UNIVERSITY *of* WASHINGTON

# Software Design for Data Science

## Project

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*January 31, 2023*

# Course Project

- Collaborative software engineering experience
- Teams of 3 to 4 with 4 being optimal
- Develop project using version control

GitHub

# Course Project

Collaborative software engineering experience

- Design (use cases, component specification)
- Documentation (how to, docstrings)
- Style (PEP8, pylint)
- Coding, testing & milestones
- Standup & code reviews

# Project Type 1: Answer “Research” Questions

Problem statement: Answer two to three questions of business or scientific relevance

- Use a Jupyter notebook and supporting python files

Example

- Climate Police: Analyze effects of pollution on the planet.

# Project Type 2: Create Reusable Data

Problem statement: Create data repository with tools (e.g., search, visualization, analytics)

Example

Car2Know: Provide car rental data to users of Car2Go (e.g., for planning trips)

# Project Type 3: Create a Tool

Problem statement: Solve a problem common to many users

- Don’t reinvent the wheel

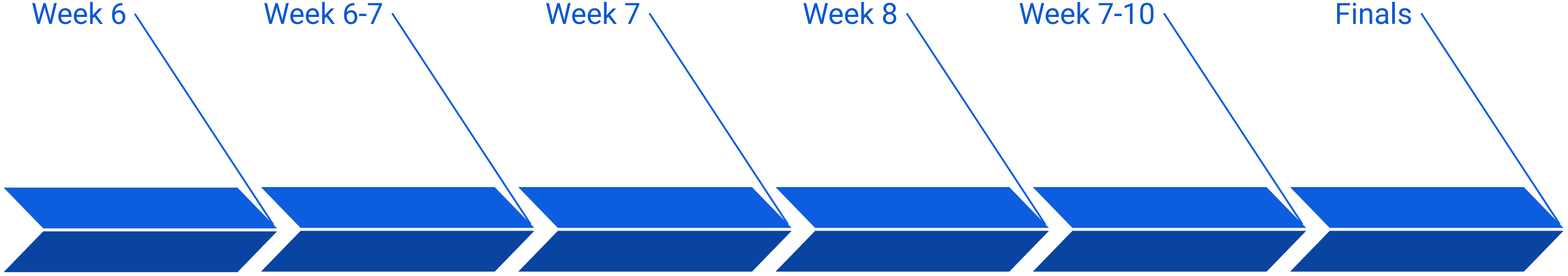
Example

BioReactor Data Logging – Monitor and publish data from BioReactor experiments

# More on the Data

- At least two non-trivial data sets
- Data need to be combined, joined, merged, etc. to answer the scientific questions
- Have access to the data NOW!

# Project Timeline



Week 6

Project Proposals & Team Selection

Week 6-7

Idea validation

Week 7

Software & Use Case Design (in class)

Week 8

Technology Review

Week 7-10

Ongoing project work & consultations

Finals

Presentations

# Week 6: Project Proposals

Share what you're passionate about and convince others to work with you:

- 1 slide (PowerPoint, Keynote, or Google Slides)
- Title
- Project type (research, reusable data, tool)
- Short pitch - what will you do, why it is cool
- Your 2+ data sources (could be tentative)
- Your name

**Due by 12pm next Tuesday via Canvas**

In-class presentation of your proposal (2 minutes) - volunteers*

Participation points! If you are unable to attend, please let me know.

# Week 6: Team Selection

During project proposals:

- Take notes on what projects sound interesting to you

After project proposals:

- You’ll have time in class to talk to each other and form teams around a project proposal
- 3-4 people per team - 1 person submits names via Canvas
- If a team has 1-2 people and can’t find more people or a project, I will help coordinate
- If you have to miss class
    - Let me know
    - I will help you find a project team

# Week 6-7: Idea Validation

- Agree as a team on what the project is
  - Clarity about the project type
  - Consensus on the problem being solved
- Validate that the project is feasible and large enough
  - Is there an unmet need (i.e. no code already exists)?
  - Do you have data that can solve the problem?
  - Will this project take about a month of effort for 3-4 people to complete?
- Create a git repository for your team
  - README.md with result of the idea validation
  - One person submits the repository link via Canvas

# Week 7: Software & Use Case Design (in class)

In-class exercise to design your project:

- Who are the users? What do they know?
- What information do users want from the system?
- Use cases - how users interact with the system

After class: complete and submit the design in your GitHub repository by the next lecture

# Week 8: Technology Reviews

In-class presentation addressing a choice of library.

