CMSC 436 Semester Project Ideas

We have created the following list of ideas as starting points for your semester projects. These ideas tend towards projects for which 1) there is a known or likely end user who would like to have such an app, 2) the app has some "wow" factor because it could have some impact on civic or social issues, or university life, etc., and where appropriate, 3) the app creates and/or uses large publicly-available data sets, such as that found at data.gov, that are stored/retrieved from the network.

Please read over the following list of ideas. Students can suggest additional ideas by sending email to Dr. Porter (aporter@umd.edu). We may add some additional choices, so check back later in the week. Once you have identified your top 4 choices, submit them through the Google survey form linked in an upcoming Piazza post.

Remember that these project ideas are only starting points. You will need to flesh out many details in order to come up with your actual project. Please put in your project bids by Monday, Sept. 11thth at 11:59pm. Note that some ideas might require the use of an actual Android device, but most can be done with an emulator. These apps will require you to interact with some kind of back end server (e.g., Firebase). **In cases where you choose to leverage libraries or services not covered in depth in this course, you will need to learn them on your own. Get started early.**

1. Hate Crime News Maps.

   Use a dataset such as: `https://www.propublica.org/datastore/dataset/documenting-hate-news-index` to give people a data-driven view of the prevalence and details of hate crimes in a given area. Alternatively, build a different app using a different public data set, such as one found at: `https://www.propublica.org/datastore/datasets`

2. In My Garden.

   Users are shown a depiction of a plant when they activate the app. Users are able to take care of their parents with items acquired based on reaching physical activity goals, such as steps taken in a day. Based on progress towards goals set by the user, users receive water, sunlight, nutrients, peaceful music, etc., needed to help their plant flourish.

3. Open Source Intelligence Notebook.

   This app helps the user link digital information to images that are being analyzed. The app allows the user to take or import a photo. The user will then hand write notes onto the photo in particular locations. The app will recognize the handwriting and convert it into traditional text. The app will also be able to search the Internet for links related to the notes. The user can then save some of these links with the annotated document.

4. Smell DC app. Build an app that lets users report strong smells in their environment (often correlated with airborne pollutants). Based on existing work, such as Smell Pittsburgh. See: `https://smellpgh.org/`

5. Find A Plant (or Find An Animal).

   Using datasets (such as iNaturalist) which record plant/animal sightings, help folks locate potential trails, parks, or other public areas nearby where they are most likely to see a particular animal. General idea could be refined to specific categories (e.g. Find a Bird could be an app titled Birdwatcher Buddy, or Find a Fish could be The Angler's Compass).

6. Change My View.

   Inside the application participants respond to a selection of core questions (e.g. perhaps ten questions) about modern topics (for example, should USA have a single payer healthcare system). Participants are linked, anonymously and inside the application, to email partners who want to debate the question and have an opposing viewpoint. Some things to consider, include handling abusive behavior, etc.

7. Foreign Language Text Recognizer.

This app helps travelers navigate in a foreign country. The app takes a picture of a particular area, identify foreign text that appears in that picture, and then translates that text into a different language. The app could also then remove the original text from the photo and replace it with the translated text.

8. The Oyster Recover Partnership.

The Oyster Recover Partnership office in Annapolis has a project to recover and recycle oyster shells from bars and restaurants in the region to use as oyster seed medium. The ORP sends trucks out through the region to collect them and dumps them in the bay at select oyster farming sites. Your will create two apps – one for drivers and one for restaurants that will help optimize collections times, routes, advise ORP when a restaurant has a sufficient supply to warrant a pick up, etc. (see https://oysterrecovery.org/sra/).

9. Audio Simon.

This app will be an audio version of the game, "Simon". Simon was device-based game with 4 large, colored buttons that could light up one at a time. The goal of the game was to mimic the sequence of button lightings. At the beginning of the game the device would light one random button. The user would then press the button that had been lighted. If it was the correct button, the device would play back the previous sequence and then add one more lighting, chosen at random. The game continued until user failed to exactly reproduce the device's sequence. This game will work similarly, but instead of using visual input, the game will use stereo audio input. In addition, the user response will involve manipulating the phone (such as by moving it in a particular direction), rather than by pressing a button.

