Oral presentations: CV and abstracts

November 24th, 2020

Clean Mob

Salah EL HAJJI holds an msc in energy and fluid dynamics from ENSEEIHT and a second msc in powertrain engineering from IFP school. He started his career at the Volvo group in engine calibration as part of an international graduate programme. He became in charge of advanced methods development and deployment for solving engine related optimization problems. Salah has a wide international experience in his field and in machine learning.

As a tech for good enthusiast, Salah is the co-founder of CleanMob, a startup that promotes sustainable mobility.

Salah El Hajji

Abstract: Foster clean and multimodal mobility using smartphone data

Environmental stakes bring major challenges for mobility development and usage. Technological innovations such as electric vehicles and autonomous vehicles can be part of the solution. Alternatively, we have witnessed multiple encouraging pilot projects proving a shift towards Mobility-as-a-Service is possible. However, we still see today in our major cities a massive usage of personal cars with their inherent drawbacks: local pollution, GHG emissions, and traffic congestion. Additionally, the general public is often trapped in the "eco-friendly" fog and does not know the true environmental cost of its mobility, therefore lacks the means to take proper action to reduce said cost.

At the same time, the wide adoption of connected devices, including smartphones, offers a substantial opportunity. We are working on including the users via their smartphones to solve tomorrow's mobility equation by fostering behavioral changes. We transform the smartphone into a virtual CO_2 sensor by harnessing geospatial data, sensors data, machine learning, and vehicle physical modeling. We believe that the combination of accurate information on the climate impact of mobility and rewards on prevented CO_2 emissions can contribute to the shift towards low carbon mobility.

TRANSDEV	**William Levassor**
French engineer from the IFP School, William has worked 10 years in the automotive industry. In Renault and PSA he contributed in major powertrain projects to reduce CO2 emissions. In 2016, William joined Transdev as a project leader in a new team to develop Transdev's expertise in the autonomous field. In 2017, he became Deputy Director of this unit. He contributes to the development of technologies and services to support local operators to integrate and operate daily autonomous mobility services worldwide. He focuses on building partnerships and strategy to ensure passenger security, quality of service and customer experience in the solutions Transdev will run.	

Abstract: Public Transport and Autonomous Technology synergies

In a world where mobility is facing a revolution, the rise of self-driving technologies is helping Public Transport to optimize itself.

Through experimentations and developments Transdev embracing this revolution and is preparing its networks to run autonomous mobility services.

Transdev Autonomous Transport Systems integrates autonomous transport systems, including vehicles, AV supervision and connected infrastructure providing technologies such as supervision software and services to local networks for day-to-day operations on a large scale. Integration and set-up services before operation and data-driven technical support during operation.

To realize these synergies and drive the change forward, the ATS team benefits, on one hand, from the ability to understand the engineering of the autonomous driving technologies, and, on the other hand, from the ability to understand the complexity of daily operations. The objective is to turn this new self-driving technology into a commercial reality in public transport mobility services.

HUAWEI (GERMANY)

Olivier Lobey

Since March 2020, Olivier Lobey has been leading the newly created EV Lab for Huawei in Nuremberg Research Center, Germany.

Olivier had previously been working for 23 years in Energy & Automotive fields: Central Driving Intelligence for Byton EV with his team in Nanjing and Santa Clara; Technology and Innovation for Continental Powertrain China …

Olivier Lobey holds Master of Science Degrees from France IFP School, and from École Nationale Supérieure des mines de Saint-Étienne.

Abstract: V2X, The EV Powertrain at the Heart of the Power Grid

With generalization of electrification of the vehicles, the powertrain has become even more intertwined with other automotive systems, such as Braking Systems, and Assistant Driving Automotive Systems. In parallel, energy production is being diversified as well, especially for transportation.

This gives an opportunity for the vehicle optimization to affect the upstream value of the energy chain, while keeping the right priorities for all the other key market drivers, from comfort to efficiency. Which of those trends could be resolved by continuous improvement, and which would have to be dealt by disruptive solutions?

V2X, "Vehicle to Everything", hides two sides: Energy Interconnection, and Information Exchange. And scenarios show that Electric Vehicles powertrain architectures could yield benefits with either modularity, or integration. Huawei is addressing all those market drivers, from both ends: Power Electronics for Photovoltaic, and powertrain platform. The single target remains to address the customer's unique use cases, and ecosystems.

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IFPEN

Samir Anbri received his M.Sc. degree in energy and environment engineering from INSA Lyon in 2018. He was a research intern at UC Berkeley Laboratory (LBNL) in 2017. He received a specialization degree in the field of new mobility from IFP School (ENSPM) in 2019. He is now a research engineer at IFP Energies nouvelles where he is working on connected and autonomous mobility projects.

