

PROJECT 3

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# MODEL SELECTION AND EVALUATION

This is not a project about  
deep learning.

# PROJECT 3 DESCRIPTION

- ▶ Carry out model evaluation and selection for predictive analytics on image data.
- ▶ Evaluate different modeling/analysis strategies and decide what is the best.
- ▶ Present sound evidence in the form of model assessment, validation and comparison.
- ▶ Communicate your decision and supporting evidence clearly and convincingly in an accessible fashion.

**NOT A COMPETITION OF  
PREDICTION ACCURACY**

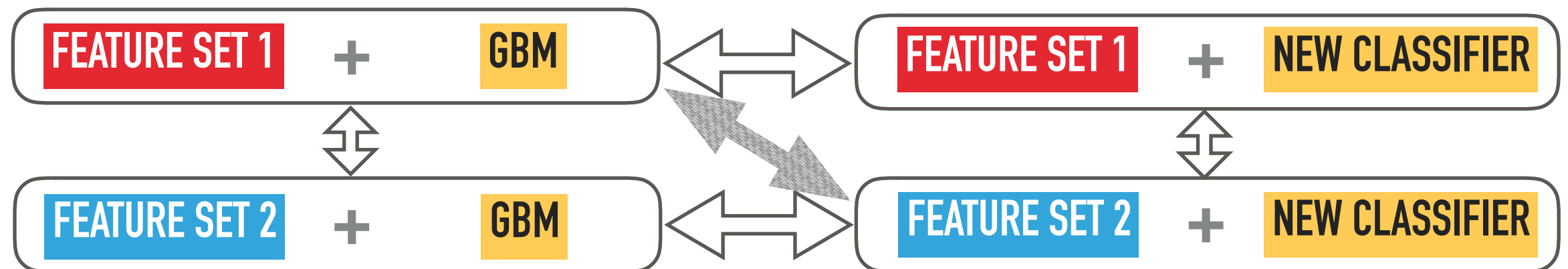
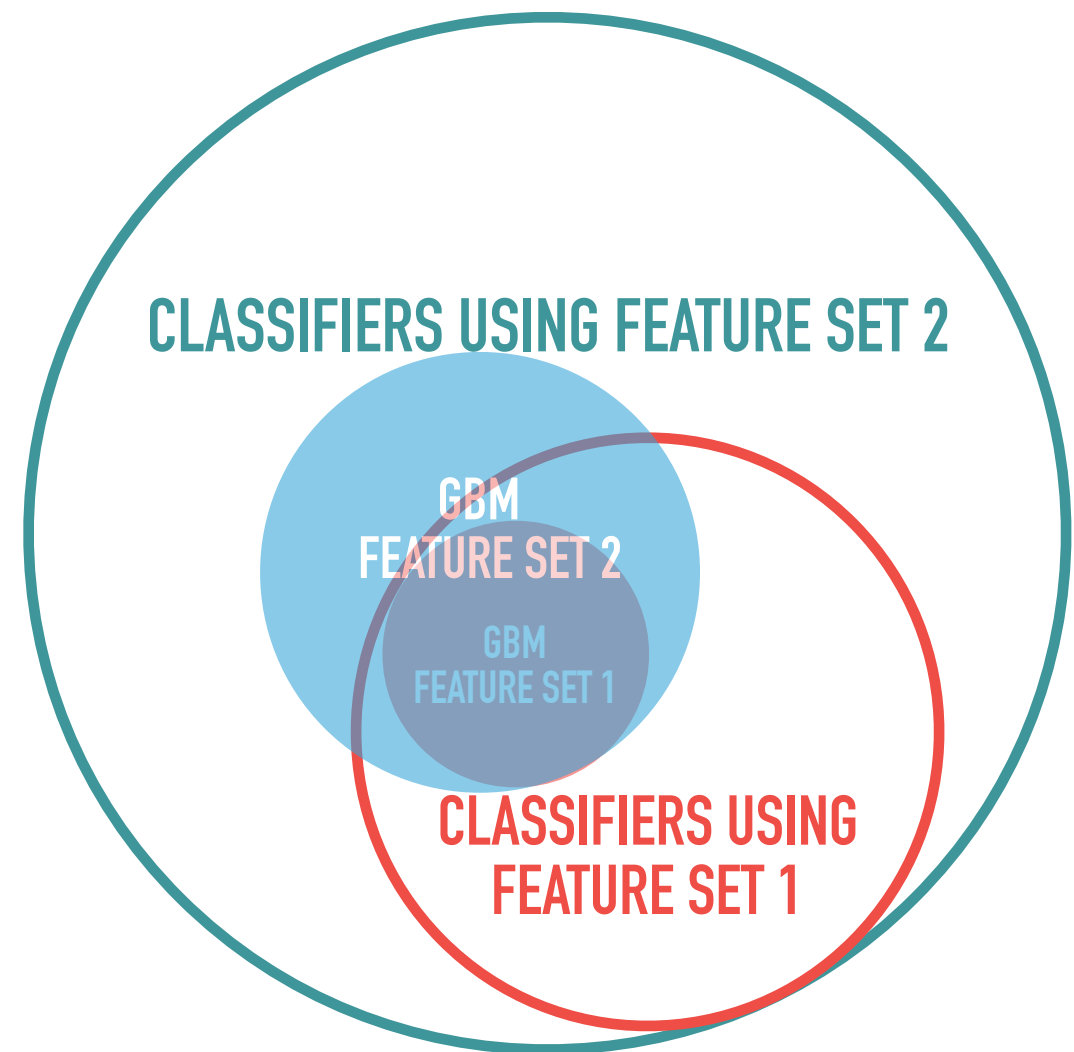
### **BASELINE** MODEL

