Campus Sustainability Grants Program - Application Form 2014-2015

Application Materials:

- Pre-proposal (Described below; optional)
- Cover Sheet
- Project Overview (Attach; 2-page limit)
- Compliance Requirements Form
- Budget Sheet
- Implementation Plan (Attach; 4-page limit)
- Communications Plan (Attach; 1-page limit)
- Faculty / Staff Sponsor Letter of Support (Attach; 1-page limit)
- Additional Supporting Documents &/or Recommendations for Future Support (Attach; optional)
- List of Anticipated Grant Project Metrics (1-page limit; see Campus Sustainability Grants Program – Reporting Guidelines for reference)

Program Contacts:

Office of Sustainability, sustain@uga.edu; (706) 542-1301
Kevin Kirsche, Director, Office of Sustainability, Kkirsche@uga.edu; (706) 542-1301

Notes to Remember:

- The optional Pre-proposal submission is strongly encouraged to receive feedback from the Office of Sustainability for incorporation into final Proposal. Pre-proposal must include Cover Sheet (included in this application form) and Proposal Overview (as described in program Guidelines).
- Consult appropriate faculty and/or staff members as well as your faculty/staff sponsor when creating a project budget and to verify project implementation commitment and feasibility.
- All Campus Sustainability Grant funds must be expended by June 30th and in accordance with UGA policies and procedures. UGA employee(s) will assist successful proposals with all fiscal matters, and all purchases will be made by UGA staff.
- Additional Supporting Documents &/or Recommendations for Future Support may be attached as needed.
- All grant application materials must be submitted at the same time and within program deadlines.
- Review all required documents for mistakes or errors before submitting final grant proposal.
- Final proposals shall be follow standard file name format (“Proposer’s Last Name_Campus Sustainability Grant_Project Title.PDF”) and shall be submitted in PDF format via email to the UGA Office of Sustainability, sustain@uga.edu.
- A completed Report of Grant Project Expenses and Metrics is required upon completion of awarded projects.
**PROPOSAL INFORMATION**

Project Title: Analyzing Electric Vehicle Use in the University of Georgia and Athens Community

**PRINCIPAL STUDENT INVESTIGATOR (PROPOSER) INFORMATION**

Name: Huawei Yang, Kevin Wu  
Email: hy78964@uga.edu, kwu@uga.edu  
Phone: 573-202-8258, 404-200-8785  
Degree Program / Graduation Date: PhD in Engineering/2017, Undergraduate in Engineering/2015

**FACULTY / STAFF SPONSOR INFORMATION**

Name: Dr. Zion Tse  
Email: ziontse@uga.edu  
Phone: 706-542-4189  
Title / Department: Assistant Professor / College of Engineering

**ADDITIONAL PROPOSAL INFORMATION**

The proposal includes the following fields (check all that apply):

- [X] Education  
- [X] Research  
- [X] Service / Social Entrepreneurship  
- [X] Campus Operations

**Summary of Budget:**

<table>
<thead>
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<th>Category</th>
<th>Amount</th>
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</thead>
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<tr>
<td>Personnel Funding</td>
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</tr>
<tr>
<td>Equipment</td>
<td>$0</td>
</tr>
<tr>
<td>Supplies / General Expenses</td>
<td>$4,800</td>
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<tr>
<td>TOTAL</td>
<td>$4,800</td>
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</tbody>
</table>
Campus Sustainability Grant Application – Compliance Form

Please answer all of the following questions, and explain in full where required.

Will this project require compliance review in any of the following areas?
Please place an “X” on the appropriate line to indicate “Yes” or “No” for all three compliance areas.

