NORTH AMERICAN COUNCIL OF AUTOMOTIVE TEACHERS

NACAT News

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Officer and Board Update

Chairman of the Board

2018 came and went in a hurry! It seems like just last week I was driving in to Penn College, passing the fountain out front, in the humid July heat. Hard to believe that was 6 months ago now! But, I have overheard inside information that humidity won't be a problem during the 2019 conference!

All joking aside, mark your calendars NOW for the 2019 NACAT Conference and Expo, July 15-18 in Calgary, AB. Our hosts at the Southern Alberta Institute of Technology (SAIT) are hard at work making preparations for your arrival. Registration will be open soon – visit nacatconference.org for the latest information.

2018 saw a number of different changes and announcements within the Council. Did you catch these moments?

- Within the NACAT Board, we combined the Secretary and Treasurer positions into one.
- The debut of the NACAT eNews.
- NACAT dissolved its Foundation in favor of moving to a new model aimed at providing scholarships and financial aid solutions.
- NACAT members elected Jason Bronsther and Louie Longhi to their first term as Board Members.
- Name change for the summer conference to the NACAT Conference and Expo.

Speaking of the NACAT eNews, you probably noticed you haven't received an issue in a few months. As Robert Burns, an 18th century Scottish poet wrote, "The best-laid schemes o' mice an' men gang aft agley." Our own Bob Chabot, editor and publisher of the NACAT eNews, suffered a stroke following the 2018 conference. Bob is in good spirits and optimistic about his recovery, but please keep him in your thoughts and prayers. Because of what this industry means to Bob, what Bob means to us, and to show appreciation of what Bob has done for NACAT, we will not be sourcing this e-newsletter out to another publisher; it will be right here waiting for him when he is ready to return. In the meantime, NACAT is exploring other digital methods to engage our members throughout the school year. The Board hopes to announce more later this Spring.

I am optimistic of what 2019 will bring. Before we know it, we will be thinking about the end of the school year, warmer weather, and all the good things that come along. I hope one of the thoughts on your mind will be registering for the 2019 NACAT Conference and Expo. We will have some awesome training experiences waiting for you – I hope to see you there!

Steve Gibson, Board Chair
Program Coordinator, K&N Engineering

Do Your Students Know About Available Scholarships?

Do your students know about the various, non-NACAT, scholarships for which they can apply? While this list is nowhere near extensive, please make certain your students apply for scholarships at the following:

- American Muscle (www.americanmuscle.com/scholarships.html)
- Automotive Hall of Fame Scholarships (www.automotivehalloffame.org/education/scholarships)
- Automotive Women's Alliance Foundation (www.awafoundation.org/pages/Scholarships)
- BUICK Achievers Scholarships (www.buickachievers.com)
- College JumpStart Scholarships (www.jumpstart-scholarship.net)
- The Corvair Society of America (CORSA) Frank Winchell Memorial Corvair Scholarship (E-mail Mike Hall, CSA President (mrhvair@aol.com) or Sarah Bruce, Scholarship Chair (sarahvair@cfl.rr.com) for scholarship applications.)
- Federal-Mogul Automotive Technician Scholarship Program (www.fmmotorparts.com/garage-gurus/scholarships.html)
- SEMA Scholarships (www.sema.org/scholarships)
- The ShearComfort Automotive Scholarship (www.shearcomfort.com/scholarship.asp)
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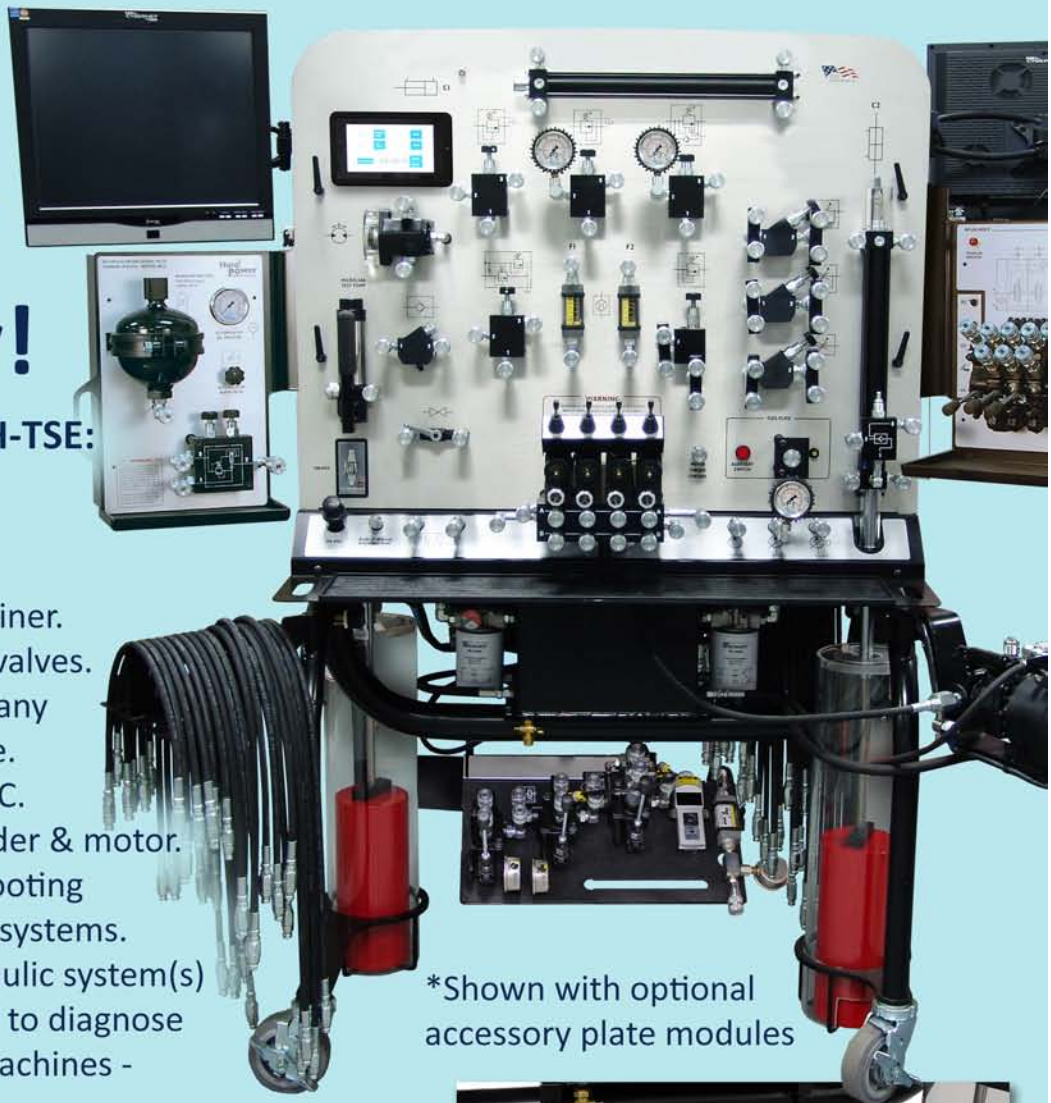

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Cover Art:

Peace Bridge over the Bow River in Calgary.

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Hands-On Vehicle Electrical Troubleshooting Training Program

by Vince Fischelli, Veejer Enterprises Inc., Garland, Texas

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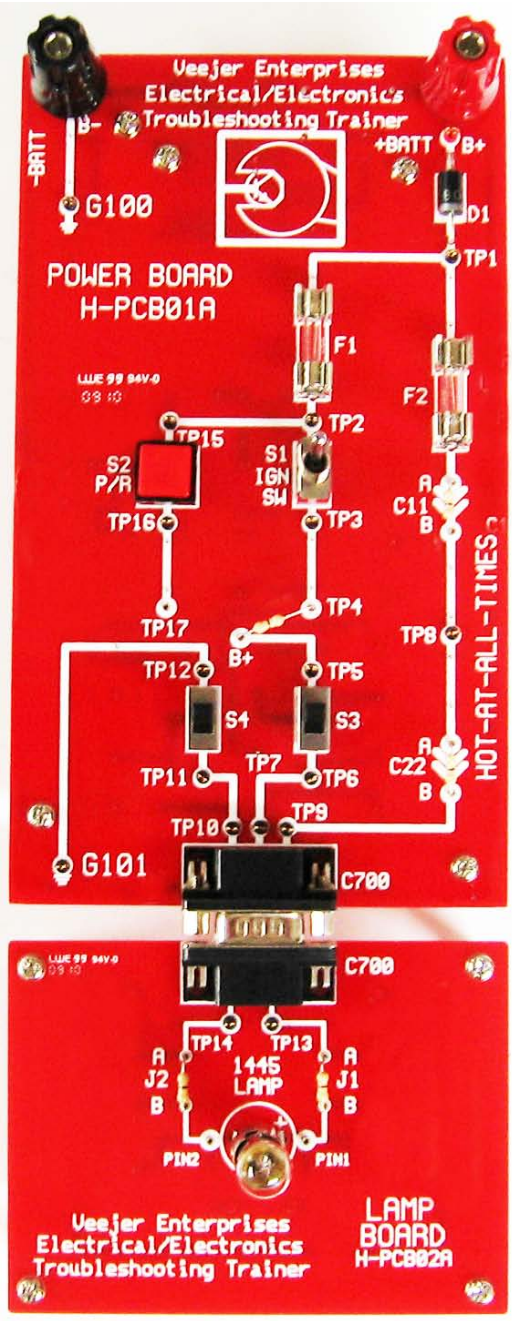

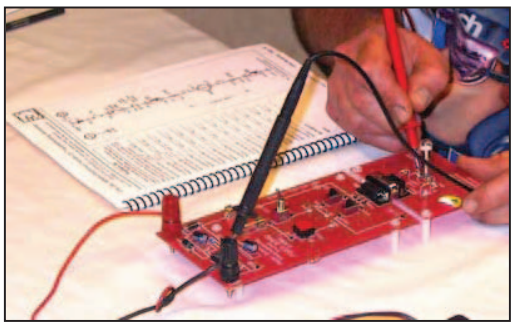

H-111A(S) The Starter Kit

Introducing an effective Hands-On Electrical Troubleshooting Training Program that teaches automotive, truck, diesel and heavy-duty future service technicians how to troubleshoot vehicle electrical-electronic circuits with "hands-on" Electrical Troubleshooting Trainers designed by Vince Fischelli, Veejer Enterprises Inc.

