

SpeechWorks

Speech Therapy Treatment Tool

Technical Documentation

INEW 2434 - Advanced Web Programming

Ilhem Berzou

Houston City College

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1. Introduction

1.1 Project Overview

SpeechWorks is a comprehensive web-based speech therapy treatment tool designed specifically for speech-language pathologists (SLPs). The application provides an integrated platform for managing clients, conducting therapy sessions, delivering interactive activities, and tracking progress over time.

The system addresses the need for a modern, technology-enhanced solution that can improve efficiency of therapy practices while maintaining detailed documentation capabilities.

1.2 Purpose and Scope

The primary purposes of SpeechWorks include:

- Client management with articulation, fluency, voice, and language profiles
- Treatment goal setting and tracking
- Session scheduling with SOAP notes documentation
- Interactive therapy activities with progress tracking
- Progress visualization with visual analytics
- Resource library for therapy materials

1.3 Technology Stack

SpeechWorks is built using the following technologies:

| Layer | Technology |
|----------------|--|
| Frontend | AngularJS 1.8.x, HTML5, CSS3, JavaScript |
| Backend | Python FastAPI with SQLAlchemy ORM |
| Database | MySQL 8.0 |
| Storage | AWS S3 for file uploads |
| Authentication | JWT (JSON Web Tokens) with bcrypt |

2. System Architecture

2.1 Multi-Tier Architecture

SpeechWorks follows a three-tier architecture pattern that separates concerns and enhances scalability:

Presentation Layer (Frontend)

The frontend consists of a single-page application (SPA) that runs in the user's browser. It handles user interface rendering, input validation, and client-side state management. It communicates with the backend exclusively through RESTful API calls.

Application Layer (Backend)

The backend is a Python FastAPI application that contains all business logic, authorization, data validation, and API endpoints. The `main.py` file initializes the FastAPI application, configures CORS middleware for cross-origin requests, and registers all routers on startup.

Data Layer (Database)

MySQL database stores all persistent data including user accounts, client records, sessions, progress data, and resource metadata. SQLAlchemy ORM provides database abstraction.

2.2 Backend Structure

The backend is organized into the following modules:

| Module | Purpose |
|----------------------------|--|
| <code>app/main.py</code> | Application entry point, CORS config |
| <code>app/routers/</code> | API route handlers (auth, clients, sessions, etc.) |
| <code>app/models/</code> | SQLAlchemy database models |
| <code>app/schemas/</code> | Pydantic validation schemas |
| <code>app/services/</code> | Business logic (auth_service, s3_service) |

2.3 Frontend Structure

The frontend follows AngularJS MVC pattern:

| File/Folder | Purpose |
|-------------------------|---|
| <code>index.html</code> | Main HTML template with all views |
| <code>js/app.js</code> | Angular module, services (ApiService, ToastService) |

| File/Folder | Purpose |
|--------------------|---|
| js/controllers/ | Controllers for each view (Dashboard, Clients, Sessions, Activities, Resources) |
| css/styles.css | Custom CSS with CSS variables, responsive design |

3. Database Design

3.1 Entity Relationship Diagram

The database follows a relational model with the following key relationships:

- **Users → Clients:** One-to-many (therapist has many clients)
- **Clients → Goals:** One-to-many (client has many treatment goals)
- **Clients → Sessions:** One-to-many (client has many therapy sessions)
- **Sessions → SessionActivities:** One-to-many (session has many assigned activities)
- **Clients → ProgressRecords:** One-to-many (client has many progress records)

3.2 Core Tables

Users Table

| Column | Type | Description |
|-----------------|-------------|-----------------------------|
| id | Integer PK | Auto-increment primary key |
| email | String(255) | Unique login email |
| hashed_password | String(255) | Bcrypt hashed password |
| full_name | String(255) | Therapist's full name |
| license_number | String(100) | Professional license number |

Clients Table

| Column | Type | Description |
|-----------------------|-------------|----------------------------|
| id | Integer PK | Auto-increment primary key |
| therapist_id | Integer FK | Reference to users table |
| first_name, last_name | String(100) | Client name |
| date_of_birth | Date | Client DOB |
| diagnosis | Text | Speech/language diagnosis |
| is_active | Boolean | Active/inactive status |

