

MICHIGAN STATE

U N I V E R S I T Y

Project Plan

Patient Service Delivery Planning

The Capstone Experience

Team Capstone Experience

Chas Bean

Josh Curl

Justin Oh

Luke Stanton

James Torres

Department of Computer Science and Engineering
Michigan State University

Fall 2015



*From Students...
...to Professionals*

Functional Specifications

- Allows Spectrum Health to provide optimal care by predicting staffing needs
- Allows patients to find the facility with the shortest estimated treatment time
- Predictions based off of multiple data sources
 - Past Spectrum Health data
 - CDC, Weather Channel, and Census Bureau



Design Specifications

- Simple Patient UI
 - Focused on simplicity and accessibility
 - Designed for potential use in an emergency scenario
- Sophisticated Staff UI
 - More options for statistical analysis and data visualization
 - Includes charts of past data and future predictions



Screen Mockup: Patient Interface

SPECTRUM HEALTH **Urgent Care**

>Map View

Alpine Urgent Care 616.391.6220	0.3 miles	3 patients waiting per Provider	Recommended >Details
Broadmoor Urgent Care 616.391.8020	4.7 miles	0 patients waiting per Provider	Recommended >Details
East Beltline Urgent Care 616.391.6220	10.3 miles	2 patients waiting per Provider	Recommended >Details
South Pavilion Urgent Care 616.391.8242	16.0 miles	5 patients waiting per Provider	Recommended >Details
West Pavilion Urgent Care 616.486.5100	20.7 miles	3 patients waiting per Provider	Recommended >Details
Zeeland Community Urgent Care 616.772.4644	8.1 miles	1 patients waiting per Provider	Recommended >Details

>Map View

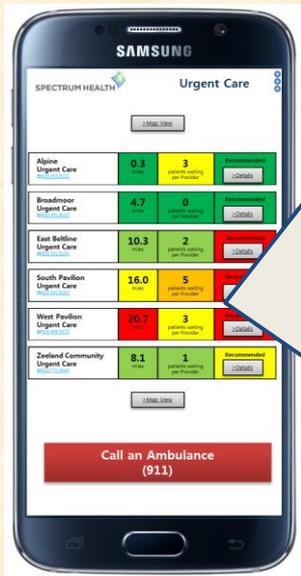
Call an Ambulance (911)