10. Disc Golf Practice Aid.

Disc golf is a game in which players aim to throw flying discs into baskets located on a course. Develop an app that allows users to record their games scores and notes. Note: There is a disc golf course near campus - See: `https://www.dgcoursereview.com/course.php?id=478`

11. Neurological Diagnostic Aid.

You're app will allow users to take three diagnostic tests

Go-No Go (NIH). The Go-No Go task is a test of inhibition. In this task, the individual is asked to press a button when the screen flashes one color and to do nothing when it shows another color. The type of data collected for each response should be: 1) Type of required response (Go or No-go) 2) The amount of time it took to elicit a response since the color showed on the screen 3) Whether the response was correct or not

The Corsi-Block Tapping task is a test of visuospatial memory. In this task, the individual is asked to memorize a series of block that has been tapped by the test administrator, then tap the blocks in the exact same order. On the computer, participants memorize a series of flashing blocks. There are multiple rounds of testing, and the number of blocks to remember increases by one with each round. If the participant does not tap the blocks in the correct flashing order, they are prompted to redo that specific round one more time. If they miss the second round, the test terminates. The data should record the highest number of blocks that the participant memorized and how long it took the participant to complete the tapping task (for each round).

In the Trail-Making task is a test for visual search speed. In this task, the individual is given a random pattern of circles on the screen. Each circle contains a number, and the individual is asked to connect those numbers in consecutive order (1-2-3-4, etc). Please see this video for a demonstration of this task. Students may also want to consider reviewing certain medical literature for recommendations on how to structure the test/randomize the trail pattern, and how each type of error on the trail-making test informs clinicians of patients' cognitive functions. Data collection should include, at minimum, the amount of time it took the individual to complete the test, the time at which each connection was chosen, whether it was the right or wrong connection, and possibly location on the screen where each circle is placed.

12. Daily Journal.

Journaling apps typically record just a text log, like a virtual diary, but our speech and actions contain a lot of information that describes how we feel. A journaling app that can record your speech, and possibly pictures you take (e.g. a selfie, your facial expressions tell a lot about you), or what activity you're engaged in can all be used to find relationship in describing how you feel. The app can allow the user to start/stop an activity, record microphone, text, sensor data, as well as reminders and notifications about their activity, etc., all tagged with a timestamp to track the start/end of the activity. Also, making the app more accessible by deep linking through text messages to open/download the app.

13. Composting.

A few municipalities in Prince George's County have begun composting programs. Hyattsville is beginning such a program to complement its existing yard waste program to reduce tipping fees at landfills and increase use of food waste as a resource. How could an app help to engage participants and improve their composting behaviors?

14. Bar/Restaurant recycling.

Most bars and restaurants in College Park do not recycle for a variety of reasons. The Student Government Association Sustainability Committee is working with the College Park Committee for a Better Environment to explore how to increase or maximize business recycling, beginning with some of the more popular collegiate bars. Can Bar and Restaurant customers help encourage recycling by the establishments they patronize?

15. Trails and bikes.

The proximity of University Park lends itself to bike riding to neighboring College Park and the University of Maryland, and this project seeks to enhance and expand the trail system to facilitate walking or biking. Some trails need to be clarified and improved, and all can be better mapped and promoted.

16. Food Pantries Support.

Cities like Riverdale Park aim to provide food supplies for the hungry and low-income residents of their towns. Apps could support the economic viability of local food production (e.g., community gardens, non-profit and for-profit urban farming), food recovery, and distribution of food and money from local stakeholders. This might build on current University efforts such as the Field of Greens, the Food Recovery Network and Terps Against Hunger.

17. Catch the Skeeter.

This app creates a virtual room of a fixed dimension that surrounds an actual person called the "target". In the virtual room there is a virtual object called the "skeeter" that emits a characteristic sound (e.g., the buzz of mosquito wings). The skeeter starts in a certain direction and can move toward the target with a given speed. The target wears a set of wireless stereo headphones through which they hear the sounds emanating from the skeeter. The sound should reflect the distance and orientation of the skeeter relative to the target. The target's goal is to turn to face the skeeter before it reaches the target.

18. Adopt a stream.

Every school and every building in the immediate vicinity of the University of Maryland is located in a subwatershed of the Anacostia Watershed. If, as a part of Green School certification or otherwise, every Prince George's County public school in the immediate surrounding area of the University of Maryland were to adopt a local stream, the potential for increased engagement in reduced contamination could be significant.