These Troubleshooting Trainers begin with the H-111A(S) shown at the left. They are completely constructed circuit boards that snap together to simulate a live vehicle circuit. Using the Student Workbook, H-WB111A, a student is guided through a series of circuit voltage tests, voltage drop tests and resistance measurements to learn how to test a live vehicle circuit using a DMM. This focuses electrical training time on actual testing of circuits, how they work and how they fail, rather than consuming valuable classroom time building circuits.

Once a technician understands essential circuit measurement skills with a DMM, the Instructor Guide, H-IG111A, explains how to insert electrical problems on the bottom of the circuit boards. Then the student troubleshoots from the top of the circuit boards while documenting his troubleshooting steps in the Student Workbook, H-WB111A, to compare with answers provided in the instructor guide.

Problems are inserted in seconds at various points in the voltage side or the ground side of the circuit to keep technicians busy troubleshooting. By removing a wire jumper on the bottom, an open circuit is created at some point in the circuit. By inserting a fixed resistor, a voltage drop problem is created. Inserting wire jumpers at various points create shorts-to-ground. Students learn to successfully troubleshoot vehicle electrical-electronic circuits by doing it rather than watching someone else do it or just by talking about it. Students successfully troubleshoot electrical problems by themselves, over and over 32 times until they get it right and electrical circuit troubleshooting becomes second nature.

Students practice hands-on troubleshooting a live circuit with real problems to develop self-confidence and convince students they can troubleshoot vehicle electrical circuit problems. The benefits of this electrical troubleshooting training will last for the rest of their careers. It's a great way to master electrical troubleshooting skills as students become confident electrical circuit troubleshooters who won't troubleshoot by changing parts but first troubleshoot by testing a circuit with a DMM to identify the problem. The student below is troubleshooting a problem and recording troubleshooting steps with DMM readings in a student workbook to be reviewed later.

The Starter Kit: Part # H-111A(S) is the first troubleshooting trainer. Comes with 2 circuit boards with step-by-step troubleshooting training. ("S" is the school version) Each Starter Kit contains the two Troubleshooting Trainers shown at the left; Power Board, H-PCB01A and Lamp Board, H-PCB02A. Each H-111A(S) is purchased without books. A bag of fixed resistors for inserting problems is included. Student workbooks, H-WB111A are purchased separately, as well as the Instructor Guide, H-IG111A and the Power Point for H-111A. Other trainers connect to The Starter Kit: H-113(S) DC Motor Circuit Troubleshooting; H-115(S) Troubleshooting Relay Circuits; H-116(S) Wire Harness Troubleshooting and H-200(S) CAN Bus Troubleshooting.. Each circuit board develops a student's understanding of advanced circuit troubleshooting and builds self-confidence.

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A Hierarchical Detection Method in External Communication for Self-Driving Vehicles Based on TDMA (Part II)

By: Khattab M. Ali Alheeti, Muzhir Shaban Al-ani, & Klaus McDonald-Maier

H. Authentication phase

In this paper, we proposed a novel authentication technique to protect the external communication system of autonomous vehicles. It is considered one of the most important security part which must be supported for each wireless communication system. The proposed authentication system has the ability to assist the self-driving vehicles to identify between authorised and unauthorised cars so that these vehicles can communicate with other vehicles and RSUs in that radio coverage area. In more details, the authentication process is heavily based on MAC number that has been generated from any device on the on board unit such as sensors, GPS or Lider. The authentication scenario is shown in Fig 5.

The security system in this paper assumes that each mobility vehicle has the hash value that extracted from the devices on board unit of self-driving vehicles. The hash value that generated from MAC number with salt value that is considered an identifying aspect for each autonomous vehicles on roads.

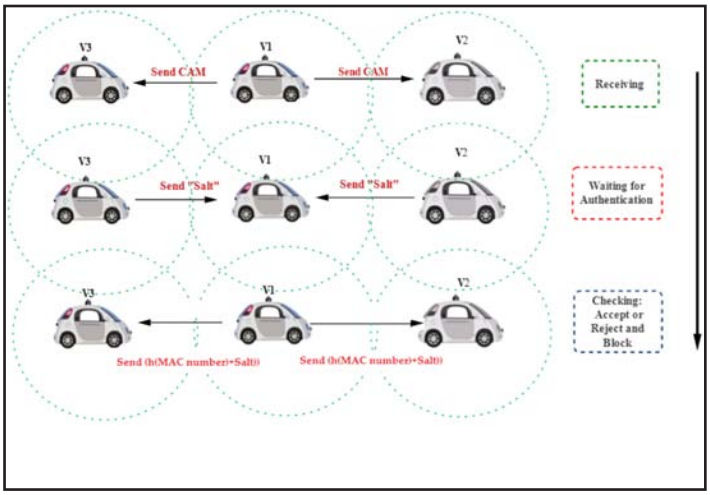

Fig 5. Authentication scenario.
https://doi.org/10.1371/journal.pone.0188760.g005

Definition: salt value is random number that integrated with messages from source vehicle to destination vehicle. This value plays important role in increase the protection of the communication system of autonomous vehicles.

The authentication scenario:

- The vehicle-V1 send message to the vehicles V2 and V3.
- The Vehicles V2 and V3 send salt number to the source vehicle and wait.
- The vehicle-V1 sends summation of the salt value with h(MAC) value to the destination vehicles (V2 and V3).
- The Vehicles V2 and V3 will match the received value with their own value. If the value matches the decision it "accepts the message", otherwise they will "reject and block the communication with vehicle-V1".

The algorithm below shows an algorithm vehicles authentication that proposed to protect the external communication for autonomous vehicles.

Vehicles Authentication Algorithm Input:

- Started when vehicles with in rang of central transmission.
- Authorised vehicles are understanding the MAC number.
- Central Vehilce = v1, client Vehicles = v2, v3, … vn.

Procedure:

- Vehicle V1 send CAM message to the fixed radio rang.
- Authorised vehicles (with rang) v2 … vn send response message (salt) and wait.
- Vehicle v1 send summation (salt + h(MAC)) to the destination vehicles.
- Destination vehicles will match the received value with own value.

Continued on facing page

 Continued from page 6

Output:

- Accept communication if matching the received value.
- Otherwise, Reject communication.

End.

I. Intelligent intrusion detection

In the clustering scheme, we install IDS on each self-driving vehicle. The role of CMs is to collect information of neighbour vehicles in the zone. It is assumed that CHs are trusted in external communication of self-driving vehicles. Each vehicle uses rules and thresholds to detect abnormal behaviour when identifying a malicious vehicle. Whether Sybil or a Wormhole attack are detected; the vehicle will have sent a message to notify its In the clustering scheme, we install IDS on each self-driving vehicle. The role of CMs is to collect information of neighbour vehicles in the zone. It is assumed that CHs are trusted in external communication of self-driving vehicles. Each vehicle uses rules and thresholds to detect abnormal behaviour when identifying a malicious vehicle. Whether Sybil or a Wormhole attack are detected; the vehicle will have sent a message to notify its CH. The CH will block and broadcast the malicious ID's to its CMs and to other CHs. The following are the 7 stages of utilised, and the overall architecture of the proposed security system is shown in Fig 6 (page 16).

1. Generate the highway mobility - In this stage, two tools are utilised to generate highway mobility and traffic to simulate the real communication environment of self-driving vehicles (see above). The output files of this stage are considered input files to ns-2 to generate trace file and routing table of normal and abnormal behaviour.
2. ns-2 - CMs will determine information from other vehicles. They generate a routing table for each vehicle. Each vehicle will broadcast 3-10 packets/second [10]. The CMs can extract features like timestamp, vehicle ID, GPS position and number of hops from routing table and trace file.
3. Distance and angle calculation - In this stage, the proposed system can calculate distance and angle degree between vehicles based on values of X-axis and Y-axis obtained from GPS and applied on Eqs 1 and 2.

Continued on Page 16

NACAT President

Hello to all,

As this edition of NACAT news reaches you, I recognize you are busy and well into classes. Let me begin this edition by reminding you to register for the 2019 conference in Calgary, AB. Make sure you have booked your hotel, and start making arrangements for your travel to Calgary. Booking does not cost you anything, but it does ensure you will have a room. If you have been to Calgary before you are aware of what to expect. If you have not, you need to attend this conference. The faculty and staff at SAIT have always worked to ensure that the conference is extraordinary, and this year's conference will be no exception. Visit www.nacatconference.org for updates. I look forward to seeing you in Calgary in July.

Change! This is something that can either be revered or feared. Here in Alberta we are currently going through a full curriculum redesign. "Redesign", that word often brings the strongest of educators to their knees. The work required to create new outlines, and then develop the materials to support it, is immense. As Educators do we not take on this challenge and ensure that we create the best. Do we not say: "Our students deserve that!" This is reflective of where NACAT is today. "The NACAT membership deserve change". For those of you that attended the conference in Williamsport you would have experience some of the new changes. Changes that ensure you are receiving the support that NACAT is known for. With that one of the largest changes will be how NACAT reaches out to the membership. NACAT News will remain, but there will also be NACAT E-news (an electronic publication to reach out between the edition of NACAT news), changes to the website, and, finally, the use of different social media updates. This enables you to be able to stay apprised of what NACAT has for you without taking you away from your already busy schedule. NACAT will use multiple forms of media to reach you, the membership, and we require you, the membership, to share with other educators. NACAT is as strong as the membership, and the stronger the membership becomes the greater the support each individual educator receives.

