trips
 - Conditional on completing those two steps, the response rate was relatively high (74%), though some trips may not have been recorded
- Measurement
 - Passively collected information (time waiting at each transit stop) that would be difficult to collect via self reports
 - *in situ* measurement of trip satisfaction
- Social impact
 - Results will be shared with the community. Goal is to start a conversation among the stakeholders involved: residents, advocacy groups and decision-makers.

Unresolved Design Questions

- Implications of automatically logging trips vs. user-initiated trips
 - Considerations: user privacy, burden, nonparticipation
- What are the data quality and cost tradeoffs with other modes?
 - Considerations: extent to passive data collected by app helps answer important research questions; measurement properties of *in situ* reports vs. retrospective reports

Thank you!

Chris Antoun

antoun@umd.edu