Database to Access Services in Massachusetts for ASD Adults Without an Intellectual Disability

A Major Qualifying Project to be submitted to the faculty of
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Abstract

Many adults on the autism spectrum without intellectual disabilities in Massachusetts have difficulties finding services to help them. There is a lack of awareness about such existing providers and where to look them up. People have trouble finding the resources easily due to the lack of a centralized system that has the information about all the existing services and their providers, all in one place. This project sets about creating a centralized database and web interface to unify all these resources. The project uses SQL and JavaScript, using MySQL to run the database with React.js and Node.js holding the client user interface.

Acknowledgments

I would like to thank my advisor Professor Mohamed Eltabakh for support and guidance throughout this project. Also, thank him and Sami Baral for teaching me new skills while developing this project. I also wish to thank Jeanne Hoerter, Marla Lucas, and the team at AANE for the inspiration for this database.

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1. Introduction

This project aimed to create a unified database of providers and services specific to adults on the autism spectrum without intellectual disabilities (ASD no ID) in Massachusetts. In 2014, the Massachusetts Autism Omnibus Act was passed to address the growing needs of people on the autism spectrum. AANE (Asperger/Autism Network), an organization that supports people on the autism spectrum, performed a survey to find out what services benefited adults with ASD no ID and what additional resources are needed. In 2019, AANE published their findings in *What Works: Meeting Needs and Improving Access to Services, Findings from the AANE Massachusetts Survey for Adults on the Autism Spectrum Without an Intellectual Disability*. [1] The inspiration of this project was the report's findings of the limited availability of knowledge about services and providers and that a unified database could make it easier to find them.

I wrote this project in SQL and JavaScript. The server manager, MySQL, had been used to handle the server back end, with Node.js handling the retrieval from the server and React.JS running the user interface. I researched a sizable sample of such services I was aware of to form my database architecture around and be used in my proof of concept. So far, the work's intent is a proof of concept in creating a working database framework that will hopefully be expanded in the future by other teams.

I did not have a partner for my MQP but received assistance to expand my skills and help me work through problems. Before starting the project, I had not taken a database class or knew the SQL programming language. I received a lot of support and guidance in learning databases, using React.JS and Node.js, and integrating them with a local database server from Professor Eltabakh and Sami Baral.

The following link has all the code associated with this project: https://github.com/stephenlucas600/MQP-Project

2. Background

2.1 Massachusetts Autism Omnibus Act

The Autism Omnibus Bill was passed into law in 2014. The bill focused on six crucial areas:

- MassHealth must cover medically necessary treatment for autistic children under 21 years, including Applied Behavior Analysis Therapy (ABA) and Augmentative and Alternative Communication (AAC).[3][4]

- Enabling adults on the autism spectrum to apply for Department of Development Services (DDS) programs and supports. Also, persons with Prader Willi Syndrome and Smith-Magenis syndrome.[3][4]

- To provide the opportunity for special education teachers to obtain additional education specific to autism is called an Autism Endorsement.[3][4]

- Instituting an *Achieving a Better Life Experience* (ABLE) account is a tax-free saving program that allows families to provide for disability-related expenses and save for their retirement.[3][4]

- The Department of Mental Health and Department of Development Services must implement a joint services plan between the two departments.[3][4]

- Requiring that the Autism Commission, which was initially set up to explore the needs of people on the Autism Spectrum in Massachusetts, be a permanent entity.[3][4]

This project will focus on accessing Department of Development Services (DDS) programs and supports for adults on the autism spectrum.

2.2 Findings from the AANE Massachusetts Survey for Adults on the Autism Spectrum Without an Intellectual Disability

In 2019, Asperger/Autism Network (AANE) conducted a survey published as What Works: Meeting Needs and Improving Access to Services, Findings from the AANE Massachusetts Survey for Adults on the Autism Spectrum Without an Intellectual Disability. Before passing the Massachusetts Autism Omnibus Act, adults with an IQ above 70 were ineligible to apply to the Department of Disability Services (DDS). The law expanded eligibility to more adults with autism regardless of their IQ. The criteria were determined based on substantial functional limitations in three or more major life areas; self-care, receptive and expressive language, learning, mobility, self-direction, independent living, and economic self-sufficiency or a person's ability to support themselves financially. This group was initially referred to as "Newly Eligible" and in 2019 "Eligible." [1]

The goal of the report's survey was that the specific needs of Adults with ASD no ID have not been fulfilled and improve the finding and obtaining relevant services. [1] The AANE report notes that many adults with ASD no ID can gain competitive employment and be economically self-sufficient when provided with appropriate support. [1] As well as "*build meaningful, connected lives, and empower them to maximize their strengths and participate in their communities.*" [1] The report stresses that with the right kind of support, many adults on the spectrum can be economically independent by finding and keeping competitive employment and living a self-sufficient life. In the long run, ongoing support will reduce overall costs to Massachusetts and benefit these adults and their families. [1]

The survey found that the surveyees' primary critical needs not being supported were related to employment, housing, mental health support, social / community engagement, and transportation. [1] The survey also found that this problem is often compounded by limited access to services. The "Key barriers are: lack of awareness; lack of state funding; difficulty navigating the system; the need for more flexible guidelines so that adults can choose the services they need; and lack of qualified service providers." [1]

2.3 AANE Survey Recommendations

There were many recommendations on expanding awareness of the Autism Omnibus Act and how to support adults with ASD no ID. This project focuses on fulfilling some proposals to raise awareness and navigate eligible families and adults about DDS and other related groups and networks. The main goal of this project is to create a foundation for a database of all Massachusetts agencies, providers, and their services. This database is a tool to reach out to providers (psychologists and psychiatrists), schools, parent groups, and autism agencies. They can search for services from public and private providers that can be found in one location. [1] The Figure below describes the most common examples of private and non-private service providers as listed in "What Works." [1]

Private and non-profit service providers:
Medical doctors
Mental health professionals
Pharmacies for medicine
Life / school / job coaches
Case management programs
Specialized employment agencies
Schools - classes (i.e., cooking, coding), vocational schools, colleges
Tutors
Physical therapists
Board Certified Behavioral Analysts (BCBA) / Applied Behavioral Analysis (ABA) therapists
Occupational therapists
Speech therapists
Support groups
Driving schools (sometimes adaptive)
Specialized community/recreational activities - e.g., Special Olympics
Independent living support - cleaning, shopping, adult companion
Respite care providers for caregivers of adults
Also, legal services were often needed to complete applications, create special needs trusts, enforce disability rights, or resolve access to service issues.

