

CSCE 633 – Fall 2019

Final Project

Guidelines

Pick an area that you like. It can be from any real-life application, e.g. sports, life-science & health, finance & commerce, computer vision, speech processing, music, astronomy, etc. Identify a topic or open problem in that area that can be solved using machine learning. Think about how to formulate and solve your problem. **Team-up with two other classmates!** This will make you learn more things and help you to get to know your colleagues!

Project Proposal (due October 21st: 11:59 pm)

The project proposal is a one-page document (you might go a little over but please keep it under two pages), in which you will describe your topic and a proposed solution for that. The topic can be something that you like or something that you do research on. Please use Piazza and office hours to discuss and finalize project ideas and teams prior to this proposal submission deadline. The project proposal should include the following information:

- Problem objective: what is the problem that you are working on?
- Problem significance: why is the problem that you are tackling timely and important? (With references supporting these claims!)
- Current State of the Art: A preliminary literature review – have people tried to do this? Has it worked? If not what are the gaps?
- Proposed approach: how do you plan to solve this problem (e.g. what features, machine learning methods, etc.) and how do you plan to evaluate your approach? Come up with a baseline method against which you can evaluate your proposed approach.
- Data description: what types of data do you plan to use or collect?
- Expected outcomes: what are the expected results and several challenges that you expect to face? (and do you plan to try to publish this at the end of the semester)

Project Implementation

Implement the ideas that you discussed in the proposal. See which of these ideas went well and which of them didn't work. Try to think of possible reasons and solutions on the ideas that didn't work. Keep track of your (intermediate) results so that you can use them later.

Project Presentation

Final Presentation details will be announced later – they will take place the final two days of class.

Project Report (due December 4th: 11:59 pm)

This will describe all the details about your problem, approach, and results. The report should follow the standard IEEE conference **double column format** and include at least 4 pages. The report will contain the following parts:

- **Introduction:** you describe the problem and the motivation behind it

- **Literature review:** describe previous work that has been performed for this problem and where does your contribution lie
- **Problem formulation:** describe what is the problem being addressed
- **Proposed solution:** describe your proposed solution in terms of features, machine learning methods, system evaluation techniques, i.e. system settings, implementation details, data, etc.
- **Data description:** describe the data being used to validate your method (e.g. #subjects, #trials per subject, etc.)
- **Results:** describe and explain (interpret) your main results, present examples that work well and examples that work poorly and try to explain why
- **Limitations and Future Directions:** What limiting assumptions did you make? What would the interesting next steps be, as a result?
- **Conclusions:** main take-away messages and future work

Additionally, you will submit your code/implementation

B) Resources:

Kaggle Datasets: <https://www.kaggle.com/datasets>

UCI Machine Learning Repository: <https://www.kaggle.com/datasets>

Additional Ideas:

User modeling for computer applications and human-computer interaction

Resources: Smart Reasoning Systems for Well-Being at work and at home ([SWELL](#)), Database for Emotional Analysis using Physiological Signals ([DEAP](#))

1. Estimating user's subjective ratings of mental/emotional state (e.g. stress, mental effort, etc.) from multimodal sensor data (SWELL)
2. Data-driven clustering of user's behavior with respect to work interruptions (e.g. emails) and task difficulty (e.g. time pressure) (SWELL)
3. Task detection (e.g. writing a report, preparing a presentation) based on user's multimodal behavior (SWELL)
4. Estimating user's affective experience from multimodal content (DEAP)

Health and pathology

Resources: NKI CCRT Speech Corpus (NCSC), [UCI Repository](#) for human activity recognition, [MIT-BIH Arrhythmia](#), [MIT Media Lab Stress Database](#), [MIMIC III repository](#), [eICU-CRD](#)

5. Developing predictive models from ICU patients with various conditions (MIMIC III or eICU-CRD)
6. Developing time-based models to automatically assess intelligibility of speech in patients affected by chemo-radiation treatment (NCSC)
7. ECG feature extraction for classifying heart abnormalities ([MIT-BIH Arrhythmia](#)) -> transfer knowledge, MIMIC database
8. Human activity recognition from smartphone devices (UCI Repository)
9. Automatic stress detection from physiological signals (MIT Media Lab Stress Database)

Automatic Emotion Recognition

Resources: [IEMOCAP](#): audiovisual data for human emotion, [CreativeIT](#): audiovisual data of affective dyadic interactions

10. Developing speech features for emotion recognition
11. Multimodal fusion for emotion recognition

Others

12. [SSPNet Conflict Corpus](#): Audiovisual feature extraction for automatic detection of conflict in political debates (SSPNet Conflict Corpus) -> Gaussian Processes-Kim et al.
13. UCI Human Activity Recognition Dataset: acceleration and gyroscope data for recognizing human activity (e.g. standing, walking, etc.),
<http://archive.ics.uci.edu/ml/datasets/Human+Activity+Recognition+Using+Smartphone>
[s](#)
14. UCI Smartphone-Based Recognition of Human Activities and Postural Transitions: updated version of the above, <http://archive.ics.uci.edu/ml/datasets/Smartphone-Based+Recognition+of+Human+Activities+and+Postural+Transitions>
15. MIT Media Lab Stress Database: physiological signals over 8 affective states, 20 days, 25mins/day <https://physionet.org/pn3/drivedb/>, <http://affect.media.mit.edu/share-data.php>
16. SSPNet Conflict Corpus: audio clips from political debates with annotated conflict instances, <http://www.dcs.gla.ac.uk/vincia/?p=270>
17. Employment Scam Dataset: real-life job adds with scam/no scam labels,
<http://emscad.samos.aegean.gr/>
18. More ideas for projects: <http://cs229.stanford.edu/projects2016.html>