

# CollabTrack

## Version-Controlled File Management for Musicians

A secure platform that brings professional version control to music collaboration

By Damien Ha



# The Problem: File Chaos in Music Collaboration

Musicians face mounting challenges when collaborating remotely:

- Ad-hoc file sharing via email and cloud drives
- Lost versions and ambiguity ("Is this the latest mix?")
- No audit trail or change history
- Incompatible DAW files across platforms



❏ **Real musician feedback:** *"Give me a version control software that works for musical collaboration. It has to be simple for musicians to use... Remote collaboration is a huge hurdle for most bands to overcome."*



# The Solution: Secure Data Lifecycle

## Single Source of Truth

Centralized platform for all project files with complete version history and traceability

## Professional Version Control

Track every change, revert when needed, and maintain clear project evolution

## Future: Human Verification

Planned badges to authenticate human-created work in the age of AI

# User Journey



## Register & Login

Secure authentication with encrypted credentials



## Create Project

Establish new collaboration workspace



## Upload Version

Add files with automatic versioning



## View History

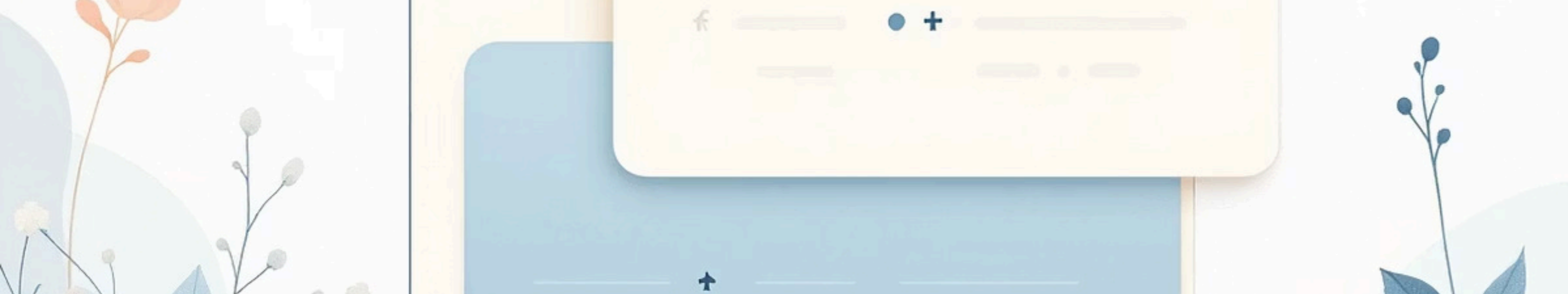
Track all changes and contributors



## Download

Secure access to any version

The platform provides an intuitive workflow that replaces chaotic file sharing with systematic tracking, ensuring collaborators always work with the right version.



# Three-Tier Architecture

## Flask Backend

Python-based application core handling routing, business logic, and user authentication

## PostgreSQL Database

Relational storage for user accounts, project metadata, and complete version history