Lastly, I ask you to reflect on what NACAT is to you. Do you want to give back to the membership? Put your name forward, and nominate yourself to sit on the board of directors.

I look forward to seeing you in Calgary for the Instructor conference. Stay in touch with NACAT.

Patrick Brown-Harrison, President

NACAT Member Benefits

- NACAT members receive a discounted registration to the NACAT Conference. This annual event provides technical training and professional development classes. The sessions are presented by the industry's leading subject matter experts. The conference tradeshow provides attendees time to meet textbook authors, publishers and manufacturers of training aides. There is plenty of time for networking, fun, and industry awards in a very family friendly atmosphere.
- NACAT members are eligible to receive awards and scholarships.
- NACAT members receive three (3) issues of the NACAT News per year.
- NACAT Members receive nine (9) issues of the NACAT eNews per year.
- NACAT members receive preferred pricing on equipment, subscriptions, tools and training aides from NACAT's industry friends. This information is available in the NACAT News and the NACAT website.
- NACAT members have access to the shared resources repository at the NACAT website.
- NACAT members make life-long friendships through this network of like-minded individuals. Members are part of a family of educators preparing people for careers in the automotive industry or wherever life may lead them.

Article

Optimizing Technical Education Pathways: Does Dual-Credit Course Completion Predict Students' College and Labor Market Success? (Part I)

By: L. Allen Phelps and Hsun-Yu Chan

Abstract

Post-recession Federal policy initiatives, such as secondary/postsecondary career pathways and gainful employment higher education accountability standards, prioritize the alignment of education practices with market-driven outcomes. Using longitudinal student record data merged from college and state K-12 data systems with the Unemployment Insurance wage records, this study examined the relationship between college and career success and the completion of dual credit courses in high school. During 2008-10, nearly 30% of graduates from 20 high schools who subsequently enrolled at a regional public technical college transferred an average of 6.0 dual high school and college credits. After controlling for several high school-level and individual-level factors, hierarchical linear models revealed that dual credit learners had significantly better outcomes than non-dual credit learners in terms of college course completion rates, second year retention, three-year graduation rate, as well as earnings in 2012-13. While our findings are limited to an upper Midwest community, they extend and highlight the positive relationship between high school dual credit completion and later college and labor market outcomes. Compared to dual credit courses completed on the college campus, courses offered at the high school and taught by high school career and technical instructors consistently predicted greater levels of college student success and better labor market outcomes. Additionally, several actionable student-level factors were associated with the significant college and career pathway outcomes, including high school preparation in mathematics.

Introduction

At both the national and state level, post-recesssion education policy has centered on improving the economic and marketplace returns, especially for secondary and postsecondary students and the institutions they attend. To wit, over the past five years, legislative, fiscal, and regulatory priorities have called for: (a) college and career readiness as a benchmark standard for the new Every Student Succeeds Act of 2015, (b) career pathways framework for state-level alignment of Federal investments in employment training, adult education, and vocational rehabilitation (U.S. Departments of Education, Labor, and Health and Human Services, 2012), and (c) adding graduates' wage and employment to college performance standards (U.S. Department of Education, July, 2015). More than 30 states now have performance funding in place for colleges (National Conference of State Legislatures, 2016), including several in which graduates' employment and earnings are among the criteria used to document institutional performance.

Nothwithstanding the current debates surrounding the efficacy of market-driven education policy initiatives (Brown, Boser, Sargrad, & Marchitello, 2016; Darling-Hammond, Wilhoit & Pittenger 2014), there is an absence of compelling research and evaluation evidence informing how well particular career-technical education policies and practices work under particular conditions for various groups of students (Gamoran, 2011, October 12 ; U.S. Department of Education, 2014). In this regard, the Independent Advisory Panel for the recently completed National Assessment of Career and Technical Education (2014) argued that assessing the impact of career and technical education (CTE) on student attainment and achievement "requires timely access to student-level longitudinal data on course-taking behaviors, proficiency in core subject and career areas, and post-high school behaviors (e.g., postsecondary education, workforce activity)" (p. 6). According to the Panel, only two states provide leaders with access to such actionable data from their State longitudinal data systems.

Continued on page 18

Phelps, L.A. and Chan, H.-Y., 2017. Optimizing Technical Education Pathways: Does Dual-Credit Course Completion Predict Students' College and Labor Market Success?. Journal of Career and Technical Education, 31(1). DOI: http://doi.org/10.21061/jcte.v31i1.1496

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Automotive Center to be Renamed in Honor of Former CFADA Leader

From left to right (standing): Barbara Miller, former executive vice president of the Central Florida Auto Dealers Association (CFADA) and John Gyllin, Vice President, Resource and Economic Development at Seminole State College.

The Seminole State College of Florida Board of Trustees has unanimously approved renaming the College's CFADA Professional Automotive Training Center to the Barbara Miller CFADA Automotive Training Center in honor of her long-term efforts on behalf of the program and at the request of the Central Florida Auto Dealers Association (CFADA).

For over 30 years, Miller has been a tenacious champion of the top-ranked automotive training program at Seminole State, both personally and prior to her retirement as executive vice president of CFADA last year.

"It is an honor I never dreamed of. It's all about a team effort. You have a vision and see the vision become reality. I'm so happy that I've been part of a team that has touched so many lives in our community," said Miller.

In 1996, Miller successfully led the campaign to raise $2.5 million to replace the College's outdated buildings with a new automotive training center. When the state's 50 percent match was in danger in 2003, Miller marched in Tallahassee with 10 fellow CFADA members, educating legislative members on the importance of private business support. She was successful in securing the $2.5 million match, as well as garnering an additional $1.5 million in support with help from Sen. Dan Webster, who became a staunch supporter of the program after hearing Miller. The 55,000-square-foot automotive training center opened in January 2007 and features five high-tech classrooms, a shop with 40 bays, a 2,000-square-foot showroom and CFADA corporate offices.

"Barbara Miller has been one of our greatest voices of support at Seminole State for the past 30 years," said Scott Howat, chairman of Seminole State's Board of Trustees. "Her vision of our College's future and importance to the community, combined with her determination to fight for our students and the resources they need to succeed, has in great part brought us to where we are today. We are eternally grateful and see no honor more fitting than renaming the automotive center that would not be standing today without her."

Under Miller's direction, CFADA has directly provided almost $2.4 million in funding to Seminole State College and has raised an additional $4.8 million in state funding and private donations from car dealers. Miller has personally donated $60,000 in support of scholarships and the College's automotive program, establishing two endowed scholarships through the Foundation for Seminole State College.

Miller served on the Foundation's Board of Directors for 13 years, with the distinction of serving as the first female chair. During her tenure, she was instrumental in the success of the Foundation's major fundraising campaign that completed in 2016.

"The Foundation is overjoyed with the Board of Trustees' actions today," said Dr. John Gyllin, vice president of resource and economic development at Seminole State and executive director of the Foundation. "Barbara Miller is one of the most dedicated champions of our students and programs. Seminole State enjoys one of the nation's outstanding automotive programs due largely in part to the efforts of Ms. Miller throughout the years."

This press release was written by Elisa Rohr. Permission was obtained for reprint.

The original press release may be found at: https://www.seminolestate.edu/newsroom/article/5973/automotive-center-to-be-renamed-in-honor-of-former-cfada-leader

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The 2010 NACAT Conference was very successfully held at Seminole State College of Florida. Learn more about the relationship between NACAT and Seminole State College of Florida's automotive program by listening to Jim Cox speak during the 2010 NACAT Conference Banquet. His testimonial is available on YouTube at https://youtu.be/JNeupeADDOE

The Light Diesel Corner

By Curt Ward

As the instructor of the light duty diesel class at the community college, I receive many diesel related questions from faculty, staff and students who are interested in what is going on in the industry. The other day a staff member asked about a new excavator that was parked in his neighborhood overnight. He noticed that it looked like the machine had an exhaust aftertreatment system similar to his truck. He was interested in what was going on in the construction equipment industry that would require this change. The answer to his question is the basis of my article this issue.

On May 11, 2004 the EPA signed into law the requirements for the Tier 4 diesel non-road engine emission requirements. The law required that these changes be phased in over the period of 2008 through 2015. Much like the light-duty diesel requirements, the Tier 4 emission rules addressed the allowable levels of particulate matter (PM) and oxides of nitrogen (NOx). These rules and regulations apply to construction equipment, farm equipment, fork lifts, airport ground equipment, generators, pumps, compressors and more. The requirements in this regulation have forced manufacturers of non-road engines to implement some of the same changes to their equipment that manufacturers of light duty diesel vehicles made some years before.

The first change is the requirement of the use of ultra-low sulfur diesel (ULSD) fuel. Beginning in late 2009 it was mandated that all non-road diesel engines use ULSD that has a sulfur level of 15 ppm. This change was implemented due to the increased use of catalysts on this equipment. Higher levels of sulfur have a negative effect on the performance and longevity of these systems.

In addition to the changes in the fuel, the design of the fuel systems on many engines changed. The use of high pressure common rail (HPCR) fuel systems was widely implemented. Fuel pressure at the injector of 30,000 PSI became very common. Additionally, the design of the air induction systems changed. The use of twin turbocharges and variable vane turbochargers increased. The improvements in the fuel combustion process significantly decreased the level of particulate matter while improving engine performance.