Stay tuned!

# Week 7-10: Project Work

- Weekly standups in class
- Collaboration outside of class - code reviews & pull requests
- Deliver on the milestones you've defined
  - Functionality
  - Documentation
  - Style
  - Testing

# Finals: Presentations

- 8 minute oral presentations
  - All group members should present a part
  - Background
  - Data
  - Use cases
  - Component design
  - Demo
  - Lessons learned
- Slides + demo

# Some Public Data

http://drugbank.ca

http://toxnet.nlm.nih.gov

https://data.seattle.gov/Transportation/Traffic-Flow-Counts/7svg-ds5z

https://www.divvybikes.com/data

http://www.nyc.gov/html/tlc/html/about/trip_record_data.shtml

https://www.kaggle.com

Pronto bike data

American Fact Finder Data

European union data (World bank)

Russian federation data (World bank)

China data (World bank)

# Project Proposal Examples

Just to get your mind working

# Weather Wizard for Farmers

- Project output: a tool (a simple web app)
  - Give it your location (zip code?)
  - Use a machine learning model to predict future temperature and precipitation for your zip code
  - It will predict your last frost and whether it will be a warmer/cooler or wetter/dryer year
  - It will predict which crops you (the farmer) should plant to make the most money
- Data
  - NOAA data
    - Historical weather (temperature/precipitation) by location
    - El Niño/Southern Oscillation history
    - Atlantic/Pacific Multidecadal Oscillation history
    - Solar Cycle history
  - USDA data
    - State agricultural output data by crop

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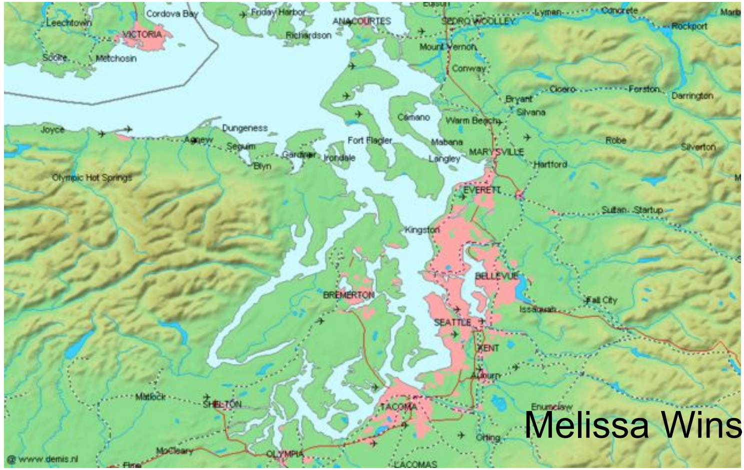
# Tide Me Over!

- Project output: research & reusable data (map visualizations)
  - Research how tides affect water changes in Puget Sound via mooring buoy
    - Depth, oxygen, chlorophyll, and salinity
  - Build map visualizations with a time slider to show the changes
  - Include a search feature to narrow in on a particular location
- Data
  - NOAA historical tide data
  - King County mooring buoy data



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# Fantastical Basketball*

- Project output: a tool (a simple web app)
  - Give today's best fantasy lineup for the NBA
    - Daily/weekly/whole season
    - Option to select best=points or best=money
  - Show how the tool has performed for the previous week's worth of games, relative to existing fantasy players
- Data
  - NBA historical data from basketball-reference.com (or NBA site)
  - Day-by-day projection data from fantasydata.com (or other fantasy site)

** This is a VERY HARD PROBLEM. The output of the project is not a predictor that does better than existing players, but one that at least is not terrible.*

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