19. The Seas are Rising.

Develop an augmented reality app that uses elevations readings and other data to visually indicate areas likely to flood in the future.

20. Removing invasive species.

As part of Berwyn Height's landscape management, removal of invasive plant species will help native plants and animals survive and thrive. Your might might let people identify and report invasive plant species and assist in getting them removed.

21. Recycling reminder.

Create an app that lets garbage collectors tag a residence (on a map) as not separating recyclables. Helpful electronic reminder sent to homeowner, homeowner on a given street, etc. Could include some historical views of repeat offenders.

22. Mobile survey system.

Allow people visiting a park or other city facility to take a survey, leave suggestions, etc. Could be based on scanning a posted QR code.

23. Citizen science.

Use an app to organize and execute distributed, crowd-source data collection and experiments. For instance, count the number of cars passing at a given intersection and identify the model/type of the car (i.e., for school kids), or similar data for bird sightings, pest control, etc.

24. Heal City / Moving with the Mayor.

Support existing city programs by building a virtual game app where people get points or badges for completing activites/quests, such as walking a certain distance, visiting all parks in the city, eating 5 fruits and vegetables in a day, etc. Additionally, consider tracking city residents and awarding points based on various criteria such as walking or taking public transportation to an event.

25. Tree counters.

Tree surveys involve a very manual process. Can citizens help by mapping the trees in their neighborhood?

26. Planet.com.

Planet.com provides access to detailed map images around the world. Unlike other services, these images are updated relatively frequently. Therefore, the images may be useful in business intelligence applications, such as identifying the number of cars in a store's parking lot to see how popular that business really is. Another application might be to compute biomass in a given area, to determine how much fertilizer a farmer should use on their farm. Given the recent occurrences of hurricanes in the US, can you think up an interesting app aimed at disaster recovery?

27. UMD Newbie Guide.

Build a system and framework where an author can create tours for a set of locations on the UMD campus. The system allows users to link audio and video content to each stop on a tour. Users use the app to follow the tour and to automatically view linked content when they are arrive at a particular location on the tour.

For example, UMD could create information content for interesting sites of campus, a history professor could create a tour of important sites at the Antietam battlefield, etc. App users could then go to these places and see the information.

28. Feelings Diary.

Your app will allow high-school to college age users record and respond to negative personal feelings. See `http://psychcentral.com/lib/an-overview-of-dialectical-behavior-therapy/` for more information.

29. Collaborative Art.

Create an app that lets users collaboratively create art personal stories. Your app will allow people to create and share "Six-Word Memoirs" that are organized around geographic locations. See: `http://www.npr.org/2008/02/07/18768430/six-word-memoirs-life-stories-distilled`.

30. Call Your Mother.

   We communicate with many different people. Often urgent, day-to-day communications crowd out other important communications, such as reaching out to extended family members. Design and create an application that tracks who the users calls to a circle of people, and then presents the user with information or reminders that some contacts are being neglected. Some issues to consider are defining which contacts are part of the calling circle, what normal or acceptable calling patterns are, what happens when certain contacts haven't been called recently?

31. Read Aloud with Stuffed Animal.

   This app will allow a small child to create a simple text story, laid out over several book pages. Your app might allow the child to illustrate the story's text. This story can then be sent to an electronic stuffed animal that can read the story back to the child, automatically turning the pages of the story as the story is read.

32. Who's There?

   This app allows people to meet up with friends. For instance, if the user is in the same building as a friend both would each receive a notification informing them that the other friend is in the building.

   This app should be configurable so that it only notifies people when meeting up would be unusual to some degree. For example, family members shouldn't be notified each time they enter their common home. In addition, this add should be configurable so that the distance at which two people are considered to be in the same place changes. This might interact with meeting frequency as well. If a friend I haven't seen in a year is 50 miles away, I might want to be notified. In addition, this app could be expanded to consider a user's likely location in the future (by examining the user's calendar).

33. Bullet Journal.

   This tablet app will support a journaling style called, bullet journaling. See: https://www.youtube.com/watch?v=fm15

34. Blockchain

   Blockchain is a hot technology that allows people and businesses to exchange value in a decentralized and trusted way. For example, blockchain underlies the virtual currency, BitCoin. Develop an app that uses blockchain in a novel way.