Sessions Table

| Column | Type | Description |
|------------------|------------|--|
| id | Integer PK | Auto-increment primary key |
| client_id | Integer FK | Reference to clients table |
| session_date | DateTime | Scheduled date/time |
| duration_minutes | Integer | Session length (15-90 min) |
| status | Enum | scheduled, in_progress, completed, cancelled |
| soap_* | Text | SOAP notes (subjective, objective, assessment, plan) |

4. API Documentation

4.1 Authentication Endpoints

| Method | Endpoint | Description |
|--------|--------------------|--------------------------------|
| POST | /api/auth/register | Create new therapist account |
| POST | /api/auth/login | Authenticate and get JWT token |
| GET | /api/auth/me | Get current user info |

4.2 Client Endpoints

| Method | Endpoint | Description |
|--------|-------------------|-------------------------------|
| GET | /api/clients | List all clients |
| POST | /api/clients | Create new client |
| GET | /api/clients/{id} | Get client details with goals |
| PUT | /api/clients/{id} | Update client information |

4.3 Session Endpoints

| Method | Endpoint | Description |
|--------|-------------------------------------|----------------------------|
| GET | /api/sessions | List sessions with filters |
| POST | /api/sessions | Create new session |
| PUT | /api/sessions/{id} | Update session/SOAP notes |
| GET | /api/sessions/{id}/activities | Get session activities |
| PUT | /api/sessions/{id}/activities/{aid} | Update activity record |

5. Frontend Application

5.1 Controllers Overview

MainController

Handles authentication state, navigation, and global functions. Manages login/logout, view switching, and toast notifications.

DashboardController

Displays summary statistics, today's sessions (sorted by proximity to current time), quick actions, and recent activity.

ClientsController

Manages client CRUD operations, treatment goals, progress history, and client detail views with tabs for info, goals, progress, and history.

SessionsController

Handles session scheduling, status management, SOAP notes, activity assignment, and navigation to activities. Includes time-based validation for status changes.

ActivitiesController

Manages interactive therapy activities, trial tracking, progress recording, and return navigation to sessions after completion.

ResourcesController

Handles resource library with file uploads to S3, categorization, and search functionality.

6. Session Activity Workflow

The session activity workflow allows therapists to seamlessly navigate between session management and therapy activities with automatic data synchronization.

6.1 Clickable Activities on Session Cards

Activity tags displayed on session cards are interactive based on session status:

- **In-Progress Sessions:** Activities are clickable if not yet completed (trials_attempted = 0)
- **Completed Activities:** Display green badge with checkmark and accuracy percentage (e.g., "✓ 85%")
- **Other Statuses:** Activities displayed as read-only tags with tooltip "Session must be In Progress to start"
- **Click Hint:** Shows "Click an activity to start" when incomplete activities exist

6.2 Activity Navigation Flow

When a user clicks an activity tag on an in-progress session:

1. System validates session is "in_progress" and activity not completed
2. Client is retrieved from session data
3. Pending activity data stored on `$rootScope.pendingActivity`
4. Navigation triggers to Activities tab
5. ActivitiesController detects pending activity and auto-starts session with preselected client

6.3 Return Navigation After Completion

After activity completion:

- Progress record created via POST `/api/progress`
- Session activity record updated with trials_attempted, trials_correct, and accuracy
- `$rootScope.returnToSessionId` set to trigger session reload
- Automatic navigation back to Sessions tab
- Session card updates to show completed activity with accuracy badge

7. Session Status Management

7.1 Status Values

| Status | Description |
|-------------|--|
| scheduled | Session is scheduled for future date/time |
| in_progress | Session is currently active, activities can be started |
| completed | Session finished, all activities completed |
| cancelled | Session was cancelled (displayed grayed out) |

7.2 Time-Based Status Validation

Manual status change to "in_progress" is validated against session time window:

- **Session Window:** session_date to (session_date + duration_minutes)
- **Validation:** Current time must be within session window
- **Error:** "Cannot start session - session time (HH:MM) does not match current time"

7.3 Auto-Complete Sessions

Sessions automatically complete when all assigned activities are done:

- **Trigger:** Immediately after session activities load (checkSessionAutoComplete function)
- **Condition:** All assigned activities have trials_attempted > 0
- **Result:** Status updated to "completed" with toast notification

7.4 Timezone Handling

Session dates use convertLocalDateTimeToISO() function which creates ISO strings with timezone offset instead of UTC conversion, ensuring times display correctly in user's local timezone.

