Initial Report

Last Modified: 01/30/2018

1. Name (first and last)

Text Response
Lise Montefiore

Statistic	Value
Total Responses	1

2. Email

Text Response
lrmontef@ncsu.edu

Statistic	Value
Total Responses	1

3. Contact Phone

Text Response
4054029425

Statistic	Value
Total Responses	1

4. In Fall 2018 you will consider yourself to be a:

#	Answer	Bar	Response	%
1	VT Freshmen Undergraduate Student		0	0%
2	VT Sophomore Undergraduate Student		0	0%
3	VT Junior Undergraduate Student		0	0%
4	VT Senior Undergraduate Student		0	0%
5	Between Undergrad and Graduate school		0	0%
6	Graduate school		1	100%
	Total		1	

Statistic	Value
Min Value	6
Max Value	6
Mean	6.00
Variance	0.00
Standard Deviation	0.00
Total Responses	1

5. What degree(s) and major(s) are you pursuing along with institution?

Text Response
I am pursuing a Ph.D. in Biological and Agricultural Engineering at North Carolina State University

Statistic	Value
Total Responses	1

6. List any Minors you are pursuing.

Text Response
I am pursuing a minor in Water Resources

Statistic	Value
Total Responses	1

7. List any honors and/or awards received:

Text Response
I receive the Provost's Doctoral Fellowship (2017-2018)

Statistic	Value
Total Responses	1

8. Currently we have 1 program accepting applications which includes:

#	Answer		Total Responses
15	Data Science for the Public Good	0	0
	Total	0	-

Statistic	Data Science for the Public Good
Min Value	-
Max Value	-
Mean	0.00
Variance	0.00
Standard Deviation	0.00
Total Responses	-

9. Essay (up to 500 words): “What do you want to get out of this experience?”

Text Response
Quickly after beginning my PhD program in the Biosystems Analytics Lab in the Biological and Agricultural Engineering Department at North Carolina State University last August, I discovered how broadly the field of data analytics impacts all aspects of research and society. I am currently learning and applying data analytic methods and synthesizing national datasets as part of my research project, which satisfies my curiosity every day. Though I have made great progress, I yearn for broader experience with data analytic approaches. I am excited to apply to the Data Science for Public Good (DSPG) program because of the opportunities it provides its participants to gain more diverse experience not only in data science and modeling, but also in disciplinary perspective. I am particularly drawn to the strong emphasis on social sciences within this program; throughout my work experiences, I realized that social factors were often primary elements motivating engineering projects. At the end of this program, I would like to be able to extract critical information from different types of data – from socioeconomic to environmental – and communicate this information in an appropriate and pertinent manner. In reviewing the work prepared by previous students who participated in this program, I was amazed by the quality and the clarity of the research, and impressive variety of approaches utilized to present and synthesize results. The adequate choice of data analysis and visualization is, in my opinion, fundamental to share and effectively communicate results to a target audience. Moreover, this program offers the opportunity to interact with government and community leaders in the context of real-world problem solving. This level of interaction is presently lacking from my PhD training, though I strongly wish to work directly with those who are making decisions and in need data-based products. Participating in the DSPG program would allow for me to fill this gap in my current education. Furthermore, while this experience will be a fantastic for my professional development, I think it would also be a valuable educational experience as a member of society. Indeed, one of the positive points of this program, in my opinion, is its interdisciplinary training, which offers the opportunity to learn from students and professionals from different fields. I believe working in a multidisciplinary team is extremely valuable from a professional and personal perspective. Each person has experience and expertise that enables us, as researchers, to rethink complex societal problems that require transdisciplinary solutions. The kind of collaboration and open-mindedness promoted by the DSPG program encourages progress and creativity, which are critical for the successful communication of data analytics. Moreover, at the end of this experience, I wish to share my experience with people in my department who are interested in leveraging data science in their research. In this sense, my participation in this program would increase is impact.

