

# **ECE 5258 – Pattern Recognition**

## *Fall 2016*

### **Individual Course Project Guidelines & Deliverables**

This document provides details about the class project in the ECE 5258 (Pattern Recognition) course. Specific deadlines for delivering project-related material or for presenting your project will be announced in class.

#### **Project Selection**

---

With regards to project topic selection, this semester you may choose one of the following topics discussed in our textbook:

- Support Vector Machines (for binary classification)
- Kernel K-Means (for clustering)
- Spectral Clustering (for clustering)
- Decision Trees (for classification)
- Non-Negative Matrix Factorization (for recommender systems)
- Auto-associative Neural Networks (auto-encoders; for dimensionality reduction)
- Mixture of Logistic (Multinomial) Regression Models (for classification)
- Boosting (say, with Decision Trees; for classification)

or you can suggest your own topic (for example, in coordination with your research advisor). Once you have selected a topic, please write up a long paragraph that will propose the scope of your project and consult with your instructor for approval.

#### **Implementation**

---

You may use any programming language and/or development environment to implement the demonstrations, simulations, etc. planned for. It is suggested you select languages and tools that you are familiar and feel comfortable with. If you have no particular preference, it is highly recommended you use MATLAB, because of several advantages it offers (platform that integrates computations and graphical presentations, ideal for rapid prototyping, etc.). Make sure that your implementation(s) meet(s) the specifications set forth in your proposal. Collect results and observations after experimenting with your implementations.

Be aware: In case you use source code, scripts, executables, binaries (such as 3rd-party libraries) that you have not developed yourself, make sure you clearly indicate so. Failing

to do so may have serious consequences, as not doing so may be perceived as plagiarism or academic dishonesty.

## Technical Report

The Technical Report (TR) for your major project should be 6-8 pages using the provided templates (see further below) and containing the following elements:

- **Title Material.** Specify your project title, name(s) and affiliation(s).
- **Abstract.** About 250 words summarizing what your project is about, what its goals are and how they were achieved and what major results/observations were obtained.
- **Introduction.** Perform a brief/basic literature review about subjects related to your topic. For example, here you would mention who introduced the particular classification model and when, what variations of it exist, what recent papers use it and for what application. If your project also has an application component to it, also include relevant literature about recent research in that application domain. Next, describe what your work in your TR is about. Finally, close the section by describing how your manuscript is organized (which section talks about what).
- **PR Problem Model Description.** This section should provide a concise, nevertheless, lucid explanation of the specifics of both your pattern recognition related problem you are tackling, as well the models you are investigating. Discuss the importance of the problem you are addressing, provide application domain-specific information and discuss the nature of features you are going to extract and/or select. Make sure you describe the training and the testing/performance phases of your classification model, if applicable. Also, discuss computational complexity aspects of your models' operation. Finally, discuss any advantages or disadvantages of your model(s). The existence of explanatory diagrams and pseudo-code(s) is imperative.
- **Experimental Outcomes.** Explain your application domain, the nature of the problem considered, the nature of the relevant data and the entire experimental setup. Moreover, list, describe and comment on the results that you have obtained from your simulations. Present your results in figures and tables; their captions should be verbose enough for the reader to understand what is displayed and noted without consulting the text. What new knowledge has been gained? How are the results useful?
- **Discussion.** Provide a discussion based on your experience with implementing the particular model and working with it on your application. Also, if available, provide some ideas of enhancements or extensions of the architecture you dealt with.
- **References.** Add a list of 10-20 briefly annotated references (could be other technical reports, conference/journal papers, books, websites, etc.) that are related with the main aspects of your project and are referenced in your manuscript.

The formatting of your technical report should **strictly** comply with SPIE's Conference Proceedings specifications, which are among the most simple and straightforward ones. They can be found at <http://spie.org/x14101.xml>. At the bottom of this page you will also

find MS Word and LaTeX templates to help you compile the document. Please select the ones for letter-sized (not A4-sized) templates.

## Presentation & Demonstration

For the purpose of presenting your work to the rest of the class you will prepare presentation slides and a demonstration of your model. You will have a total of 20 minutes to present your work, which includes your slide presentation (~10 minutes), your demo (~5 minutes) and a bit of time to entertain a few quick questions from the rest of the class (~5 minutes). This means that you should have 10 to 15 slides in the main presentation, about 5 back-up slides (to be prepared in anticipation of questions from the audience).

