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Injury Forecasting Application Implementation to Maximize Workers' Safety

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Nathan Nayda
Yoshinori Ushiyama
Spencer Huang
Qingyang Shen
Xinye Li
(Advisor: Brian J Kolowitz)

pennsylvania
DEPARTMENT OF LABOR & INDUSTRY

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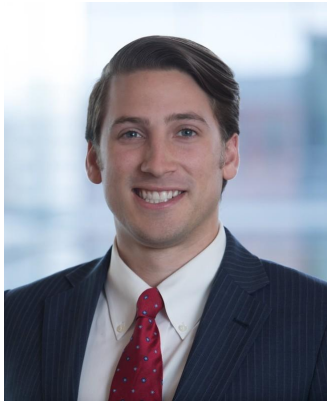
Project Member

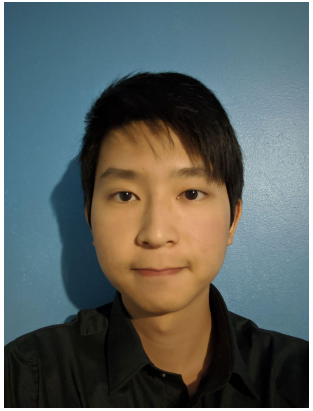


Nathan Nayda

Project Manager

Yoshinori Ushiyama

Process Organizer



Spencer Huang

Chief System Administrator

Qingyang Shen

Financial Manager

Xinye Li

Chief Engineer

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Agenda

- Client/Purpose/Background
- Business Impact
- Methodology & Approach
- Project Breakdown
- Demo
- Final Deliverables & Next Steps

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Client/Purpose

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Client: "PA Dept of Labor & Industry - Bureau of Workers' Compensation"

- Established to reduce injuries and provide lost wages and medical benefits to Pennsylvania employees who become ill or injured on the job

Purpose:

- Identify areas and occupations with high risks of workplace injury
- Conduct proactive training and outreach to prevent these incidents

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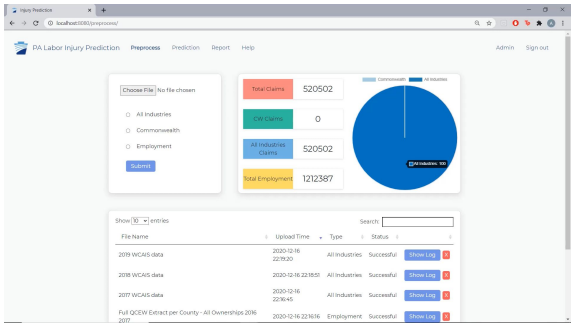
Background

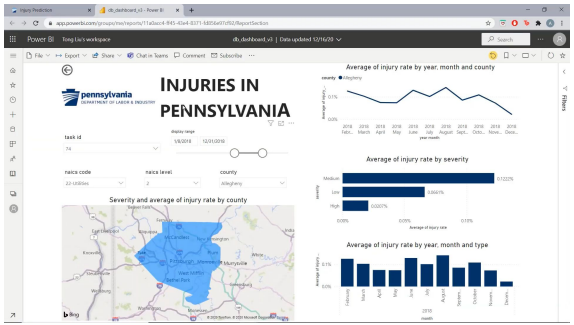
pennsylvania
DEPARTMENT OF LABOR & INDUSTRY

Background:

- Eighth phase of an ongoing initiative between the Pennsylvania Department of Labor & Industry and CMU

(Achievement up to the 7th phase: The PoC result of the prediction tool & Power BI dashboard)





- However, the tool has not been used in the real business place.

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Business Impact

- Give the PA Department of Labor & Industry more quantitative data to draw from for making decisions and to allocate resources more effectively.
  - Training
  - Injury prevention protocols
- **Goal:** Decrease Workers Compensation Paid due to work related injuries by 1% per year

If the tool reduces 1%,

Reduce injuries and illness by 1,700 case/year

Economic Effect $28 million/year

	2019
Work Injuries and Illness in PA	172,756 cases
Workers Compensation Paid	$2.8 billion

(source: 2020 Pennsylvania WC Annual Report)