8. UI Components

8.1 Session Card Actions

Each session card displays action buttons with labels (hidden on mobile < 768px):

| Button | Label | Function |
|---------------|--------------------|--------------------------|
| Notes Button | Notes & Activities | Opens SOAP notes modal |
| Edit Button | Edit Session | Opens session edit modal |
| Delete Button | Cancel | Cancels session |

8.2 Cancelled Session Styling

| Location | Styling |
|----------------------------|--|
| Sessions Tab Cards | 60% opacity, gray background, gray left border |
| Dashboard Today's Sessions | 50% opacity, gray background, gray text |

8.3 Activity Completion Badge

Completed activities display with visual indicators:

- **Background:** Green (#D1FAE5) with green border
- **Badge:** Dark green background with "✓ XX%" showing accuracy
- **Interaction:** Not clickable, cursor default

9. AWS Cloud Integration

9.1 AWS Services Used

| Service | Purpose |
|------------|--|
| Amazon RDS | MySQL database hosting (db.t3.micro) |
| Amazon S3 | File storage for therapy resources and uploads |
| Amazon EC2 | Backend API hosting (optional) |

9.2 S3 Configuration

The S3 service (`s3_service.py`) handles:

- Presigned URL generation for secure uploads
- File categorization by resource type
- Unique filename generation to prevent conflicts

9.3 Estimated Costs

| Service | Monthly Cost |
|-------------------|---------------------------------|
| RDS (db.t3.micro) | \$15-25 (free tier eligible) |
| S3 Storage | \$1-5 (depends on usage) |
| EC2 (if used) | \$0 (750 hours/month free tier) |

10. Deployment Guide

10.1 Backend Deployment

1. Clone repository and navigate to backend directory
2. Create virtual environment: `python -m venv venv`
3. Install dependencies: `pip install -r requirements.txt`
4. Configure `.env` file with database and S3 credentials
5. Run migrations to create database tables
6. Start server: `uvicorn app.main:app --host 0.0.0.0 --port 8000`

10.2 Frontend Deployment

1. Update `API_BASE_URL` in `js/app.js` to production backend URL
2. Deploy static files to web server (Nginx, Netlify, etc.)
3. Configure CORS on backend to allow frontend domain

10.3 Environment Variables

| Variable | Description |
|------------------------------------|----------------------------|
| <code>DATABASE_URL</code> | MySQL connection string |
| <code>SECRET_KEY</code> | JWT signing secret |
| <code>AWS_ACCESS_KEY_ID</code> | AWS credentials for S3 |
| <code>AWS_SECRET_ACCESS_KEY</code> | AWS credentials for S3 |
| <code>S3_BUCKET_NAME</code> | S3 bucket for file uploads |

11. User Guide

11.1 Getting Started

1. Register a new account with your email and professional license number
2. Log in to access the dashboard
3. Add your first client with their information and diagnosis
4. Create treatment goals for the client
5. Schedule therapy sessions

11.2 Conducting Sessions

1. Navigate to Sessions tab
2. Change session status to "In Progress" when ready to start
3. Click on activity tags to start interactive therapy activities
4. Record correct/incorrect responses during activities
5. Session auto-completes when all activities are finished
6. Complete SOAP notes documentation

11.3 Tracking Progress

- View client progress in the Clients tab under Progress section
- Check activity history showing accuracy trends over time
- Update goal status as client progresses (In Progress, Mastered, etc.)

12. Implementation Plan

12.1 Development Timeline

| Phase | Tasks |
|-----------|---|
| Week 1-2 | Project setup, database design, authentication system |
| Week 3-4 | Client management, goal tracking, session scheduling |
| Week 5-6 | Interactive activities, progress tracking, SOAP notes |
| Week 7-8 | Session-activity workflow, UI refinements, testing |
| Week 9-10 | AWS integration, deployment, documentation |