- ▶ Using *provided* SIFT descriptors as features.
- ▶ Gradient boosting machine with decision stumps as classifier.
- ▶ Task 1 will be implementing this strategy and tune it correctly.

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## PROPOSED STRATEGY

- ▶ Consider better features
- ▶ Consider better models
- ▶ Comparison should be structured to establish the values added by
  - ▶ New features
  - ▶ New method
- ▶ Nested model comparison structure.



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# SUBMISSION OF PROJECT 3

- ▶ Submission

- ▶ A well-documented GitHub repo (following instruction given in the starter codes).
- ▶ A **main.rmd** that carries out the project.



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- ▶ main.rmd calls

- ▶ a file of feature processing codes (**feature.R**) should take
  - ▶ an input folder of images
  - ▶ outputs a folder of "feature" objects with features for the images
    - ▶ RData, or other R readable file
    - ▶ Make sure you keep track of the file names of the images.

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- ▶ main.rmd calls

- ▶ a file of training codes (**train.R**) should take
  - ▶ a path for input feature objects (for training images)
  - ▶ a CSV file contains image names and labels
  - ▶ outputs “model” objects (RData, or other R readable file);  
One for the baseline model and one for the new model.
- ▶ model training should include tuning.

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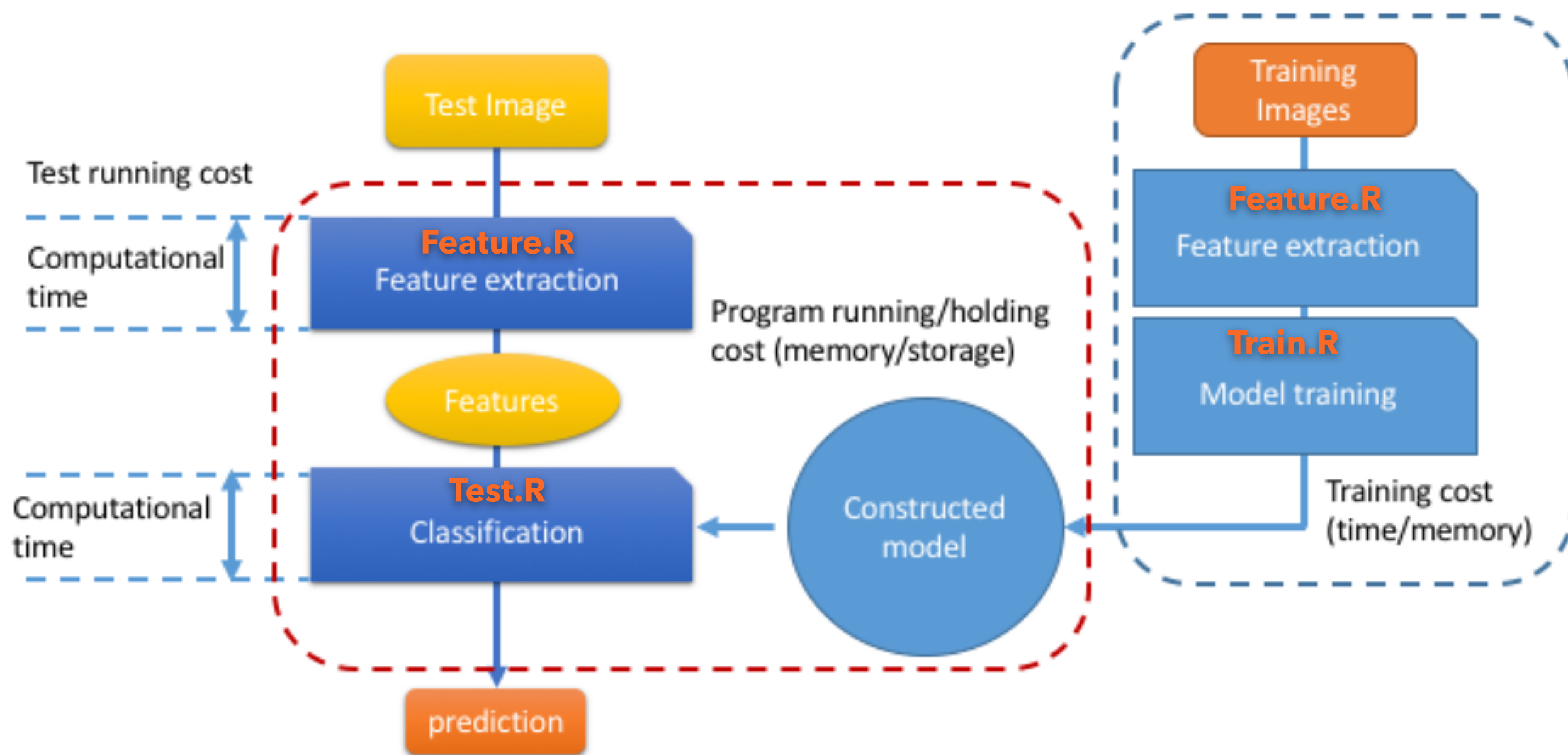
## SUBMISSION OF PROJECT 3

- ▶ main.rmd calls
  - ▶ a file of testing codes (**test.R**) should take
    - ▶ a path input feature objects (for testing images)
    - ▶ an input “model” object from train.R
    - ▶ output predicted labels