Statistic	Value
Total Responses	1

10. Essay (up to 500 words): "Please describe any previous research experience and/or work experience you may have.”

Text Response
Before starting my Ph.D. in data analytics at NCSU, I held several internship positions both in research institutes and consulting companies. My first experiences in research took place at Oklahoma State University in the Biosystems and Agricultural Engineering department. While there, I conducted two projects over the span of 17 months. Both projects were experimental and designed to tackle issues in the field of Low Impact Development and green infrastructure. The first project consisted of studying long-term infiltration of five pervious concrete materials to evaluate the clogging and the efficiency of cleaning methods. After collecting data in the field and laboratory, I analyzed the data using several statistical operations (T-tests, regression, etc.) to bring out relationships between the different pervious concrete materials and the cleaning methods applied. The second project consisted of evaluating phosphorous removal by fly-ash pellets. The ultimate goal of this project was to quantify transport parameters to allow the design of underdrain pipes filled with fly-ash. Column leaching experiments using synthetic phosphorous solutions were set up and run for several months. After obtaining the experimental data, I fit a transport model to my experimental data to represent the relationships between phosphorus and fly-ash. Inspired by the results, I designed a cost-effective green infrastructure system. These two experiences allowed me to couple the different methods (statistics and process-based modelling). Concerning my work experience, I interned for two consulting companies, Egis and Suez Consulting, in their water resources management departments. Both experiences exposed me to new technical and social perspectives. At Egis (Montpellier, France), I worked on the development of a Flood Action and Prevention Plan for the Ouvèze watershed. The purpose of this project was to identify local strategies that would avoid damage caused by floods, and to protect lives and resources. This region precipitously suffered from a deadly flood in 1992, which affected thousands of people. I conducted site investigations to determine local challenges and to produce a Cost-Benefit Analysis. During this experience, I realized that social data were fundamental to effective decision-making when confronting real-world issues. My second work experience took place at Suez Consulting (Le Lamentin, French West Indies). There, I worked for six months in a team composed of ten engineers. My main responsibility was to parameterize and calibrate a 2D-hydraulic model to support the design of a bridge reconstruction project in Saut-Sabbat, French Guiana (South America). This work required that I compile information from national databases. In addition to working with these data, I built and ran hydrologic models through the combination of several software programs (ArcGis, MapInfo, Fudaa pro, and TELEMAC-2D), and processed the outputs to make them usable to a variety of audiences. These two internships brought me great experience in understanding how data are traditionally used in the private sector, as well as the importance of valuing stakeholder perspectives and expectations. Additionally, these projects afforded me with invaluable opportunities to interact with peers from Europe to South America and learn about hydrologic modeling from diverse viewpoints.

Statistic	Value
Total Responses	1

11. Essay (up to 500 words): "Please describe your background (courses taken, research projects, etc.) in statistics and mathematics."

