CS 145 Milestone 1 - ToMEto

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1 Goals

As per our project plan, the two early milestones we wanted to accomplish were:

1. Begin data collecting
2. Set up storate environments

On the specifics of the milestones, these past two weeks we planned on familiarizing ourselves with the environment, i.e. looking at APIs, figuring out which websites to crawl. Additionally, as per last week's meeting, we set out to investigate

1. More of the literature regarding recipe recommendations
2. Existing recipe applications
3. Obtain data quickly, either by scraping ourselves or asking others

2 Progress

2.1 Existing applications

There are several recipe apps, but not many of them are set out to discover new ingredient combinations. Many recipe apps are meant to be primarily used as a ”recipe management system”; step-by-step recipe instructions, cooking tips, saving favorited recipes and suggesting (already existing) recipes based on the ones you have favorited, and so on.
Of the ones that appear to be the most novel and are not just a database for recipes, there are:

1. Yummly - a user inputs dietary restrictions/tastes to find recipes that are tailored to those constraints
2. Tender - similar interface as *Tinder*: the user can swipe left or right on the shown recipe, and recommended recipes are filtered by swipe choices

There are also a number of food pairing apps, but a majority of these are merely food-and-wine pairings, not necessarily food-and-food suggestions. Such an example is Pair It!, which is a subscription-based service that provides recommendations on wine that would pair with a particular cheese or other solid ingredient.

One particular contender is `http://www.foodpairing.com`, which is perhaps the closest in terms of the end case that we wish to accomplish. The approach however, appears to be much more at a molecular level: they use laboratory techniques to categorize ingredients exactly by molecular composition, and determine pairings by looking at combinations or different molecular aromas. This website appears to be geared towards chefs; a quick glimpse at their blog, for example, lists pairings between ingredients that are not commonplace and the preparation is incredibly detailed.

2.2 Literature

Much of the existing literature uses machine-learning techniques to make recommendations, rate recipes, or make suggestions about substituting ingredients, and due to our limited knowledge in this field, it is not a path we wish to pursue much further. Consequently, we refine our search for simpler food-related papers. Before we decided on a use case, we perused through a variety of articles, some of which we list and reflect on below:

1. **Recipe recommendation using ingredient networks:** `http://dl.acm.org/citation.cfm?id=2380757`
   This was the original paper that was our inspiration. The authors scrape allrecipes.com, gathering not only recipes with their ingredients, but user reviews as well. Using machine learning techniques and also some network specific tools, such as centrality measures, they create a rating system for lists of ingredients. They are able to accurately predict user preference not using a full list of ingredients, but by using the relationship between ingredients, indicating there is a significant underlying network effect in play here.

2. **Personalized recipe for healthy choices:** `http://dl.acm.org/citation.cfm?id=1943487`
   This describes a prototype for personalizing recipes such that the result returned to the user is nutritious and healthy. This allows the user to specify down to the nutrient level (e.g. vitamins and fibers), and takes information about the user's past meal choices. This could be something to look further into but there exist a plethora of websites and applications that offer healthy alternatives to certain ingredients in recipes, and often the "tastiness" of the recipe is very subjective, so for the moment healthiness of a recipe is not a use case we'd like to pursue.

   Geography and Similarity of Regional Cuisines in China
   `http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0079161`.
   This is a paper about identifying and explaining how different cuisines in China arose from regional differences in China. They scraped `http://www.meishij.net`, which is a site that categorizes chinese recipes by regions. Their main finding was that regions with similar cuisines were more geographically close, as opposed to having similar climates. Here they used the Pearson correlation

coefficient to determine linearity between two sets of vectors (e.g., a vector of recipes, and a vector of ingredients). The analysis may be worth looking into, because it will help us better understand how to quantify the similarities between a set of ingredients.