It is very important that, before you show up for your presentation/demonstration you have done the following:

- You have adequately rehearsed your presentation, if possible with the help of an audience. Do not go much over or under your allocated time (~15 minutes)
- You have adequately tested your executables to avoid issues with faulty logic and/or runtime errors.
- You have setup in advance the necessary software & hardware on the computer you are going to use for the demonstration.
- Ensure that your efforts are effectively showcased in the presentation and the demonstration.

## Final Deliverables

Your final deliverables are the following items:

- **Technical Report.** Provide hardcopies of your TR for your instructor and your audience at the time of your presentation.
- **Project Bundle.** Before the announced deadline, please upload to *Canvas* a single ZIP or RAR file of a folder that contains **(i)** a softcopy of your final TR in PDF, DOC or DOCX format, **(ii)** your presentation slides in PDF, PPT or PPTX format, **(iii)** another folder named “*src*,” which should contain all source and script files that were used for your demonstrations and/or for generating your simulation results including a document (a text file suffices) that plays the role of a brief user’s manual and, if applicable, **(iv)** yet another folder named “*bin*”, which should contain stand-alone versions of your executables, demonstrations, etc., and any additional user’s manual(s).

## Student Performance Assessment & Grading Policy

The project and its deliverables should reflect work that you have performed. Nevertheless, in case you have received help, either as a service or as a product from another party, clearly state so and acknowledge it appropriately in your project report and presentation. Note that in case of plagiarism or any other unethical conduct, the project will be dismissed in addition to any other disciplinary action that will be taken on behalf of the University.

Grading itself will be based on the following factors:

- The quality of your presentation and demonstration (40%)
- The quality of your final project report, as well as the commenting of your implementations (40%)
- The opinions of your classmates via peer-review forms (20%)

For a sample peer review rubric, please refer to the last page of this document.

## Final Remarks

This class project should be viewed as an opportunity for you **(i)** to demonstrate that you have understood and mastered a few selected concepts of the course and **(ii)** to learn and explore topics and knowledge beyond the material the course can offer you via its lectures. The project will become what you will make out of it; therefore, make it a valuable experience to you.

Finally, if you encounter any issue related to your project and have trouble overcoming it, do not hesitate to contact your instructor. As a matter of fact, the sooner you make him aware of the problem, the better the chances he may be able to help you.

**ECE5268 – PRESENTATION RUBRIC**

&lt;date here&gt;

PRESENTER(S):  <div style="text-align: center; margin-top: 10px;"> <i>&lt;first name&gt; &lt;last name&gt;</i> </div>
-----------------------------------------------------------------------------------------------------------------------------

		RATING				
		High			Low	
		5	4	3	2	1
<b>ORGANIZATION</b>	<b>1. PRESENTATION FLOW</b> How logical and intuitive was the sequence of information presented?					
	<b>2. VISUAL AIDS: ADEQUACY &amp; EFFECTIVENESS</b> How effectively were visual aids (images, plots, etc.) used to communicate concepts that were hard to communicate verbally? Were they adequate?					
	<b>3. PRESENTATION PLANNING &amp; PREPARATION</b> What was your impression on how well the presentation was planned and prepared?					
<b>TECHNICAL QUALITY</b>	<b>4. SUBJECT UNDERSTANDING</b> What was your impression on how well/deep the presenter(s) knew the subject/topic that was presented?					
	<b>5. TECHNICAL QUALITY</b> Does the presentation reflect work of high technical quality?					
	<b>6. LITERATURE REVIEW</b> Did the presenter(s) cite adequate references? Does it seem that the presenter(s) have performed an in-depth literature review?					
<b>DELIVERY</b>	<b>7. COMMUNICATION OF MAIN IDEA &amp; CONCEPTS</b> How clearly did the presenter(s) communicate the main idea and other important concepts of their topic?					
	<b>8. INDUCEMENT OF INTEREST</b> Was/were the presenter(s) able to spark/enhance your interest on the presented topic?					
	<b>9. PRESENTATION SKILLS</b> How do you rate the speaker(s) presentation skills?					
<b>COMMENTS</b>						