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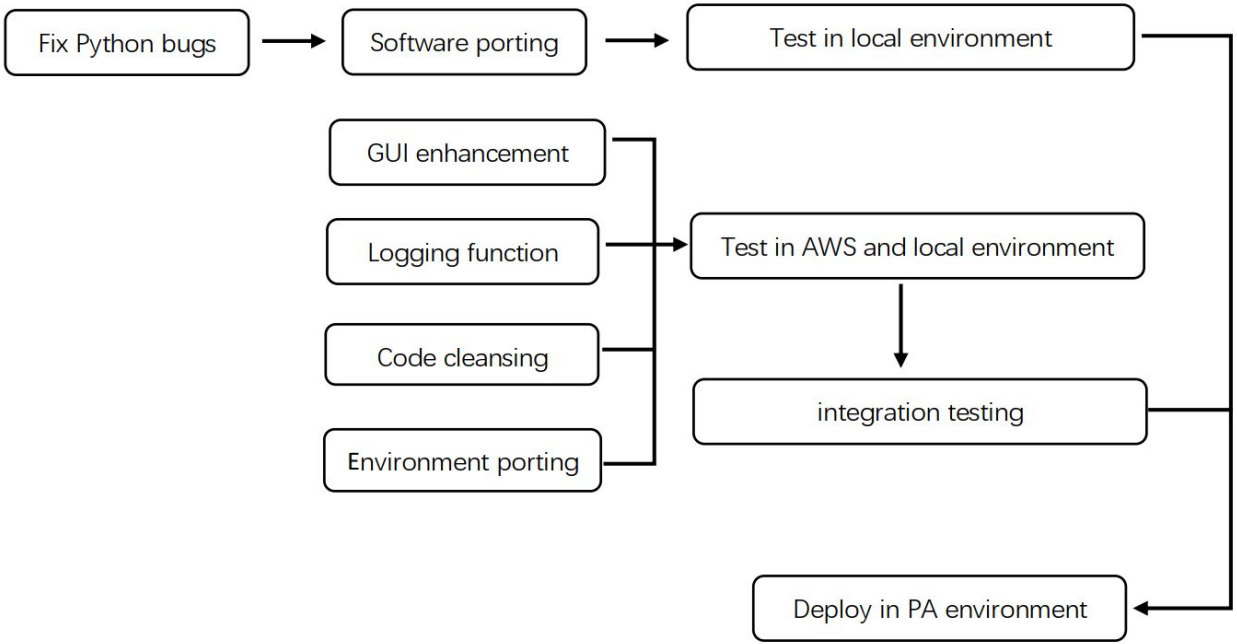
Methodology & Approach



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Methodology & Approach

Scope Area	Proposed Action Item	Priority
Fix Python bugs	Fix identified issue	1
Port software from "Linux" to "Windows"-based version	Replace Docker with another solution	2
	Move flask functionality to Django	
	Improve build process (MS SQL/ MS IIS implement)	
Enhance GUI	- Add functionality to select different prediction models - Add ability to select subsets of counties and codes	3
	- Progress bar for prediction process	
Security and Code Quality Control	Logging and code cleansing (for future development)	4

Project Break down

- Software Porting
- Compliant to the Production Environment

GUI Enhancement

- Codebase Cleanup
- Workflow improvement

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Project Break down

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Software Porting
Compliant to the Production Environment

Problems:

- Non-compliant software
- Production environment compatibility
- Complex usage of Framework

Solution:

- Software porting
- Simplification of framework usage to fit production environment