Figure 1: Private and non-profit service providers

2.4 Specific Organizations selected in Development of the Database

At the start of the project and the testing, I picked organizations I was already familiar with, then expanded the sample with online research. Organizations include:

Organization	Main Web Page	Service
AANE (Asperger/Autism Network)	https://www.aane.org/about-us/contact-us/	Coaching, Housing Support, Social Activities
Aspire Teen & Adult Programs: Massachusetts General Hospital	https://www.massgeneral.org/children/aspire/teen-adult/	Social Activities, College and Employment Support

Metro West Regional Transit Authority	https://www.mwrta.com/senior-and-disabled/senior-and-disabled	Transportation
MBTA The Ride	https://www.mbta.com/accessibility/the-ride	Transportation, Autism Awareness Training, Social Activities
TILL	https://www.tillinc.org/	Independent Living, Employment Skills
You're with Us!	https://www.yourewithus.org/	Social Activities, Autism Awareness Training
Northeast Arc	https://ne-arc.org/	Social Activities, College and Employment Support
Lifeworks	https://lifeworksarc.org/	Independent Living, Employment Support, Social Activities
Community Autism Resources	http://community-autism-resources.com/	College and Employment Support, Autism Awareness Training
Autism Resources Central	https://www.autismresourcecentral.org/	Independent Living
Autism Alliance	https://www.autismalliance.org/	Social Activities

Table 1: Organizations

3. Designing Database

The collection of data from the organizations allowed me to make assumptions about how to design the database. As a resource to streamline the services provided to include in the database, I focused on the AANE report, "*What Works: Meeting needs and improving access to services*." The report identified the basis of the various disabilities, problems that occur due to them, services to support the deficits, and obstacles when accessing the services.

To design a database from scratch, I first needed to develop the steps in creating a well-structured database—this time-consuming step of identifying and recording information the end-user would like to know. I started understanding the requirements by researching multiple websites of organizations that I was familiar with that provided services for adults with ASD. I then needed to expand my scope to include other organizations that provided the services shown in Figure 1. The next step was to deconstruct what properties of the organizations' websites offered into a database hierarchy as found in the following table, Table 2.

Database Table	Description
Organizations	Contains general information and main web address about the providing organization
Programs	Contains information about long-term programs offered by organizations to assist people on the autistic spectrum.
Contacts	Contains information on Contact information relating to organization and programs (i.e., email, address, phone number).
Programs_Contacts	Joining Table between Programs and Contacts table. Contains information on contacts connected to a given program
Services_Type_has_Programs	Joining Table between Services_Type and Programs table. Contains information on what type of Services a program provides.

Services_Type	Contains information on the different areas of service a program may provide.
Events	Contains information on events (i.e., an open invitation or signup party, get-togethers, game nights) and details (i.e., is it online, is it repeating, or one of the events, address).
Event_Dates	Information on the time(s) and Date(s) an event will occur.
Regions_has_Programs	Joining Table between Regions and Programs table. Contains information on given districts in Massachusetts a program is offered in (no region will be listed for a program if it is only online).
Regions	Contains Information on given districts in Massachusetts
Regions_Cities	Joining Table between Cities and Regions table.
Cities	Contains information on names and zip codes of cities, towns, villages, and census-designated places in Massachusetts

Table 2: Database Tables

3.1 Service Types and Examples

As expressed in the AANE Report [1], the kind of need-based support each program provides was broken down and consolidated into six general categories identified as Service Types. I obtained program examples from survey questions, survey responses, and recommendations found in the report. Separating and identifying the Service Types, as seen in Table 3 below, made it easier to search and sort the database by the end-user.

Service Types	Program Examples
Employment (including pre-employment support)- Obtaining and maintaining employment with an adequate living wage.	-Provide one-on-one assistance to obtain and maintain employment, Job coaching *(on and off-site)* -Provide traditional job readiness support and placement services: Job exploration / job-seeking support (*resume writing, interview skills*)

	-Employment supports ongoing both employee and employer, specialized employment agencies. -Vocational schools/college classes (*cooking, coding*)
Housing and independent living - Provide skill development and direct supports for adults to live independently and offer physical housing options	-Ongoing support with independent living skills *(cleaning, shopping, adult companion, manage aspects of daily living throughout their lifetime)* -Low-income supportive housing -Group or residential home when more direct supports needed -Support with navigating the complex process of finding disabled and low-income housing -Housing and Urban Development (HUD) / subsidized apartment DMH housing
Mental Health Support (Health Care)	Department of Developmental Services (DDS) Massachusetts Rehabilitation Commission (MRC) Department of Mental Health (DMH) Board Certified Behavioral Analysts (BCBA) / Applied Behavioral Analysis (ABA) therapists
Social and Community Engagement	-Offer opportunities for social and community engagement -Direct coaching/mentors -Offer-in-person meetups and online platforms -Specialized community/recreational activities - e.g., Special Olympics
Transportation	-Provide transportation assistance as needed -The Ride -Transportation reimbursement stipends for a ride -Share app services -Driving schools (*sometimes adaptive)*
Other Needs	-Family Support. -Respite care providers for caregivers of adults. -Safe and Healthy Intimate Relationships. -Criminal Justice.

Table 3: Service Types and Program Examples.