1. Animal Use
   _____ Yes
   __X__ No
   If “Yes,” please reference the section and page number in the proposal describing animal use:

   For more information contact:
   706-542-5933

2. Biohazardous Materials
   _____ Yes
   __X__ No
   If “Yes,” please reference the section and page number in the proposal describing biohazardous material use:

   For more information contact:
   706-542-9876

3. Human Subjects
   _____ Yes
   __X__ No
   If “Yes,” please reference the section and page number in the proposal describing human subject use:

   For more information contact:
   706-542-5318

Name: Huawei Yang, Kevin Wu
Title: PhD student, Undergraduate Student Researcher
Date: 09/08/2014

__X__ By placing an “X” on this line, I certify I will fulfill all requirements pertaining to compliance if this grant is approved.
## Campus Sustainability Grant Application – Budget Sheet

Complete all sections.

### I. Personnel**

<table>
<thead>
<tr>
<th>Number</th>
<th>Amount/Person</th>
<th>Total Amount</th>
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<td>Other 0</td>
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<td>2.</td>
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<td>3.</td>
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<tr>
<td><strong>Total Cost:</strong></td>
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<td>$0</td>
</tr>
</tbody>
</table>

### III. Supplies/General Expenses**

<table>
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<tr>
<th>Type of Supplies</th>
<th>Comment</th>
<th>Cost</th>
</tr>
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<tr>
<td>1. EV users recruit</td>
<td>$40 Amazon Gift Card for Recruitment X15</td>
<td>$600</td>
</tr>
<tr>
<td>2. Connectors and Cables to Connect Nissan Leaf</td>
<td>ELM 327 Bluetooth Diagnostic Scanner and Cables X15</td>
<td>$325</td>
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<td>3. 15 Android smartphones with 1-year cellular plans</td>
<td></td>
<td>$3600</td>
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<td>4. Data Analysis and Streaming Software</td>
<td>Leaf Spy X15</td>
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<td>5.</td>
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<td>6.</td>
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<td></td>
<td>$</td>
</tr>
<tr>
<td><strong>Total Cost:</strong></td>
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</tbody>
</table>
Acceptable personnel funding include: 1) hiring outside consultants or contractors to perform required project tasks, 2) UGA Facilities Management Division staff labor charges for project implementation, 3) UGA student workers managed by participating UGA department to perform required project tasks.

**If more space is needed, please attach a separate document listing specific items and their costs.

Note: All Campus Sustainability Grant funds must be expended before June 30th.

Campus Sustainability Grants Program - Application Form 2013-2014

Attach the following additional proposal components to this application:

- Project Overview (Attach; 2-page limit)
- Implementation Plan (Attach; 4-page limit)
- Communications Plan (Attach; 1-page limit)
- Faculty / Staff Sponsor Letter of Support (Attach; 1-page limit)
- Additional Supporting Documents &/or Recommendations for Future Support (Attach; optional)
- List of Anticipated Grant Project Metrics (Attach; 1-page limit; see Campus Sustainability Grants Program – Reporting Guidelines for reference)

Thank you for applying for a Campus Sustainability Grant.
We look forward to reviewing your application!
Project overview: Analyzing Electric Vehicle Use in the University of Georgia and Athens Community

A. Developing Electric Vehicles Market: Electric Vehicles (EV) are becoming more and more popular in the US, driven by the government and the automotive industry (Fig. 1) [1]. The United States has the largest EV market in the world in the past few years thanks to both federal and state incentives [2], and the fact that EVs are environmentally friendly and energy-efficient [3]. In 2013, sales of Plug-in Hybrid Electric Vehicles (PHEV) jumped 27 percent from 2012, and more excitingly, sales of Battery-Electric Vehicles (BEV), achieved a 241 percent jump in 2013, to 47,600 in total. Sales of Tesla Motor’s Model S and Nissan’s Leaf also leapt up, with 18,800 and 22,610 sales, respectively [4].

This rapid growth in 2013 indicates that Americans are interested in highly efficient, environmentally friendly EVs, and this growth will continue for years to come. Unlike traditional cars, BEVs are powered exclusively by batteries and require special charging stations. While the EV infrastructure is expanding significantly, charging stations are still relatively rare in light of the high demand. According to the US Department of Energy, there are only 8,468 public charging stations in the US, and most of them are located on the coasts [5]. Today, EV users primarily charge their cars at home with a suboptimal garage charging station. Since the power level for home use is relatively low, garage charging is slow. For the Nissan Leaf, a level 1 charge, which is the typical charging station for daily use at home, takes an entire night to charge the vehicle enough for a 40 mile trip [6].