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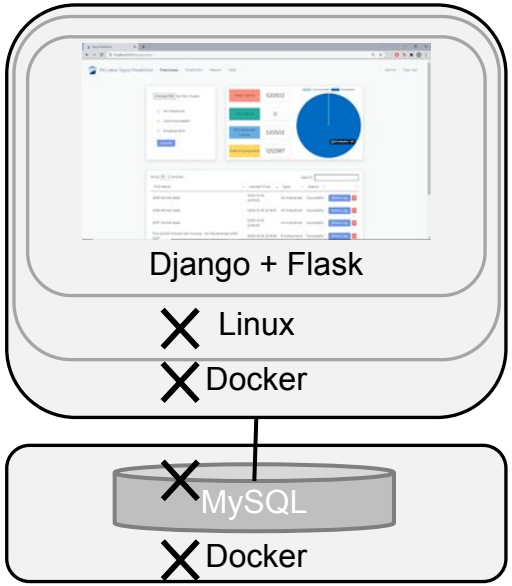
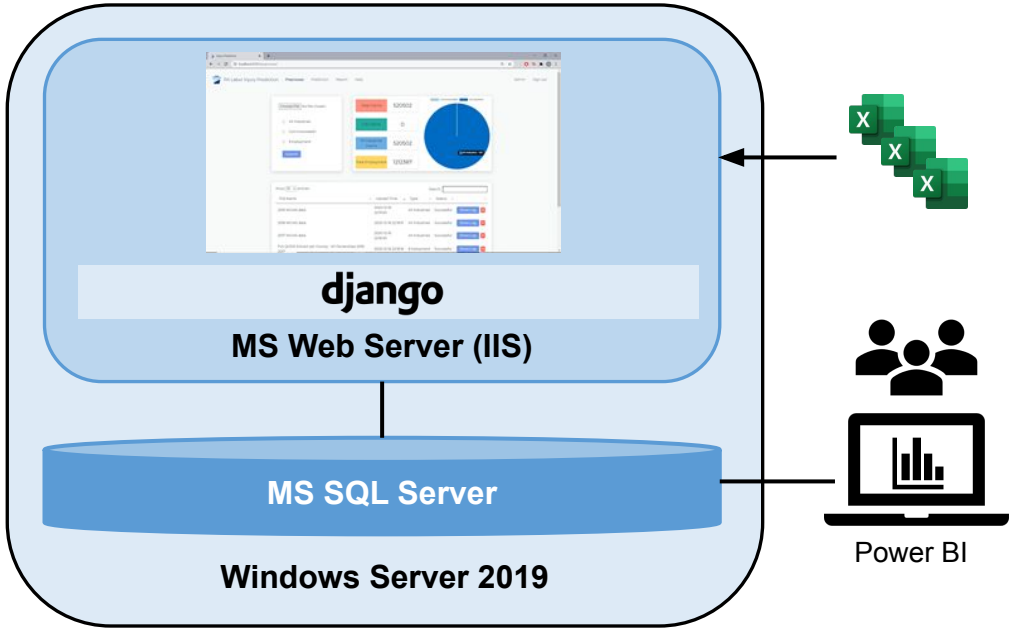
New Architecture

Old Version



PA Environment Compliant Version



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GUI Enhancement

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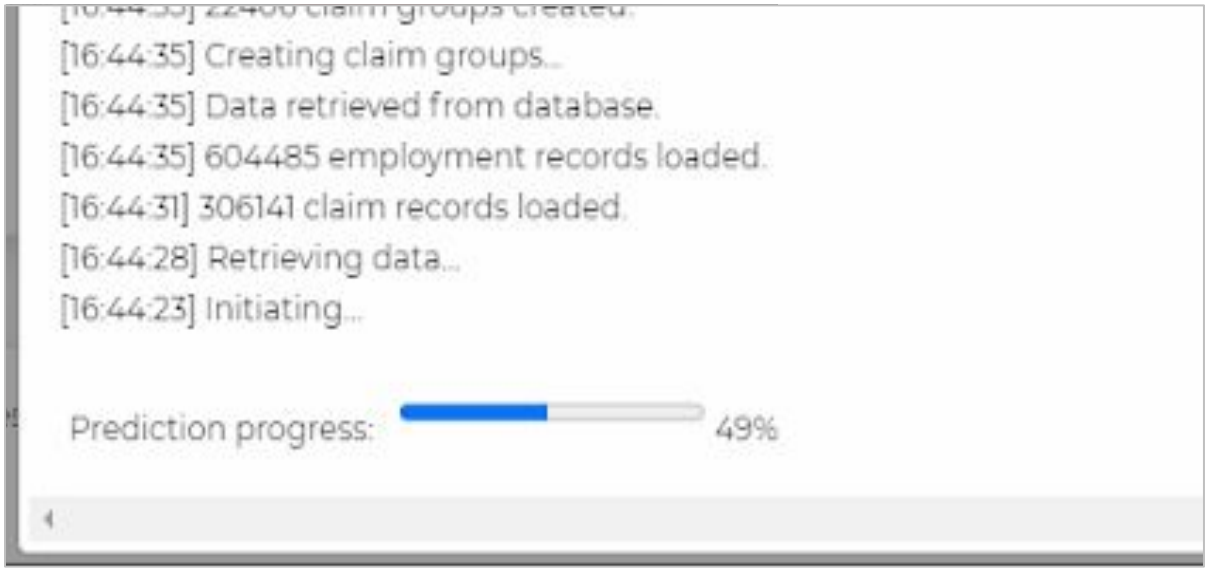
GUI Enhancement



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Security fixes and refactoring

- Security fixes
  - Added a SAST analyzer to detect security vulnerabilities
- Refactored existing codebase
  - Added a local logging feature
  - Aggregate globally defined settings to a settings.py