## AWS S3 Cloud Storage

Scalable object storage for audio files with secure access control

# Database Design & Metadata Strategy

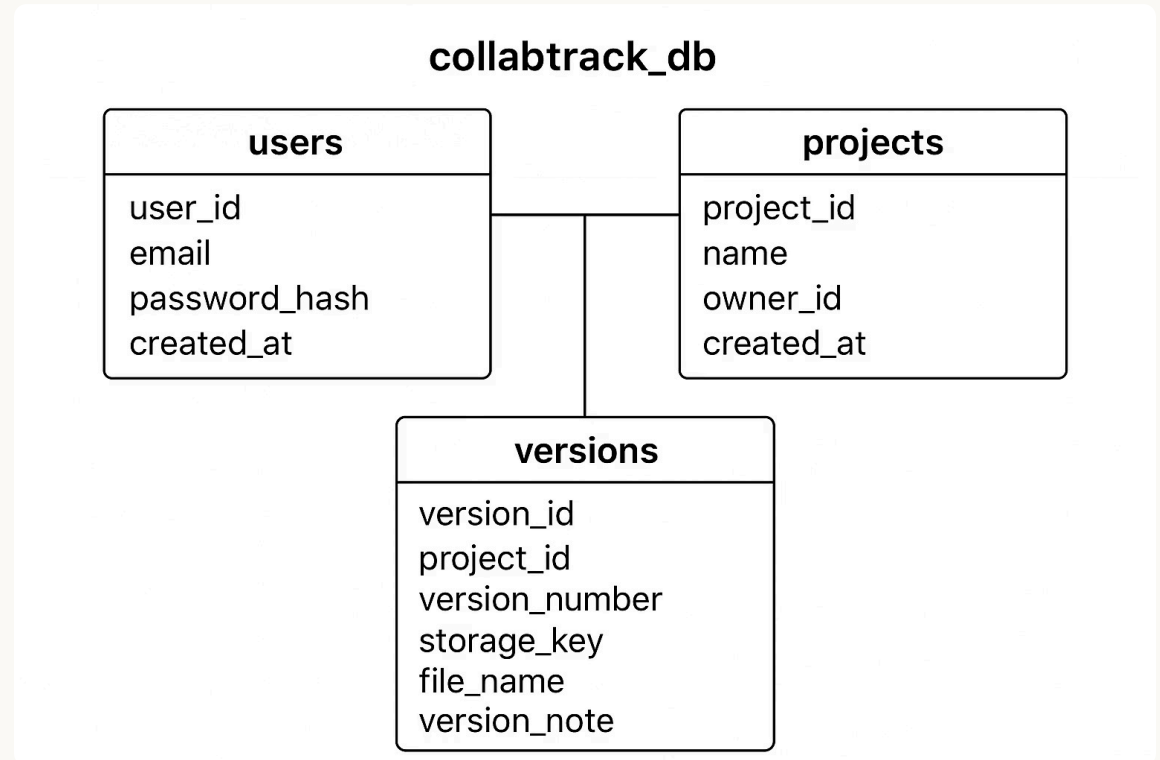
## Relational Schema

**Users Table:** Authentication and profile data

**Projects Table:** Collaboration workspaces with ownership tracking


**Versions Table:** The heart of the system

- Sequential version numbering
- S3 storage keys for file retrieval
- Upload timestamps for audit trails
- File metadata (name, size, format)



This structured approach enables comprehensive version tracking while maintaining data integrity and supporting future features like human verification badges.





# Cloud Integration: Secure File Management

01

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## File Upload

User uploads audio file through Flask application interface

02

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## Metadata Storage

PostgreSQL records version details, timestamps, and S3 storage key

03

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## S3 Upload

Boto3 SDK securely transfers file to AWS S3 bucket

04

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## Secure Download

Pre-signed URLs provide time-limited, authenticated access to files

The pre-signed URL approach ensures files never pass through the application server during download, optimizing performance while maintaining security.

# Security Architecture



## Password Protection

Bcrypt hashing ensures passwords are never stored in plain text, protecting user accounts even in breach scenarios



## Session Management

Flask sessions with secure cookies maintain authenticated user state across requests



## Route Protection

Custom `@login_required` decorator enforces authentication on every sensitive endpoint



## Credential Management

DOTENV keeps AWS keys, database passwords, and secret keys out of version control



# MVP Achievement: Full CRUD Lifecycle



## Create

Users create projects and upload files with automatic metadata capture and S3 storage



## Read

Dashboard displays user projects and detailed version history for each collaboration



## Update

Sequential versioning system tracks file evolution with complete audit trails



## Download

Secure pre-signed URLs enable authorized access to any version without compromising security

The complete data lifecycle demonstrates proficiency in database design, cloud architecture, and secure application development—core competencies for modern data engineering.

# From Personal Passion to Technical Solution



As a Statistics and Data Science major who played clarinet in UCLA's ensembles, I witnessed firsthand the collision of music and technology challenges.

**The Vision:** CollabTrack addresses immediate collaboration pain points while preparing for tomorrow's AI challenges through planned human verification features.

**Next Steps:** Professional Jinja templating, custom error handling, and ultimately—the human verification badge system that will help musicians prove authenticity in an AI-saturated landscape.

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GitHub Repository: [collabtrack](#)

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