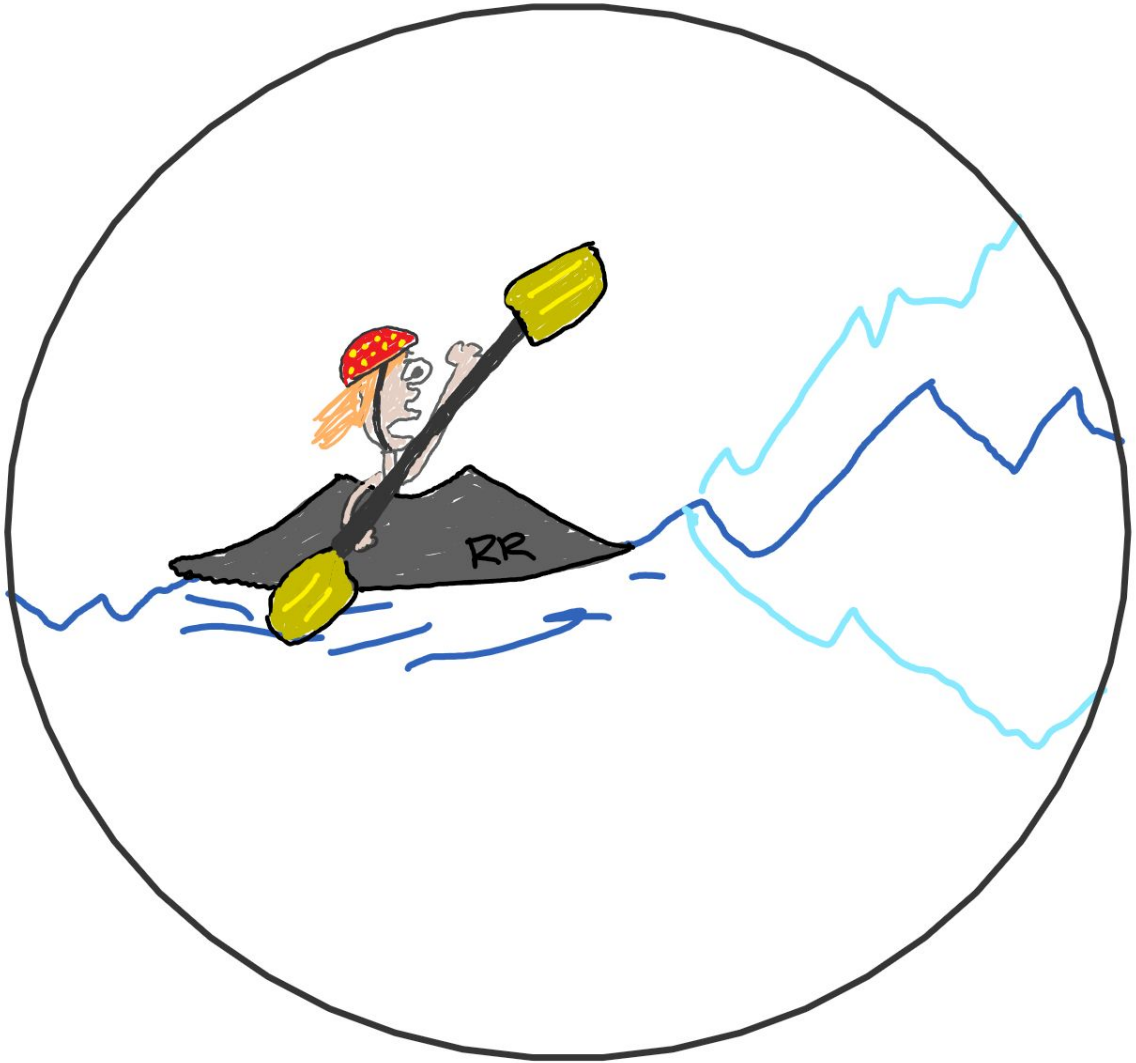
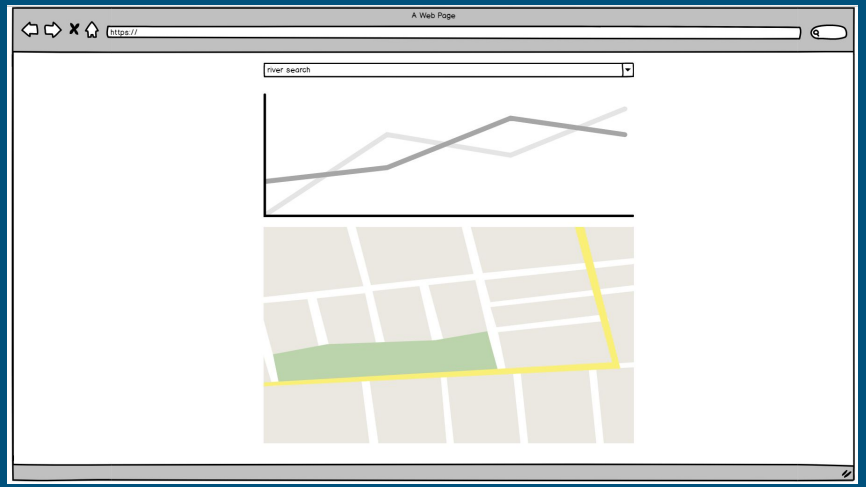
Technology Review