3.2 Database Assumptions and Creation

The multiple-step process of creating a database started with the basic assumptions of

needing one table for the organizations, one for programs, and another for the physical and

digital contact information. As I expanded my list of organizations, I also expanded what

information would be available to the end-user, including adding events and a tag to identify which services a program provides. The final step is to turn the written statements into an Entity Relation (ER) Model, as seen in Figure 2. The final assumptions about the database were:

- Every Organization's table entry has a unique `Organization_ID`, an `Organization_NAME`, a `Website_Link`, a `Description`, and one or more Office Contacts.

- Every Organization provides multiple Programs. Each Program has the following attributes: Unique `Program_ID`, a `Program_NAME`, its primary `Program_Website_Link`, an `Organization_ID` linked to the Organization table, one or more Office Contacts, a `Description`, and whether the `Provider` is a public, private, or an insured service.

- Each Program can have multiple social events. Each Event has the following attributes: a Unique `Event_ID`, `Event_NAME`, `IS_Online`, `IS_Repeating`, `Address`, `Description`, and a `Program_ID` linking it to the Programs table,

- Each Event has multiple Event_Dates with the following attributes: `Start_Date`, `End_Date`, and an Event_ID to connect it to an Events table entry.

- Every Contact has a unique `Contacts_ID` and may have a `Title`, `Address`, `Email`, `Phone_Number`, and an `Organization_ID` to link to the entry it's connected to in the Organizations table.

- A Contact is connected to one Organization, but an Organizations and Program can have multiple Contacts, and contacts can belong to multiple programs.

- The Programs_Contacts possess `Program_ID` and `Contacts_ID` to connect Programs with the Contact table.

- Each Service has a `Service_Type_ID`, `Service_Type_NAME`, and a `Description`.

- Each Organization provides multiple Services, and each Program may involve several of these Services. A Program entry of a given `Program_ID` can have one or more services, and one or more Programs can have the same services entry of a given `Service_Type_ID`.

- Each Program is part of one or more Regions. Each Region has a `Region_ID` and `Region_NAME`.

- Program entry of a given `Program_ID` is joined with one or more Regions, and one or more Programs can join a Regions entry of a given `Region_ID`.

- Each Cities Entry has a `City_NAME`, a `State_NAME` (should be all Massachusetts [MA]), and a `ZIP_CODE`. Cities Entries can have the same name but different zip codes.

- Each Region of a given `Region_ID` has every Cities Entry that falls at least partly under its jurisdiction, and every Cities Entry of a given `City_NAME` can be part of multiple Regions.
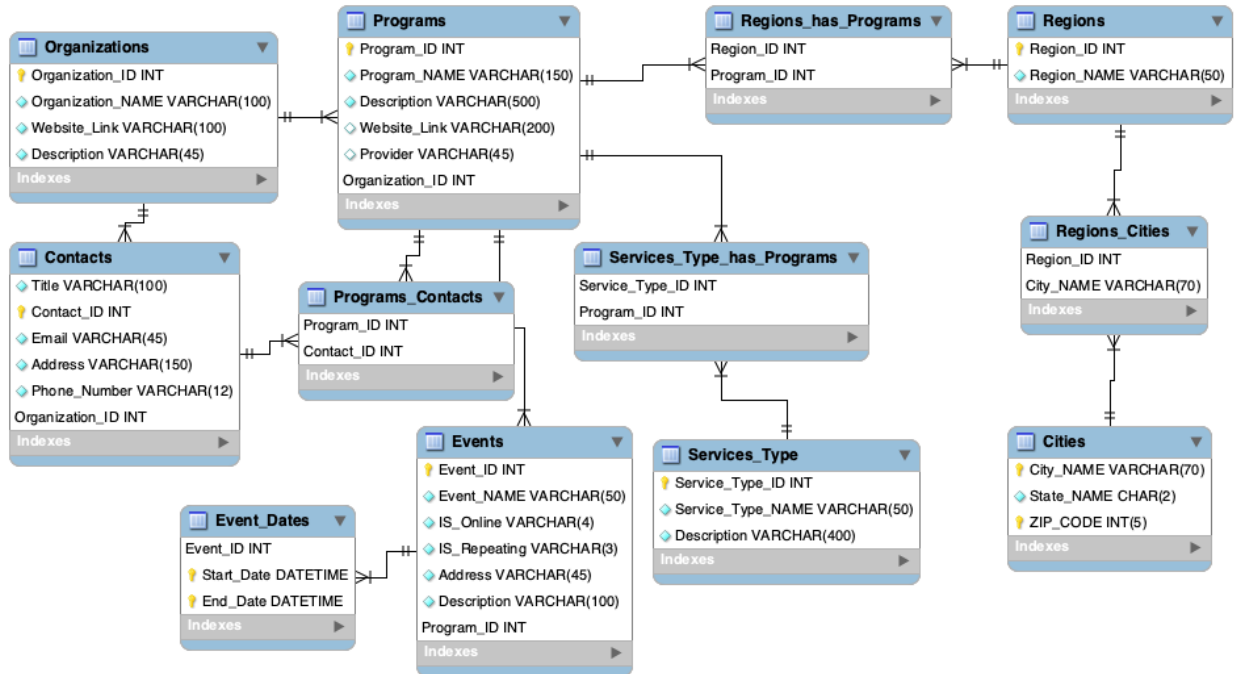
Figure 2: Database Entity Relation Model (ER)

As seen in Figure 2 above, the ER model gave me a visual perspective of the entity relationships and where to reduce redundancies. I found the flowchart process very helpful in communicating with my advisor and expanding the project's scope. For the most part, my initial assumptions were adequate, but after applying the MySQL software and adding data entries, I needed to make a few changes to optimize the tables. For example, while writing the queries, I realized that the dates in Events entries were not normalized, repeating values unnecessarily like the Event's name when it would be more memory efficient for the Event's dates to be separated into different tables. I had been daunted that the organizations each had defined the regions in Massachusetts differently. I wished to include location as an entry to help find programs near a given area. After looking up MA counties, I settled with a system listing the regions as all counties, including the associated cities, towns, villages, and census-designated places, along with their zip codes under them.