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Workflow Improvement

- Improved development workflow
  - Established a best practice guideline for development
  - Add build tools and linters to detect syntax and format issues in each code push
- Updated deployment user manual and the help page

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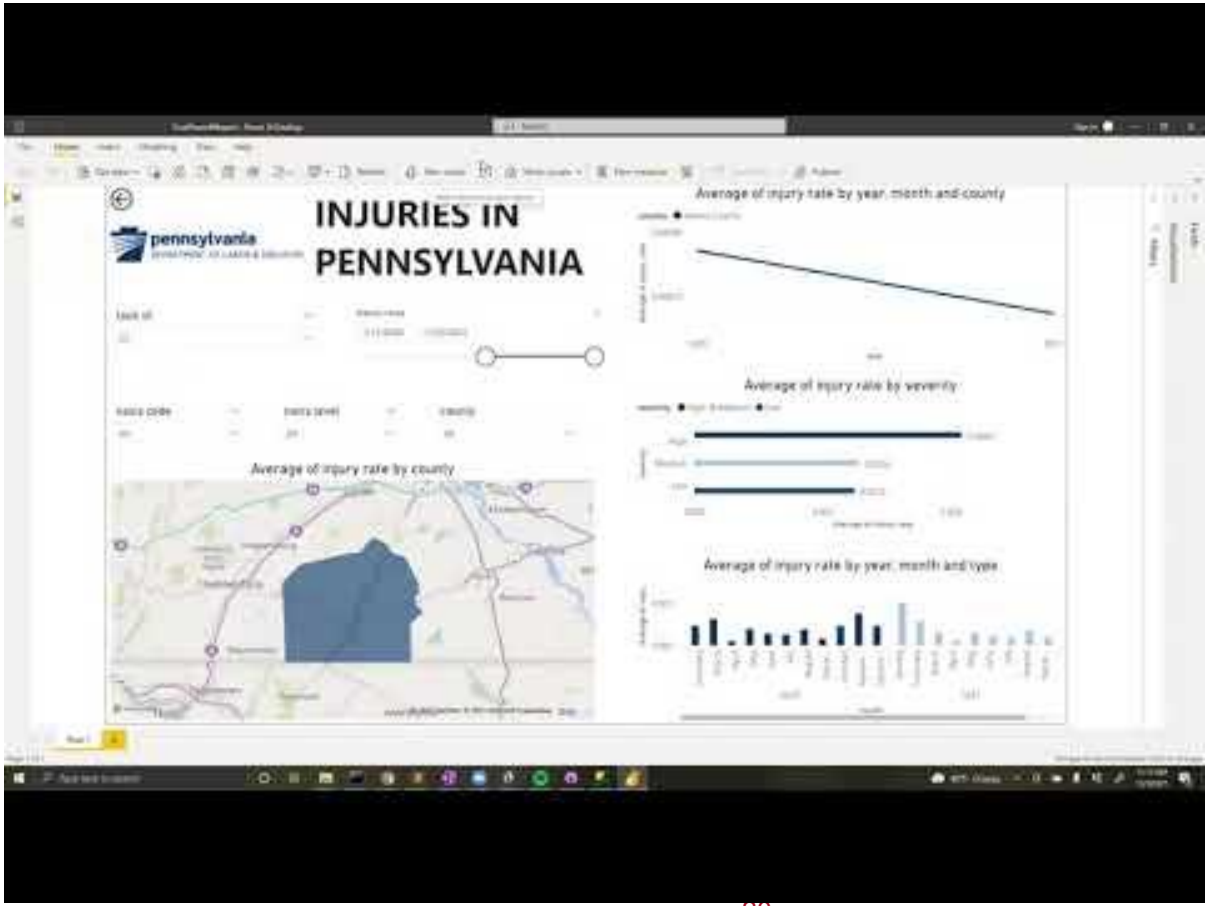
DEMO



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Final Deliverables & Next Steps

- Resource and Final Deliverables
  - GitHub Repository
    - Entire codebase
    - ReadMe with deployment instructions
  - Final Report
    - Includes links to tutorial videos

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Final Deliverables & Next Steps

- Future Improvements
  - Implement Power BI report functionality inside the app
  - Enhance reporting to better assess predictions across different models
  - Assess more sophisticated models:
    - including measures of injury severity
    - taking into account forecasted employment numbers

Final Deliverables & Next Steps

- Lesson Learned
  - Deploying applications to a production environment
  - Conducting testing without access to client environment
  - Managing code quality and security
  - Software development project management and teamwork

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THANK YOU

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