12.2 Future Enhancements

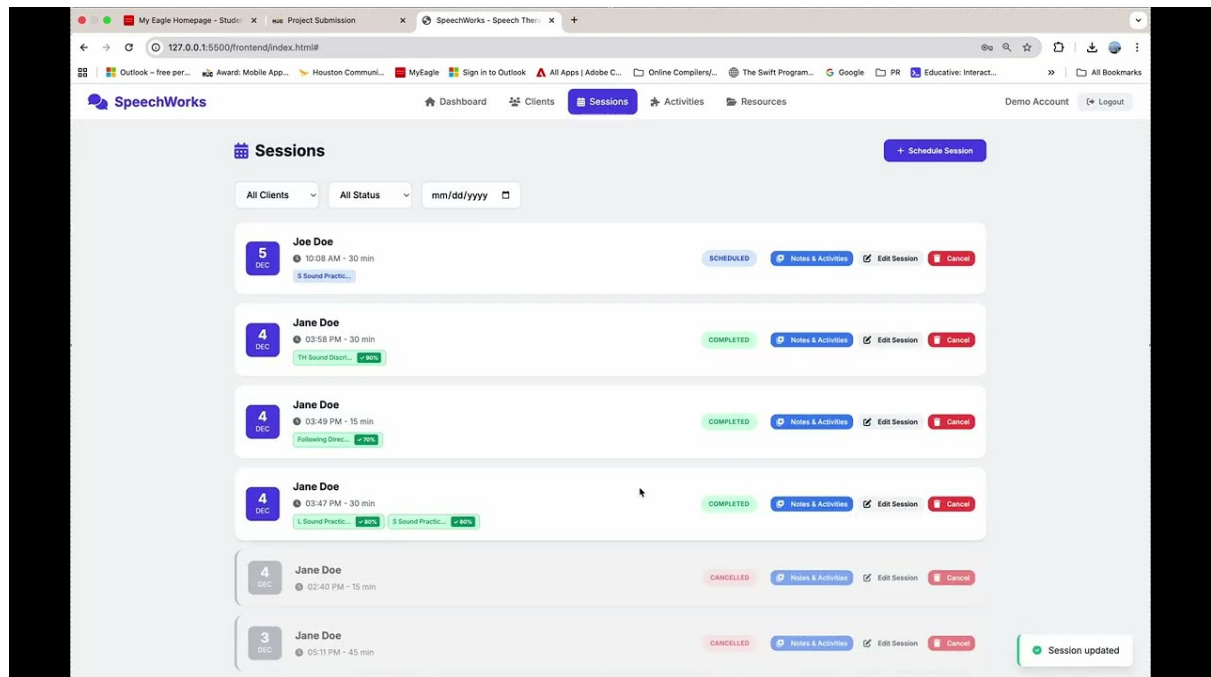
- Mobile-responsive native app version
- Video recording integration for session documentation
- Advanced analytics and reporting dashboards
- Multi-therapist practice management
- Parent/guardian portal for home practice
- Insurance billing integration

Conclusion

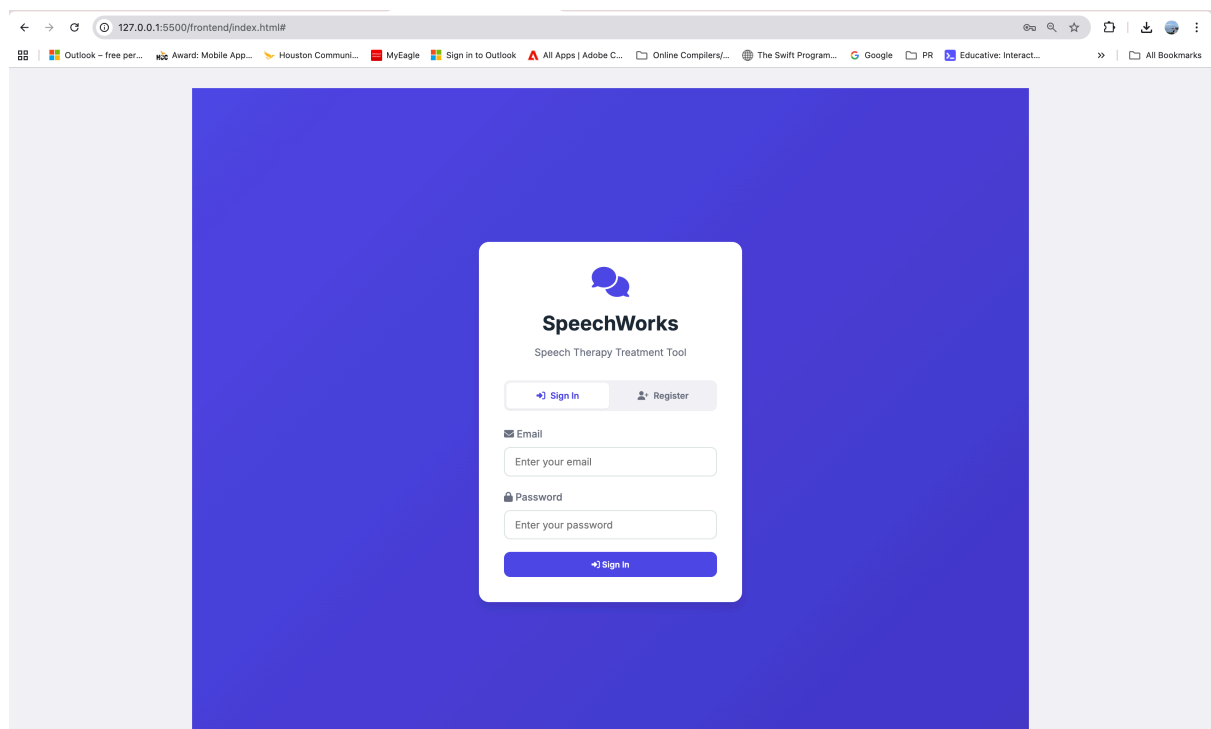
SpeechWorks provides a comprehensive solution for speech-language pathologists to manage their practice efficiently. The application combines client management, session scheduling, interactive therapy activities, and progress tracking in a single integrated platform. The session-activity workflow enables seamless navigation between scheduling and therapy delivery, while automatic status management reduces administrative burden.