Samir Anbri

Abstract: Simulation approach for predicting the environmental footprint of connected and autonomous mobility

Mobility systems are becoming more sustainable as they have to reduce their pollutant emissions and energy consumption. To achieve this aim, vehicle manufacturers are improving engine efficiency and are massively developing vehicle electrification. Besides, new technological solutions, such as vehicle connectivity, are emerging and allow significant gains. The exchange of data between connected vehicles opens the door to control strategies such as eco-routing and eco-driving. These emission benefits can be observed on the scale of a vehicle (engine emissions reduction) but also on a larger scale through the introduction of connected/autonomous public services in some cities. The objective of this presentation is to investigate and quantify the emission reduction enabled by connectivity. A simulation approach for predicting the environmental footprint of connected and autonomous mobility is presented. Based on IFPEN eco-routing and eco-driving algorithms, a methodology for modeling connected vehicle emissions has been developed. By combining this approach with traffic analysis tools, it is also possible to model the impact of autonomous on-demand services on emissions in an area.

Univ. Eiffel

Pierre-Olivier Vandanjon, received the B. Sc and the M. Sc in applied mathematics from the Paris-Dauphine University (Paris, 1990). He graduated, as a civil engineer, from Ecole des Mines de Paris (Paris, 1992) . He received the Ph. D degree from both the Ecole des Mines de Paris and the French Atomic Agency (CEA) (1995). He has been researcher with the French institute of sciences and technology for transport, development and networks (Ifsttar) since 1997 inside the following contracts : European projects : Circ, Osyris, Intro, Fuel Cell Cargo Pedelecs, French projects : Cervifer, contracts with Ermont, Eurovia, Ratp, Renault, RMC, SNCF, Tisséo, City of Rouen.

He provides robotic techniques on research projects for transport systems (road and railway) in order to improve productivity, safety and energy efficiency. His current domain of interest is ecodesign and sustainable operation.

Dr. Pierre-Olivier Vandanjon

Abstract: Environmental assessment of a line of autonomous shuttles based on open data and a multi-agent system: the case of an innovative mobility offer in Nantes

In the framework of energy transition, many cities - especially the largest - are seeking to take action on transportation, a sector that accounts for nearly 32% of national energy consumption. Acting on transportation and, more generally, on travel (both in terms of how it is carried out and the mode in which it is done) appears to be a way of, on, achieving the GhG emission reduction targets and reducing the various nuisances associated with motorized transportation, particularly noise and local pollution. As an example, Nantes Métropole, an urban area of approximately 620000 inhabitants, has committed to reducing annual emissions per inhabitant by 50% in 2030 compared to 2003.

The urban transport ecosystem is undergoing major changes. On the one hand, new services are emerging: car sharing, car pooling, autonomous shuttle services and, on the other hand, traditional services are being renewed: modernization and extension of public transportation networks, renewal of cycling equipment networks. The evaluation of these offers is often very localized, with externalities that are sometimes poorly taken into account. For example, the extension of a bus line will reduce certain externalities such as pollution, noise and pollutant emissions at localized locations, but may lead to an increase in these same externalities at other locations. Moreover, locally, some externalities, such as pollutant emissions, may decrease and others, such as noise, may increase.

A global model of urban travel that would support these systemic and interdisciplinary evaluations is therefore interesting. Multi-agent modeling models the interactions between travel demand resulting from agents' activity plans and transport supply. This modeling is now more accurate thanks to the opening of socio-demographic (INSEE database), fiscal (Filosofi database) and travel survey (EDGT) databases. Coupling with multi-physical models from the most recent work shifts the paradigm of a static evaluation to a dynamic evaluation of the impacts suffered by each agent.

We present our current and future work to articulate multi-agent system, open data and environmental assessment by taking as a case study: the ecodesign of a new line of autonomous shuttles in the urban area of Nantes.

Arrival | **Alex Charr**

Alexandre Charr (PWT-2012) is Project Manager of Mobility Projects at Arrival. He is managing a portfolio of collaborative projects tackling the mobility challenges of tomorrow, from autonomous driving to Mobility as a Service (MaaS). Before joining Arrival Alex held various technical and project management positions, in Toyota Motor Europe, Jaguar Land Rover, PSA Peugeot Citroen and Renault.