Obstacles to Electric Vehicle Use: Issues facing charging station and EV providers include: how fast can the EVs be charged without damaging the batteries? How much power can the power grid provide at what electricity prices ($/kWh)? Where should the chargers be located? How to balance between the charging speed, battery life, and the associated cost for fast charging infrastructure?

EV battery package is an expensive part of the EV cost. A larger power rating battery package would get more distance range per charge in return for more expensive and heavy batteries. For example, the Tesla model S battery costs a quarter of the total EV cost, around $20,000 or $238/kWh [7]; for the Nissan Leaf, the battery cost is almost half the total price, which is around $10,000 or $416/kWh [8]. Battery optimization to balance the cost and the distance range would be a worthwhile study for car manufacturers and will save money and make EVs a more attractive purchase, encouraging sustainability in the community and nation [9].

Electric Vehicle Popularization in Athens and UGA’s Role: UGA installed the first public level 2 EV chargers in UGA Athens Campus North Deck in May 2014, and there are currently five charging stations serving the Athens community (Fig. 2). As EV usage increases gradually, UGA Parking Services and the Office of Sustainability together plan to install more charging stations around the campus to meet the needs of faculty, staff, students and visitors at UGA. JuiceCar Inc, an Athens startup company that provides EV rental services (Fig. 2), is partnering with UGA College of Engineering to promote EV use on the UGA campus as well as in Athens.
In this project, we will implement smartphone technology (Fig. 3) to analyze EV use within the Athens and UGA communities, which will allow the UGA Parking Services, Sustainability Office, and Athens Transportation & Public Works Department to plan and optimize the locations and installations of EV charging stations. Partnering with a local Athens startup, JuiceCar Inc, to promote EV use, this project could contribute to the UGA sustainability plan of reducing carbon emissions by helping people understand EV and increasing the amount of EV use within the UGA as well as Athens communities.

B. Expected Outcomes:
Smartphone technology for EV monitoring has been tested in our in-house Nissan Leaf EV at UGA College of Engineering. The focus of this project will be to analyze EV usages in Athens Community and the methods are detailed in the following steps:

1) Data will be collected from at least 15 EVs in Athens regarding daily charging habits and EV battery parameters of Athens Nissan Leaf users. We aim to analyze patterns such as daily miles driven, parking time and locations to optimize charging station locations and determine the necessary battery charging speed (Level 1 and 2, and DC fast charging) required during office hours and weekends. The parking time, location and battery state data will be helpful in analysis of charge frequency and identify the users’ favorite charging locations. Those data will provide important information for manufacturers to improve their EV designs and optimize the placement and installation of EV charging stations.

2) Information about battery capacity loss will be collected and analysis over the course of the project. The results will help EV users monitor and optimize their battery performance.

3) After a year-long data collection, a database will be created. The analysis of optimized charge station location, daily drive mileage etc. will help Athens and UGA transportation officers, battery charging station providers and EV manufacturers create more realistic and efficient strategy plans to optimize charging station locations, charging speed levels and battery capacity for different EV users.

4) Students in the Senior Year Capstone Design (ENGR4920) course, instructed by Dr. Zion Tse, will have chances to help collect and analyze EV usage data and gain hands-on experience in locating, understanding and evaluating EV information, which will inspire more students to conduct graduate level research develop critical thinking, communicating and working with people in diversity, as contributing to the UGA 2020 Strategic Plan, Strategic Direction I,II, building and enhancing the undergraduate education and graduate program [10].