SPECTRUM HEALTH **Urgent Care**

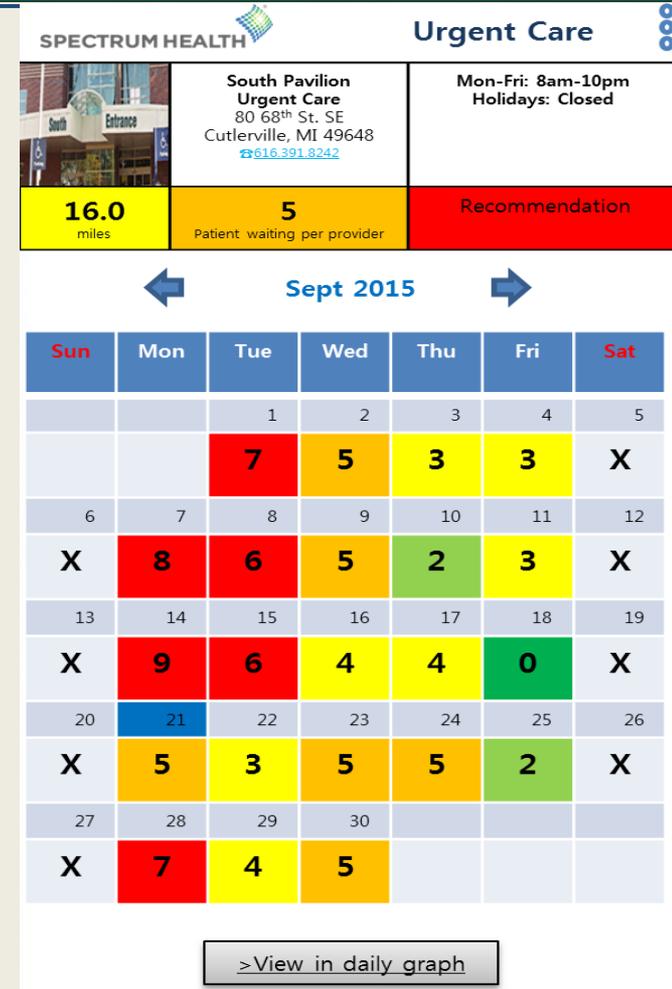
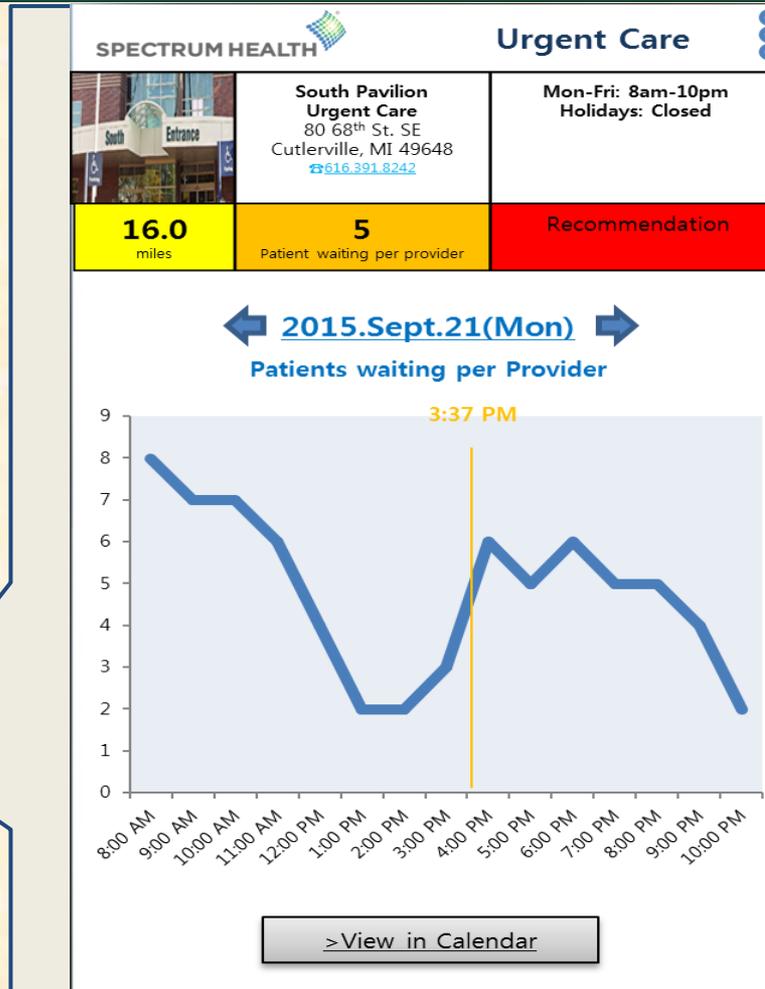
>View in Table

>View in Table

Call an Ambulance (911)



Screen Mockup: Patient Interface



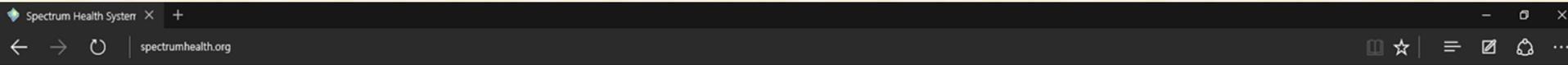
Screen Mockup: Staff Interface

The screenshot shows a web browser window with the URL spectrumhealth.org. The page header features the Spectrum Health logo on the left and a user profile for Markus Neuhoff on the right, with a "Log Out" button. The main content area displays a list of six urgent care locations, each with a photo, name, phone number, and a colored box indicating the number of patients waiting per provider.

Location	Phone Number	Patients Waiting per Provider
 Alpine Urgent Care	616.391.6220	3
 Broadmoor Urgent Care	616.391.8020	0
 East Beltline Urgent Care	616.391.6230	2
 South Pavilion Urgent Care	616.391.8242	5
 West Pavilion Urgent Care	616.396.3183	3
 Zeeland Community Urgent Care	616.772.4644	1



Screen Mockup: Staff Interface



Markus Neuhoff

Log Out



South Pavilion
Urgent Care
80 68th St. SE
Cutlerville, MI 49648
[616.391.8242](tel:616.391.8242)

Mon-Fri: 8am-10pm
Holidays: Closed

5
Patients waiting per Provider

6
Providers

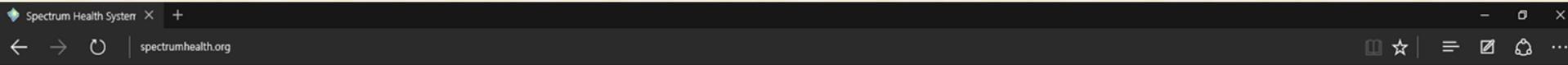
Waiting:	30
Under treatment:	6
Treated	173

