**CP1: CSCI 8715**

**Tentative Title:** Predicting Pipeline Failure Risk using Pipeline Incident Reports and GIS Imagery data for Pipeline, Terrain and Population Characteristics.

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**2. Research Abstract**

Pipeline safety is vital because pipeline incidents threaten human health, biological life, and the environment. One single pipeline incident can result in a significant consequence. For instance, the cleanup expense of the Kalamazoo River incident was estimated at 1.21 billion dollars. While the pipeline industry faces considerable pressure of monitoring, scrutiny, and sanction and the stakeholders (e.g., pipeline operators, Department of Transportation) have increased investment in complying standards, preventing pipeline incidents is still very challenging because it is difficult to predict the risk of the pipeline system. First, the total pipeline mileage in the United States is more than 2 million miles and pipeline incidents are low-probability high-consequence events. Second, traditional statistical approaches cannot deal with high dimensional data from geographical characteristics (e.g. hydrography, waterway, land cover, pipeline network shape). In this respect, our study is focused on developing and validating the performance of predictive models of future pipeline risk severity and likelihood by analyzing multiple raster images created from geographical information (e.g., hydrography, population density, protected areas, and, commercially navigable waterway).

**Research Questions**

1) Descriptive analysis

- What is the impact of geographical characteristics (e.g. hydrography, population) on pipeline risk: probability and consequence?

2) Predictive analysis

- Given data, predict pipeline incident frequency. Which data/factors will exhibit predictive power?

- Given data and incidents, predict the pipeline incident consequence. Which data/factors will exhibit predictive power?

3) Prescriptive analysis

- Is it possible to suggest an alternative pipeline route to reduce short term and long term risks and consequences?