3.3 Database Outline

Below, in Figure 4 below, is the code written in the SQL programing language. This code

is a transcription of the ER model found in Figure 2 and was used to create the database for the

project.

```
CREATE TABLE Organizations(
Organization_ID INT NOT NULL AUTO_INCREMENT,
Organization_NAME varchar(100) NOT NULL DEFAULT 'N/A',
Website_Link varchar(100) NOT NULL DEFAULT 'N/A',
Description varchar(100) NOT NULL DEFAULT 'N/A',
PRIMARY KEY (Organization_ID)
);

CREATE TABLE Programs(
Program_ID INT NOT NULL AUTO_INCREMENT,
Program_NAME varchar(150) NOT NULL DEFAULT 'N/A',
Description varchar(500) NOT NULL DEFAULT 'N/A',
Program_Website_Link varchar(200) DEFAULT 'N/A',
Provider varchar(45) CHECK (Type IN ('Public ','Private ',
'Insured')),
Organization_ID INT NOT NULL,
FOREIGN KEY (Organization_ID) REFERENCES Organizations
(Organization_ID)
);

CREATE TABLE Contacts(
Title varchar(100) NOT NULL DEFAULT 'N/A',
Contacts_ID INT NOT NULL AUTO_INCREMENT,
Email varchar(45) DEFAULT 'N/A',
Address varchar(150) DEFAULT 'N/A',
Phone_Number varchar(12) CHECK (Phone_Number LIKE
'###/###/####'),
Organization_ID INT NOT NULL,
FOREIGN KEY (Organization_ID)  REFERENCES Organizations
(Organization_ID),
PRIMARY KEY (Contacts_ID)
);

CREATE TABLE Programs_to_Contacts(
Program_ID INT NOT NULL,
FOREIGN KEY (Program_ID) REFERENCES Programs (Program_ID),
Contacts_ID INT NOT NULL,
FOREIGN KEY (Contacts_ID) REFERENCES Contacts (Contacts_ID),
PRIMARY KEY (Program_ID, Contacts_ID)
);
```

```
CREATE TABLE Events (
IS_Online varchar(4) CHECK (Type IN ('Yes', 'No', 'Both')),
IS_Repeating varchar(3) CHECK (Type IN ('Yes', 'No')),
Address varchar(45)  DEFAULT 'N/A',
Description varchar(100) NOT NULL DEFAULT 'N/A',
Event_ID INT NOT NULL AUTO_INCREMENT,
Event_NAME varchar(50) NOT NULL DEFAULT 'N/A',
Program_ID INT,
FOREIGN KEY (Program_ID) REFERENCES Programs (Program_ID),
PRIMARY KEY (Event_ID)
);

CREATE TABLE Event_Dates(
End_Date datetime NOT NULL,
Start_Date datetime NOT NULL,
Event_ID INT NOT NULL,
PRIMARY KEY(Event_ID, Start_Date, End_Date)
);

CREATE TABLE Services_Type(
Service_Type_ID INT NOT NULL AUTO_INCREMENT,
Service_Type_NAME varchar(50) NOT NULL,
Description varchar(400) NOT NULL DEFAULT 'N/A',
PRIMARY KEY (Service_Type_ID)
);

CREATE TABLE Services_Type_has_Programs(
Service_Type_ID INT,
FOREIGN KEY (Service_Type_ID) REFERENCES Services_Type
(Service_Type_ID),
Program_ID INT,
FOREIGN KEY (Program_ID) REFERENCES Programs (Program_ID)
);

CREATE TABLE Regions(
Region_ID INT NOT NULL AUTO_INCREMENT,
Region_NAME varchar(50) NOT NULL DEFAULT 'N/A',
PRIMARY KEY (Region_ID)
);

CREATE TABLE Regions_Cities(
Region_ID INT NOT NULL AUTO_INCREMENT,
City_NAME varchar(70) NOT NULL DEFAULT 'N/A',
PRIMARY KEY (Region_ID)
);

CREATE TABLE Cities(
City_NAME varchar(70) NOT NULL DEFAULT 'N/A',
State_NAME varchar(2) NOT NULL DEFAULT 'N/A',
ZIP_CODE INT NOT NULL,
```

```
PRIMARY KEY (City_NAME, ZIP_CODE)
);


CREATE TABLE Regions_has_Programs(
Region_ID INT NOT NULL,
FOREIGN KEY (Region_ID)  REFERENCES Regions (Region_ID),
Program_ID INT NOT NULL,
FOREIGN KEY (Program_ID)  REFERENCES Programs (Program_ID),
PRIMARY KEY (Region_ID, Program_ID)
);
```
Figure 3: Database Outline Code
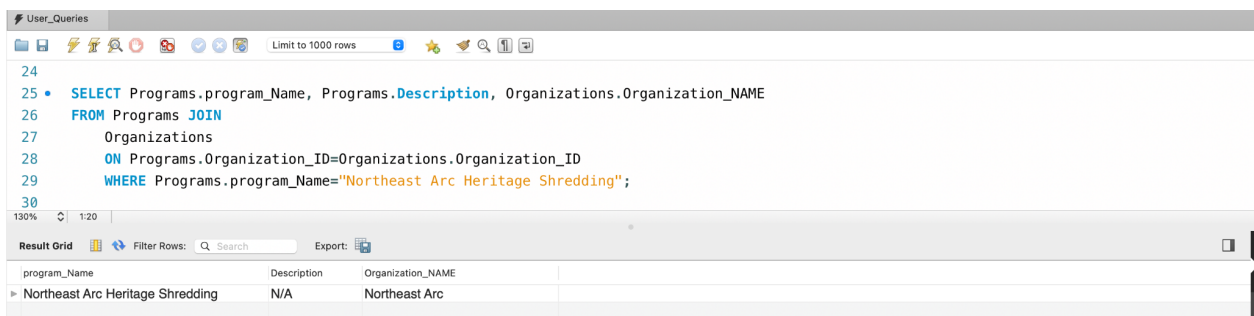
4. Queries

In the development of Queries, the first step was to create user statements the end-user can ask the database such as "What location is this program being held?" or "Which organization offers programs related to employment?"

