

*January 18, 2017*

**Student Projects**

App for Answer Sheet Automatic Recognition

Cheng Lyu Bachelor’s May 2019 Electrical & Computer Engineering / Computer Science

In many tests like SAT, the answer sheet is a piece of paper with many circles to be filled with 2B pencil. Manually grading this kind of answer sheet is frustrating. So I provide an easy way to automatically identify and grade the answer sheet by using computer image recognition. The final product will be a phone APP, by which the teachers only have to take a picture of the answer sheet using their smart phone and let the APP recognize and grade the answer sheet automatically.

Campus Wallet

Mitchell Kim Bachelor’s May 2018 Electrical & Computer Engineering / Statistics

Kedar Prabhudesai PhD May 2018 Electrical & Computer Engineering

Victor Wang Bachelor’s May 2018 Computer Science

You're tired and you need some coffee. Therefore, you walk into Duke's best coffee shop, Joe Van Gogh. You buy your espresso drink and you're about to get your wonderful stamp. Oh wait, you forgot your card. You ask for a new stamp card. Next week, you come back. You're about to get your stamp. But again, you forgot your card!

Admit it, this has happened to you before. By the time you realize you want to collect your 10 stamps for a free drink, you realize you've gone through so many unused single stamp cards. We've figured out how to solve this problem, already partnered with Joe Van Gogh, and also found a way for you to track your caffeine intake!

If you are interested in tracking your caffeine levels and the amount of coffee you drink, you are likely also the kind of person who would use a coffee shop loyalty program, or even multiple. CampusWallet is not just your regular loyalty card. It is an all encompassing coffee companion. CampusWallet offers a way to track both the health and the loyalty program for needs of coffee drinkers while providing the analytics and outreach a company needs to grow their brand and better interact with its most loyal customers. We are working closely with on-campus coffee shops like Joe van Gogh, Saladelia and Red Mango to make CampusWallet the only app you need for all your on-campus coffee and loyalty needs. CampusWallet is an opportunity to benefit consumer health and business performance by bringing together what brings us together: coffee.

Device Prototyping in Robotics

Peter Moran Bachelor’s May 2017 Electrical & Computer Engineering

Two different devices built and developed for integration in large scale robotic projects. (1) An easy to command 3-joint robot that provides extra precision to imprecise robotic arms and give them ability to press buttons by acting as a pointer finger. (2) A fully isolated, self-powered, data logging 10-dof IMU module modified for aquatic use to 1000 ft depth, for use in underwater localization.

Dodge the Potholes

Jonathan Buie Master’s May 2017 Electrical & Computer Engineering

Young-hoon Kim Master’s May 2017 Electrical & Computer Engineering

Colby Stanley Master’s May 2017 Electrical & Computer Engineering

In this project, we developed a 2-dimensional top down driving game for the iPhone/iPod Touch. The user's car is controlled by using the gyroscope in the iOS device, and the objective of the game is to dodge the potholes. However, in addition to potholes there are other obstacles such as traffic zones and elderly men that reduce the number of lives the user has remaining. Other features include a store where items like new songs and cars can be purchased and a leaderboard where users can see how their scores stack up against the world.

Duke Tents

Emily Meng Bachelor’s May 2019 Computer Science / Linguistics

Darryl Yan Bachelor’s May 2019 Computer Science

A Python web application that builds and manages tenting schedules for Duke's basketball tradition.

Fava -- Social Delivery for Immediate Gratification

Gilbert Brooks Bachelor’s May 2017 Computer Science

Fava is a social delivery application deploying this spring. We will leverage the good will and camaraderie on Duke's campus to make getting a meal or obtaining medicines not requiring a prescription, or even homework from a missed lecture, as simple as sending a request to our application.

Glance, Focus and Point: Hand Pose Estimation by Recurrent Neural Network with Attention

Weiyao Wang Bachelor’s May 2018 Computer Science

This project proposes a novel data-driven approach for 3D hand pose estimation, which mimics how human handles this task: glance, focus and point each joint one by one. It first predicts the coarse region of each joint based on features extracted from Variational Autoencoder (VAE), and then the Recurrent Neural Network (RNN)  sequentially fuse the low level features of each region to predict the corresponding joint. This approach incorporates both global and local information to make prediction and model dependency across joints without hand-designed model or iterative refinement loop.