2.3 Use case

Because recipe suggestion appears to be largely based on machine-learning, we turned instead our attention a use case that relies less on recommendations, and looks into how food is represented as a graph, and the connections between different ingredients. In particular, we have currently decided to focus on utilizing *fusion of cuisines*, given that particular ingredients may be cross-utilized in different regions. Therefore, our use case is to:

1. User inputs what fusion cuisine they desire
2. Result returns a recipe that is from one cuisine, but contains substituted ingredients that exist in a second cuisine, thereby creating a fusion dish

2.4 Data collection & storage

We have begun acquiring data from online recipe sources, namely `http://cooking.nytimes.com` and `http://allrecipes.com` because their sites make it easy to extract the list of ingredients. We wrote scrapers that crawl the websites, collecting recipe webpages and saving them locally as html/text files. Right now we are downloading recipes at about 1000 per hour from each website. We employ a sleep timer to slow down downloads and avoid being throttled.

For parsing the data, we wrote scripts that employ regex that extract the ingredients from each recipe webpage. Right now the data is still stored locally in text files. In the upcoming week, we will work on post-processing the ingredients list. One specific task that needs to be done is removing the quantifiers (1 cup, 1 tablespoon, etc.) from the `http://allrecipes.com` recipes. The `http://cooking.nytimes.com` recipes have quantifiers separate, so not much postprocessing needs to be done for them.

2.5 Front-end APIs

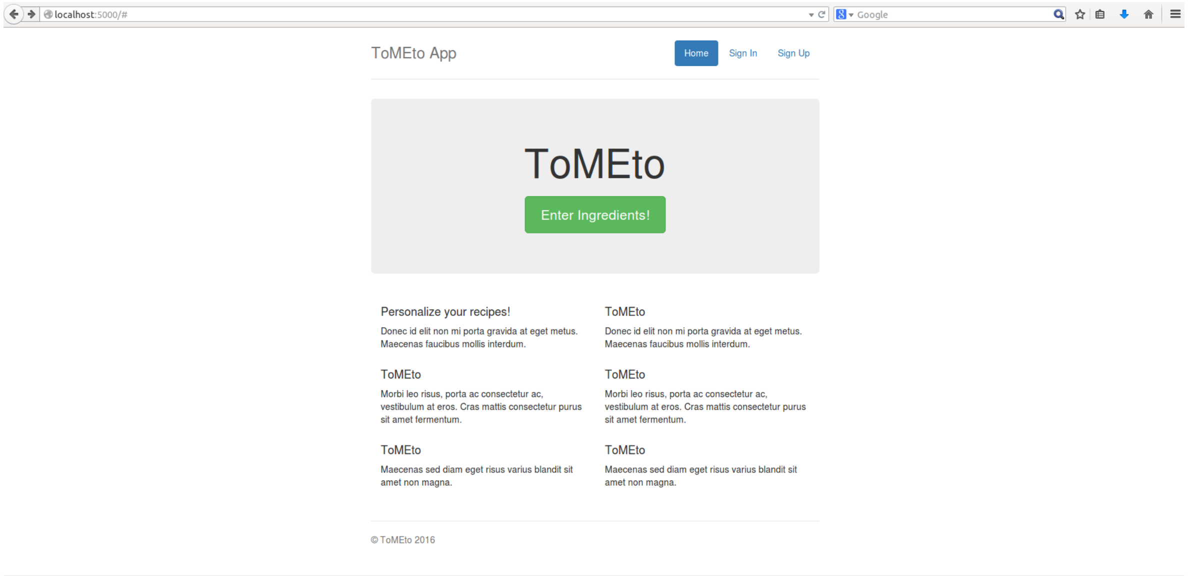
For front-end, we were able to get some baseline code up and running for our website. We currently have two pages, a landing page and then a page that allows you to enter up to ten ingredients. Upon pressing a button, these ingredients are then sent to app.py, which is a python script which will likely handle all of the algorithms with this information. The ingredients are conveniently stored in an array, so that our backend can use these inputs to determine which ingredients to generate.

The following sites were useful in creating this website, which is fully interactive and usable right now.

- http://code.tutsplus.com/tutorials/creating-a-web-app-from-scratch-using-python-flask-and-mysql–cms-22972

- http://www.randomsnippets.com/2008/02/21/how-to-dynamically-add-form-elements-via-javascript/

Here is a screenshot of our landing page:



ToMEto

Personalize your recipes!