- **Q1: What organization does this program belong to?** *Joins the Organizations and Programs table by Organization ID to find which Organization a given Programs entry belongs to.*

Figure 4: Query 1 - What organization does this program belong to

- **Q2: What times does this event happen?** *Joins the Events and Event_Dates table by Event_ID to finding the start and end times for a given event.*

Figure 5: Query 2 -What times does this event happen

- **Q3: All programs that belong to this organization?** Joins the Organization and Programs table by Organization ID and returns all Programs connected to a given Organization.

Figure 6: Query 3 - All programs that belong to this organization

- **Q4: What other programs do this contact info relate to?** *Join the Contact table with the Organization and Programs table to find the Organization and all Programs associated with the Contact.*

Figure 7: Query 4 - What other programs does this contact info relate to

- **Q5: Find programs (description, contacts, organization name) under a specific services type. (ex: What programs and organizations have that involve employment?).** *Have the Programs table joined together with the Services_Type, Organizations, and Contact table?*

```sql
110
111 •  SELECT Programs.Program_Name, Programs.Description, Services_Type.Service_Type_Name,
112        Organizations.Organization_NAME, Contacts.Email,Contacts.Address, Contacts.Phone_Number
113        FROM Services_Type_has_Programs
114        JOIN Services_Type ON Services_Type.Service_Type_ID=Services_Type_has_Programs.Service_Type_ID
115        JOIN Programs ON Services_Type_has_Programs.Program_ID=Programs.Program_ID
116        JOIN Organizations ON Organizations.Organization_ID=Programs.Organization_ID
117        JOIN Programs_Contacts ON Programs.Program_ID=Programs_Contacts.Program_ID
118        JOIN Contacts ON Contacts.Contact_ID=Programs_Contacts.Contact_ID
119        where Services_Type.Service_Type_Name LIKE "%Employment%";
```

Program_Name	Description	Service_Type_Name	Organization_NAME	Email	Address	Phone_Number
► Find a Job	N/A	Employment	TILL	N/A	333 South Street Shrewsbury, MA 01545	877-937-9675
Clinics for Adults - Resume...	N/A	Employment	Community Autism Resources	paula.aiesi@tillinc.org	N/A	781-302-4608
Clinics for Adults - Intervie...	N/A	Employment	Community Autism Resources	Dale.Belcher@tillinc.org	N/A	781-302-4608
Clinics for Adults - ISP Rev...	N/A	Employment	Community Autism Resources	N/A	TILL, Inc. 20 Eastbrook Road Dedham, MA 02026-2056 Attenti...	0
ASD Adult Training Series	N/A	Employment	You're with Us!	N/A	120 Main St., 2nd Floor Bridgewater, MA 02324	508-379-0371

Figure 8: Query 5 - Find programs (description, contact, organization name) under a specific services type

- **Q6: What location is this program being held***? Join the Programs table with Contacts and Regions to find what region the program is held in and the contact's address.*

```sql
122
123 •  SELECT Programs.Program_Name, Contacts.Address, Regions.Region_NAME FROM Programs_Contacts
124        JOIN Programs
125            ON Programs.Program_ID=Programs_Contacts.Program_ID
126        JOIN Contacts
127            ON Contacts.Contact_ID=Programs_Contacts.Contact_ID
128        JOIN Regions_has_Programs
129            ON Regions_has_Programs.Program_ID=Programs.Program_ID
130        JOIN Regions
131            ON Regions.Region_ID=Regions_has_Programs.Region_ID
132            WHERE Programs.program_Name LIKE "Neurodiverse Couples Coaching";
```

Program_Name	Address	Region_NAME
► Neurodiverse Couples Coaching	1881 Worcester Road, Suite 100A Framingham, MA 01701	Remote

Figure 9: Query 6 - What location is this program being held

- **Q7: Are there any events coming up soon (today, tomorrow, this week, this month)?** *Return all events in the Events table when joined with the Event_Dates table that falls between two given dates*

Figure 10: Query 7 - Are there any events coming up soon (today, tomorrow, this week, this month)

- **Q8: Is a program funded private/public or insured?** *Return the provider type from the Programs table.*

Figure 11: Query 8 - Is a program funded private/public or insured

- **Q9: Which organization offers more than one event in the coming month?** *Join the Organization, Programs, Events, and Event_Dates tables and return only Organizations that possess two or more events held between two given dates.*

Figure 12: Query 9 - Which organization offers more than one event in the coming month

- **Q10: Which organization provided the most number of events last year?** *Join the Organization, Programs, and Events table and return the Organization with the most number of Events entries.*
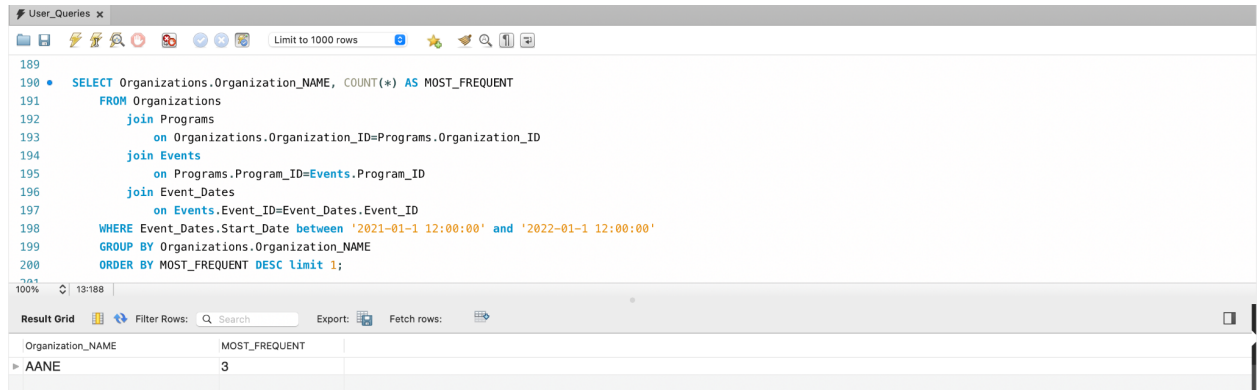
Figure 13: Query 10 - Which organization provided the most number of events last year