35. uCurate

   This app meant will encourage art enthusiasts to explore their local communities and discover its art. Piloted on the UMD campus, art pieces (as defined by the user) can be tracked by location and by image. Users can organize subsets of these art pieces into collections. The app will then create walking tours allowing other users to visit this collection. Additional features may include public artworks tagged by users, supplementary information designated by gallery/museum curators, etc.

36. Geek-Out.

   Adapt the tabletop trivia game Geek-Out for use on a mobile platform. Geek-Out asks open-ended questions that can have multiple answers, such as "Named Fictional Dragons" or "Coen Brothers' Films". Advantage is given to players who know more rather than players who say answers faster. This app should allow multiple players to play at the same time (possibly remotely).

37. Barze.

   Create an app that allows users to record and check key information about bars in the College Park area. Such information might include the current wait time for entry, cover charge, ambience once inside, etc. The application receives this data from the users similar to how Waze updates the current traffic conditions and special hazards on the road. Consider how your app will incentivize user participation.

38. Seefood.

   With this app users will take pictures of food labels and the app will extract nutritional information from the food labels. This capability will be used in some nutritional use case (diabetes or high

blood pressure sufferers, people trying to lose weight, people supporting vegetarian lifestyles, etc.) Rather than expecting the user to record every single food item they eat the purpose of the app would instead be to give a visual display to see how a serving size of the food plays into a healthy, daily diet. For example could show a pie chart with what percentage of daily sodium the serving would be.

39. StoryBoard.

An app that will help organize thoughts, connect the writers' community, and advertise products for writers. The Storyboard app will help writers come up with ideas, organize ideas for an original story, suggest plots or themes for writing prompts, etc. Along with weekly challenges to be submitted to the communities, and individuals beta-reading/viewing other writer's pieces, this app helps connect the writers' community and further improve an individual's creative prowess via pushing the limits of their current studies and providing peers to learn from.

40. Local Apparel.

This app will allow people to sell and rent clothes to people near them. Sometimes people may not afford to buy a whole new wardrobe or do not what to buy a whole new outfit for a particular event where they will only wear it once. This app will allow people to post any clothing piece they might want to get rid or rent a certain piece of clothing in order to get some money in their pocket, while still helping people who want or need their clothing. This app will track the sellers and customers location and filter the clothing items displayed based on proximity. How will your app be better than other similar, existing websites? Be creative.

41. Queue Up.

Develop an app that allows people to intelligently schedule and use multiple shared resources. For instance, suppose there is a set of laundry machines that are available to use. The app should allow people to get into line, set a preferred start time, and then give them notifications when the requested machine is available. Depending on the kind of system being managed, the app should remind people when their service is about to end and should intelligently move work around based on real time behaviors in the system.

42. Sharing Content Anonymously.

OnionShare allows users to securely and anonymously send and receive files. After installing Onion-Share the sender and receiver exchange an (onion) address via a messenger, email or whatever. Then they drag and drop the files to share into their running OnionShare programs. OnionShare exists for Mac, Windows and various linux distributions. But in some scenarios, you can't access your computer to quickly share one file. What if you want to securely exchange files using OnionShare with your smartphone? A solution alike OnionShare for smartphones would come in handy.

43. Poker Cash Game Session Tracker.

Write an app that allows cash-game poker players to track their sessions, to track how much they win/lose, to calculate their win-rate (in big blinds/hour), variance and std. deviation, and to see those results plotted over time. The app will allow users to create game sessions and track a number of statistics. Each session incorporates information such as play location, the stakes played for, the game type (Pot Limit Omaha, No Limit Texas Hold 'Em, etc.), initial buy-in, and cash-out total, or zero if they get felted.

44. Land Mapper for Robotic Testing

Ongoing research using autonomous robots requires a ground-truth understanding the characteristics of terrain (hilly, muddy, contains gopher holes, dry, has steep incline, etc.) in a given test area. Develop an app that allows multiple users to walk a given area, taking notes about the terrain. The results of multiple users will then be stitched together to create an overall map that can be used in experiments running within a virtual simulation environment.

45. Weightlifting Tracker

The Fitness Tracker can log exercises, track statistics, and plan customizable weightlifting workouts. Users will be able to select exercises that they want to perform and add them to the day's workout.