Donec id elit non mi porta gravida at eget metus. Maecenas faucibus mollis interdum.

ToMEto

Donec id elit non mi porta gravida at eget metus. Maecenas faucibus mollis interdum.

ToMEto

Morbi leo risus, porta ac consectetur ac, vestibulum at eros. Cras mattis consectetur purus sit amet fermentum.

ToMEto

Morbi leo risus, porta ac consectetur ac, vestibulum at eros. Cras mattis consectetur purus sit amet fermentum.

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Maecenas sed diam eget risus varius blandit sit amet non magna.

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Maecenas sed diam eget risus varius blandit sit amet non magna.

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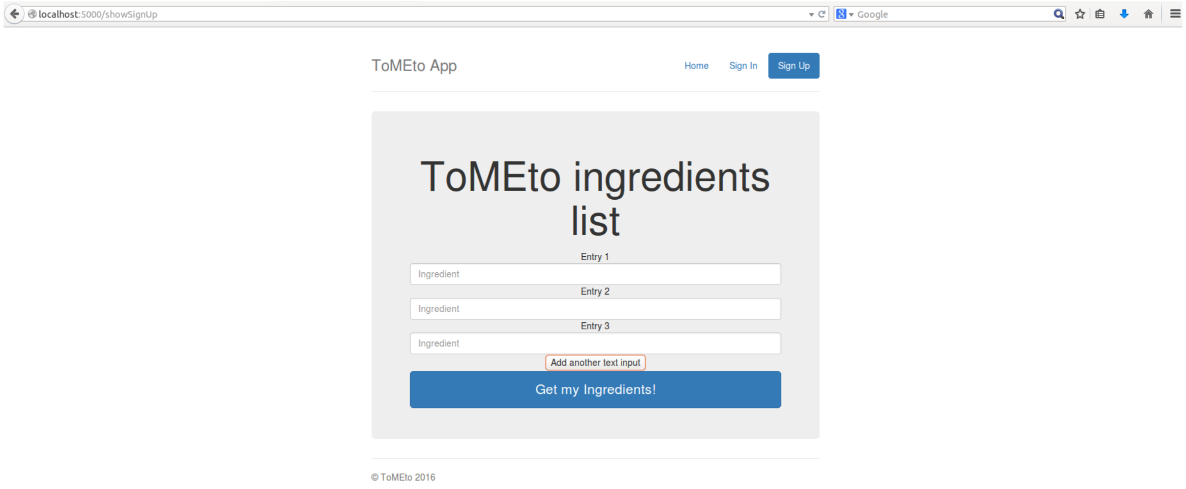
And our submission page:



ToMEto ingredients list

Entry 1

Ingredient

Entry 2

Ingredient

Entry 3

Ingredient

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The major challenge was learning about front-end development. Furthermore, while there existed sites which explained the implementation of certain features, it was difficult to determine how the existing code worked, and modify it as needed.

This basic layout is useful for testing purposes and offers a good foundation for the further development of our web application. From this, we know that integration of back-end and front-end should not be too much of an issue, as the large part of linking the two was accomplished with our test webpage.

TODO: As far as front-end, there is a lot that can be done to improve the overall look and feel of the webpage. Once we get a better idea of our target use cases, we can edit the formatting and the entry forms on our webpage to be more intuitive regarding the use case, as well as add some descriptions on what ToMEto actually does.

3 Contributions

Jonathan Joo: Front-end APIs (2.5)

Matthew Jin: Research on existing applications & literature (2.1-2.2)

Charlie Tong: Data collection & storage (2.4)

Albert Ge: Research on existing applications & literature (2.1-2.2)

4 Adjustments to plan

We've realized the paper reading has and remains an integral source of inspiration for solidifying a use case. While we have certainly met our first biweekly milestone, paper reading will remain part of our work for future weeks, as we need to continue figuring out what analytical methods will work best for our data.