C. Contribution to Sustainability at UGA:
Currently, there are approximately more than 10,000 of EVs being used in Georgia, and this number is increasing [11, 12]. The university is also considering installing more charge stations around the campus for university and Athens EV users. Using the results of this research project, we will optimize the locations of new charging stations and encourage more individuals to drive EVs without range anxiety. Driving tips for maximizing EVs’ fuel efficiency and battery life will be provided to EV users. Consequently, this project will encourage more EV usage around Athens Community, leading to less gasoline usage, reducing carbon emissions and more efficient energy consumption [13], as contributing to Strategic Direction VII [10]. The study data will also be provided to UGA and Athens officials, Georgia Power and JuiceCar for promoting EV usage.

D. Relevant Partner Organizations and Departments
1) Student Team: Huawei Yang, PhD student, Kevin Wu, Undergraduate student, College of Engineering
2) Project Advisor & Supporting Team: Zion Tse, PhD, Assistant Professor, College of Engineering; Dan Geller, Research Engineer, College of Engineering; Jerry Perry, Office of Sustainability; Don Walter, UGA Parking Services.
3) Partner: Mike Jerue, Founder of JuiceCar, Blair Fairley, Electric Transportation Engineer of Southern Company Services, Inc.
**Implementation Plan:**

**A. Background:**

Although Electric Vehicles (EV) have been proven to be more energy efficient and environmentally friendly than gasoline vehicles, EVs are still not a major mode of daily transportation due to the fact that there are not enough EV charging stations available, and the charging time varies from 30 minutes (using DC fast charging) to a couple of hours (using standard level 2 charging) [14]. Level 2 chargers supply 240V AC voltage with up to 19.2kW, while DC fast chargers can go up to 50kW at 480V AC input voltage [15]. Take the Nissan Leaf for example: with its 44kWh battery, a level 2 charger will take nearly 3 hours to full charge, and a DC fast charger could charge the battery to 80% in less than 30 minutes [16]. Installing more EV charging stations in Athens could encourage EV usage and improve the sustainability of the UGA campus and the Athens local community. However, a number of practical issues will need consideration, such as where to put the charging stations, whether level 2 or DC fast chargers should be installed, and how the extra charging stations will affect EV users’ driving behaviors. This proposed study aims to perform a yearlong investigation of EV usage in the Athens community by using smartphone devices to collect and stream data from EV computers. The acquired data will be analyzed statistically to determine the optimal charging station location in Athens.

**B. Significance:**

Smartphone technology for EV monitoring has been tested and integrated into our in-house Nissan Leaf EV at the UGA College of Engineering. The focus of this project is to analyze EV usage in the Athens community. After a year of data collection, a database will be created. The analysis will help Athens and UGA transportation officers, battery charging station providers, and EV manufacturers create more realistic and efficient strategy plans to optimize charging station locations, charging speed levels, and battery capacity for different EV users. It will also increase EV users’ knowledge on their EV battery performance and when to charge their battery most efficiently [17].

**C. Project Goals:**

This project aims to implement data collection devices, based on smartphones, with Leaf custom software applications to capture and transfer EV data wirelessly 24/7 via 3G network from 15 EV users around Athens. We will analyze daily EV use to determine optimal locations and power ratings of charging stations, EV battery capabilities, and electricity prices based on EV users’ driving behavior. This project has two specific implementation stages as follows:

**Task 1: Develop Software and Hardware for EV Monitoring**

We aim to set up, test, and optimize the software and hardware for EV data collection and streaming (Fig. 1). We have been collaborating with JuiceCar LLC to optimize our data logger design to make sure that data can be recorded and transferred wirelessly and reliably. JuiceCar is a local startup in Athens providing EV rental services, and has 3 EVs used for EV sharing in the Athens community. Preliminary installation and data collection has been pilot tested in the JuiceCar EVs. We will assemble and install a total of 15 setups in EVs belonging to participating drivers from the Athens area.

**Task 2: Recruit Users, Collect and Analyze Data**

We aim to recruit EV users in Athens for our study, particularly UGA faculty, staff, and students. As Nissan leaf has the dominating market share, the recruitment will mostly within leaf users [4]. We have been in contact with the EV Club of
the South (www.evclubofthesouth.wildapricot.org) to work out a systemic EV user recruitment plan in the Athens community. After user recruitment and installation, the setups will be able to collect data and transfer them wirelessly to the campus-based server 24/7. Received data will be summarized, analyzed, and compared with data from local EV charging stations such as ChargePoint\textsuperscript{®} station at UGA North Deck.

