Mathematics Clinic

Final Report for
PilotCity

Automating an Engine to Extract Educational Priorities for Workforce City Innovation

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Team Members

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0.1 Background

PilotCity is a startup that was created to help transform small to medium sized cities into innovation engines by converting local high school classrooms into workforce incubators. The motivation behind PilotCity is to generate talent within a city, rather than attract it from the outside. They are accomplishing this by connecting local schools and employers, and promoting the idea of project based learning. Their goal is to start empowering students from an early age, as the first step to building an innovation ecosystem from scratch.

0.2 Goal

The goal of this project is to optimize automation, scalability, and user engagement of PilotCity programming. Specifically, we strive to automate a process which has historically been done by hand because as PilotCity grows, making matches by hand will be intractable. We also seek to build an automated in-house data collection system which, combined with public data, will better inform PilotCity programming.

0.3 Objectives

There are several objectives that are set to be achieved during the course of the project. Some objectives are prioritized over others because some solutions built will be deployed during the project – instead of after the project – to collect data and attract users.

- Build a website with a login/membership system that can store basic user data such as usernames, passwords, names, phone number and email address.
  - The website will permit users to fill out surveys/questionnaires that can be updated at any time. The site will serve as a temporary platform for enrolling users interested in PilotCity's WorkForce Incubator program.
  - Eventually, the data stored on the site will be integrated into a mobile application that would take longer to build. The project's liaison wants the website to be developed as soon as possible to kick start enrollment of users and early sign ups.
- Design and build a matchmaking/recommending system for participants of the WorkForce Incubator.
  - The goal is to match employers such as Sony and DJI with high school classrooms. Previously, PilotCity employees performed the matchmaking by hand and mental heuristics. We aim to automate this process electronically and efficiently.
- Build an iOS application that will end up absorbing the website, employing the matchmaking algorithm, and digitizing tasks that PilotCity used to do by hand.
  - Tasks will include a notification system for users, schedules for teachers and employers, chat rooms connecting users, and templates for facilitating the process of project days such as Hack day and Review day.

0.4 Possible Approaches

Machine Learning Algorithm

One approach is to use existing data and train a machine learning model in order to predict future events.

- Pros
  - More complex and could work well with a lot of data in PilotCity's future
- Cons
  - The current historical PilotCity data is too small to be able to train a high-performing model
  - Highly subjective to limited previous examples

Matchmaking Algorithm

What may work better is to match classrooms and projects based solely on data we gather each year. We can send out roughly the same set of questions to both teachers and employers specifying a range of constraints (topic, timing, etc). We then score each teacher's responses against every employer project, adding points for each question matched. The 10 or so projects with the highest match rate will be presented to the teachers for their ultimate selection.

- Pros
  - Reusable pipeline each year
  - Solves problem in simplest, most efficient way possible
- Cons
  - Does not directly leverage data year after year
  - Highly subjective to whatever survey questions we ask

We are confident that we can address the goals of this project with a matchmaking algorithm as opposed to a machine learning algorithm. Perhaps, however, as PilotCity grows, machine learning could be incorporated to make even better matches!

In either case, we will first build a website to prototype our design, then produce an app to house our automated processes and interface with students, teachers, and employers.

0.5 Tasks

Design Based Tasks

- Design match-making surveys for employers, teachers, and students.
- Design a matchmaking algorithm that recommends a list of suitable employers to every teacher, based on a list of constraints.

Data Tasks

- Interview students, teachers and employers on their partnership with PilotCity so far
- Deploy pre-experience surveys
- Deploy weekly mid-experience surveys
- Design and deploy exit surveys

Automation Tasks

- Create a website that allows teachers and employers to register for PilotCity's program early, and answer two rounds of survey questions. The survey questions will eventually be moved to the mobile apps.
- Create a website that allows teachers and employers to register for PilotCity's program early, and answer two rounds of survey questions. The survey questions will eventually be moved to the mobile apps.
- Create an iOS and an Android Application that will be the go-to for every student, teacher, and employer in the program. It will contain every user's schedule, send push notifications for important announcements, have a local messaging platform, and the aforementioned surveys.

0.6 Milestones

Fall Semester

- Website deployed in Beta 10/3
  - Has sign-in/user account set up
- Website Completed 11/5
  - Has sign-in/user account set up
  - Has surveys for teachers and employers
  - Has a map in employers' survey to limit school choices

Spring Semester

- iOS App Completed 3/4
  - Has sign-in/user account set up
  - Has surveys for teachers and employers
  - Has a map in employers' survey to limit school choices

Stretch Goal

- Android App Completed
  - Has sign-in/user account set up
  - Has surveys for teachers and employers
  - Has a map in employers' survey to limit school choices
  - Has matchmaking algorithm built in
  - Has push-notifications
  - Has messenger

0.7 Deliverables

Site Visit - October 4th and 5th

Website

Matchmaking algorithm

iOS App

Oral Presentation(s)

Midyear Report

Final Report

Projects Day presentation and poster

0.8 Schedule

September	9/4	Design surveys for employers and teachers
	9/18	Start building low-level web application
	9/24	Research efficient matching algorithms
October	10/3	First draft of web application
	10/4 - 10/5	On-site visit to PilotCity
	10/15	Finalize experience surveys for PilotCity alumni
	10/22	Find and analyze public educational data to analyze value of Project-Based Learning
	10/29	Prototype project matching algorithm using historical data
November	11/5	Complete web application that can support matching based on teacher and employer survey results
	11/12	Design layout of mobile application
	11/6 - 11/30	Iterate on web application and matching algorithm
December	12/3	Ready matching algorithm for deployment
	12/4	iOS application prototype with layout (non-functional)
	12/8	Mid-year report due
	12/10	Project matching based on teacher and employer survey data
January	1/28	Project matching based on student, teacher, and employer survey data
February	2/11	iOS application prototype with integrated engagements aspects
March	3/4	Complete iOS application with integrated engagements aspects and matching abilities
	3/5 - 3/18	Ensure stability and readiness of application and matching algorithm for next academic year
	3/18	Results/Project should be done
April	TBD	On-site visit to PilotCity
	4/17	Poster due
	4/27	Poster Session
May	5/4	Final Report due

0.9 Contact Information

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