The changes in the Tier 4 emission rules also caused an increase in the use of cooled exhaust gas recirculation (EGR) systems. EGR systems were widely introduced with Tier three non-road emissions for the purpose of displacing oxygen with inert exhaust gases in the combustion chamber for the purpose of lowering combustion temperatures and reducing the levels of NOx. The cooling of the exhaust gasses further reduces the level of NOx and allows for the more precise control of the system.

The Tier 4 emission changes caused an increase in the use of diesel particulate filters (DPF). This was to insure that the equipment met the requirements related to the allowable levels of particulate matter. The use of DPFs began with the Tier 3 emission regulations on high horsepower engines as a way to meet the requirements at that time. Just like light duty vehicles the DPF holds the particulate matter in the filter until such time that the restriction becomes too great. At that time, the particulate matter is reduced to ash during a regeneration event. The regeneration event is slightly different than an on-road vehicle due to normal differences in the way they are operated.

The introduction of the Tier 4 emission rules led to the first use of a selective catalyst reduction (SCR) system being used on a non-road engine. The use of diesel exhaust fluid (DEF) in the SCR catalyst significantly reduces the level of NOx without a significant reduction in engine performance. Most non-road engines use DEF at the rate of about 3-6% of the fuel consumption.

As these changes were implemented it created some changes in the way the operators of this type of equipment had to take care of their machines. First and most importantly, they had to use quality diesel fuel and properly stored diesel exhaust fluid. Additionally, the operators had to make sure their machines did not idle excessively and periodically met the requirements for a regeneration event. These are same changes that were experienced by the drivers of light-duty vehicles several years before.

In short, the non-road engines now must meet the same emission requirements as the on-road engines. Hopefully this short explanation answers the question the staff member posed and provided an update on what is changing in non-road diesel emission rules.

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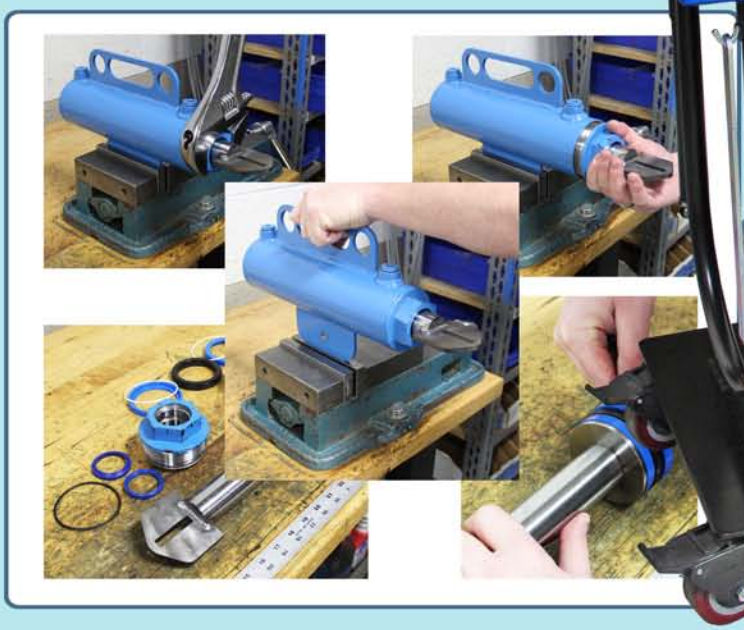

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Continued from page 7

4. Detection phase - In this stage, the IDS on CMs has ability to detect the wormhole attacks from parameters that have been extracted from the routing table and trace file. The parameters are: number of hops, forward value and time. The IDS on CMs can identify the Sybil vehicles from normal vehicles based on some important features such as distance, angle and vehicle ID.
5. CMs - The IDS on CMs will send notification to CH when it detects malicious behaviour. It sends warning message with full details about the malicious vehicle that is detected in clustering mode.
6. Reaction of CHs - The CH will generate alarms and block the malicious vehicle to alert other vehicles in the inter-cluster and sends the same warning message to all CHs and RSUs in that zone.
7. Performance metrics - In this stage, we evaluate the proposed IDS by calculating the performance metrics such as the packet delay rate, (PDR) and throughput.

As shown in Fig 6, the proposed system has seven parameters as input to CMs while it has three outputs: malicious vehicle (Sybil / wormhole) and normal vehicle.

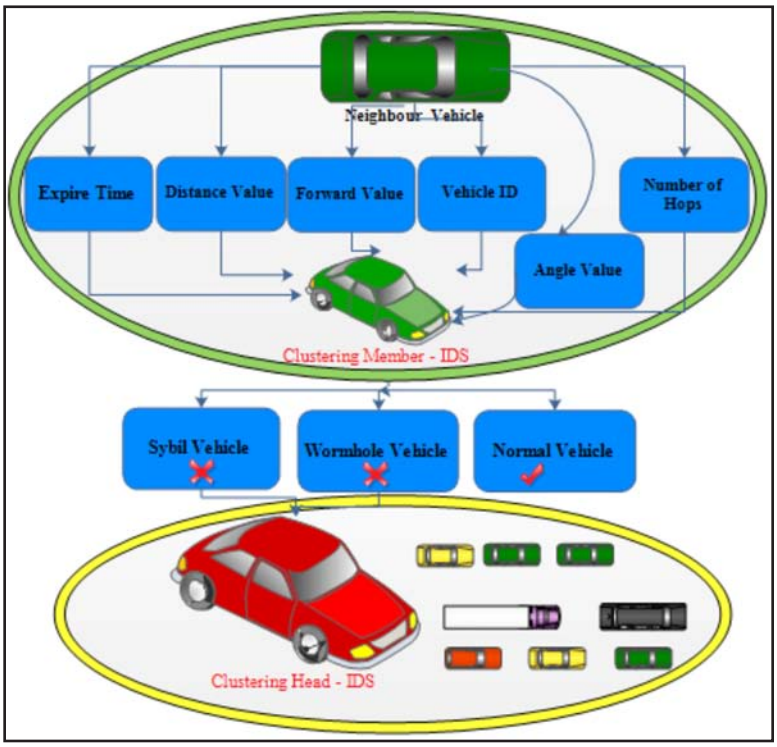

Fig 6. IDS architecture.
https://doi.org/10.1371/journal.pone.0188760.g006

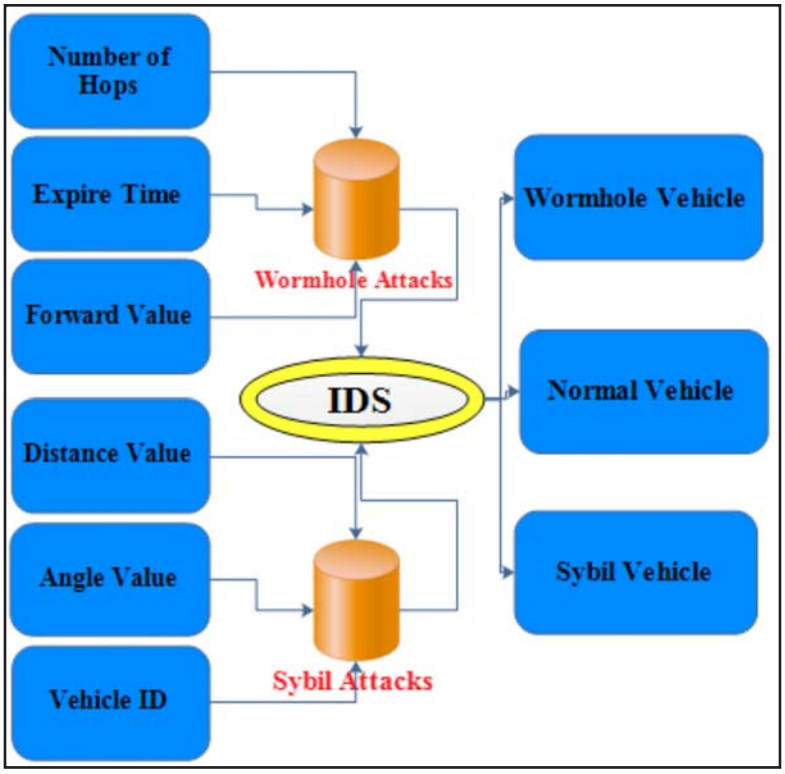

Fig 7. Type parameters of detection.
https://doi.org/10.1371/journal.pone.0188760.g007

6. Simulation results and analysis

The IDS can detect two most common but serious attacks in VANETs: Sybil and Wormhole attacks. As we know each of these attacks has a different behaviour. Thus, each attack has different parameters to detect malicious behaviour. Fig 7 shows type parameters of proposed IDS.

Here, to evaluate the proposed IDS performance, we need to analysing efficiency, effectiveness, and calculate the performance metrics. First, Table 4 (page 20) is generated which describes the different parameter values that have been extracted, calculated and stored by each vehicle.

Continued on page 20

NACAT

December 10, 2018

Dear NACAT Members:

As announced at our 2018 Conference and Expo, the Board of Directors of the North American Council of Automotive Teachers voted unanimously in favor of dissolving the NACAT Education Foundation which it had established in 1994. The NACAT Education Foundation recently concluded its "wrapping up" period and officially dissolved on December 1, 2018.

NACAT will assume all duties and responsibilities once handled by the Education Foundation out of the Tyler, TX office, including donations, scholarships and awards. Donations will continue to be tax deductible.

On behalf of all who have volunteered their time to serve on the Foundation's Board, past Chairmen and Chairwomen, and Foundation Directors, thank you for supporting the NACAT Education Foundation for the past 24 years. Along with the Board and Officers, I am excited to be moving forward with a new philanthropic model operated from within NACAT and the benefits that will provide in the near future.