D. Approach:

Task 1: Develop Software and Hardware for EV Monitoring

The setup (Fig. 1), namely “EV Dr.” prototyped by our student team, includes an ELM 327 OBDII Bluetooth CAN-BUS auto diagnostic tool, an android smartphone with Leaf spy and Dropsync software applications (apps), and a portable back-up phone battery that can be charged by a 12V car power outlet. The ELM 327 tool will first obtain the data and transfer it to the phone via Bluetooth. Next, the Leaf spy app will create a log file to record the data in the phone. Finally, the Dropsync app will synchronize the log file to a remote Dropbox account.

Task 1.1: Pilot Testing and Preliminary Data

Preliminary data from our pilot study with the EVs from JuiceCar shows the feasibility of our data recording prototype. Fig. 2 (a-c) shows number of trips, mileage range per trip, and daily EV activities. Fig 2(a) shows the trips distribution of the blue Leaf from 9/18 to 10/4 (the total number of trips is 95). Most trip numbers vary from 4 to 9 per day. Fig. 2(b) describes the mileage range distribution per trip. Of 346 trips total, 85% are less than 5 miles, 13% range from 5 to 15 miles, and 2% exceed 15 miles. Fig. 2(c) shows the locations the EV travelled. The latitude and longitude are also recorded. This data will help analyze users’ most frequent parking places and the interval of time between parking at each place. Fig. 2(d) describes the relation between travel distance and CO\textsubscript{2} emission reduction. Approximately, this rate is fixed, indicating a linear relation between them.

Task 1.2: Optimize Existing Software and Hardware
**Task 1.3: Assembly of 15 Sets of EV Dr. Prototype**

After setting up the software and hardware successfully, 15 setups will be built and tested in two pilot Nissan Leafs from JuiceCar for data collection. This will include the ELM327 Bluetooth, a smartphone with data plan, a portable backup battery to power the phone up to 14 days (when the Leaf engine is off), and an industrial compact ABS box of 15cmX7cmX4cm to contain those devices placed inside the front cabinet of the car. The portable backup battery will be connected to and charged by the Leaf 12 volt power outlet whenever the Leaf engine is started.

**Task 2: User Recruitment and Data Collection**

**Task 2.1: Recruit 15 EV Users**

Initially, 15 Nissan Leaf users in different locations around Athens will be recruited to participate in this project. The *EV Dr.* installation is very simple, does not change any existing setup in the EV, and takes approximately 10-15 minutes. The installation will be provided by our student team free of charge. Data collection will then be started, with the driving and battery data wirelessly and automatically updated to our UGA webserver 24/7 for the entire 2015 spring semester. The 15 recruited EVs will be based in the Athens area, including on-campus EV users. Recruitment flyers will be posted to the ChargePoint® charging station at UGA North Deck and emails/flyers will be sent to the EV Club of the South. $20 Amazon gift cards will be given to participants as an incentive to join the study.

**Task 2.2: EV Driving Habits from EV Dr. Data Analysis**

Data analysis will be performed automatically every hour by our web-based Matlab/Python data processing program, generating real-time information about the most common parking places, the duration of parking in these parking places, median and average daily miles traveled, the relationship between driving behavior and environment, etc. The data analysis will include a heat map on google maps to indicate the best position to locate a new public charging station in Athens, the average and median drive range, average parking time at most frequented parking lot, temperature impact on battery, and the best charging location according to different usage and driving habits. By analyzing temperature and battery level data, information will be provided to users for efficient driving habits and the temperature effects on battery performance. The recorded geographic information will help UGA Parking Services, UGA Office of Sustainability, and Georgia Power optimize the locations and power ratings of future charging stations in the Athens community.