- **Q11: Which organization provides employment services, and is it offered in an area near me?** *Join the Organization, Programs, Services_Type, Regions, and Cities tables to return all employment service programs offered in a given city or is online.*
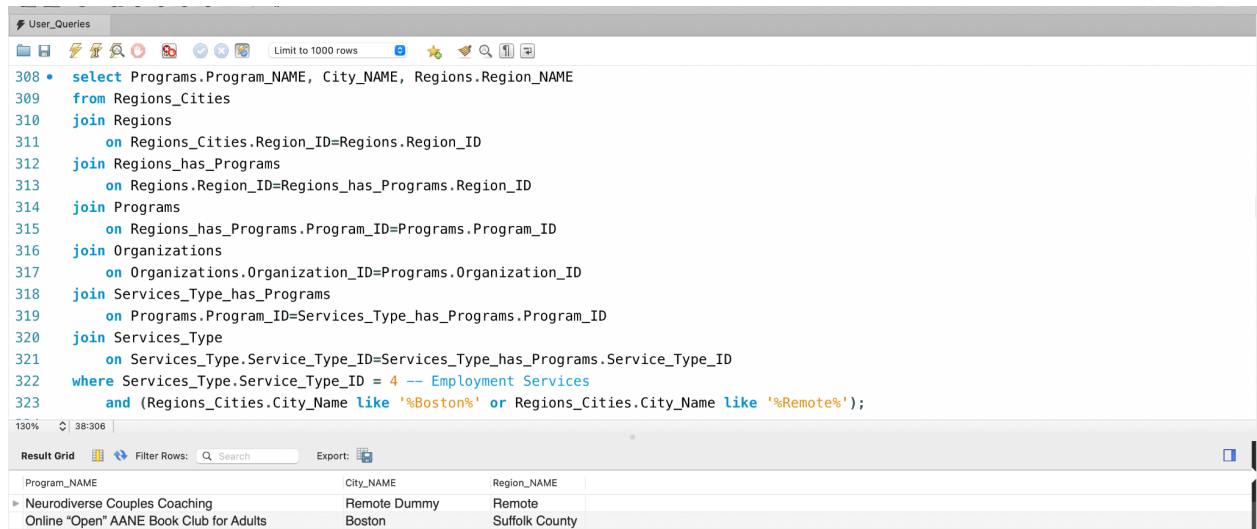
Figure 14: Query 11 - Which organization provides employment services, and is it offered in an area near me

- **Q12: Which service type is offered by more than two organizations?** *Join the Organization, Programs, and Services_Type table and return the Services_Type that three or more Organizations offer.*

Figure 15: Query 12 - Which service type is offered by more than two organizations

- **Q13: Which organization offers no programs related to employment?** *Join the Organization, Programs, and Services_Type table and return the Organizations that do not have a program with the employment service type.*

Figure 16: Query 13 - Which organization offers no programs related to employment

5. Webpage/Interface Design

      The final piece of the project was to provide a web interface for end-user access, with the desired goal of making it easier to query information. The search engine filters allow the user to select from the drop-down menu **Select Table** to find grouped information helpful in selecting or contacting the various **Organizations**. When the **Programs** table is open, the available tabs specific to the table are revealed, allowing users to pick from the **Service** column. The additional options in their drop-down menus let the user search for target information. The drop-down menu choices are consistent, like the **Select Table** tab or unique to tables in the **Select Column** and **Select Services** tab. The below figures display the table and related tabs.
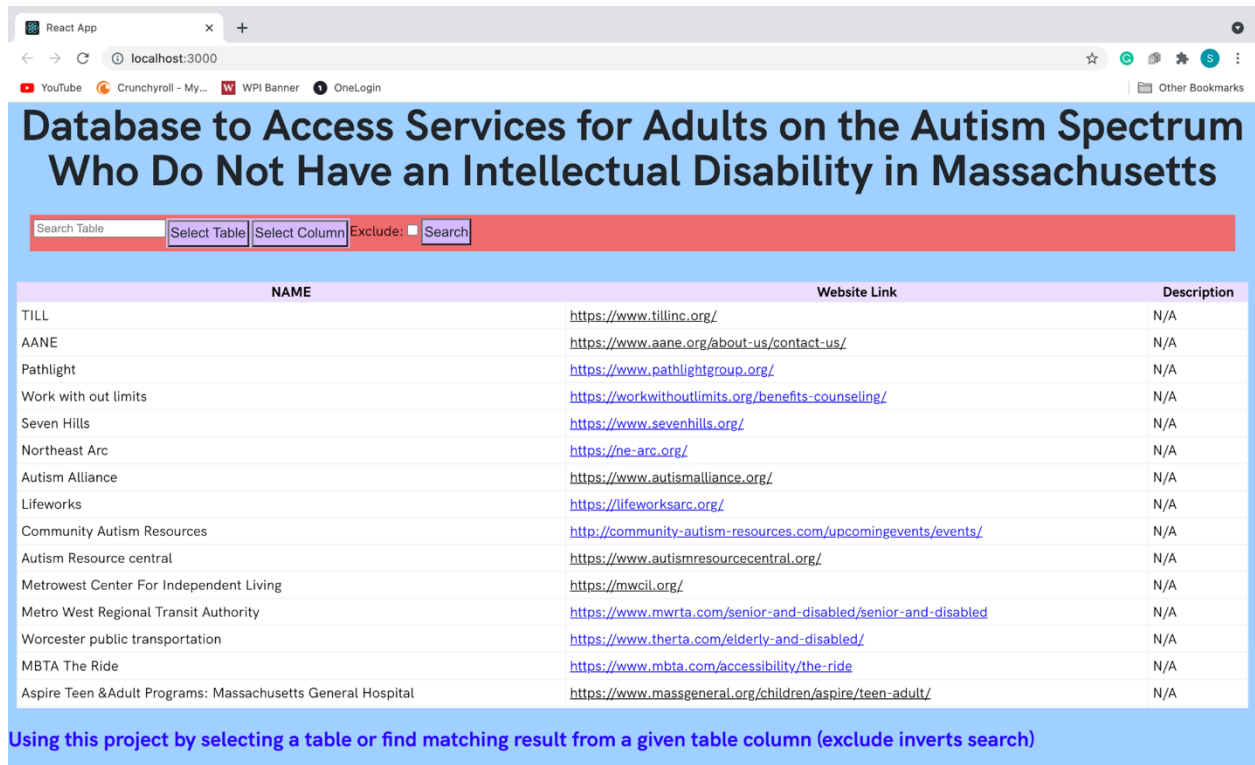
Figure 17: Home page