Best Regards,

Steve Gibson
Chairman, Board of Directors

Continued from page 10

Among the critical questions longitudinal data sets are able to answer is the conditions under which promising practices – such as completing and transferring dual credit high school/college course credit – are capable of providing students with higher levels of success as they pursue a technical education career pathway beyond high school. For example, in 2011, 76% of U.S. high schools reported that students took at least one dual enrollment courses (DE) with an academic focus, while 46% reported students completing dual enrollment courses with a CTE focus (Thomas, Marken, Gray & Lewis, 2013). To be sure, dual-credit academic course completion has been widely implemented and carefully studied using national data sets (An, 2013 ; Swanson, 2008), as well as integrated state, local, and college databases in Florida, Texas, Tennessee, California, Washington, and New York City (Allen & Dadgar, 2012 ; Community College Research Center, 2012 ; Cowan & Goldhaber, 2015; Giani, Alexander & Reyes, 2014 ; Karp, 2013; Speroni, 2011). These studies have used advanced analytical tools to examine the net direct and indirect influence of "academic dual credit learning" experiences in high school on postsecondary outcomes, while controlling for other observed factors (e.g., student motivation, parental expectations, peer influences). However, albeit the recent increases in the rigor of dual credit study designs, considerably less is known about the influence of "CTE dual credit learning" experiences on student success in starting and completing career pathway programs in two-year colleges (Wang, Chan, Phelps & Washbon, 2015; Zinth Dounay, 2014). Additionally, others argue that because most states and school districts offer an array of high school dual credit courses (e.g., Advanced Placement courses, International Baccalaureate, Early College High Schools, Project Lead the Way, and varied state postsecondary credit options), research is needed to understand the comparative benefits of various dual credit course offerings (Giani, et al., 2014).

In addition, beyond the comparative benefits of CTE dual credit courses, relatively little is known about the factors and practices that contribute to student success in subsequent college or workplace settings. To bring these promising practices to scale, more knowledge about how they work, for whom, and under what conditions is also needed as studies comparing the location, staffing, funding, and outcomes are not prominent in the literature. For instance, roughly two thirds (67%) of the high schools offering CTE dual credit courses in 2010-11 reported using only high school instructors (Thomas et al., 2013). Given these circumstances, Zinth Dounay (2015a) argued that it is imperative for states to ensure that course content and instructor qualifications are in line with those used in traditional college courses. Affirming Zinth Dounay's assessment, the Higher Learning Commission (HLC, 2014) recently issued guidelines to institutional peer reviewers on the standards for accrediting institutions that engage in dual credit partnerships with high schools. The core accreditation standards were expanded to include "dual credit courses and programs" comparable course pre-requisites, course rigor, faculty qualifications, and access to learning resources. Since many high school CTE instructors lack the qualifications to teach at the collegiate level, studies of dual credit programs must inform the viability of these standards, particularly in secondary and postsecondary CTE areas where instructors' industry experience has often been considered an important qualification.

Equally important, the capacity for studying and tracking regional and local variation in student achievement and success has expanded. As Gamoran (2011) noted, state longitudinal data systems now permit educators, researchers, and policy makers to monitor student achievement trends at various points in time and across schools and classrooms. "Yet too little is known about the conditions under which achievement differences are produced. [The profession] need[s] more research . . . that links school conditions and instructional practices to student outcomes. . . . This type of work is especially critical because successful implementation of science, technology, engineering, and math (STEM) programs may depend on contextual factors such as leadership and professional supports" (p. 9).

Given the highly diverse array of state and local options for implementing dual enrollment and dual credit programs (see the Education Commission of the State's 50-State High School Reform Database; Zinth Dounay, 2015b), inter- and intra-state policy variation is considerable, or permissible, when examining program components, access, finance, transferability, and program quality standards. Local information and knowledge about the design and implementation of programs that produce better outcomes guides both the implementation and improvement of CTE dual credit programs. Thus, building a robust understanding of the outcomes and key program implementation features of dual credit programs on a local or regional basis is essential to the quality and sustainability of CTE programs.

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Time	Parameters	V1	V2	V3	V4	V2
T0	Vehicle-ID	V0	V1	Vworm	V5	V9sybil
T0	Destination Value	64.6m	97.7m	130m	67.2m	97.7m
T0	Angle Value	-50.6d	-30.7d	-21d	-48.01d	-30.7d
T0	Time Stamp	7s	7s	7s	7s	7s
T0	Forward Value	1	3	2	1	3
T0	Number of Hops	1	2	1	3	2
T1	Vehicle-ID	Vw	V1	V4	V5	V8sybil
T1	Destination Value	8.68m	139.2m	139m	107.3m	139.2m
T1	Angle Value	-35.1d	-21.03d	-21d	-27.7d	-21.03d
T1	Time Stamp	10s	10s	10s	10s	10s
T1	Forward Value	1	5	3	11	5
T1	Number of Hops	1	3	5	3	3
T2	Vehicle-ID	V0	V1	V4	V5	V6sybil
T2	Destination Value	126.3m	139m	139.2m	111.8m	139m
T2	Angle Value	-23.3d	-21d	-21d	-26.5d	-26
T2	Time Stamp	16s	16s	16s	16s	16s
T2	Forward Value	1	10	8	12	8
T2	Number of Hops	1	2	3	5	4

https://doi.org/10.1371/journal.pone.0188760.t004

Table 4. Shows some extracted and calculated parameters.
https://doi.org/10.1371/journal.pone.0188760.t004

Table 4 demonstrates the sample database of vehicles that have been collected and calculated from routing table and trace file. According to Table 4, Sybil attacks are detected by using distance and angle. To detect the wormhole attacks, the forward value and number of hops are used. The simulation process is applied 20 times to evaluate/test of the proposed security and authentication systems in this research. In addition, the average classification rate is calculated in Table 5 of two types of attacks targeting autonomous vehicles in VANETs.

IDS	Accuracy	Class
IDS-Clustering	76.84	Normal
IDS-Clustering	95.7	Abnormal

https://doi.org/10.1371/journal.pone.0188760.t005

Table 5. Classification rate.
https://doi.org/10.1371/journal.pone.0188760.t005

The efficiency of this IDS is assessed using ns-2 under two conditions: self-driving vehicles with IDS and self-driving vehicles without IDS. To evaluate the efficient of VANET with IDS, we calculate the performance metrics of VANETs, such as packet delivery ratio (PDR), packet delay and throughput [25], as shown in Fig 8:

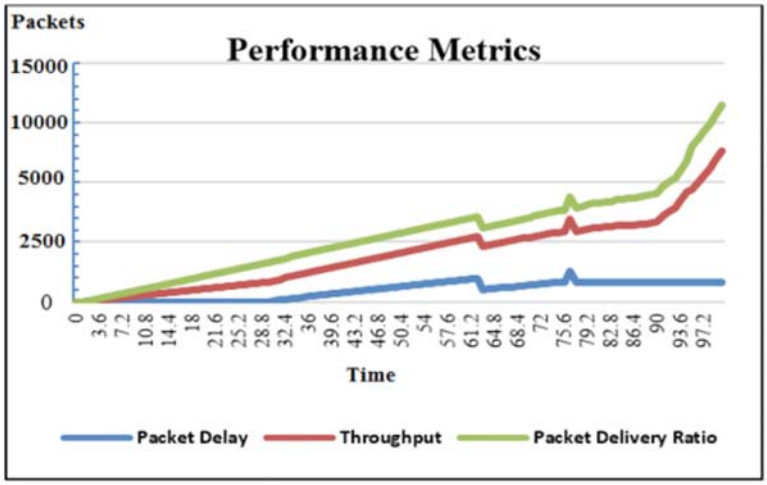

Fig 8. Performance metrics.
https://doi.org/10.1371/journal.pone.0188760.g008

It is easily noticed from the simulation results that this IDS can play a vital role on enhancing the performance of the external communication in autonomous and semi-autonomous vehicles. The proposed security system can overcome one of the common security problems, which is due to the lack of fixed security infrastructures by using clustering mode in the external communication systems a virtual gateway of control. It is built on control data and sensitive information that sent/received between vehicles and their RSUs on the road side.

Continued on page 24

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Purpose of the Study

This study sought to explore the relationship between high school CTE dual credit course completion, college and labor market outcomes, and factors that influenced this relationship. Specifically, we investigated four research questions about dual credit attainment in CTE programs:

1. What student- and school-level demographic variables are related to students' dual credit history?
2. What types of dual credits are related to 2-year college students' early academic success in terms of course completion rate, and second-year retention?
3. What types of dual credits are related to students' three-year graduation/completion status?
4. What types of dual credits are related to students' labor market success in terms of employment status and annual income?

We examined the factors associated with dual credit CTE offerings and student success in a regional high school/technical college network in an upper Midwest state. The target sample included near 2,300 students from 20 high schools who completed dual credit high school courses between 2008-2010. We focused on students who used their dual credits in a local institution. In addition to estimating the benefits of dual credit courses, our longitudinal education and workforce data set allowed us to consider the importance of other factors associated with student decisions in the high school-to-college-to-work transition. In the time period examined (2008-10), three distinct forms of CTE dual credit courses were offered: Youth Options, Transcripted Credit, and Advanced Standing (see Table 1 for definitions). In this regard, Barnett and Andrews (2002) assert the importance of defining and differentiating between dual credit and dual enrollment. In this study, all three options (see Table 1 for the definitions) provide students with exposure to college-level content, however students in the Advanced Standing option do not receive a college transcript but may subsequently receive college credit once they enroll.

A deeper understanding of the relationship between CTE dual credit course implementation practices and post high school outcomes in a single community provides an evidence-based template for studying, evaluating, and improving dual credit courses. This template can guide future CTE innovations, as well as inform the design of additional evaluation and research studies of dual credit practices.