**Task 2.3: Data Analysis from EV Dr. and EV ChargePoint® Charging Station**

*EV Dr.* will create a log file to record the data in the phone and the Dropsync app will synchronize the log file to a remote Dropbox account. The logged data will be uploaded to the project server, analyzed, and displayed synchronously on a password-protected UGA website where all data will be anonymized.
Charging data at the UGA North Deck ChargePoint® charging station will provide valuable information about the duration, frequency, and power requirement for each charging session, which will be useful in determining EV users’ charging habits.

Previous data analysis from the EV ChargePoint® charging station at UGA North Deck can be seen in Figure 4.

Data collected from the 15 recruited EV users will be analyzed alongside the data from the ChargePoint® charging station. These two sets of data have different emphases. The EV Dr. data focuses on driving habits and EV performance by recording the travel distance of every trip, the energy consumed, the CO2 emission reduction, etc. The ChargePoint® charging station data focuses on charging habits, so it is a useful supplement to the EV Dr. data. Analyzing both the ChargePoint® charging station data and the EV Dr. data will provide a comprehensive understanding of EV usage.

**Task 2.4: Data Sharing**

The acquired data and the generated reports will be released to the public and organizations related to this study, including Georgia Power (the charging station provider), UGA Office of Sustainability, Athens transportation officials, and the Nissan EV Division (the EV manufacturer). Driving suggestions will be provided to EV users in Athens and the EV Club of the South to help EV users establish efficient driving habits.

**E. Data Analysis Methods**

The data is recorded by Leaf spy and generated as a comma separated value (CSV) file. In this file, almost all the key features are included. With the battery level, temperature, and driving speed, a formula predicting the mileage remaining will be proposed. With the latitude, longitude, and time, the average parking time at the most frequently parking lot will be discovered. Battery level will also indicate to the driver when they should charge the battery. For example, the analysis could yield a monthly summary of the average number and hours of trips, average and median mileage in these trips, monthly number of charge sessions and their average durations, energy transferred per charging event (Fig. 4(a)), and relation between charge time and energy (Fig. 4(b)).

**F. Project Timeframe and Major Milestones (Table 1)**

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<th>Feb 15</th>
<th>Mar 15</th>
<th>Apr 15</th>
<th>May 15</th>
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<td>1.2 Acquire 15 sets of EV Dr. setup</td>
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<td>2.1 Recruit 15 EV Users</td>
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<td>2.2 EV User Data Analysis</td>
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<td>2.3 Comparison between data from EV users &amp; ChargePoint® station</td>
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<td>2.4 Proposal report and presentation to UGA Office of Sustainability</td>
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<td>HY: Huawei Yang, KW: Kevin Wu</td>
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</table>

**G. Merit and Feasibility of Implementing the Project with Available Resources**

After data collection and analysis, new charging station locations will be proposed according to EV users’ driving behavior. Based on the charge duration, average distance per day, and parking duration, the optimal power rating of the charge station can be determined. Also, this project can be continued after the installation of new charging stations on campus and in Athens to study changes of EV users’ driving behavior. This project will build up a rigorous study protocol to examine cost-/time-efficiency of EV charging infrastructures in Athens. It can also study the reduction of carbon emissions due to increased EV usage in UGA and the Athens area.
References:


Communication Plan:

We will work with the University of Georgia College of Engineering, Office of Sustainability, JuiceCar Company to promote this project as an effort to increase UGA campus and Athens sustainability with the following strategies:

Campus Exhibition:

1) A website will be established to show the synchronous data uploaded though EV Dr. Setup to monitor the daily use of different leaf cars. On the website, the geographic hotspots will display the most frequently places EVs are parked. In addition, a questionnaire will allow people to vote on where they think the best spot would be for a charge station.

2) A press release would be sent out to reporters and editors about EV usage around campus. Contact units include University Public Affairs New Services (Mr. April Sorrow), College of Engineering (Mrs. Mickey Montevideo), The Red&Black newspaper (Mr. Nick Watson), Georgia Magazine (Mr. Kelly Simmons), OnlineAthens (Mr. Donnie Fetter), and other media outside Athens.