Built with modern web technologies (AngularJS frontend, Python FastAPI backend, MySQL database), the application is designed for scalability and maintainability. AWS cloud integration provides reliable hosting and file storage capabilities.

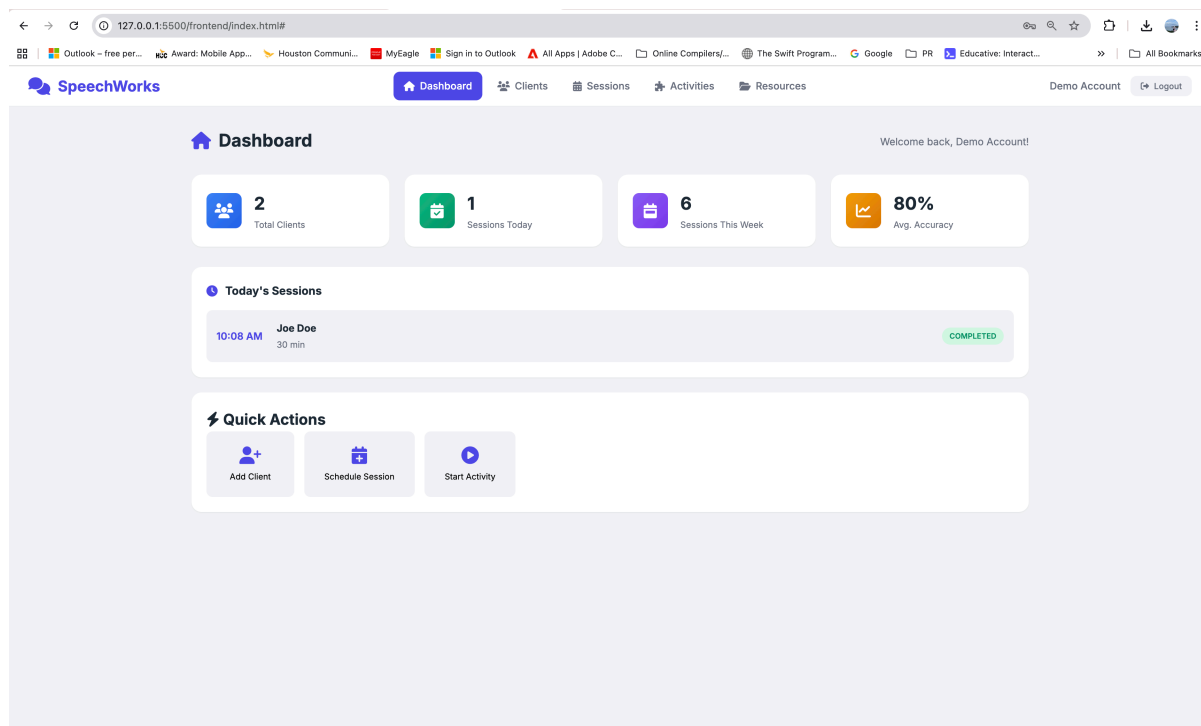
13. Video Demonstrating SpeechWorks App Working



