

- [ ] Datasets
  - [ ] Select two datasets
  - [ ] Preprocess datasets
  - [ ] Choose a performance metric (accuracy, error, precision or recall) for each dataset and justify choice
  - [ ] Introduce each dataset and write why they are interesting, and brief description of the preprocessing
- [ ] Talk about overall experimental methodology
- [ ] Decision Trees (DT)
  - [ ] Learning Curve plot and analysis
    - [ ] Keep the optimal hyperparameter choice . Vary the training data set size , train models with data and plot the curves
    - [ ] bias and variance / overfit and underfit analysis
  - [ ] Validation curves for at least two hyperparameters
    - [ ] Pruning is a required hyperparameter
    - [ ] Vary hyperparameter of interest keeping all other optimal hyperparameters fixed and train the models and plot the curves
    - [ ] bias and variance / overfit and underfit analysis
  - [ ] Add intermidate learning or validation curve to show suboptimal performance and analysis
  - [ ] Link back results to some algorithmic behavior, hyperparameter interaction between the algorithm and input data, etc
  - [ ] Document wall clock times
  - [ ] Tune model to be optimal (GridSearch allowed)
  - [ ] Analyze results isolated to other algoritms
  - [ ] Compare and contrast results across algorithms and across datasets
- [ ] Neural Networks (NN)
  - [ ] Learning Curve plot and analysis
    - [ ] X axis should be iterations or epoch - ie loss curve
    - [ ] Keep the optimal hyperparameter choice . Vary the training data set size , train models with data and plot the curves
    - [ ] Bias and variance / overfit and underfit analysis
  - [ ] Validation curves for at least two hyperparameters
    - [ ] Hidden Layer Size is a required hyperparameter
    - [ ] Vary hyperparameter of interest keeping all other optimal hyperparameters fixed and train the models and plot the curves
    - [ ] Bias and variance / overfit and underfit analysis
  - [ ] Add intermidate learning or validation curve to show suboptimal performance and analysis
  - [ ] Link back results to some algorithmic behavior, hyperparameter interaction between the algorithm and input data, etc
  - [ ] Document wall clock times
  - [ ] Tune model to be optimal (GridSearch allowed)
  - [ ] Analyze results isolated to other algoritms
  - [ ] Compare and contrast results across algorithms and across datasets
- [ ] Boosting

- [ ] Learning Curve plot and analysis
  - [ ] Keep the optimal hyperparameter choice . Vary the training data set size , train models with data and plot the curves
    - [ ] Bias and variance / overfit and underfit analysis
  - [ ] Validation curves for at least two hyperparameters
    - [ ] \# of Weak Learners is a required hyperparameter
  - [ ] Vary hyperparameter of interest keeping all other optimal hyperparameters fixed and train the models and plot the curves
    - [ ] Bias and variance / overfit and underfit analysis
  - [ ] Add intermidate learning or validation curve to show suboptimal performance and analysis
  - [ ] Link back results to some algorithmic behavior, hyperparameter interaction between the algorithm and input data, etc
    - [ ] Document wall clock times
    - [ ] Tune model to be optimal (GridSearch allowed)
    - [ ] Analyze results isolated to other algoritms
    - [ ] Compare and contrast results across algorithms and across datasets
- [ ] Support vector machines (SVM)
  - [ ] Learning Curve plot and analysis
    - [ ] Keep the optimal hyperparameter choice . Vary the training data set size , train models with data and plot the curves
      - [ ] Bias and variance / overfit and underfit analysis
    - [ ] Validation curves for at least two hyperparameters
      - [ ] Kernel Type is a required hyperparameter
    - [ ] Vary hyperparameter of interest keeping all other optimal hyperparameters fixed and train the models and plot the curves
      - [ ] Bias and variance / overfit and underfit analysis
    - [ ] Add intermidate learning or validation curve to show suboptimal performance and analysis
    - [ ] Link back results to some algorithmic behavior, hyperparameter interaction between the algorithm and input data, etc
      - [ ] Document wall clock times
      - [ ] Tune model to be optimal (GridSearch allowed)
      - [ ] Analyze results isolated to other algoritms
      - [ ] Compare and contrast results across algorithms and across datasets
- [ ] K-Nearest Neighbor (kNN)
  - [ ] Learning Curve plot and analysis
    - [ ] Keep the optimal hyperparameter choice . Vary the training data set size , train models with data and plot the curves
      - [ ] Bias and variance / overfit and underfit analysis
    - [ ] Validation curves for at least two hyperparameters
      - [ ] K is a required hyperparameter
    - [ ] Vary hyperparameter of interest keeping all other optimal hyperparameters fixed and train the models and plot the curves
      - [ ] Bias and variance / overfit and underfit analysis
    - [ ] Add intermidate learning or validation curve to show suboptimal performance and analysis

- [ ] Link back results to some algorithmic behavior, hyperparameter interaction between the algorithm and input data, etc
- [ ] Document wall clock times
- [ ] Tune model to be optimal (GridSearch allowed)
- [ ] Analyze results isolated to other algorithms
- [ ] Compare and contrast results across algorithms and across datasets
- [ ] Write solid conclusion