← Sept 2015 →

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
		7	5	3	3	X
6	7	8	9	10	11	12
X	8	6	5	2	3	X
13	14	15	16	17	18	19
X	9	6	4	4	0	X
20	21	22	23	24	25	26
X	5	3	5	5	2	X



Screen Mockup: Staff Interface



Markus Neuhoff

Log Out



**South Pavilion
Urgent Care**
80 68th St. SE
Cutlerville, MI 49648
[616.391.8242](tel:616.391.8242)

Mon-Fri: 8am-10pm
Holidays: Closed

5
Patients waiting per Provider

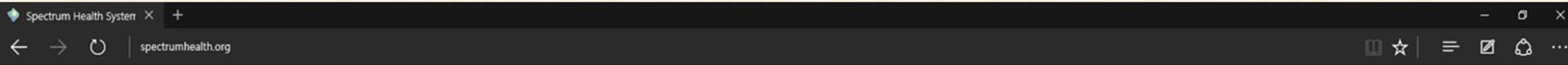
6
Providers

Waiting:	30
Under treatment:	6
Treated	173

2015-Sept-21 (Mon)



Screen Mockup: Staff Interface



Markus Neuhoff

Log Out



**South Pavilion
Urgent Care**
80 68th St. SE
Cutlerville, MI 49648
[616.391.8242](tel:616.391.8242)

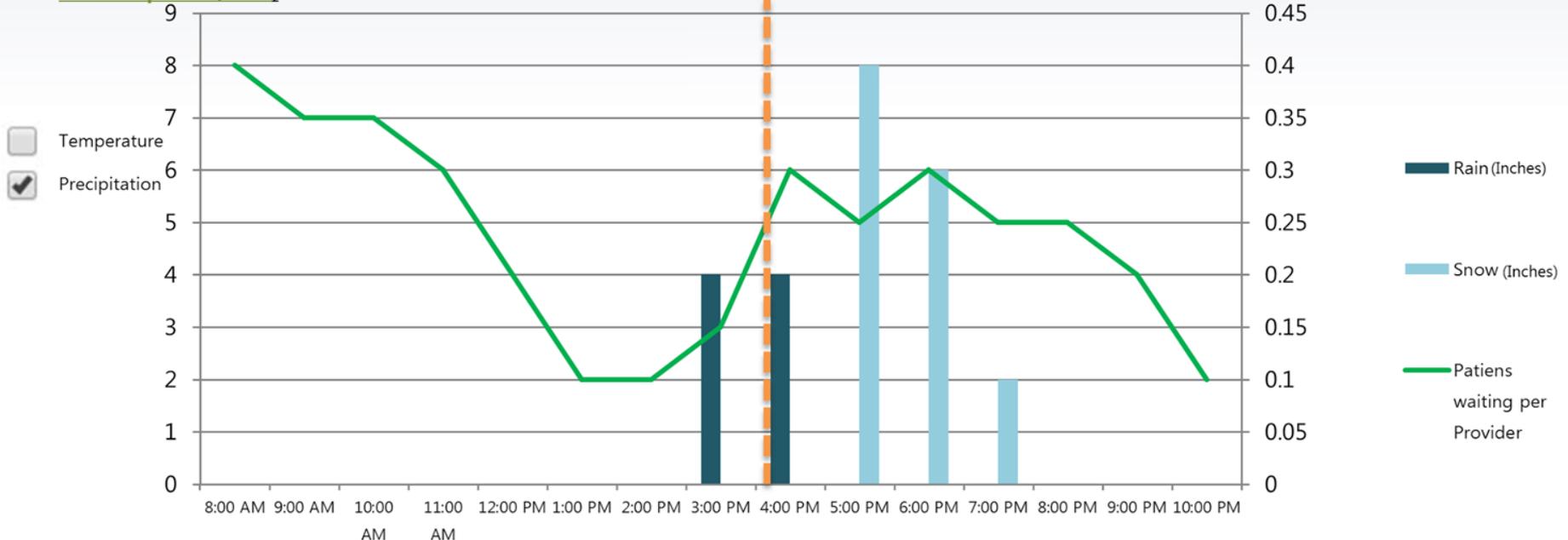
Mon-Fri: 8am-10pm
Holidays: Closed

5
Patients waiting per Provider

6
Providers

Waiting:	30
Under treatment:	6
Treated	173

2015-Sept-21 (Mon)