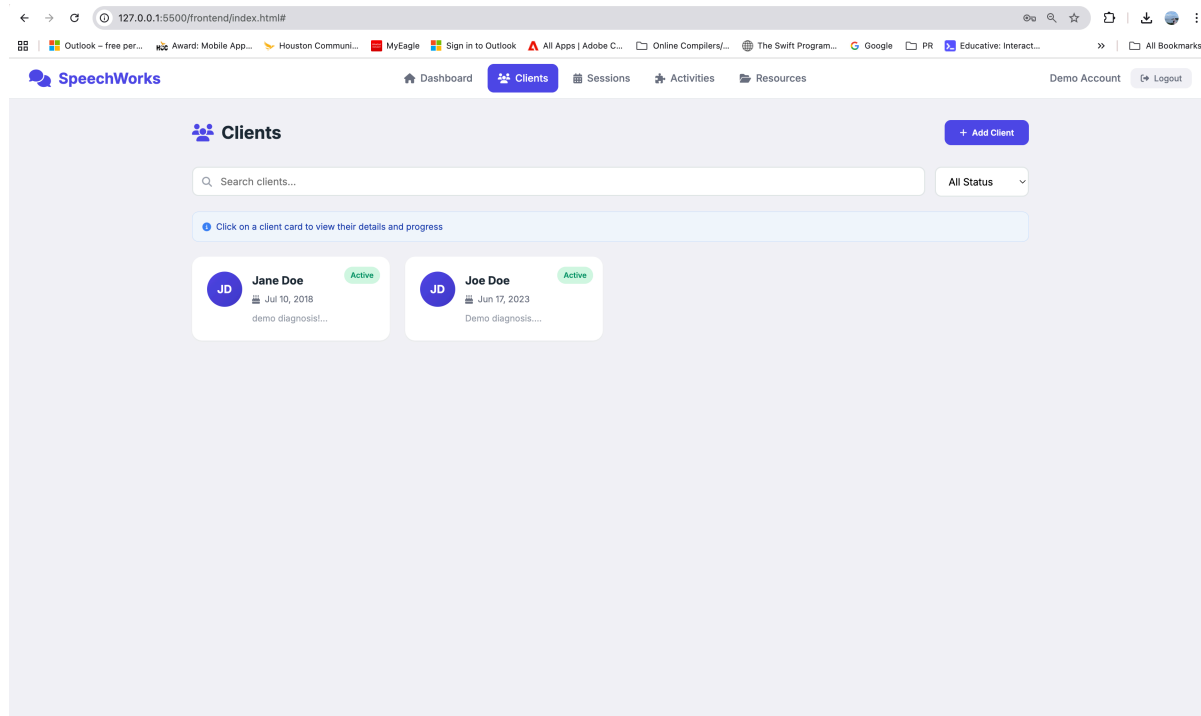
14. Screenshots of SpeechWorks App



SpeechWorks Sign in/Registration page



Landing Page After Login is Dashboard Tab



Clients Tab

The screenshot shows a 'Clients' management interface. At the top, there's a search bar labeled 'Search clients...' and a status filter set to 'All Status'. Below this, a list of clients is visible, including 'Jane Doe' and 'Joe Doe', both marked as 'Active'. A modal window titled 'Jane Doe' is open, displaying personal information. The modal has tabs for 'Info', 'Goals', and 'Progress'. The 'Info' tab is active, showing fields for Date of Birth (Jul 10, 2018), Diagnosis (demo diagnosis!), Guardian (Dorothy Doe), and Contact (2222222223 | dorothy@example.com). There is also a 'Notes' section with the text 'Demo!!!'. At the bottom of the modal are 'Edit' and 'Delete' buttons.

| Jane Doe | |
|---------------|----------------------------------|
| Date of Birth | Diagnosis |
| Jul 10, 2018 | demo diagnosis! |
| Guardian | Contact |
| Dorothy Doe | 2222222223 dorothy@example.com |
| Notes | |
| Demo!!! | |

Client Card - Personal Info

The screenshot shows the 'Edit Client' form. It contains fields for First Name (Jane), Last Name (Doe), Date of Birth (mm/dd/yyyy), Status (Active), Diagnosis (demo diagnosis!), Guardian Name (Dorothy Doe), Contact Phone (2222222223), Contact Email (dorothy@example.com), and Notes (Demo!!!). At the bottom, there are buttons for 'Cancel', '+ Add Goal', and 'Update'.

| Edit Client | |
|---------------------|---------------|
| First Name * | Last Name * |
| Jane | Doe |
| Date of Birth | Status |
| mm/dd/yyyy | Active |
| Diagnosis | |
| demo diagnosis! | |
| Guardian Name | Contact Phone |
| Dorothy Doe | 2222222223 |
| Contact Email | |
| dorothy@example.com | |
| Notes | |
| Demo!!! | |