The website's home page lists all the organizations' possible entities in the database and their corresponding details. The user can obtain more information about a particular organization by clicking the **Website Link** column.
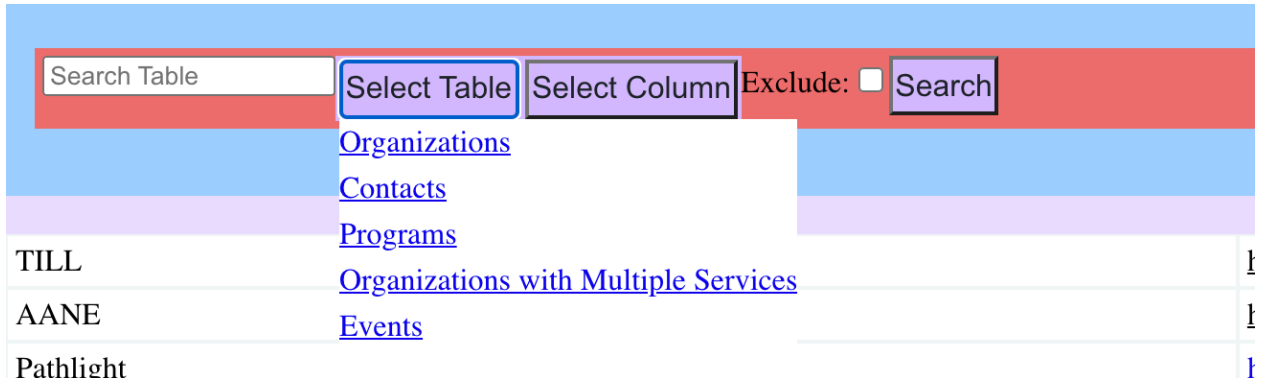
Figure 18: Select table drop-down

Clicking the **Select Table** drop-down opens a list of all possible entries to search the database and allows the users to switch between tables. The user can either look for **Organizations, Contacts** of the organizations, **Programs**, and **Events** related to these organizations, and other **Organizations with Multiple Services**. As seen below, additional drop-down menus are available.
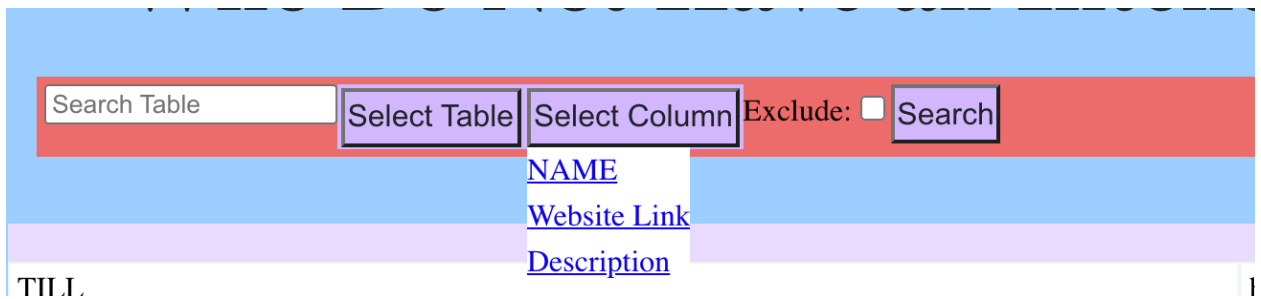
Figure 19: column table drop-down

Once a table is selected, a search bar **Select Column** is available to filter down results for an easier search, displaying all the of all the columns titles of the currently displayed table. In this Example for **Organizations**, the additional filters are by **NAME**, **Website Link**, or **Description**. For example, if a user wants to search an organization based on its name, they would have to select **Organizations** in the **Select Table** drop-down, **NAME** in the **Select Column** drop-down, and add the search text in the **Search Table** input; finally, click the **Search** button.

Figure 20: Return organizations with name partial matching "Til"

For efficiency when searching, the database allows for partial word matching. By selecting **NAME** in the **Select Column** drop-down table, type "Til" in the Search table, and press the **Search** button, it will return all organizations with "Til" in their name. If the **Exclude** is checked off In the **Organizations** table, the search will return all organizations that do not have "Til" in the name.

Figure 21: Contacts

The **Contacts** table gives a collection of Contact information an end-user may want that is associated with given organization-specific programs. It has information on their **Address**, **Email**, and **Phone Number**.

Figure 22: Programs

Programs table gives all programs recorded in the database, having information about: the Service they are a part of, the program's name, the program's page **Website Link**, **Description** if it is operated by a private, public or insured provider, the associated organization plus their main webpage, **City**, and Massachusetts counties they operate in or if it is held as a remote service, and the associated contact **Address**, **Email**, and **Phone Number**.