IFP School

Émilien Bouton is Junior Engineer enrolled in the Powertrain engineering Master's program (class 2020) at IFP School , he had 2 year experiences in eDrive development at system level. Worked on early phase powertrain development for PSA Group's future electric vehicles. Worked for Valeo on the first 48V eDrive produced by Valeo. Interested in electric powertrain development, integration, design and testing. Available early 2021

Abstract: Drivetrain optimisation for an electric van

Five IFP PWT students collaborated with the Arrival Powertrain Team to optimise the Arrival Van's transmission performance and software control to maximise the range, unit's manufacturability and cost. The optimisation looked at several design parameters such as the number of gears, shifting methodology and shifting strategy. The project started with a literature review which led to design choices that were simulated in a one-dimensional (1D) vehicle model developed in Matlab/Simulink.
The students designed a transmission and software control which resulted in an efficiency increase of 1% while optimizing the number of gear and gear ratios in function of split usage, allowing a trade-off between energy consumption and durability.

Goggo Network

As a graduate engineer in motorisation, Michaël began his career in 2008 at PSA and contributes in particular to the digital transformation of the group by promoting digital computing.

After completing an MBA in entrepreneurship at EM Lyon in 2013, he co-founded DRUST in 2014, a startup specializing in vehicle data analysis whose technology will be sold in 2019 to Continental.

Passionate about autotech, he created the France AutoTech startup association in 2017, which now has 80 members and which he will chair until 2020.

In 2019, he joins the European startup Goggo Network as VP of Product & Partnership, which aims to operate autonomous mobility in a network.

Michael Fernandez
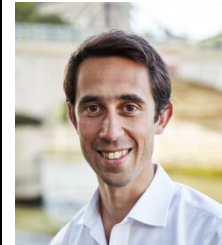
Abstract: Autonomous Mobility Networks

Europe is currently leading the mobility landscape. But a new mobility transformation is underway with the arrival of electric engines, extensive adoption of Mobility-as-a-Service platforms and autonomous systems.

This time, Europe is lagging behind, while others are rushing ahead. Europe must be at the vanguard of this new transformation.

Without a strong action plan, European mobility players will struggle to keep their leadership, while large foreign players will both define and supply the European mobility landscape. They will tend to focus on the most profitable areas for them to deploy vehicles, leaving out rural areas and flooding urban centers with underused fleets. Europe will lose even more control over its future.

We think Autonomous cars will not be simple upgrades to the cars we drive now. Autonomous cars will be operated as networks.

But these mobility networks won't happen automatically. Europe must act with intention to set up intelligent and rational rules for autonomous mobility networks.

At Goggo we are helping develop the legal and engineering framework for European autonomous mobility networks. This is anchored on 5 key pillars: Safety, universal access, fair competition, efficient allocation of public assets and multidisciplinary collaboration.

A European regulatory system will encourage investment for shared and self-driving electric mobility across the continent, paving a clear path to market, and creating a healthy, competitive landscape. We believe that Europe can be at the forefront of the mobility revolution for much safer, less polluted, less congested and human-centric mobility.

CES-Mines Paris Tech

Hussein Basma

My field of expertise covers several aspects of automotive applications, from hybrid and electric passenger vehicles, to fully electric buses. I am finalizing my PhD at Mines ParisTech, and my thesis tackles the different challenges that face new electric bus technologies and provides technical solutions and strategies to overcome them. I also hold an M.Sc. in powertrain engineering from IFP School with concentration on Hybrid electric vehicles design and energy management.
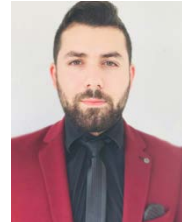
Abstract: The Deployment of Battery Electric Buses: Benefits, Challenges and Methods

Battery Electric Bus (BEB) is a promising technology that could replace the current diesel bus fleet and reduce its environmental burden, thanks to its high well-to-wheel energy efficiency. However, there are many challenges preventing the wide deployment of BEB mainly related to the limited bus driving range, the required charging infrastructure, and high costs in comparison to diesel buses or any other alternative vehicle technology. Nonetheless, a proper design of the energy storage system capacity coupled with an adequate charging strategy and infrastructure could help to overcome the aforementioned challenges and ease the deployment of BEB at a massive scale. In this session, the benefits and challenges of BEB deployment are discussed, while introducing a systematic approach that would facilitate BEB deployment and exploit its benefits by overcoming its challenges.

