



Colorado Water Quality Trend Analysis Software

Company Background

[Niche Systems](#) is a new software consulting firm run by Mines students. We're focused on writing principled software for engineering and academic applications. Our client for this project is the Water Quality Lab for the City of Arvada. This is a non-profit project.

Project Description

The goal is to develop software that helps measure the correlation between spikes in chemical levels and variables, such as specific weather events, from water sampling sites. Scientists at water quality labs regularly investigate trends in elevated levels of various chemicals. Right now, the city of Arvada is looking at spikes in Manganese levels that have been occurring in their treated water samples over the past 3 years. The team will be given a dataset of measurements taken at various water treatment sites over time containing Manganese levels along with pH, temperature, Chlorine, and conductivity. Elevated Mn levels are the anomaly of interest. Our water sampling data points were collected roughly every week over the past five years.

Looking into water quality trends over time involves comparing data from the scientists' local experiments with weather variables, such as precipitation, humidity, and more. Therefore, we want to build a specialized application for water quality scientists to easily combine their time-series geographic data with a few other sources. Primarily, we want to use publicly available water quality data in Colorado along with (interpolated) historical weather data from open APIs, such as gridMET.

Software Architecture

The following is one possible architecture for this application: use a map data visualization library like [kepler.gl](#) combined with an offline framework like electron or [tauri.app](#) to allow the business logic of the application, such as data processing and saving/loading large projects to happen quickly. This stack makes it easy to render heatmaps and other visualizations on top of maps, our primary goal.

Although we believe that this stack will be effective, it is ultimately a suggestion. It is up to the teams' discretion to decide what approach to take. The engineers at Niche Systems will be available for guidance and advising throughout the project.

Desired Skillset

We're looking for programmers interested in building software specializing in data processing, visualization, and statistics that could influence real decisions made by our water treatment officials in Colorado. The ideal candidate has experience developing software with a team, is willing to learn new technologies quickly, and is interested in building complete applications that require both frontend UI development combined with engineering-focused systems. Other than that, we prefer working with strongly-typed, compiled languages whenever possible (i.e. Rust) although this is not a requirement for this project.

Team Size: 4-6 students

Further Opportunities: Niche Systems is actively hiring software engineer interns, and this is a great opportunity to prove yourself.

Location: We will be available on campus, or the meetings can be done remotely. Our field session group will also have the opportunity to tour the City of Arvada water treatment facility.