Study of Classification Uncertainty

By Shaun Pinto
Advised by Professor Xumin Liu
Background

- Goal of classification / prediction is to learn the function estimate
- Achieved by Neural networks by adjusting the weights of neurons during training
- They do not consider uncertainty of the model
- Issues with unseen classes and succumbs more to adversarial examples
Related Work

- **Bayesian Neural Network**: Incorporate uncertainty in weights which in turn incorporate uncertainty in prediction

- Evidential Neural Networks: Incorporate uncertainty in prediction directly by learning parameters of a Dirichlet distribution

  [Evidential Deep Learning to Quantify Classification Uncertainty](#)
Motivation

- Mitigate issues with unseen classes
- Mitigate issues with adversarial examples
- Study these concepts by applying it on different datasets and finding out possible areas of improvements and applications
Proposed Work

- Run implementations of Bayesian Neural Networks, Evidential neural networks etc on Web Services datasets for the purpose of Service Classification (and other such datasets)
- Compare and contrast different approaches on the different datasets
- Propose changes / improvements to existing datasets
- Implement / Incorporate these concepts into different models
Concrete Examples (Deliverables)

- A comprehensive study of the different approaches used
- Other Models implemented using these concepts
- Model built with proposed improvements / changes
Results and Evaluation

- F1 score will be used to evaluate the results of the different models

- Time taken to train the different models will also be considered
Milestones

● Milestone 1:
  ○ Project planning: This will involve finalizing the scope of the project, breaking the project into subtasks and assigning estimates for each task so that progress can be tracked
  ○ Literature Review: Read, summarize and contrast a list of papers related to this topic.
Milestones (Continued)

- **Milestone 2:**
  - Data Collection: Collect the necessary data from MNIST and CIFAR
  - Implementation: Have the implementations of the different approaches up and running
  - Improvements: Explore possible improvements that can be made and implement the same.

- **Milestone 3:**
  - Results: Carry out experiments, note down results and provide possible explanations for the results obtained
  - Presentation: Have the final presentation, poster and report/paper ready