ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

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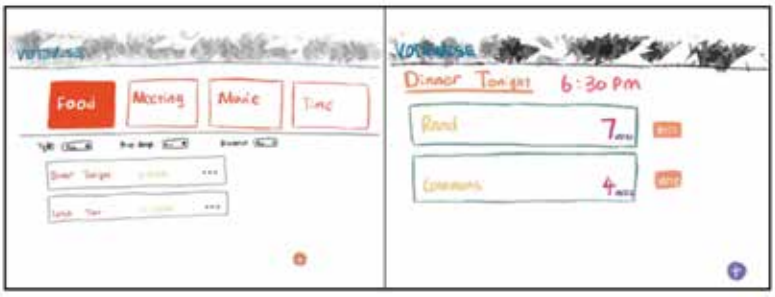
VoteWise

VoteWise is a responsive web application that allow users to poll their preferences for group activities.

Among other things, users can create polls for what to eat, when to leave and where to meet up for activities. Unlike other applications with polls as a side feature, VoteWise serves as a central location for managing all group decisions with easy to track results. Creating polls with VoteWise potentially will reduce time wasted when using group chats for decision making.



Left, Main page user interface. Right, Detailed event page.

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Using Machine Learning Models to Study Financial Market Movement

We are using machine-learning models to determine how well we can predict financial market movement. Focusing on cryptocurrency markets, we are investigating how well different models and algorithms perform in the context of long-term decision making using a moderate amount of past data provided to the models. Our approach aims to optimize decisions to conform to common goals, typically maximizing profit or minimizing loss, and use machine learning to train a model that makes decisions that support the long-term goal. Developing automated trading tools for crytocurrency markets is speculated to provide a stabilizing effect on cryptocurrency prices.

A glimpse into the financial market.

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Use of Machine Learning and Deep Learning Models with Longitudinal EHR to Better Predict 10-year Stroke Risk

Our team is using machine-learning techniques to develop a predictive model for an individual's 10-year stroke risk based on longitudinal electronic health records. Although several studies, such as the Framingham Stroke Risk Profile, have focused on predicting stroke risk, they did so only through the examination of conventional stroke risk factors (i.e. smoking, age, diabetes). Increased attention to stroke prevention behaviors have decreased the prevalence and impact of many conventional risk factors. However, stroke remains a major cause of death worldwide, second only to heart disease, which demonstrates a clear need for new systems to predict risk. Our team is using decision trees along with other models to predict the risk of stroke in patients and comparing the performance of such techniques with the Framingham Stroke Risk Profile.

```
def id3(data, list_of_features):
    global counter
    if data.empty:
        return None
    potential_classifier = check_if_classifiers_all_same(data)
    if potential_classifier != False or len(list_of_features) == 0:
        return  Decision_Node(get_majority_classifier(data), data)
    max_info_gain = 0
    best_feature = 0
    best_feat_num = 0
    feat_num = 0
    for feat in list_of_features:
        info_gain_of_set = infoGain(data, feat, feat_num)
        if info_gain_of_set > max_info_gain:
            max_info_gain = info_gain_of_set
            best_feature = feat
            best_feat_num = feat_num
        feat_num = feat_num + 1
    if best_feature == 0:
        return None
```

A snapshot of the ID3 algorithm used to determine the best feature in decision trees.

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ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Hot or Not: Using Machine Learning to Classify Success of Boy Bands

Boy bands like *One Direction, Five Seconds of Summer* and the *Jonas Brothers* dominate popular music. This is not new. Boy bands have played a significant role in pop culture for the last 70 years, but what makes certain bands achieve huge and lasting success while others struggle to reach relevancy? We are using machine-learning techniques to explore the relationship between certain features of boy bands such as brand sponsorship and demographics, and their success. We aim to create a classifier to predict the success of emerging boy bands and determine which features are the best predictors of success. We are investigating ways to use this fun and accessible topic as a way to demonstrate how machine learning works.

Boy bands, past and present.

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Flight Delay Predictor

Our team is building a flight delay prediction app using Python. The application uses flight information such as date, weather predictions, starting point and destination to predict if a flight will be delayed or not. The application uses various supervised learning algorithms from machine learning to make a prediction. We also are creating a web-based user interface to interact with the application. Our overall project goal is to give a user the opportunity to check the probability of delays before booking flights. This predictive capability would be useful to travelers and to airlines.