Figure 23: Select Services

When the **Select Services** drop-down is open, it shows the five main categories of services. For example, selecting **Employment** in the **Select Service** drop-down returns all programs of that service type.

Figure 24: Return all programs that are social and community engagement services not in Boston

When a **Select Service** is selected, it returns all entries with that given Service. It is not affected by the **Exclude** button, so In this **Programs** table example, it returns **Social and Community Engagement** service entries and that are not located in the **City** of "Boston."

6. Tools and Technologies

I initially wrote the user interface (UI) on Glitch using JavaScript. I learned how to create a web page with JavaScript's React Extension and connected it to my local MySQL workbench database using Node.JS. I used Node.JS to build RESTful APIs architecture (api/index.js) to join the database to the frontend of the application. The filter function originally called the backend for every user query but later switched to making one backend call to fetch a table and then filter it further.

Name	Description
Glitch	I used Glitch and its tutorial on using React during the initial project investigation. It is an online web page code editor. Unfortunately, I had to drop it and remake the project on the desktop as an unidentified error prevented Glitch from rendering the page. [2]
ReactJS for frontend	It is an open-source JavaScript library used to create interfaces for single-page applications. Professor Eltabakh and Glitch.com recommended it, as it was an easy way to write and render my application.
Node.JS for backend	It is an open-source, cross-platform runtime environment that is used for server-side programming. [5] In this project, we use NodeJS to build RESTful APIs to connect the database to the frontend of the application. Another professor recommended connecting the MySQL server backend to the front end.
NPM	Node.JS package manager is a package manager for the JavaScript programming language. It is a free and widely used Software Registry (Library) and the default Software package manager for Node.JS. Sami Baral recommended it to build and run the application's client.
MySQL	It is an open-source SQL database management system. [6] One of the first applications my professor told me about. MySQL was employed in this project for managing a database server in the back end.

Table 4: Tools and Technologies

7. Conclusion

This project creates a foundation for designing a database to search for services available in Massachusetts for adults with ASD no ID by creating a web interface for end-users to query information. The application is run with MySQL as the server manager, Node.js as the front end, and the user interface running on React.JS. As part of the project, I had transcribed my research of the various services into the SQL database. As the project's goal was to create a prototype, I made a functioning interface by the end. The application can fetch data tables from the local database. It displays the information in a readable and scrollable manner, a search bar with drop-down menus and buttons that can change based on which table is active and perform partial word matching.

It is apparent there is more to work needed in many areas. Most manual summaries of entry descriptions were left blank as they required more time and people to do proper research. Along with that, the providers attribute for programs was also left unassigned as it would require another cycle of research on how each program would be classified under Massachusetts law. As the goal of this project was to have at least the client's foundations established, they had to be left to be written in the future. There had been early discussion on using a Web Crawler to find the websites that provide relevant services. However, there was not enough time to learn to develop one while also learning to construct a database and interface.

I hope this proof of concept will be continued and fleshed out further. Currently, the database and the client only run on a local computer. Ultimately, the final product should move to a public webserver and further improve the interface layout and add features required on a website. Completing this project and making it public will make an excellent resource for adults on the autism spectrum without intellectual disabilities in Massachusetts.

While doing this project, I learned many skills required to create and integrate a database. Using SQL and creating a page with react.js and using node.js to bridge the two together.

8. Background Materials

Here is a list of some of the tools and tutorials I used when working on this project.

- Glitch Hello React
- https://reactjs.org/tutorial/tutorial.html
- https://react-bootstrap.github.io/components/dropdowns/
- https://www.emgoto.com/react-search-bar/
- https://react-bootstrap.github.io/components/dropdowns/
- https://www.mysqltutorial.org/mysql-nodejs/connect/
- https://dev.to/abdulbasit313/an-easy-way-to-create-a-customize-dynamic-table-in-react-js-3igg
- https://dev.to/nasreenkhalid/simple-react-js-and-mysql-integration-crud-app-backend-5aom
- https://github.com/imaslarab/MedicalMgmt
- https://www.geeksforgeeks.org/node-js-export-module/#:~:text=The%20module.&text=js%20is%20used%20to%20export,is%20exposed%20as%20a%20module
- https://www.npmjs.com/package/express-async-handler
- https://modernweb.com/the-basics-of-express-routes/
- https://codebrahma.com/build-table-componenet-with-react-hooks/
- https://www.digitalocean.com/community/tutorials/how-to-manage-state-on-react-class-components
- https://www.digitalocean.com/community/tutorials/how-to-share-state-across-react-components-with-context
- https://www.pluralsight.com/guides/form-submission-in-reactjs
- https://www.ukessays.com/essays/information-technology/website-design-report-9971.php
- https://searchapparchitecture.techtarget.com/definition/RESTful-API

9. Bibliography

1. AANE. *What Works: Meeting Needs and Improving Access to Services, Findings from the AANE Massachusetts Survey for Adults on the Autism Spectrum Without an Intellectual Disability.* Watertown: Asperger/Autism Network (AANE), 2019.
2. Glitch, Inc. *glitch.com*. 29 2017. Glitch, Inc. 29 03 2021. <https://glitch.com>.
3. Mass Legal Services. *Autism Omnibus Bill*. 06 08 2014. Mass Legal Services. 19 09 2021. <https://www.masslegalservices.org/content/autism-omnibus-bill>.
4. Massachusetts Advocates for Children. *The Autism Omnibus Law*. n.d. 19 09 2021. <https://www.massadvocates.org/autism-omnibus-law>.
5. OpenJS Foundation. *What is npm?* 26 08 2011. OpenJS Foundation. 30 09 2021. <https://nodejs.org/en/knowledge/getting-started/npm/what-is-npm/>.
6. Oracle Corporation. "What is MySQL?" Vers. 70940. 2021. *MySQL 8.0 Reference Manual :: 1.2.1 What is MySQL?* Oracle Corporation. 30 09 2021. <https://dev.mysql.com/doc/refman/8.0/en/what-is-mysql.html>.