Text Response

I did my undergraduate and graduate education in France where I majored in water resources engineering science at Polytech Montpellier (Montpellier, France) and took several courses in mathematics and statistics. During my undergraduate career, I had about ten hours a week of mathematics and statistics courses. In this program, I studied linear algebra, trigonometry, differential equations, and calculus, probability, and descriptive statistics. Throughout my program, I was tested both through traditional written assignments and weekly oral demonstrations. During my graduate studies, I further specialized in water resources engineering sciences and took courses that were more oriented towards solving practical mathematical and statistical problems, such as numerical methods, spectral analyses, and transport phenomena. One of the most consequential mathematically-oriented projects I worked on consisted of evaluating and modeling the minimum distance needed between an outdoor recreational park and a farm wastewater stream to ensure safe water quality conditions. This project required the application of spectral and numerical methods and translated the different mathematical principles I learned during my education to a real-world setting. Additionally, throughout my program, I worked with real datasets curated by research departments and national databases. These courses demonstrated how mathematics and statistics offer robust approaches for making sense of data. As mentioned in my previous essays, I have utilized math and statistics in several research and consulting projects. The methods used ranged from mechanistic modeling to determining statistically-significant differences between experimental treatments. Presently, for my PhD, I am building upon these past experiences and quantifying estuarine vulnerability across the Southeast United States as a function of projected water quality change. This interdisciplinary study leverages land use, climate, and demographic datasets, among others. The final goal of this study is to create a vulnerability index that estimates the projected exposure of regional resources to human (e.g. land use) and environmental (e.g., changing precipitation, sea level) stressors. Algorithms I am developing will allow for these human and natural stressors to be combined into a single scaled quantitative metric. Results of this analysis will identify areas that are at greater risk of water quality degradation as a function of global and local change. To carry out this project, I am using R to synthesize multiple large datasets. I have already produced spatially-interpolated sea level rise data from point measurements through the use of the inverse distance weighted method. Currently, I am compiling historical and projected climatic data with the United States Geological Survey's (USGS) Geoknife package in R. This package allows for large gridded datasets found on the USGS Geo Data Portal Web Application to be batch downloaded. With Geoknife, I am specifically downloading high spatial resolution (4-6 km2) daily data for 60-year climate projections produced from an ensemble of downscaled climatic model products. I will also incorporate the US Environmental Protection Agency's population density projections calculated at the county-scale in my index. This data-driven project is one of the most challenging I have worked on to date, and is also a greatly enriching experience.

Statistic	Value
Total Responses	1

12. Essay (up to 500 words): "Please describe your background (courses taken, research projects, etc.) in social and behavioral sciences."

Text Response

During my undergraduate program, I took courses in philosophy and geography, which first exposed me to the humanities and social sciences in an academic context. These courses introduced to me the general organization of society and exposed me to different ways of thinking. During my graduate courses, the social courses I took were highly oriented towards economics. I studied the different economies that rule the world, and the broader consequences of their dominance on the society. Moreover, to further understand the industry environment and organization, I took courses in management, which discussed human behaviors and personalities. To illustrate these concepts, I participated in different exercises designed to teach students how to identify personality types in professional situations. Although these courses were informative, I ultimately acquired more background in social science through my work experiences. Social components were critical to their success of all projects in the different water resources departments of the two consulting companies where I worked. In Egis, the elaboration of the Flood Action and Prevention Plan for the Ouvèze watershed relied on different human components. Risk was evaluated as the crossover between the social component and the intensity of the flood probability. The goal of this project was to define local strategies to decrease flood risk based on an in-depth analysis of the territory. Through this in-depth assessment, I realized there were many one-floor habitations where people would be unable to seek refuge in upper floors. Moreover, there were many sensitive buildings such as hospitals, schools, assisted living facilities, etc. These data were critical to establishing effective local strategies to protect lives and resources from floods. Moreover, several surveys were sent through the territory to elected representatives. These surveys aimed to evaluate their views on urbanization. It appeared that most of them did not have adequate strategies regarding the associated risks. We needed to propose actions that would increase the awareness of these officials and the public on flood risks, such as to create flooding benchmarks. Communicating with the public about the risks and previous tragic events was critical to the success of the project. Indeed, several studies demonstrated that over time, people forgot the previous floods and even the deadliest. Additionally, when I was with Suez Consulting, I worked on several hydraulic and environmental studies. The region was confronted by several natural stressors (floods, tsunamis, liquefaction, earthquake, and volcanism). Each project started with a preliminary phase that consisted of evaluating the socio-economic challenges in relation to natural hazards observed or expected in the area. This stage was critical for selecting appropriate strategies to adopt for the projects. For example, an area with a low population was defined as low risk compared to a high density urban area. These data oriented our subsequent analysis plans when conducting environmental and modeling studies. These work experiences demonstrated to me how social data were fundamental in the engineering field and how they define the choice of strategies to adopt in engineering projects.

