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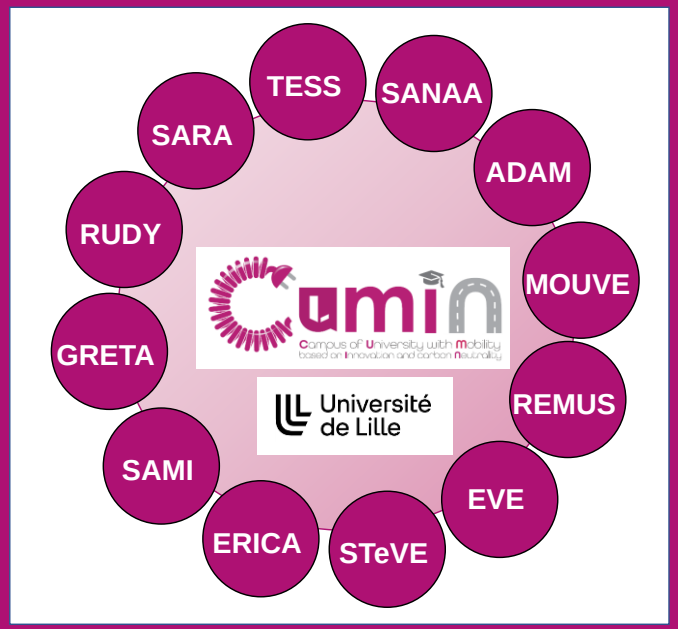

CUMIN MOUVE

Charging Strategies for Electric Vehicle in Various Climatic Conditions

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Prof. Loïc BOULON[2], Prof. Audrey GROLEAU[2],

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[2] Université du Québec à Trois-Rivières, Canada

Swapnil REVANKAR
(PhD Student)

Outline

1. Context and introduction
2. PhD objective
3. Reference vehicle & charger
4. Conclusion

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Context and introduction

Team & position in CUMIN program

Pr. Alain Bouscayrol

Electric Vehicles
EMR

Dr. Ronan German

Batteries

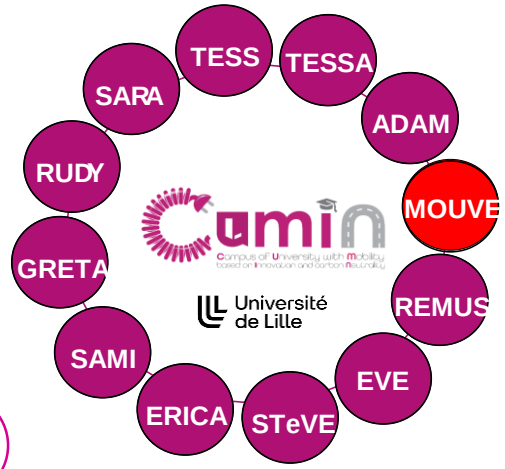
Cotutelle

Pr. Loïc Boulon

Electric Vehicle in low temperature

Pr. Audrey Groleau

Didactics of science & technology



Région Hauts-de-France

Université de Lille

UQTR Université du Québec à Trois-Rivières

L2EP Laboratoire d'électrotechnique et d'électronique de puissance de Lille

Laboratoire International Associé (LIA): international collaboration around a common scientific project.

Campus comparison

[UQTR 2019]

Temperature -30°C / +30.9°C
Population 16,000

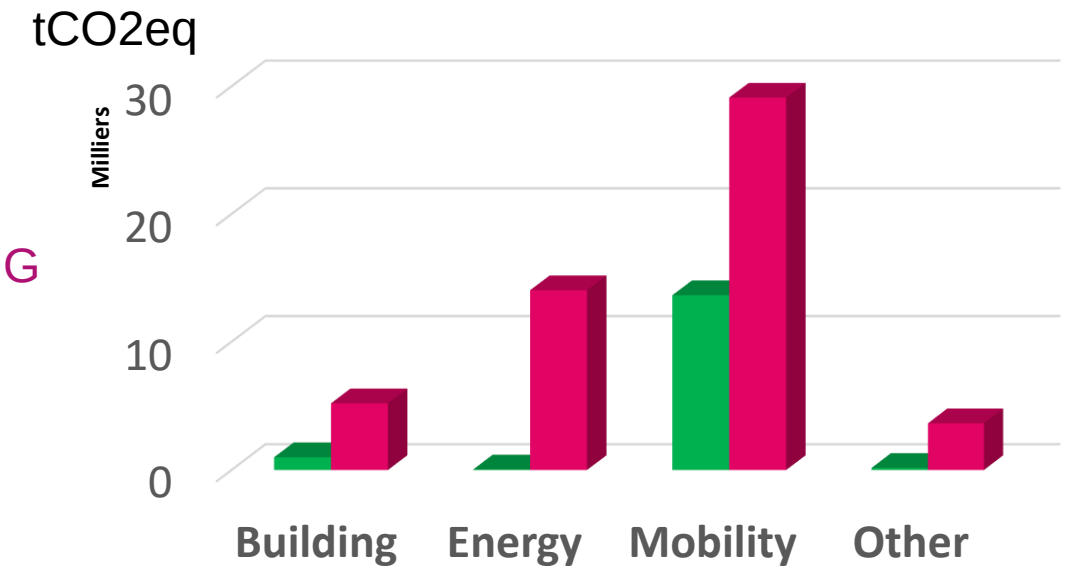
[COMUE 2015]