The struggle with flight delays is real.

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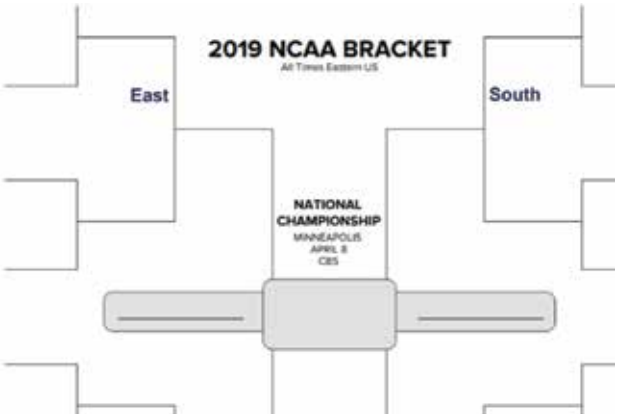
Predicting March Madness Using Machine Learning

Our team is developing a machine-learning model to predict NCAA men's basketball games. Using averaged team stats for both teams going into a game, the model will predict a score and winner. We are training the model on conference games from all Division 1 teams over the past 10 years. We will evaluate our model on NCAA and conference tournaments and to a subset of regular season games. We are experimenting with a variety of machine learning techniques including decision trees, neural networks, Bayes classifiers and nearest-neighbor models. Although predicting a 68-team tournament is a challenge, we will study how well our models work and why on individual games as well as on full tournament prediction.



NCAA Men's Basketball Tournament bracket before the model makes its predictions.

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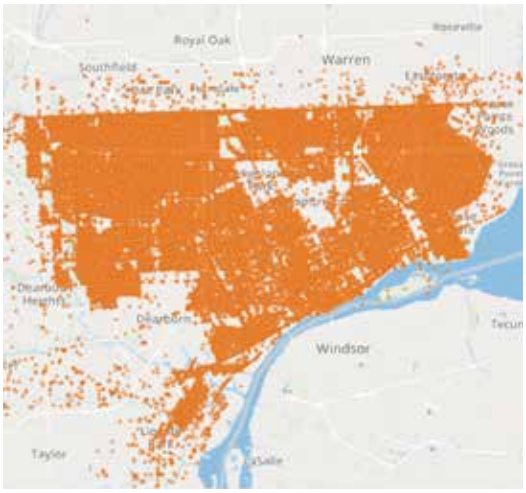
Exploring Police Response Times in Big Cities through Machine Learning

Data from 911 calls and the subsequent responses by emergency services are an example of "big data" analyzed for insights using new technology-based approaches. Analyses of urban area data could yield important findings for emergency service agencies to refine and improve their services. Our team is using supervised machine learning techniques to explore police response times in Detroit. Using public datasets on 911 calls and corresponding response times from the Detroit Police Department to build our models, we are investigating if response times can be predicted from other known features of the incident such as time of day, location (including demographic information of the area), kind of incident, proximity to a police station, and more. We also are examining the extent to which our results are generalizable to other large cities in the United States.



A map of police calls for service in the City of Detroit from Sept. 20, 2016 to March 19, 2019. Each orange dot represents a response to either a 911 call or an officer-initiated call. Source: Detroit Police Department

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Supervised Learning Algorithms for March Madness Bracket Predictions

We are developing a variety of algorithmic classifiers using popular machine learning techniques such as decision trees, neural networks, K-Nearest Neighbors and Naive Bayes classification to explore which approach is best suited to the task of bracket prediction. For such predictions, an agent picks a probable winner for a match-up between two teams using a variety of historical data such each team's current season statistics (seed, win/loss percentage, shooting accuracy, conference, past tournament matches, etc.). The agent will try to learn the potentially complex relationships among these statistics to predict the outcome of the match. A successful classifier presents both financial and academic value by possibly revealing non-intuitive relationships and reinforcing or disrupting traditional thought, or revealing which traditional beliefs are the most impactful for accurate decisions.

NCAA MARCH MADNESS

NCAA March Madness, Division I Men's Basketball Tournament.

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