Kitchen Queues: Smart Cooking

Daniel DeVeau Bachelor’s May 2018 Computer Science

Kitchen Queues aims to speed up restaurants by helping chefs choose what to cook first on busy, overwhelming nights. This will be achieved by an integer program (in development) which sorts food orders in real time, eliminating possible miscommunication between cooks, and ensuring that customers receive their food as quickly as possible.

Project Prism

Andrew Arnold Bachelor’s May 2020 Electrical & Computer Engineering / Computer Science

Jeremy Morgan Bachelor’s May 2020 Electrical & Computer Engineering / Computer Science

Remotely controllable and autonomous quad-bot capable of charging drones in remote regions.

Self-consistent numerical solver for wave optics simulation based on hybrid boundary-integral spectral element method

Jun Niu PhD May 2017 Electrical & Computer Engineering

Development of advanced numerical solvers for efficient and accurate wave optics simulation, including linear and nonlinear processes, is essential for the estimation, design, and fabrication of opto-electronic devices. The boundary-integral spectral element method (BI-SEM) has demonstrated considerable promises in computational electromagnetics, yet related higher order methods have not been elegantly extended to the area of computational optics/ photonics. In this work, a self-consistent numerical solver is proposed for wave optics simulation. Starting from the BI-SEM theory, highly efficient numerical solver is developed for linear and non-linear optical simulation for both periodic and non-periodic structures. With a novel hybrid radiation boundary condition, the solver can self-consistently switch between periodic simulation and non-periodic simulation with minimum cost. In the meantime, the layered structure commonly encountered in optical designs are also carefully addressed. Combined with the matrix-friendly periodic dyadic layered medium Greenâ€™s function and the block-Thomas method, both the flat stratified medium and the multi-layer structure with curvature can be efficiently analyzed. Typical testing applications have validated the proposed solverâ€™s great potential in both performance estimation, such as defect analyses in extremely ultraviolet lithography, and opto-electronic structure design, such as the third-harmonic engineering of graphene. As an on-going investigation, singularity subtraction for the thin layered structure and the domain decomposition method are being integrated with current solver for further performance enhancement.

SLAM team for Shell Ocean Discovery XPRIZE Blue Devil Ocean Engineering

Mingfei Chen Master’s May 2018 Electrical & Computer Engineering

Shangxing Sun Master’s May 2018 Electrical & Computer Engineering

This project is done to develop Synthetic Aperture Sonar Diving Pod to detect deep ocean, collect data and create models of ocean measurements. The work of our group is to do Offline Location and Mapping applying Simultaneous Localization and Mapping(SLAM). Up to now we have done some jobs on designing bathymetric SLAM algorithms and doing simulation using ocean acoustics models. In the future our group will try to match simulation with measurements,build 3D ocean maps and do global optimization.

Tetris AI Design

Wanxin Yuan Master’s May 2018 Electrical & Computer Engineering

This is an Independent project. Designed a Tetris game with C++ and displayed the game progress with a graphical interface. Applied A\* algorithm to determine the best possible move on each turn thus making the game can play automatically.

App for Answer Sheet Automatic Recognition

Hassan Albalawi Ph.D. July 2018 Electrical Engineering

WakeCap serves as the first optimum and smart safety solution for outside workers to prevent heat-related illnesses. WakeCap technology is utilizing the identical safety helmet which the workers are mandated to wear, and combines WakeCap’s state-of-the-art technology to monitor the user’s heat stress levels.

WakeCap’s innovative technology then guide the worker through personalized guidelines to prevent heat-related illnesses. These guidelines include the amount of water needed to drink and how frequent, when to rest, and when to totally stop. These guidelines are not equal for everyone; that’s why WakeCap employs machine-learning algorithms to learn the worker’s behavior in response to different heat index measures. WakeCap’s technology can also alert respective manager in cases of emergency. WakeCap was ranked as the best project in 2015 by an expert committee from Stars of Science -Qatar Foundation’s funded project-.