Table 1. Wisconsin Technical College System's Dual Credit Options, 2008-10

Dual-Credit Options	Outcomes	Location and Instructor Credentials	High School-Technical College Arrangements
Youth Options (YO)	College transcript and grade	Offered on a college campus by a college instructor.	Students apply to the school district, then to the college. If accepted, school district pays tuition, fees, and book costs for up to 18 credits.
Transcripted Credit (TC)	College transcript and grade	Offered at a high school by either: an instructor with content-aligned K-12 certification approved by WTCS, or by a college instructor*	Technical college curriculum, grading policies, and standards established in an articulation agreement. A cost-neutral arrangement is negotiated in a contract.
Advanced Standing (AS)	Credit in escrow. Students apply for credit once enrolled in a WTCS program.	Offered by a high school instructor with content-aligned K-12 certification**	High school course(s) or competencies are deemed comparable to a technical college course. Open only to students with a 3.0 GPA on a 4.0 scale.

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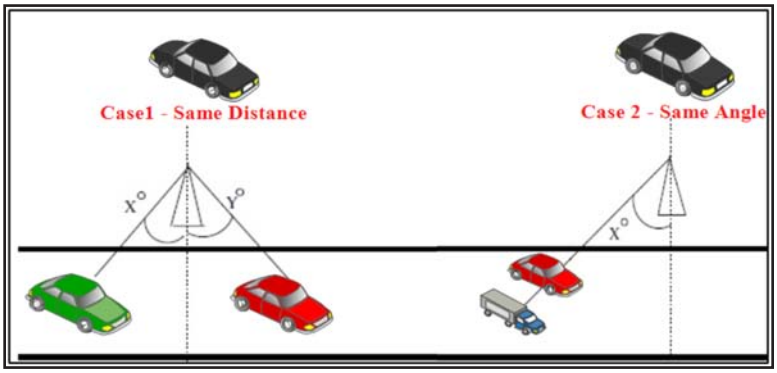
7. Discussion

The motivation of our work is to design a security system that protects external communications in self-driving and semi-autonomous vehicles. The proposed security system is implemented in seven stages namely:

- Generating the highway mobility model.
- network simulation to generate trace table and routing table.
- Calculate distance and angle.
- The detection phase.
- The role of CMs.
- The reaction of CHs.
- Performance metrics.

This security system can overcome two common problems which are that some self-driving vehicles have the same angle degree but different distances and others have the same distance but different angles degree. If the proposed IDS is just based on these features it will be confused in detection which would directly have a negative impact on detection rate and the number of false alarms, as shown in Fig 9.

Fig 9. Case 1 and Case 2 of self-driving vehicles.
https://doi.org/10.1371/journal.pone.0188760.g009



In order to validate this system, we need to compare our results with other security system such as FPN-IDS [26].

From Table 6, it is easily noticed that the vital role of the IDS-clustering in enhancing detection rate of normal behaviour in self-driving vehicles, whereas IDS-FPN provides a better detection rate than IDS-clustering. In the futur ework, we could for example design clustering FPN to obtain better result on determining normal and abnormal behaviours.

IDS	Accuracy	Class
IDS-Clustering	76.84	Normal
IDS-Clustering	95.7	Abnormal
IDS-FPN	58.33	Normal
IDS-FPN	100	Abnormal

https://doi.org/10.1371/journal.pone.0188760.t006

Table 6. Classification rate.
https://doi.org/10.1371/journal.pone.0188760.t006

The design of hierarchical IDS based on clustering mode enhances the detection rate of proposed IDS in the external communication systems by 20.15 compared to Coussement and et al. [20]. Hence the IDS-clustering has a direct and positive impact on the resulting system because of the increase in the detection rate, decrease in the false alarm rate and error rate. The proposed system can be extended to build other IDS which can detect other types of attacks such as flooding, black hole and grey hole attacks.

Intelligent IDS is proposed in this paper to detect Sybil and Wormhole attacks that based on clustering mode. The detection process is heavily based on features that extracted from trace file and routing protocol. These files are generated from network simulator. Whereas, FPN-IDS is designed to detecting Flooding and Dropping attacks that targeted control data and sensitive information of vehicles [26]. The main aspect difference between FPN-IDS and Clustering-IDS is shown in Table 5.

Continued on page 26

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Article: Pathways

Continued from page 22

*The FVTC TC course is delivered at the high school by an instructor who meets the state secondary and WTCS certification teaching requirements in particular technical fields. In 2007-10, no TC general studies courses were offered. For each TC course, a Dual Credit Memorandum of Understanding (MOU) and contract are written and annually updated by the high school and college. The MOU for each course specifies the FVTC standards for competencies, assignments, grading policies, textbooks, and software (if applicable). High school instructors must attend a Fall FVTC Articulation Workshop every other year.

** For AS courses, the high school curriculum is reviewed annually by FVTC faculty and competencies are judged to be equivalent or comparable. A formal AS Agreement is written. AS faculty must attend a Fall Articulation Workshop. Students enroll in and complete the high school course which is taught by a high school teacher with current technical education certification at the high school. Once students enter a technical college AAS or certificate program, they request a high school transcript review to receive credit for the AS courses they completed. An annual statewide record system is maintained by the WTCS and publicly available, which documents the TC and AS courses approved by each technical college. Source: FVTC (2015).

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Acknowledgements. This study was funded by the National Science Foundation (Award 1104226). The authors thank Laura Waurio of Fox Valley Technical College, as well as staff from the Wisconsin Technical College System, the Wisconsin Department of Public Instruction, and the Wisconsin Department of Workforce Development for initial data preparation. Any opinions, findings, and conclusions or recommendations expressed herein are those of the authors and do not necessarily reflect the views of the National Science Foundation. Correspondence should be directed to L. Allen Phelps, laphelps@wisc.edu

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According to Table 7, we can easily distinguish between two IDS. As a result, the IDS is proposed in this paper definitely different from FPN-IDS.

Features	Clustering-IDS	FPN-IDS
Detection tools	Clustering	Fuzzy Petri Net
IDS Architectural	Hierachal	Cooperative
Attacks Type	Sybil and Wormhole	Dropping and Flooding
Detection File Source	Trace File	Trace File and Routing Protocol
Routing Protocol	Vehicle AODV	Original AODV
Pre-precessing Dataset	Fuzzification dataset	Normal dataset

https://doi.org/10.1371/journal.pone.0188760.t007

Table 7. Comparison between IDS-Clustering and FPN-IDS.
https://doi.org/10.1371/journal.pone.0188760.t007

8. Conclusion and future work

This paper detailed the design of an IDS to efficiently detect malicious vehicles and enhance the performance of VANETs. An approach to detect Sybil and Wormhole attacks, which have an adverse effect on the communication and authenticity of self-driving vehicles. The designed IDS aims to develop an IDS that identifies and isolates malicious vehicles. Each CH uses the IDS to protect external communication of self-driving from malicious vehicles. They can compare the difference of various parameters obtained from different vehicles at regular intervals. Parameters like distance, angle degree, forward value and number of hops play a crucial role in detection Sybil and Wormhole attacks in VANETs. The distance and angle degree are unique parameters, obtained from each mobile vehicle at any time. Moreover, if the distance between two vehicles is same, the angle degree of these vehicles differentiates the normal and malicious vehicles. The number of vehicles has an important role in increasing the detection time of abnormal behaviour in the external communication systems of these vehicles.

Our proposed system has the ability to detect Sybil and Wormhole attacks by monitoring/ analysing the routing table and trace file that have been generated from the network simulator. The trace file describes the behaviour of the network through the send, receive, move, forward and drop packets. A possible further extension of the system is to design IDS on RSUs as well as designing IDS with Artificial Intelligent (AI) techniques such as neural networks and k-nearest neighbour.

Future trends of driverless cars are concentrated the safety of the overall traffic environment. The Institute of Electrical and Electronics Engineers (IEEE) predicts that driverless cars will account for up to 75 percent of vehicles on the road by the year 2040. No driving equals more safety because there'll be no more text or drunk driving. In addition, cars without drivers are smart enough to avoid accidents. There must be enough sensor technology, enough computing power within the automotive and computer algorithms that detect the data output of sensor images, real-life traffic situations and give good feedback to the car. This is the technical challenge, and the manufacturers are working hard to generate new smart environment.

Acknowledgments
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Continued on page 36

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Samsung Ponders Training Self-Driving Cars With Brain Waves

By: Daniel Golightly, *Senior Staff Writer for Android Headlines*

Samsung's efforts in the self-driving automotive industry appear poised to continue growing, based on a recent patent for a new autonomous driver training model published by WIPO. The patent itself applies primarily to an 'apparatus' and methodology for training a self-driving vehicle's AI that utilizes machine learning and a combination of human driver metrics and traditional sensor information. The data for the former is tracked and pulled from several sources within the vehicle itself while a human is in control. That includes information such as grip strength and positioning taken from the steering wheel and brake or throttle pedal movement. However, it also seems to include headset-gathered metrics, with Samsung explicitly indicating measurements taken via eye-tracking and a brain-wave electrocardiogram. The former of those is self-explanatory but the latter is more closely related to and encompasses technologies more often associated with EKG, ECG, or EEG measurements taken in a medical setting.

Samsung's description of the apparatus indicates that the electrocardiogram information would be used to assess the changes in a driving environment and dangerous driving circumstances in combination with those other metrics. However, it would also be compiled with the driver's use of turn signals and their 'manipulation' of the vehicle's horn, stereo, or other instruments in order to build a set of patterns in driving behavior to start from and improve on. That would be further underscored by metrics gathered from cameras, LiDAR, radar, and navigation data in order to compile a more complete picture from which to create an autonomous driving model for the AI to work with.