Edit Client Form

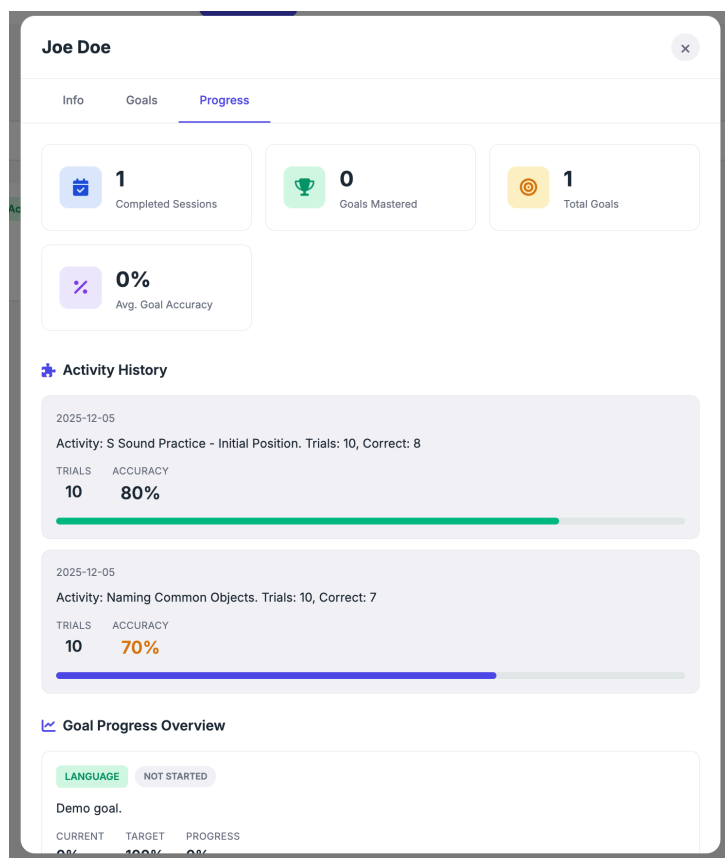
The screenshot shows a client profile for Jane Doe. The 'Goals' tab is active, displaying a goal for '/r/ sounds'. The goal is categorized as 'ARTICULATION' and is marked as 'MASTERED'. A progress bar shows the current accuracy at 80% and the target at 80%. There is an '+ Add Goal' button and edit/delete icons for the goal.

Client's Goals Tab

The 'Edit Goal' form contains the following fields and options:

- Category:** Articulation
- Goal Description *:** /r/ sounds
- Target Accuracy (%):** 80
- Current Accuracy (%):** 80
- Target Date:** mm/dd/yyyy
- Auto-set to target accuracy:** ☒
- Goal Status Dropdown:**
 - Not Started
 - In Progress
 - ✓ Mastered
 - Discontinued
- Buttons:** Cancel, Update Goal

Edit Goal Form



Client's Progress Tab

Add New Client

First Name * Last Name *

Date of Birth * Status

mm/dd/yyyy

Active

Diagnosis

Speech/language diagnosis...