CEREMA Philippe Dunez has a solid experience in vibration and acoustics activities. He holds a Master' degree in acoustics and vibrations (ATVE - University of Maine). Since 2002 he has been in charge of acoustics and vibration studies at Cerema Hauts de France. He is recognized as an Expert on anthropogenic risks by the CGEDD (General Council for the Environment and Sustainable Development). His studies in the field of transportation range from complaint management (acoustics and vibration) to methodological studies. Some notable studies: Evaluation of the noise level of a tramway according to its load, in Lille (Ifsttar research action), Vibration study for the characterization of a new process called "low rail" tramway in Toulouse (IDRRIM/CIRR), Air and Noise study of the dedicated taxi-bus lane on A1 highway between Roissy and Paris (DIRIF). Philippe Dunez has written articles for magazines such as Echo-Bruit, RGRA and Techni-Cités. He has notably contributed to the Transport and Air Pollution conference in 2016 (combined air quality and noise - evaluation of transport policies: methodology and feedback) and the Congrès Société Francophone de Santé Environnement in 2020 (Environmental impacts of a vertical axis urban wind turbine, Carnot "Urbeol" project).	**Dr. Philippe Dunez**

Abstract: Environmental analysis of an autonomous driving: methodology for acoustic and vibratory evaluation

SAM project, supported by ADEME, consists on studying the Safety and Acceptability of driving and autonomous Mobility included environmental analyses. The objective of this presentation is to describe the methodology for acoustic and vibration thematics and also its application on a study site, in comparison with a conventional vehicle as a reference. Vehicles are equipped with microphones and accelerometers. Measurements are recorded continuously several times on the car's course. Several indicators are analysed, such as overall levels and spectrum. Each particular event is analysed in greater detail: deceleration, acceleration, emergency braking, intersection, etc. Furthermore, acoustic measurements are made outside, in order to quantify the impact of autonomous driving on the surrounding noise, especially in the case of large-scale deployment. The measurements will be used to calibrate noise models.

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ENPC After completing her PhD thesis in materials and structural mechanics at the Navier laboratory of the Ecole des Ponts ParisTech, Natalia Kotelnikova-Weiler joined the Laboratoire Ville Mobilité Transport in 2013 to work on the environmental impacts of mobility. She is currently working as an evaluator in the SAM project (Safety and Acceptability of Driving and Autonomous Mobility), an autonomous vehicle experimentation programme launched in 2019, in response to the EVRA (Autonomous Road Vehicle Experimentation) call for projects, financed by ADEME (French Environment and Energy Management Agency). Her research focuses on the life cycle analysis of autonomous mobility, a method that will make it possible to assess the potential environmental impacts on all phases from manufacturing to the end-of-life of the systems involved in this new mobility".	**Dr. Natalia Kotelinikova**

Abstract: Life cycle assessment of autonomous mobility: Scope(s) of assessment

Autonomous mobility is based on a set of specific technical systems that goes beyond the strict perimeter of the vehicle and involves elements in the vehicle, the infrastructure and the supervision centre for its operation.

Given the rapid development of technologies in these fields, there is a great deal of uncertainty about the future technical choices associated with these technological building blocks - very different options are currently being considered and tested. But the context in which autonomous mobility is developing is also changing, conditioning or guiding these future technical choices: the development of communicating technologies, the arrival of 5G.

As a result, the application of the life cycle assessment method to autonomous mobility, which aims to cover the potential environmental impacts over the entire life cycle, encounters two difficulties. The first is to establish a relevant evaluation perimeter, allowing the environmental issues related to automation to be identified. Indeed, the automation introduces new issues such as the consumption of scarce resources for electronic components or energy consumption for data transfer, the relative weight of which must be assessed. The second is to develop technological scenarios to cover current uncertainties.

The Communication will present a framework for LCA assessment of autonomous transport modes and discuss the associated uncertainties. This research is part of the SAM project (Safety Acceptability of Mobility and Autonomous Driving), an autonomous vehicle experimentation programme launched in 2019 in response to the EVRA (Experimentation of the Autonomous Road Vehicle) call for projects, financed by ADEME (French Environment and Energy Management Agency).