Background: Although Samsung recently started filling out its portfolio in terms of AI automotive innovations, technologies, and platforms, this is a relatively big step for the company. Previously, the vast majority of its ambitions could summarily be collected under the umbrella of "supportive" technologies. For example, at CES 2018 in January, the company introduced a new series of self-driving technologies that sought to make the industry more modular. To that end, the 'DRVLINE' platform encompassed both hardware and software but could be put together piecemeal and was intended for use by current OEMs in the automotive industry and service industries rather than meant for use by Samsung to create its own vehicles. For the most part, all of its technologies and press releases have centered around a similar concept, building solutions that align with the self-driving vehicle industry without taking on the tasks of building out its own subsidiary to become an active manufacturer.

Bearing that in mind, the company has also applied for and received an autonomous vehicle testing license in its home country. Specifically, that was awarded way back in mid-2017 but that doesn't mean this new patent isn't geared in the same direction. In fact, this may be among the first indications that Samsung wants to do far more than simply provide components and associated software for others in the race for AI vehicle dominance. Instead, if it puts these patents into place, the company may be preparing to compete more directly with companies such as Alphabet's Waymo, which builds its own systems for use with another manufacturer's vehicle platforms rather than selling them to the OEM.

Impact: Setting that aside, most autonomous training programs depend primarily on the use of LiDAR, radar, and cameras coupled with accurate mapping data and hundreds and thousands of miles of test driving. Ordinarily, the AI is accompanied by a human driver just in case the system fails to respond or any software-related issues arise. Samsung's concept approach is different in that it combines those with a direct real-time analysis of a human driver, going as far as to read their brain waves. While there are a lot of obvious ways that could go horribly wrong, it may provide autonomous drivers with a much better way to handle non-autonomous vehicles sharing the roadway. Moreover, it could help improve a self-driving vehicle's 'situational awareness' and improve how other unknowns in an environmental setting are responded to if Samsung chooses its human drivers responsibly and carefully.

About the Author

Daniel has been writing for AndroidHeadlines since 2016. As a Senior Staff Writer for the site, Daniel specializes in reviewing a diverse range of technology products and covering topics related to Chrome OS and Chromebooks. Daniel holds a Bachelor's Degree in Software Engineering and has a background in Writing and Graphics Design that drives his passion for Android, Google products, the science behind the technology, and the direction it's heading.

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NACAT 2019 Conference Hotel Information

Accommodation information for the 2019 NACAT Conference & Expo is available. There are four hotels available for use. Registration links, when applicable, are provided at http://www.nacatconference.org/index.php/2019-accommodations.

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Figure 1 presents a conceptual framework for positing and addressing the research questions. As described below, we assumed that both student- and school-level indicators shaped students' decisions about completing CTE dual credit courses in high school.

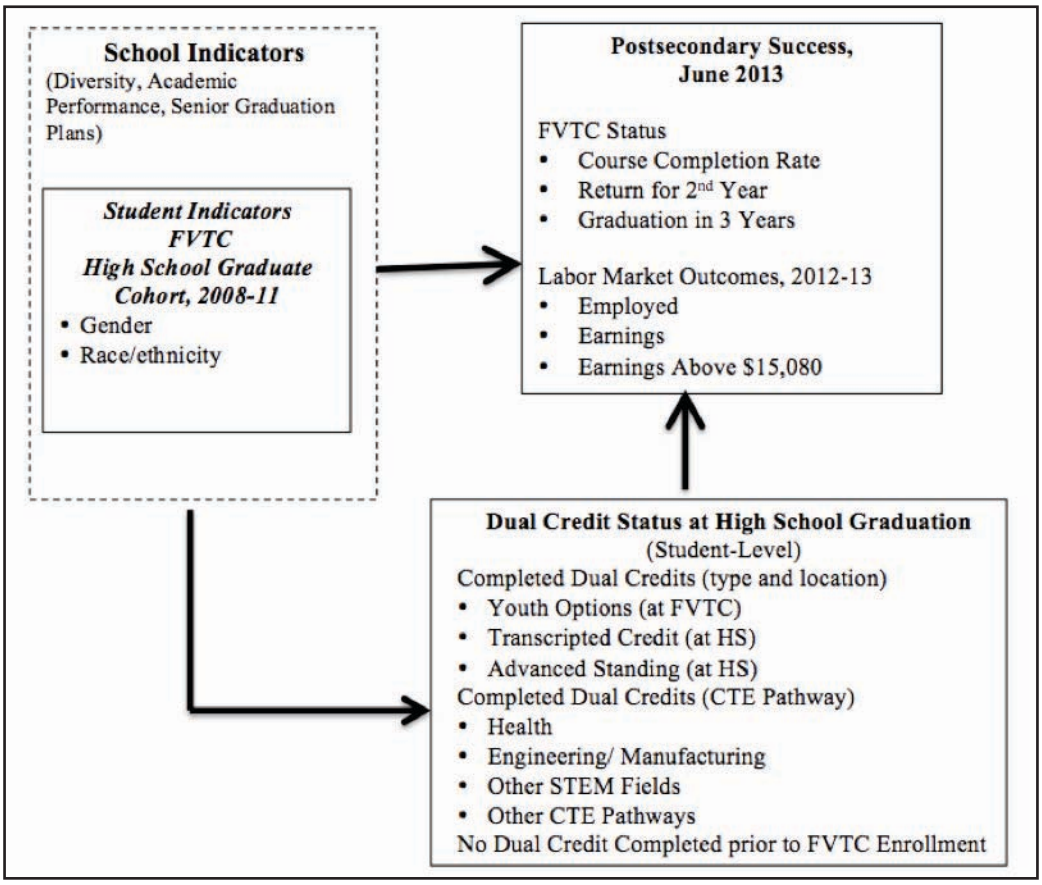

Figure 1. Conceptual Framework: CTE Dual Credit Experiences and Postsecondary Success

The lower box describes the three types of high school CTE dual credit experiences examined, as well as the four broadly defined CTE career pathways in which dual credit was earned. As suggested by three of our research questions, we were primarily interested in assessing whether any dual credit experience predicted college and labor market success during the five years beyond high school graduation. We measured student success with several typical outcome variables (e.g., academic progress, retention, graduation, employment, and annual earnings).

Literature Review

The Multiplicity of Dual Credit Goals

Completion of high school dual credit courses enables students to explore and test or advance their interests in college and career pathway options while still in high school settings (Steinberg, 2014). Moreover, dual credit courses in selected states have enabled more students to complete high school, contemplate college attendance, and reduce some of the early college cost to students and families (Zinth Dounay, 2014). In Tennessee, for example, high school dual credit offerings are considered key strategies for meeting state-specific college completion goals (Karp, 2013). Dual credit courses – along with other college readiness interventions – are aimed at addressing one or more documented student needs: better academic preparation, development of appropriate habits of mind, increased psychosocial and behavioral support, greater exposure to college, better information about college and financial aid, and better alignment of high school and college curriculum and assessment (Venezia & Jaeger, 2013). The extent to which CTE-focused dual credit programs or courses help to address these student and systemic policy priorities, and inform other outcomes (e.g., improvement of youth employment and labor market participation outcomes) is substantially under-examined in the literature. More specifically, the systematic implementation of and outcomes derived from CTE dual enrollment programs warrant further research (Zinth Dounay, 2014).

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CTE Dual Credit Outcomes and Implementation Practices

To date, several studies of dual credit CTE instruction using longitudinal data sets in New York City, California, Wisconsin, Florida, Minnesota, Texas, and Washington have identified positive career and college pathway outcomes. Table 2 (page 34) summarizes the key findings from selected, robust longitudinal studies of dual credit programs that include CTE courses, technical high schools, and/or postsecondary CTE students. These studies used longitudinal student transcripts to track student choices, college performance, and labor market status following participation in a high school dual credit program, while controlling for differences in gender, race/ethnicity, academic ability, native language, family income, and other factors that are often associated with educational attainment and student academic growth. Each study followed a target cohort of high school graduates who completed various types of CTE dual credit programs.

As noted earlier, advanced quantitative and quasi-experimental analyses were used to control for the student self-selection bias associated with elective high school courses. In some studies, CTE dual credit courses were examined as part of larger state-wide studies of dual credit completion and postsecondary access and attainment (Cowen & Goldhaber, 2015 ; Giani, et al., 2014; Karp, et al., 2007). Paradoxically, dual credit students in two states (Florida and Washington) had lower high school graduation rates, which researchers attributed to students' accelerated interest in launching careers or college entrance prior to completing graduation requirements (Cowan & Goldhaber, 2015 ; Karp et al., 2007). The diversionary effects of high school CTE courses has been a longstanding concern in the literature (Kazis, 2005; Belfield & Bailey, 2011). Researchers have examined the negative effects of work, work-based learning, and/or high school technical education concentrations on academic performance and postsecondary education attainment, and found, at best, mixed results (Kazis, 2005).

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"How wonderful it is that nobody need wait a single moment before starting to improve the world."
– Anne Frank

Summer Elections - 2019

North American Council of Automotive Teachers (NACAT) is currently accepting nominations from individuals to fill a number of board positions and vital officer position.

NACAT is a family-centered organization comprised of member educators who provide mentoring, educational support, and voice for automotive educators in secondary and post-secondary schools throughout North America. The organization is investing in the repair industry of tomorrow, and is recognized for the exemplary cutting-edge conference it provides to educators each year in different regions of the United States or Canada.

Are you an individual who currently works in the field of automotive education? Do you want to contribute to the industry that has become your profession? Are you an individual that has the desire and intent to use your unique qualities and talents to make the automotive repair industry a better place for the technician and industry of tomorrow? Do you work well with others in efforts to create a common good? If you answered "yes" to those questions and you are currently a NACAT member of record, and have been for a minimum of 24 months, you are certainly an individual who should consider our open positions.

