**Lessons Learned and Future Work**

**Property Rental System Project**

**Lessons Learned**

**Technical Expertise Gained**

Through the development of this property rental system, I've gained significant technical expertise in several areas:

1. **Database Management with MySQL**: Implemented a relational database design with interconnected tables (properties, users, landlords, neighborhoods) that efficiently manage property listings and user data.
2. **Python Development**: Developed intermediate to advanced Python programming skills, including:
   * Structured programming with modular function design
   * Database connectivity using PyMySQL
   * Data validation and error handling
   * User authentication with secure password hashing
3. **Security Implementation**: Learned best practices in implementing security features:
   * Password security using SHA-256 hashing with unique salts
   * Input validation to prevent SQL injection
   * Data integrity checks to maintain database consistency
4. **Command-line Interface Design**: Created an intuitive menu-driven interface using the tabulate library to display data in formatted tables, improving readability and user experience.

**Insights Gained**

1. **Data Domain Insights**:
   * Understood the complexity of property management systems and the various data points necessary to effectively catalog rental properties
   * Recognized the importance of flexibility in property attributes (for rent/sale, price ranges, neighborhood associations)
   * Identified key search and filter requirements for users looking for housing
2. **Time Management Insights**:
   * Breaking down the project into modular components (user authentication, property management, listing display) allowed for incremental development and testing
   * Implementing core functionality first before adding advanced features helped ensure a working baseline system
   * Documentation during development saved time when connecting modules together
3. **User Experience Insights**:
   * Simple validation with clear error messages greatly improves user experience
   * Providing confirmation before destructive actions (like deleting listings) is essential
   * Displaying updated information after changes helps users verify their actions were successful

**Alternative Design Approaches**

1. **Web Interface vs. Command Line**:
   * The current system uses a command-line interface, but a web-based interface would provide better accessibility and visual presentation
   * A potential redesign could maintain the back-end Python logic while creating a Flask or Django web interface
2. **Data Structure Alternatives**:
   * The current neighborhood relationship could be expanded to include more geographic hierarchies (campus proximity, public transportation access)
   * Property images and documents could be added with blob storage or file system references
3. **Authentication System**:
   * The current custom authentication system works well, but integrating with OAuth providers (Google, Microsoft) would allow for easier sign-in options for students
   * Role-based permissions could be more granularly defined beyond the current landlord/user distinction
4. **Search Functionality**:
   * The current filter system could be enhanced with more robust search capabilities
   * Full-text search across multiple fields could improve property discovery

**Code Challenges**

1. **SQL Query String Formatting**:
   * The current approach to building SQL queries in the filter.py file uses string formatting, which could potentially lead to SQL injection risks
   * A better approach would be to consistently use parameterized queries throughout
2. **Error Handling Consistency**:
   * Error handling varies across modules; a more consistent approach would improve maintainability
   * Some functions return None on error while others print messages but don't return status indicators
3. **Input Validation**:
   * The range filtering in filter.py has validation issues when converting string inputs to integers
   * A more robust validation system with type checking would prevent potential crashes

**Future Work**

**Planned Uses of the Database**

1. **Northeastern Student Housing Platform**:
   * Transform the system into a dedicated platform for Northeastern University students to find and list housing
   * Create student-specific profiles with verification of university affiliation
   * Implement proximity search relative to campus buildings and facilities
2. **Summer Subletting Marketplace**:
   * Develop specialized functionality for summer sublets when many students leave campus
   * Add temporal availability tracking for properties and rooms
   * Implement a scheduling system for property viewings coordinated with student schedules
3. **Community Trust Network**:
   * Build a verification system that leverages the existing university community trust
   * Implement student reviews and ratings for properties and landlords
   * Create landlord verification for students and alumni offering housing

**Potential Areas for Added Functionality**

1. **Enhanced User Experience**:
   * Develop a mobile-responsive web interface using Flask or Django
   * Add image upload and gallery viewing for property listings
   * Implement in-app messaging between potential tenants and landlords
2. **Advanced Search and Filters**:
   * Geolocation-based search with map visualization
   * Public transportation proximity filters
   * Campus walking time calculations
   * Roommate matching based on preferences and living habits
3. **Payment and Agreement System**:
   * Secure deposit payment processing
   * Electronic lease signing
   * Rent reminder and payment tracking
   * Maintenance request submission and tracking
4. **Administrative Features**:
   * Analytics dashboard for housing trends and availability
   * Verification system for landlords and properties
   * Moderation tools to ensure listing quality and accuracy
   * Integration with university housing resources and information
5. **Social Features**:
   * Roommate finding functionality
   * Group housing search for friends wanting to live together
   * Discussion forums for different neighborhoods and housing types
   * Housing fair event organization and scheduling

By transforming this project into a Northeastern-specific housing platform, it will create a valuable resource that addresses the unique needs of university students while leveraging the existing community trust. The focus on summer subletting particularly addresses a common challenge for students with 12-month leases who leave during summer breaks, creating a win-win marketplace within the university ecosystem.