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	Nadège Faul
VEDECOM Nadège Faul, is Director for the large-scale demonstration projects of connected and automated mobility in the VEDECOM Institute. Among other projects, she coordinates the methodologies for implementation and evaluation of SAM (Sécurité et Acceptabilité de la conduite et de la Mobilité autonome). SAM is a major French project, gathering 18 industrial and academic partners, aiming at demonstrating the safety, acceptability and the socio-economic impacts of automated mobility. Covering 19 experimental sites in 13 different locations, SAM is funded by the French programme EVRA, and is supporting the development of the National strategic roadmap for road automation. Beyond technical validations and user's acceptance exploration, the project is also addressing major challenges, such as the integration in the urban environment, the impacts on local governance, or developing the common methodologies and approaches for stakeholders from various sectors (automotive, transport operators, urban logistic…). Nadège has been involved in various other projects, all exploring the diversity of challenges linked to automated mobility, both on national (EVAPS), or European level (ARCADE, SHOW, CoExist). She is graduated from Neoma Business School (Rouen, France), and has completed a 24 years career as a senior executive in the automotive industry (PSA Group), in activities linked to international development, dealer network management, customer satisfaction, or the management of innovation projects.	
Jaâfar is graduated in civil engineering and mobility planning (Ecole des Ponts, Paris). He joined VEDECOM in 2016 and obtained his PhD in 2019 in demand modelling and transportation economics. His research interests focus on the assessment of socioeconomic impacts for new mobility services. He had key contributions in simulating demand for autonomous taxis by coupling a VEDECOM agent-based model with an existing macroscopic model. On the other hand, he is teaching discrete choice analysis and the prediction of individual behaviours in the Ecole des Ponts Paris-Tech (ENPC). Currently, he is the leader of the research team ANTHEM (Technical-economic analysis of mobility systems) and the assistant director of the department "New mobility solutions and shared energies" at VEDECOM. He is also involved in several national (SAM) and European projects (ARCADE and SHOW).	**Dr. Jaâfar Berrada**

Abstract: Autonomous vehicles in France: where do we stand today and first insights of socio-economic assessment in Saclay

Autonomous Vehicles (AV) are becoming more of a reality, promising beneficial yet potentially disrupting changes to our urban transportation systems. This technology presents the potential to reduce energy consumption and crash occurrences, cut travel costs and minimize urban space occupancy for parking purposes. Yet barriers to implementation and mass-market penetration

remain. Economically, the upfront costs in the initial stage will likely lack affordability. Socially, users could be reluctant to change their daily travel routines. Technically, the interactions with the other components of the transportation system remain uncertain. There are other challenges regarding liability, security, ethics and data privacy, too.

This presentation provides an overview of the situation today regarding the deployment of AVs especially in France. In particular, we presented the national project SAM, one of the main national projects to prepare the venue of AVs through evaluating their impacts on acceptability, security, traffic and economics. Two scales are considered: experimental scale and commercialization scale. The main challenges and enablers that have been identified are also discussed.

In a second step, we will focus on one of the 19 XPs of SAM: autonomous Taxis in Saclay. A methodology to assess socioeconomic impacts is then described in more detail. First insights based on simulation of a hypothetical upscaled service are presented.

SIEMENS

Mohsen Alirezaei received his PhD in Mechanical Engineering, Robotics and Control in 2011 and was a postdoc researcher at Delft University of Technology in 2012. He was a Senior Scientist in the Integrated Vehicle Safety Department of TNO automotive (2012-2019) and part time assistant professor at Delft University of Technology (2015-2019). He is currently working as a Fellow Scientist at Siemens Industry Software and Services in Helmond and is part time assistant professor at Eindhoven University of Technology, the Netherlands. His research interests are verification and validation of automated and cooperative automated driving and advance driver assistance systems.

Dr. Mohsen Alirezaei

Abstract: **Critical Scenario Creation for Verification and Validation of Cooperative and Automated Driving Functionalities**

To assess the safety of Automated vehicles (AVs) various aspects must be taken into account. Firstly, safe functionality must be ensured through functional safety, as described in ISO 26262. This standard focuses on hazards induced by technical failures due to systematic and random faults in both hardware and software. Additionally, the so-called Safety of the Intended Functionality (SOTIF) must be ensured. SOTIF focuses on an intended function that could induce hazards due to functional insufficiencies, in the absence of technical system failures. SOTIF analysis covers identification of system weaknesses as well as scenarios that lead to a hazardous event. According to SOTIF scenarios are categorized based on two properties: Firstly, scenarios are either known or unknown, depending on whether they were already indented by the designer or not and Secondly, they are either safe or unsafe. This results in four type of scenarios: (1) known-safe, (2) known-unsafe, (3) unknown-unsafe and (4) unknown-safe. SOTIF analysis concentrates mainly on identifying unknown-unsafe scenarios. When an unsafe scenario has been found, its risk can be mitigated. Systematic identification of unknown-unsafe scenarios which is crucial for development of safe automated driving systems is the main goal of this presentation.

The proposed approach contributes to this in two ways. Firstly, it addresses the need for a generally applicable way to quantify criticality, where a critical scenario is meant to be potentially hazardous. Secondly, the approach seeks a way to quantify novelty, which aids the discovery of unknown scenarios. Together, these two aspects will be used for automatic generation of unknown-unsafe scenarios.