River Runner



Background

- River Runner aims to provide predictions for whitewater kayaking run flow rates up to several weeks in advance
- Paddlers will need a publicly available graphical user interface to access the predictions for a chosen run(s)
- This front-end web framework needs to access continuously updated data from our PostgreSQL server and display ARIMA model results



Front-end Web Framework Options

- Tableau Public
- Dash
- Others considered but not reviewed in-depth include:
  - PowerBI
  - Django
  - Flask
  - Node.js

Tableau Public

How it works

- Meets the front-end requirements by providing a publicly accessible location for users to interact with the application
- Our app updates a Google Sheets workbook with predictions

putting rows

```
body = {
    'range': 'predictions!A1:E%s' % len(predictions),
    'values': [p.as_gvalue() for p in predictions if isinstance(p, models.Prediction)]
}

result = self.__gsheets.spreadsheets().values().append(
    spreadsheetId=self.__sheet_id,
    valueInputOption='USER_ENTERED',
    insertDataOption='OVERWRITE',
    range=body['range'],
    body=body
).execute()
```

getting rows

```
result = self.__gsheets.spreadsheets().values().get(
    spreadsheetId=self.__sheet_id,
    range='runs'
).execute()
```

- Tableau Public stays in sync with Sheets - proof of concept

Tableau Public

Benefits

- Easy to use
- Includes all required features such as mapping, filtering, prediction visualizations, and public publishing
- Can be embedded as an HTML iframe
- Eliminates several functional requirements
- Easy to add interactivity to visualizations

Tableau Public

Drawbacks

- Public workbooks are not permitted to access external data sources (i.e. our PostgreSQL server)
- Using this technology would force us to republish prediction data on a daily basis, or connect through Google Sheets
- Implementation and maintenance requires a subscription to Tableau (currently free for students)

Dash

How it works

- Will meet the front-end requirements of providing a publicly accessible location for users to interact with the application after hosting with a third-party service
- Dash will handle URL routing and HTTP requests
- Will be written entirely in Python, meaning our prediction data can be directly accessed and our PostgreSQL data can be accessed through the use of SQLAlchemy

Dash

Benefits

- Offers more flexibility for visualization than Tableau
- Easy to connect to external data sources
- Doesn’t require any JavaScript
- Faster than Tableau and can be run from same server as our PostgreSQL database
- More options for text/styling than Tableau
- Useful tool to learn regardless

Dash

Drawbacks

- Steeper learning curve than Tableau
- Potentially some interactivity limitations
- Mapping functionality is more difficult than Tableau and requires account and access tokens from Mapbox
- Requires extra steps to make Dash app publicly accessible