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# SUBMISSION OF PROJECT 3

- ▶ You can use any methods to generate features
- ▶ On March 24th, we will first fork all project repos to save a time-stamped version of all your codes.
- ▶ On a new set of images and SIFT descriptors, each team will have 30 minutes to process them into features chosen.
- ▶ Submit the **processed features** as a folder of feature objects file. The feature objects should be readable by **train.R** and **test.R**.
- ▶ We (the instruction team) will then run your **main.rmd** file from all submissions.
- ▶ For comparison, you are also required to submit **predictions** on the test images ***WITHOUT retrain your classifiers.***



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## SUBMISSION OF PROJECT 3

- ▶ You should also prepare **a presentation** for this project
  - ▶ Methodology details of the proposed solution
  - ▶ Evaluation results as supporting evidence
    - ▶ Prediction performance comparison between baseline and new models.
    - ▶ Time/cost analysis.

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# EVALUATION OF PROJECT 3

- ▶ Presentation 40%
  - ▶ Methodology
  - ▶ Interpretability of the features selected (scientific insights?)
  - ▶ Presentation
- ▶ Reproducibility evaluation based on new images 60%
  - ▶ Comparing training error rate and test error rate (0-1 loss will be used) on the new images.
  - ▶ Comparing stability of the methodology comparison results on baseline and new models (using cross-validation methods on the new images)
  - ▶ Consistency between the results from new images with the results from the project images (in terms of percent of improvement)

# TUTORIALS

- ▶ [Today] classification, GBM, Image features
- ▶ [Next week] Cross-validations, avoid overfitting, more image processing