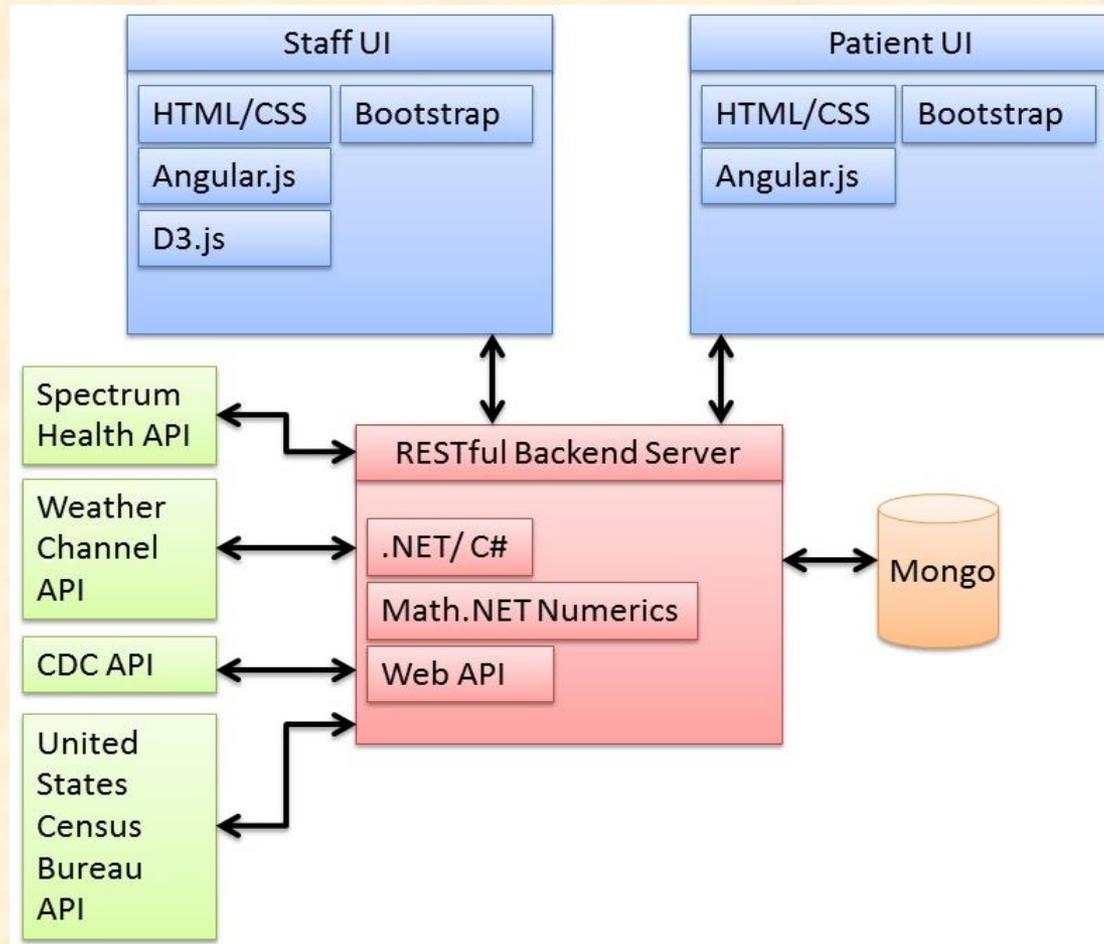


Technical Specifications

- Backend server that implements a RESTful API for fetching data and predictions
- Frontend application geared towards Spectrum Health employee usage
- Responsive frontend application geared for patient usage



System Architecture



System Components

- Hardware Platforms
 - Servers are the only hardware used
- Software Platforms / Technologies
 - C#/.NET for backend
 - Math.NET Numbers for statistic calculations
 - MongoDB for database
 - Angular.js for frontend
 - D3.js for data visualization



Testing

- Karma for frontend unit tests
- Microsoft Unit Testing Framework for Managed Code for backend tests
- TravisCI for continuous integration
- Manual testing to ensure that the UI is intuitive and results are meaningful
- A-B testing via Spectrum Health to ensure application is meeting expectations



Risks

- Risk 1
 - Determining what actually affects people going to urgent care
 - Interviewing urgent care staff, studying past data
- Risk 2
 - Mathematically predicting number of patients expected per site
 - Use “regression model” method to set up a model that predicts over different variables
- Risk 3
 - Choosing the right technologies to integrate with Spectrum Health’s systems
 - Consulting with the SH Enterprise Architect
 - Considering new technologies in place of SH legacy technology
- Risk 4
 - Easily accessible and usable user interface
 - Contacting SH designer about A-B testing and mockups
 - Simplicity for the sake of emergency

