



**ENGINEERING  
HONORS PROGRAM**  
UNIVERSITY OF MICHIGAN

# **Optimization Withi**

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**in Chronic Absenteeism**

**Industrial and Operations Engineering**

**Medical, Computer Science & Engineering**

**ism in The Detroit Public**

**ering, University of Michigan, A**

**earing, University of Michigan,**

**Public Schools Community**

**Ann Arbor, MI**

**Ann Arbor, MI**

**y District**

# Backg

What is Chronic Absenteeism?

Chronic Absenteeism is when a student r

How does Chronic Absenteeism tie into th

DPSCD has one of the highest rates of chr

has only been heightened by the results o

Why is Chronic Absenteeism so high in th

Lack of transportation is one of the leadi

lot of bus systems have been removed fro

to people moving out of the district (mak

have the means to get their child to scho

Why am I working on this project?

I have always had a passion for early edu

ty to have an education, the education ac

# ground

misses more than 10% of the school days

the Detroit Public Schools Community District?

chronic absenteeism in the nation. A quantity that  
of COVID-19 and virtual learning.

the district?

ing factors to the high absence rates in DPSCD. A  
om the district, many schools have closed due  
ing travel further), and many parents do not  
ol.

ication. Although everyone has equal opportuni-  
accessibility and quality is not always equal. I



# Model

Do you have a child  
that needs to be  
picked up for Bennett  
Elementary School  
Tomorrow?

Date: 04/03/2023

Yes

No

How m  
you ne

Ty

How many children do  
need picked up?

Date: 04/03/2023

Type number of Children

Enter

Number of

# Conclusions and Future Work

Conclusions:

Future Work:

Some future iterations of this work would be to actually put the parents and have them interacting with the software. V

# ture Work

ut the model into practice with  
Whether that be in the form of

want to use engineering tools to help ma

## Algor

DPSCD has exploited a new concept ca  
school who otherwise may not have th  
algorithm seemed useful to be able to  
most efficient way possible.

The Traveling salesperson problem (TSP  
car in this case) will visit and creates a  
In this case, it would take in the pickup  
an optimal route that can help guarant

## UI Pro

The TSP algorithm, though useful, no

ke a dent on this issue.

gorithm

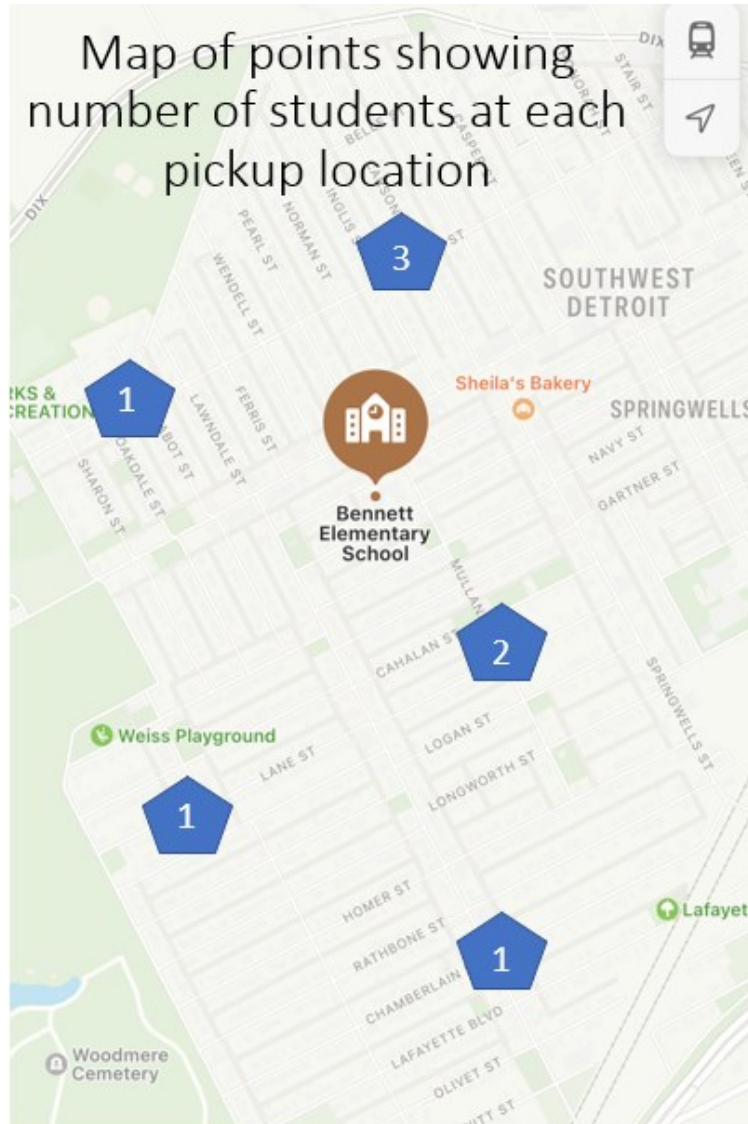
lled Pilot Cars that help pick students up for  
e ability to get to school. A traveling salesperson  
allow these pilot cars to pick up students in the