Statistic	Value
Total Responses	1

13. Essay (up to 500 words): "Please describe your background in programming."

Text Response
I gained experience in programming throughout my education and my work experience, in which I had opportunities to analyze data of different scales and sizes. I first learned to program in Visual Basic for Applications (VBA) to evaluate mathematical models that ranged from theoretical to applied. Notably, I worked on a project which aimed to simulate the role of a dike in protecting flood-prone areas. This required that a numerical flood be modeled and run through a conceptualized one-dimensional river that I programmed in VBA. The algorithms included several loops to compute the different initial conditions over the time and the space. The code created output data that were automatically plotted in an Excel file. This project helped me to understand the advantages of programming by computing with multiple data streams. However, this project was generated with synthetic data and generated limited data outputs. During my work experience with Suez Consulting, I worked with larger datasets to model hydraulic flooding in a watershed of few km2. The models were computed through TELEMAC-2D and Fudaa-Pro and was intense computing. A triangular mesh was created for the modeled area with Blueknue. Different inputs parameters were injected in the mesh and interpolated. The mesh included more than 100,000 points of calculus. This project was a fantastic opportunity to model data and applied equations at larger scale. I realized how these programs were so benefit and pertinent to prevent, inform, and anticipate actions against the risks of flooding. Currently, I am working with larger datasets. My Ph.D. project seeks to quantity the projected risks of anthropogenic and climatic pressures on estuaries across the Southeast United States. For this study, I manipulate both spatial and temporal data in R. To date, I have processed data that range from simple tables to large rasters. Moreover, I am currently learning regex or regular expression, which defines search patterns for querying data files.

Statistic	Value
Total Responses	1

14. Essay (up to 500 words): "Please provide information about other significant courses you have taken within your field of study."

Text Response
In my programs in France, I took several modeling courses that utilized hydraulic and hydrologic software and knowledge of transport phenomena. I really enjoyed these courses because I was interested in solving real-world equations that are applied to inform decision-making in engineering fields. However, I was also interested to study larger datasets that were measured via surveys, experiments, or remote sensing and not only calculated via software. For this reason, I chose to pursue my Ph.D. in data analytics which combines skills that I acquired through my engineering education, as well as my data analysis skills. I am currently taking a remote sensing course in order to gain greater proficiency in the interpretation of multi-temporal satellite imagery. This course has also increased my awareness of databases available to evaluate large-scale spatiotemporal trends. Through this course, I am deepening my experience with R, as well as Erdas Imagine, and GIS software programs. I am also taking a class on critical transitions in nature that examines the mechanisms of rapid and abrupt changes in ecosystems and the development of early warning signals that could help to prevent these changes. This course puts into perspective many concepts related to both environmental and human dynamics. Some examples we are evaluating in this course include social data, such as poverty thresholds in communities. Moreover, by the end of the semester, as a class project, we will analyze real long-term datasets to look at early warning indicators of critical transitions by using functions in the Early Warning Signals Toolbox in R. I have also taken a Research Communications course, which made a large impact on me. This class was mainly based on the analysis of scientific communication products. As part of the course, we created videos, summaries, critical analyses, and presentations. This classes helped me always to try to think about my work from another perspective. To complement Research Communications, I also took a research method course. The purpose of this class was to provide a general guide when conducting research. I was asked to perform weekly summaries of research articles and to write a review paper. This class was beneficial for improving my scientific writing and increasing my awareness of the scientific conventions. To follow up this course, I am currently taking a second research method class, in which I will learn how to write proposals.

Statistic	Value
Total Responses	1

15. Please list the name and contact information for 2 references (teachers, mentors, or employers) that we will contact for a letter of reference/brief survey. Please make sure you list the correct email and they know we will be contacting them soon (within the next week). Only 2 references will be contacted; do not list more than 2.

Text Response
nnelson4@ncsu.edu; gafox2@ncsu.edu

Statistic	Value
Total Responses	1