Suitability of use of iUTAH GAMUT data for water quality modeling of Logan river, Cache Valley, Utah
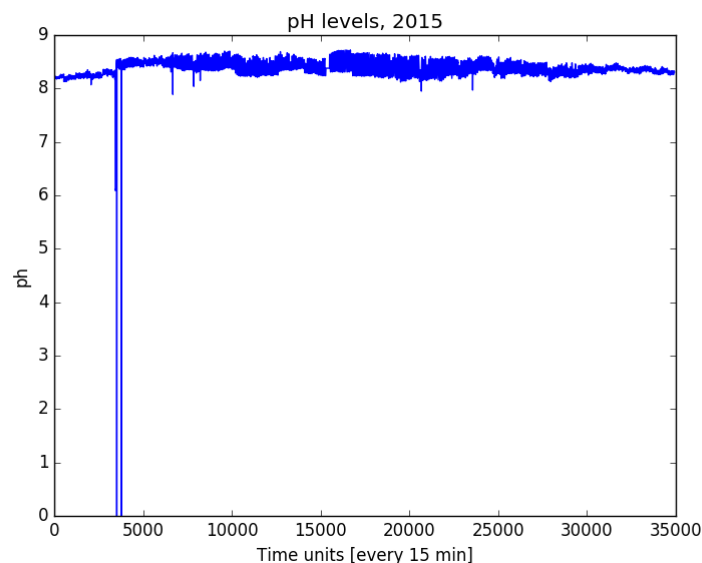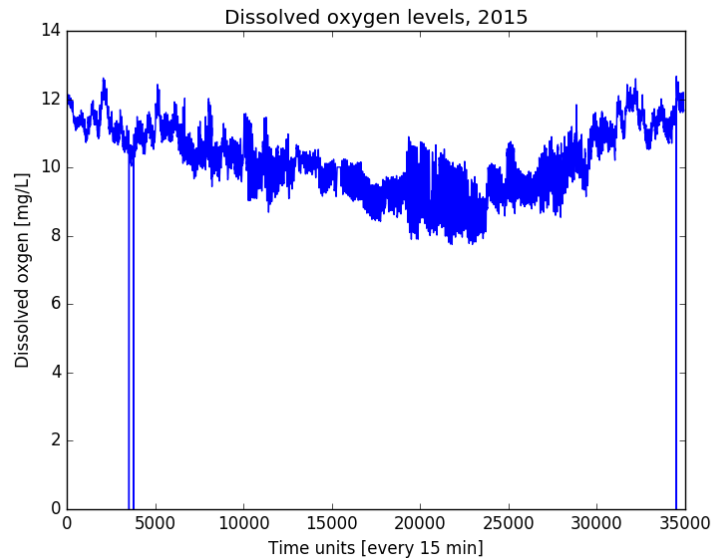
Water quality modeling is important for numerous purposes such as understanding the effects of population growth, land use change and climate scenarios, and running model simulations under various conditions. Such a model would require real world data, especially location specific which in our case is the Logan river in Cache valley, Utah. The Innovative Urban Transitions and Aridregion Hydro-sustainability ("iUTAH - Innovative Urban Transitions and Aridregion Hydro-Sustainability" 2016) cyberinfrastructure team provides raw and provisional data, that is readily available through their website ("iUTAH GAMUT Network Raw Data at Logan River near the Water Lab Advanced Aquatic Site (LR_WaterLab_AA) - iUTAH" 2016) for their aquatic Gradients Along Mountain To Urban Transitions (GAMUT) sites located at six different locations across the Logan river. Parameters being measured include temperature, specific conductance, pH, dissolved oxygen, turbidity, blue-green algae, chlorophyll fluorescence, colored dissolved organic matter, nitrogen and dissolved nitrate levels, every 15 minutes since 2013. Example plots of pH and dissolved oxygen levels of a GAMUT site near Utah Water Research Laboratory (UWRL) on the Logan river are included in the appendix for reference. From these figures, it is understood that significant amounts of data cleaning and processing is necessary before any modeling can be done. These measurements are made by industry-grade sensors, manufactured by Campbell Scientific dataloggers, and their methods of computing various metrics are reasonably accurate, mentioned in the metadata. Standard procedures are adopted by the iUTAH team to ensure no errors are present and data are of acceptable quality. For any model we develop, we will be able to use iUTAH's data in the form of comma separated values that can be easily imported to the modeling software used such as R or Python, however it would have been even easier had the data been accessible though web based Application Programming Interphases (APIs). Also, not every six GAMUT sites have three years of historical data (some just two) and not every parameter mentioned above are being measured. Overall, I would recommend using iUTAH GAMUT data for any water quality models we develop.