3) A poster with the heat map of suggested locations of charge station would be exhibited at a location such as College of Engineering, Tate student center, Georgia Center along with a project description to explain to public how this plan will benefit the sustainability of the campus.

Partnership and Awareness

1) JuiceCar Company, a start company aims at providing green transportation for UGA, has shown great interests in this project. The company has two Nissan leafs, and they have already participated in our pilot test.

2) EV Club of the South would play a big role in leaf driver recruitment. The club has many enthusiastic leaf owners over Georgia and by analyzing their usage would provide a realistic database as a reference for promoting EV usage and developing associated EV infrastructure such as chargers, parking in Georgia.

3) Southern Company Services, Inc., an existing collaborator and sponsor with the project advisor, Dr. Tse, has shown support in Electric Vehicles related research. A Nissan leaf has been sent from Southern Company Services to Dr. Tse’s group for EV researches conducted in this lab. Such a partnership would assist in further usage study and EV researches over Georgia.

4) UGA Office of Parking Service would be a great help to obtain charge station data in Athens community. This data would be a good supplementary to analyze charge behavior at user end.
**List of Anticipated Grant Project Metrics**

**Project Description:** This project aims to implement smartphone technology to analyze EV use within the Athens and UGA communities. Partnering with a local Athens startup, JuiceCar, and electricity provider, Southern Company Services, this project will help promote the use of EVs and campus sustainability.

**Project Expenses:** Table below shows the budget with the justification detailed in the budget document.

<table>
<thead>
<tr>
<th>Personnel</th>
<th>$0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
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</tr>
<tr>
<td>Total</td>
<td>$4,800</td>
</tr>
</tbody>
</table>

**Research Value:** We intend to implement the smartphone technology for a practical use by installing EV data capture setup, EV Dr., which is designed by our team to analyze EV usage within Athens and UGA communities. Data obtained from EV users as well as ChargePoint® charge station will be complementary, giving a comprehensive picture of EV efficiency performance, EV driving and charging behaviors. As the EV usage increases, this project will give an information reference for the UGA Parking Services, Sustainability Office, and Athens Transportation& Public Works Department to plan and optimize the locations and installations of EV charging facilities.

**Engagement**

1) **Partnerships:** Southern Company Services, Georgia Power, JuiceCar, ChargePoint®, UGA College of Engineering, UGA Parking Service and Sustainability Office.

2) **Beneficiaries:** Southern Company Services, Georgia Power, UGA College of Engineering, UGA Parking Service, ChargePoint®, Office of Sustainability and JuiceCar Inc.

3) **Outreach Events, Activities, and Media**
   - A press release would be sent out to reporters and editors about the EV usage at UGA. Contact units include University Public Affairs New Services (April Sorrow), College of Engineering (Mickey Montevideo), The Red&Black newspaper (Nick Watson), Georgia Magazine (Kelly Simmons), OnlineAthens (Donnie Fetter), and other media outside Athens.

**Project-specific Metrics**

Measurable outcomes of EV Dr. System

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Analysis</td>
<td>Feedback from EV users and data recorded from EV Dr. system will be updated every day and used to analyze the daily usage of EVs.</td>
</tr>
<tr>
<td>Environmental-friendly</td>
<td>Overall charging time, charging power and reduced Carbon emission will be recorded to give the overall usage of the EVs to determine its impact on energy saving.</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Data collection includes 15 EV users and a ChargePoint® charge station. The data will be used to determine effective locations for the station to be used on campus and within Athens.</td>
</tr>
<tr>
<td>Education</td>
<td>Website visits, EV user feedbacks on the implementation and data analysis of EV usage as a promotion of EV and zero emission will help people understand EV more.</td>
</tr>
</tbody>
</table>

**Photo / Video Documentation:**

Below are the extracted points from the communication plan document.

1) A poster about EV usage in UGA and Athens community will be exhibited at the College of Engineering, Tate student center, Georgia Center along with a project description to explain to public how this plan will benefit the sustainability of the campus.