) takes in a set of nodes that a salesperson (pilot  
route the minimizes total time/distance travelled.  
locations of the students as the nodes and create  
ee the students can get to school on time!

prototype

eds an interface that can allow the pilot cars to be

Family Number	Family Address	Number of Students in family at School
Fam1	123 ABC Street Detroit, MI 48226	2
Fam2	594 ABC Street Detroit, MI 48226	1
Fam3	12 Fifth Ave Detroit, MI 48201	3
Fam4	36 Well Street Detroit, MI 48226	1



**Number of  
Students  
That Need  
to be picked  
up  
Tomorrow**

2

1

2

0





an email, text message, or app (where they would get daily notifications) for them to be able to fill out the night before whether or not they were picked up or not for that next day would help properly allocate resources. Being able to provide transportation is fluid due to things like job availability and internal factors. Thus, having it a day-to-day decision would be more and more effective.

Another future iteration (much further down the line) would be to get students home from school. This, however, would have to take into account things like after-school activities.

**Acknowledgements  
and References**

(/ notifications on). Some way  
not their child to needs to be  
ocate who needs a ride. Being  
s, appointments, or other ex-  
make it easier for the parents  
ld be to use something similar  
ave more factors due to things

ments  
ces



the TSP algorithm, though useful, need to be effective for all users of the district. This is where Computer Interaction and User Interface design comes in. A more readable form of the inputs of the algorithm and how this could look for everyone in the district.

- An interface that asks the parent if they want to use the service
- A database that holds the locations of the schools and the homes of the students
- TSP algorithm that produces optimal routes
- Readable database for pilot car driver showing the route, where to go and estimated arrival times
- A final note back to the parents that the route is optimal

...as an interface that can allow the pilot cars to be  
...his takes into account the importance of Human  
...ace. The drivers and parents of the students need a  
...he outputs of the algorithm. Thus, a prototype of  
...e district was built.

...eir child needs a ride

...f students that need to be picked up

...routes for the pilot cars

...rs that gives addresses in their respective order of

...es for those locations

...reads when their child should be ready

<b>Stop Address</b>	<b>Number of Students being picked up at stop</b>	<b>Estimated Arrival Time</b>
[Start point]	N/A	7:30 AM
594 ABC Street Detroit, MI 48226	1	7:41 AM
12 Fifth Ave Detroit, MI 48201	3	7:48 AM
[School]	N/A	7:53 AM

# You're booked!

Date: 04/03/2023

Be ready for pickup at:

**7:45 AM**

Thank you to members of the Detroit Public Schools Community District Staff for their assistance in helping build this model.



References:

“Detroit’s Uniquely Challenging Context for Students *of Education*. November 2019. [https://education.w...detroit\\_s\\_uniquely\\_challenging\\_context\\_for\\_stude](https://education.w...detroit_s_uniquely_challenging_context_for_stude)



ts Attendance.” *Wayne State College*  
[wayne.edu/detroit\\_ed\\_research/5-  
nt\\_attendance102021.pdf](http://wayne.edu/detroit_ed_research/5-<br/>nt_attendance102021.pdf)