Appendix:

Dissolved oxygen levels, 2015

Python plotting code:

```
##Plotting pH and dissolved oxygen levels
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

#csv file contains logan river data for 2015 from water lab site
loganriverdata = pd.read_csv('iUTAH_GAMUT_LR_WaterLab_AA_RawData_2015.csv',
skiprows=68)

#plotting ph
plt.plot(loganriverdata['pH'])
plt.ylabel('ph')
plt.xlabel('Time units [every 15 min]')
plt.title('pH levels, 2015')
plt.show()

#plotting dissolved oxygen
plt.plot(loganriverdata['ODO'])
plt.ylabel('Dissolved oxgen [mg/L]')
plt.xlabel('Time units [every 15 min]')
plt.title('Dissolved oxygen levels, 2015')
plt.show()
```

Bibliography:
"iUTAH - Innovative Urban Transitions and Aridregion Hydro-Sustainability." 2016. Accessed
        September 15. http://iutahepscor.org/.

CEE 6110 Assignment #1
Karun Joseph, A02240287

"iUTAH GAMUT Network Raw Data at Logan River near the Water Lab Advanced Aquatic Site (LR_WaterLab_AA) - iUTAH." 2016. Accessed September 15. http://repository.iutahepscor.org/dataset/iutah-gamut-network-raw-data-at-logan-river-near-the-water-lab-advanced-aquatic-site-lr-waterlab-aa.

Grading Rubric   Assignment-1   Date:_____9/15/2016_____Student: _Karun Joseph, A02240287_____

Category (Max. Score)	No Evidence	Doesn't Meet Standard	Nearly Meets Standard	Meets Standard	Exceeds Standard	Self-Score	Instructor Score
Title (1)	Absent 0	Evidence of two or less 0	Evidence of three 0	Evidence of four 1	Title – can assess main point from title alone; Name, Instructor's Name, Course, Date, Neatly finished 1	1	
Introduction (3)	Absent, no evidence 0	There is no clear introduction or main topic. 1	Introduction states the main topic but either: 1. Does not give a full overview, Or: 2. Too detailed, leading to annoying repetition later. 2	The introduction states the main topic and previews the structure of the report. 2	The introduction states the main topic and previews the structure of the report. Good overview of the design and strategy. An effective summary. Gives enough detail to interest the reader. 3	3	
Organization and structural development of the idea: procedure, results, discussion (10)	Not applicable	Paragraphs fail to develop the main idea. No evidence of structure or organization. 1 – 5	Organization of ideas not fully developed. Paragraphs lack supporting detail sentences. No transitions. 6 - 7	Paragraph development present but not perfected. Each paragraph has sufficient supporting detail sentences. No transitions. 8	Writer demonstrates logic and sequencing of ideas through well-developed paragraphs. Each paragraph has thoughtful, supporting detail sentences that develop the main idea. The first sentence of each paragraph is the summary sentence. Transitions enhance structure. 9 - 10	10	
Engineering Calculations and Design (70)	Design point(s) not addressed. 3 – 42%	The writer has no clue what they are talking about. 45 – 58%	Sketchy: left out required design points. Did not work on this as much as you should have, and it shows. Many important answers are incorrect. 61 – 79%	Discussion lacks adequate detail, but all the necessary points are covered and nearly all answers are correct. 82 – 88%	Provides what was explicitly asked for. The function of each piece is demonstrated to the reader in adequate, but not overwhelming, detail. Answers are correct and reasonable. 91 – 100%		
	a) Introduction to the problem (10)					10	
	b) Assessment of characteristics of GAMUT data (50)					45	
	c) Recommendation on usage of GAMUT (10)					8	

Category (Max. Score)	No Evidence	Doesn't Meet Standard	Nearly Meets Standard	Meets Standard	Exceeds Standard	Self-Score	Instructor Score
Word Usage and Format (10)	Not applicable	Numerous and distracting errors in punctuation, capitalization, spelling, sentence structure, word usage, significant figures, tables, and figures. Data vomited onto page(s). Unacceptable / unprofessional at the graduate level. 1 – 5	Misspelled words, poor English grammar and word choice. Main body of report is either longer or significantly less than one page. Figures are too small and/or under-labeled, although they are usually of acceptable quality and focus. Tables incoherent or not cohesive. Bad font sizes. Too much or too little data in appendices. Could be improved by being more meticulous. 6 - 7	Almost no errors in punctuation, capitalization, spelling, sentence structure, word usage, significant figures, and presentation of figures, tables, and appendices. Main body of report is one page or less 8	Punctuation, capitalization, spelling, sentence structure, word usage, and significant figures all correct. Main body of report is one page or less. Clear, consistent fonts. Good word processing skills. Figures have adequate contrast. Informative figure and table titles and legends. Figures have appropriate axis tick spacing, labels, units, and legends. Table columns cohesive, labeled, and specify units. Document is stapled. Appendices, if provided, are separated by topic, and each have a title, discussion, and proper formatting and display of information 9 - 10	10	
Conclusion (4)	Absent 0	Incomplete and/or not focused. 1	The conclusion does not adequately restate the main results. 2	The conclusion restates the main results. 3	The conclusion restates the main results, and is an effective summary. 4	4	
References (2)	Absent 0	With many errors, off-the-wall sources used. 0	With some errors, appropriate sources were used. 1	With few errors, good sources were used 2	All cited works; text, visual, and data sources are done in the correct format with no errors. Uses innovative sources of information. 2	2	
TOTAL (100)							