Exercises will be broken up by muscle group so that the user can quickly pick appropriate exercises for their workout. Users can then modify the values for these exercises, such as the number of sets performed, the amount of weight that was lifted, the time that has elapsed, and so forth. Users will be able to create their own custom exercises as well and add them to the exercise list for future use. The Fitness Tracker can also show statistical data in the form of graphs for specific exercises that have elapsed over time. This way the user can see the progress that they have made. Users will also be able to plan workouts, such as a Push, Pull, and Legs routine or a full-body exercise routine. Once the user completes one workout for the routine, the next workout is automatically generated for the next day they plan to work out. Users will also be able to modify and customize these workouts for their own needs.

46. Food Tracker with Audio-Only Input.

    A food tracker app allows users to input and track the and amounts of food they eat during the day. One problem with these apps is that they often require a lot of manual typing to enter information. This app will allow users to input, track and search their food intake journals using only voice input.

47. UMD Gluten-Free.

    This app will enable UMD students with Gluten intolerances or Celiac's disease to record and the meals they eat each day. They will be able to rate and review their meals. They will also be able to tag their input which the name of the dining hall or restaurant in which they ate. Over time, the app will learn which items are most and least favored over a given time period for various subset of users, from all users, down to a single individual.

48. Vertical-Scrolling Comics.

    This app allows users to assemble cartoon images into a vertical scrolling webcomic. See: `https://www.clipstudio.net/how-to-draw/archives/157055`. Your app will allow users to import cartoon panels, set characteristics like background color, lay out and space panels in the scroll, add visual effects (like changing scroll speed, color tinting, haptic effects, etc.). The app will also support user comments on the cartoon.

49. Jigsaw Puzzle.

    This app will allow the user to assemble a jigsaw puzzle from a set of images corresponding to jigsaw puzzle pieces. The user will be able to import puzzles into the app and select one to work on. The app will carefully manage the display space available by allowing user to take some unassembled pieces and bring them onto the view of the partially assembled puzzle. Note: The puzzle pieces must have non-rectangular shapes.

50. Fantasy Football.

    This app allows users to import data from multiple Fantasy Football league sites (e.g., NFL, ESPN, Yahoo, CBS, Sleeper, etc) . The app will provide current statistics related to each team and player. The app will also provide real-time updates to player stats as games are played. There will also be an historical analysis function that tracks success over time.

51. Trip Maker. This app will allow a user to identify an area to visit, some amount of time for trip, and a list of interests, the app will generate a travel itinerary. The app must take into travel times between areas, reasonable amounts of time to actually conduct the visit, etc., in order to produce a draft itinerary. The user will be able to confirm, remove suggestions, add some suggestions, etc. before creating the final itinerary. The app will also support compiling albums of photos taken during the trip.

52. Terp Pro.

    This app will connect students who need a particular service with other students who are willing to provide that service. Through this app, student will can fellow students who are good at something and meet up (virtual or in person) with them to engage in that activity or to provide some specific service for some agreed upon compensation. Example activities/services might include gym buddies, cooking, tutoring, cleaning, etc. The app will verify student status, will provide an alert/notification

feature (if desired) to help users if they feel unsafe during a meet up, and will proactively attempt to match users and service providers for specific service requests. The app will need to support both users and service providers with different user interfaces for each role.

53. See Food.

    This app will allow users to scan the bar code on a food item sold at a grocery store and then check it for specific food allergens (specific allergens are often called out in text). The app will also allow users to suggest substitutes for a particular product that don't have certain allergens. The app will also support a comment feature that allows users to discuss whether they like a specific product, etc.

54. Sleep Diary.

    This app will allow a user to record notes related to the quality of their nightly sleep. The notes can be analyzed with AI techniques to produce a visual record of the sleep quality.

55. X Important Things to Know About Y.

    This app will allow a user to view a segmented presentation about some situation Y. The presentation will include X segments related to situation Y. For instance, such a presentation might refer to something like, "10 Best Study Resources for UMD CS Courses." Each segment can contain one text block and one video clip about some aspect of situation Y. To know what content to display, the system will read a text file located at a given URL. The URL will contain all relevant information about the presentation. At runtime the app will read the file and produce a visual interface to the content.