Guardian Name Contact Phone

Parent/Guardian name Phone number

Contact Email

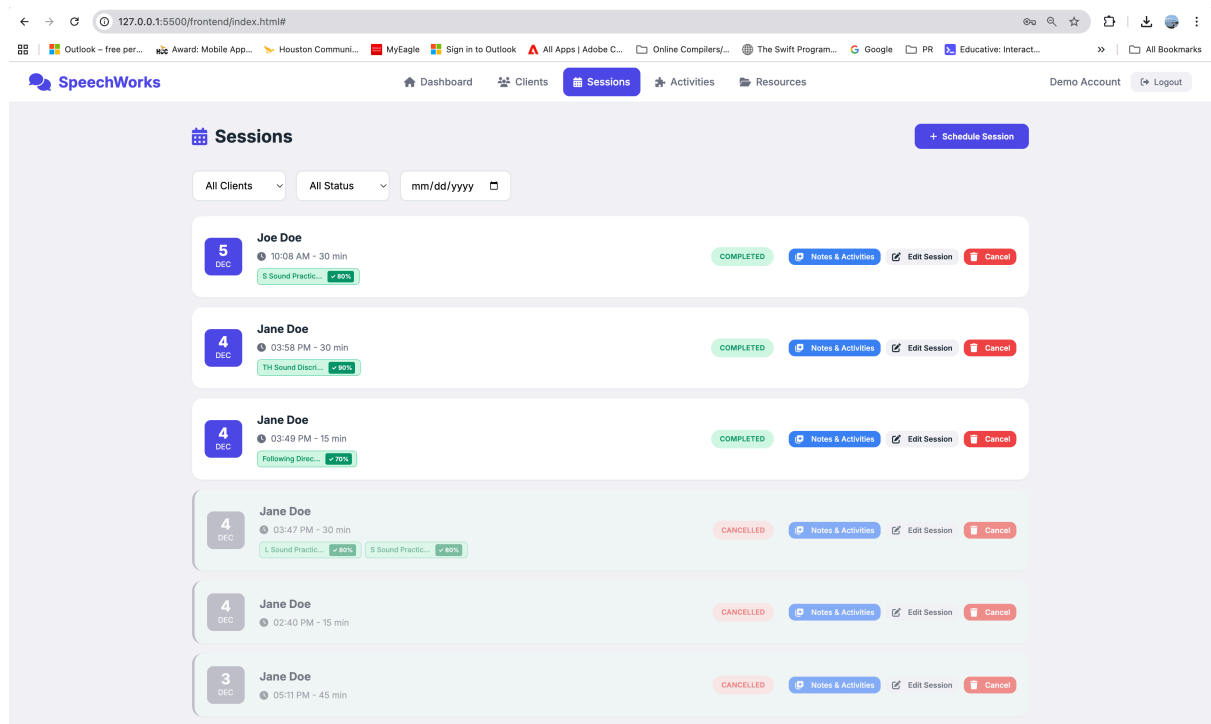
Email address

Notes

Additional notes...

Cancel Save

Add Client Form



Sessions Tab

The 'Edit Session' form is a modal window with a close button (X) in the top right. It contains the following fields:

- Client ***: A dropdown menu with 'Joe Doe' selected.
- Date & Time ***: A text input field showing 'mm/dd/yyyy, --:-- --' with a calendar icon.
- Duration (minutes)**: A dropdown menu with '30 min' selected.
- Status**: A dropdown menu with 'Completed' selected.

At the bottom of the form are two buttons: 'Cancel' and 'Update'.

Edit Session Form

Session: Joe Doe

Dec 5, 2025, 10:08 AM

30 min

COMPLETED

SOAP Notes (Subjective, Objective, Assessment, Plan)

S - Subjective

Client's report of symptoms, feelings, concerns, and goals for this session

demo

O - Objective

Measurable observations, test results, and accuracy data from this session

demo

A - Assessment

Clinical interpretation and progress toward treatment goals

demo

Session Notes Form

127.0.0.1:5500/frontend/index.html#

SpeechWorks

Dashboard

Clients

Sessions

Activities

Resources

Demo Account

Logout

Therapy Activities

All

Articulation

Language

Fluency

Voice

Phonology

S Sound Practice - Initial Position

Practice producing the /s/ sound at the beginning of words. Focus on correct tongue placement and al...

★★★★★

s

R Sound Practice - Vocalic R

Target vocalic R sounds including -AR, -ER, -IR, -OR, -UR patterns...

★★★★★

r

L Sound Practice - All Positions

Comprehensive /l/ sound practice in initial, medial, and final positions...

★★★★★

l

TH Sound Discrimination

Practice voiced and voiceless TH sounds with minimal pairs...

★★★★★

th

Naming Common Objects

Expressive naming activity using everyday objects for word retrieval...

★★★★★

Following Directions

Receptive language activity with 1-step to 3-step directions...

★★★★★

Sentence Building

Create grammatically correct sentences using word cards...

★★★★★

Easy Onset & Slow Speech

Fluency shaping with easy voice onset and reduced speech rate...

★★★★★

Voice Projection Exercises

Practice producing voice at appropriate loudness levels...

★★★★★

Minimal Pairs - Final Consonants

Phonological awareness targeting final consonant contrasts...

★★★★★

Conversation Skills

Practice initiating and maintaining conversations...

★★★★★

Activities Tab

Resources Tab

Upload Resource

Title *

Resource title

Description

Describe this resource...

Resource Type *

Worksheet

Category

Select category

File (Optional)

Choose File

No file chosen

Supported formats: PDF, DOC, MP3, PNG, JPG

☒ Make this resource public (visible to all therapists)

Cancel

Upload Resource

Upload Resource Form