2) A website will be established to show the anonymized EV usage data from the **EV Dr.** Setup to monitor the daily use of different leaf cars.

3) A press release would be sent out to reporters and editors about EV usage around campus. Contact units include University Public Affairs New Services (Mr. April Sorrow), College of Engineering (Mrs. Mickey Montevideo), The Red&Black newspaper (Mr. Nick Watson), Georgia Magazine (Mr. Kelly Simmons), OnlineAthens (Mr. Donnie Fetter), and other media outside Athens.
The University of Georgia  
Office of Sustainability  
1180 E Broad St, Athens, GA 30602  

November 6, 2014  

Dear Sustainability Officer,  

RE: Huawei Yang and Kevin Wu’s UGA Sustainability Grant Application  

I am writing in support of Huawei Yang and Kevin Wu for their UGA Sustainability Grant Application entitled “Analyzing Electric Vehicle Use in the University of Georgia and Athens Community”. I am the founder and CEO of JuiceCar, an Athens-based business for electric vehicle (EV) rental services. JuiceCar’s customers include car sharers who have given up car ownership in favor of occasional access to a car, current car owners who want an extended test drive before switching to an EV, and tourists and local residents who simply need an efficient way around town for a day or two.  

My company has been collaborating with the College of Engineering at the University of Georgia to study EV usage in Athens. The research proposed by Yang and Wu aims to implement wireless cellular technology and smartphone applications to remotely monitor and analyze the use, efficiency and performance of EVs on the university campus and the local community. The first step in solving any problem is collecting data. Their novel approach will generate a number of useful data regarding the usage patterns of EVs, battery performance, charging behaviors and locations, all of which are important for the next generation of the EV design as well as for selecting the optimal locations and power ratings of future charging stations on campus and around Athens.  

I am glad to share my expertise and resources in support of this exciting project.  

Sincerely,  

Mike Jerue  
Founder and CEO, JuiceCar  
(706) 304-0915  
mike@juicecar.com
Dear Sustainability Officer,

RE: Support Letter for Huawei Yang and Kevin Wu

I am pleased to recommend Mr. Huawei Yang and Mr. Kevin Wu for their application of the UGA Campus Sustainability Grant entitled “Analyzing Electric Vehicle Use in the University of Georgia and Athens Community”. Huawei is currently a first-year PhD student and Kevin is a senior student, both of whom are studying at the College of Engineering and conducting EV usage research in collaboration with Mr. Jason Perry and Mr. Daniel Geller at UGA.

Huawei and Kevin have been conducting research in my lab since 2014 on a project related to on-campus electric transportation sponsored by Georgia Power Inc. During the development of the experimental setup, they have both demonstrated extensive experience in designing and prototyping electronics and smartphone-enabled devices, which is attributed from their study backgrounds and training in mechatronics. In the last few months, Huawei and Kevin have designed and prototyped a preliminary smartphone monitoring device that can stream out, performance data from electric vehicles for 24/7 data collection and analysis. The use of the device will provide important information about the efficiency, battery performance, charging and driving patterns of electric vehicles. The collected information will be of significant value for improving the design of electric vehicles and associated charging infrastructure.

In their proposal, Huawei and Kevin will optimize the design of the monitoring device and implement it to collect data of the electric vehicle use on UGA campus as well as in the Athens community, aiming to provide an accurate and updated analysis that can improve the sustainability of the electric vehicle usage and the user population at UGA as well as in Athens.

Huawei and Kevin are bright and hardworking researchers and they are always willing to try different ideas in their research. It is Huawei and Kevin who always stay late in the lab to experiment novel and interesting ideas related to the project. They are passionate young men who have a pleasant personality to get along well with people around them. Therefore I strongly recommend Huawei and Kevin for the UGA Campus Sustainability Grant.

Yours faithfully,

Zion Tse, Ph.D.
Assistant Professor
The University of Georgia
College of Engineering,
Driftmier Engineering Center Annex, Rm 111,
Athens, GA 30602, USA

Tel: +01-706-542-4189 (Office)
Email: ziontse@uga.edu