Positions for 2019:

- Board Member *(Three seats open, each with a 3 year term)*
- Vice-President / President-Elect *(2 year term as Vice-President followed by 2 year term as President)*

If you feel that you have something to offer NACAT, automotive education, and the automotive industry, please consider running for one of the open positions. ***You can help us continue to make a difference.***

For more information on the open positions, or to learn how to submit a nomination form for one of the open positions, please go to http://www.nacat.org/index.php/general-election-information.

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Table 2. Dual credit outcome studies: Summary findings

Study	Program Name or State	Dual Credit Setting/ Target Sample	Significant Outcomes between Target Sample and Comparison Group				
			High School	College Choice	Early College	Retention	Graduate/Complete/ Employment/Earnings
Wang, Chan, Phelps & Washbon (2015)	WI Technical College Dual Credit courses	~1,100 high school students enrolling in any technical college within 1-2 years				4th term retention or graduation	4th term retention or graduation
Karp, Calcagno, Hughes, Jeong & Bailey (2007)	College Now: college and developmental courses	19 NYC Vocational High Schools, 2,303 grads		4-year	1st Year GPA	Total credits over 3.5 yrs	
Karp, Calcagno, Hughes, Jeong & Bailey (2007)	FL dual credit courses	High school CTE concentrators/ 14.5% of 2000-02 grads		Enroll in college	2nd term enroll-ment	2nd year retention; Total credits over 4 yrs.	
Hughes, Rodriguez, Edwards, & Belfield (2012)	Concurrent Course Initiative (CCI)	HS/College Partnerships in 8 CA cities/2008-10 CCI participants	HS graduation rate	4-year		Persistence in 4-year; Credit accumulation (20% higher over 2 years)	
Cowan and Goldhaber (2015)	WA - Running Start	Community college courses		Enroll in college directly	Second year retention in 2-year colleges		Complete an associates degree
Kotamraju (2005)	Minnesota Postsecondary Enrollment Options (PSEO)	PSEO students in 1999-01 entering college in 2001/Target sample = 469 dual credit completers				3-year cum. GPA for target sample, and for those completing CTE PSEO courses	
Speroni (2011)	Comparison of AP and DE Completers in FL. DE was academic only, no CTE courses.	All public FL high school graduates from 2000-01 and 2001-02. Of the 229,828 graduates, 29% completed DE and/or AP in high school.		DE more likely to attend college; less likely to enroll in BS/BA			
Jackson (2014)	Advanced Placement Incentive Program (APIP)	Implemented in 58 Texas urban high schools, 1996-2008/138,000 participants	Pass AP exams		2nd Year Enrollment	3rd Year Enrollment	Higher earnings after 10 years

In examining an earlier version of CTE dual credit intervention – Tech Prep programs – Cellini (2006) found in a national longitudinal analysis that Tech Prep programs increase overall academic attainment. However, such programs may also divert students from four-year to two-year colleges and "actually reduce the probability that a student will attend a four-year college in the years immediately following high school" (p. 395). Rising tuition costs, declining real wages, and high unemployment rates for young adults who lack college degrees present similar questions about the diversionary effects for those not pursuing four-year college admission or credentials. Recently, Stevens, Kurlaender & Grosz (2015) examined the education and labor market returns for CTE degrees and certificates using administrative data and pre-enrollment earnings data from the California Community Colleges. They found that, most notably overall, post-program earnings returns were 12-23 percent higher for students in health care sector programs. The estimated returns for non-health care programs ranged from 5-10 percent.

From a human capital and rational choice theoretical perspective (Becker, 1964; Mincer, 1974), these two studies also illustrate the potential for theoretical discontinuity. Higher earnings in certain career paths may divert students from their initial pathway selection. As the range of earning opportunities within and across career pathways increases within regional or local economic contexts, the prospects for college students being diverted to higher paying college majors is elevated (Carnevale, Cheah & Hanson, 2015).

Additionally, high school dual credit and community college courses could motivate some students to pursue transfer paths to baccalaureate programs in common or related career pathways. In the Stevens, et al., () study, the authors noted that for the students who embarked on a CTE credential but eventually transferred and completed a bachelors degree, the earnings of the control group are benefited disproportionately by the decision of some to transfer. When students substitute their vocational choice (e.g., AAS degree or certificate) with a transfer path (e.g., BS/BA), the economic rational choice theory is conflicted. When certificate or associate degree recipients subsequently complete credentials at baccalaureate institutions, it is difficult to determine which degree/credential or institution was the source of the variability in the estimate of earnings (Jepsen, Troske, & Coomes, 2014). At the base of this conundrum is the problem of predicting or identifying early the students who are likely to change plans and transfer to a baccalaureate institution, or to transfer career pathway programs.

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Similar to studies of academic dual credit learning experiences (An, 2013 ; Speroni, 2011), CTE dual credit courses have noteworthy advantages on early college success (e.g., first year GPA, retention to second term) and overall college retention (e.g., fourth term retention, credit accumulation in three years). However, the evidence of longer term CTE dual credit effects (e.g., college graduation, employment and annual earnings) is, at best, limited or under-examined in the current literature.

To Be Continued in the Next Issue!

Macomb Community College Graduates First Students From Tesla START Program

Macomb Community College has graduated its first class from the Tesla START program, an intensive 12-week technical training program designed to provide students with the skills necessary for job placement with Tesla as service technicians. Seven students who successfully completed the advanced service technician program have been assigned to Tesla Service Centers across the United States.

"We're serious about developing new ways to connect people with good jobs and futures, and business and industry with the talented workforce they need to prosper," said James O. Sawyer IV, president, Macomb Community College. "That's why we're excited about the Tesla START program. It provides our students with a unique opportunity to strategically position themselves for the future of the automotive industry."

The graduates of Macomb's first Tesla START program and their assignments: Brian Davis, 34, of Cincinnati, Ohio, to the Tesla Service Center in Cincinnati; Christopher Merle, 21, of Fort Wayne, Indiana, to Cincinnati; Patrick Henig, 21, of Shelby Township, mobile technician in Farmington Hills; Zachary Noland, 23, of Fairfield, Ohio, to Tucson, Arizona; Nikoll Sinishtaj, 25, of Shelby Township, to Buena Park, California; Vishal Tiwari, 22, of Shelby Township, to Sunny Vale, California; and Ryan VanSluytman, 25, of Estero, Florida, to Nashville, Tennessee.

Read the entire press release at: https://www.macomb.edu/news/2018/12/NR-2018-Tesla-START-Graduation-Final.html

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60% of Automotive Coatings Sold in 2018 Were Water-Borne, Finds Fact.MR Study

The automotive coatings market continues to witness significant transformation ranging from new material developments in the vehicle production to higher popularity of traditional colors compared to "more colorful" alternatives. The automotive coatings market is expected to witness an increase in volume sales of over 3,500 tons in 2018 over 2017, according to a recent Fact.MR study. Refinish formulations continue to gain center stage in the automotive coatings market, while water-borne coatings are gaining increased focus for basecoats.

Water borne automotive coatings have gained utter prominence over the years of evolution, primarily driven by environmental and health concerns of the solvent-borne automotive coatings. The study estimates nearly 6 in 10 tons of automotive coating sold worldwide in 2018 to be water-borne. However, demand for waterborne coatings as primer surface layer is likely to witness decline in tandem with increasing palpability of UV cure automotive coatings.

UV cure variants, albeit accounting for minor share of the market currently, have emerged as fast-selling automotive coatings and the status quo is likely to prevail in 2018 and beyond. Demand for solvent borne coatings is expected to remain higher than solvent-borne coatings in 2018, despite concerns regarding their environmental and health impacts. Preference for solvent borne automotive coatings is primarily undergird by their relative superiority in retention of pigments liquid and binding agents.

Acrylics to Remain Preferred Resin for Automotive Coatings

Fact.MR study opines that acrylics will remain the top-selling resin in the automotive coatings market, as these resins witness predominant use in passenger cars, trailed by fluoropolymers. However, recent shift in manufacturer preferences have led the demand for amines and poly alkyds, and it is highly likely that these resins will record relatively faster volume sales in 2018 and beyond.

Shares of the automotive coatings market are expected to remain clustered at the top and splintered at the bottom. Top 5 players will collectively account for nearly 40% share of the automotive coatings market. Supremacy of these players will be upheld by their sound operations and robust sales infrastructure worldwide. Small and mid-sized automotive coatings manufacturers are focused toward collaborations with established players as a key expansion strategy to strengthen their distribution and manufacturing capabilities.

Leading automotive coatings manufacturing companies emphasize providing automotive OEMs and key Tier 1 customers with value-added, best-in-class service products. These products are targeted at cutting down cost for customers while increasing their shareholder value in the automotive coatings market. Provision of cost-effective structure management to customers for maintaining safety standards and enabling process optimization, is a key focus area of leading automotive coatings market players.

"Lightweighting of vehicles and the shift toward low-temperature curing have been driving advancements in automotive coatings in recent years, with leading manufacturers exploring use of high-strength plastics and carbon fiber-reinforced polymers. Automotive coatings manufacturers are also concentrating on the development of "smart coatings" that feature enhanced performance characteristics including solar-reflective functionalities and self-healing or dirt-phobic," says a lead analyst at Fact.MR

"Penetration of smart solutions in the automotive coatings market entirely relies on requirements of automakers. Demand for self-cleaning, anti-fouling, and anti-corrosion enabling coatings among automotive companies is expected to be a key growth driver for smart coatings in the near future. However, economic slowdown and government regulations and interventions might add to confinements in growth potential of smart automotive coatings," adds the analyst.

About Fact.MR

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