Temperature 0°C / 30°C
Population 22,000

Thermal cars

- 24% of usage
- 81% of GHG

Distribution of GHG



Operating modes of electric vehicles

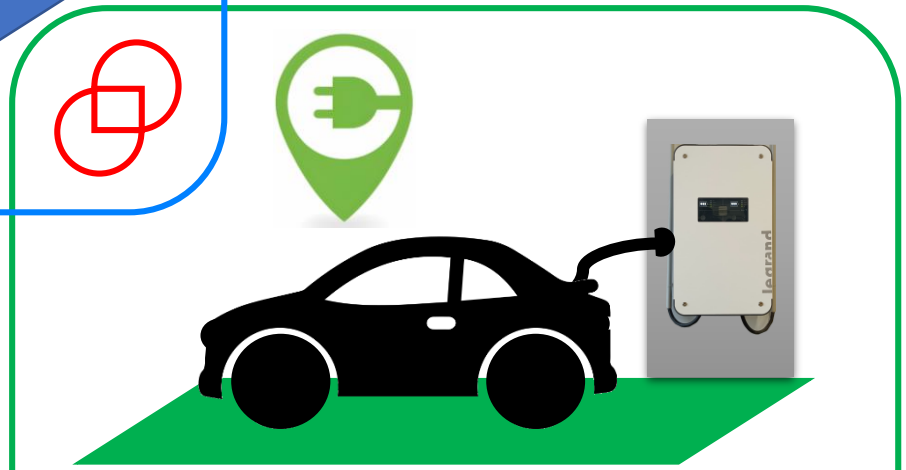
Park

20 Hour (83%)

[Xumin Huang & et al, IEEE 2018]

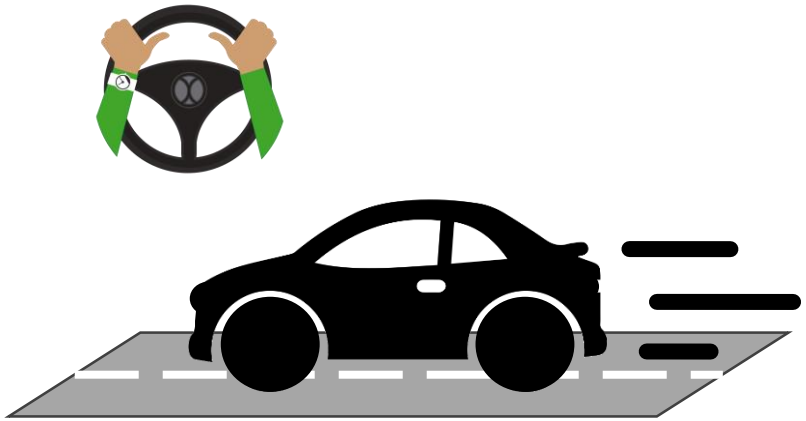
70% of vehicles everyday

Charging



3 Hour (13%)

Drive



1 Hour (4%)

[Bilan Carbone, Lille1, COMUE 2015]

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PhD objective

My PhD

Objective

Global study of EV charging strategies in diverse climatic conditions

Extended driving range

Lifecycle improvement

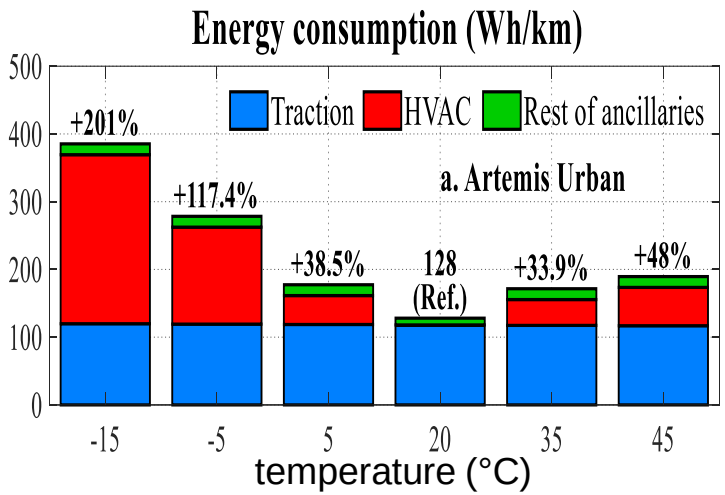
Smaller carbon footprint

Individual cost savings

Prolong battery replacement

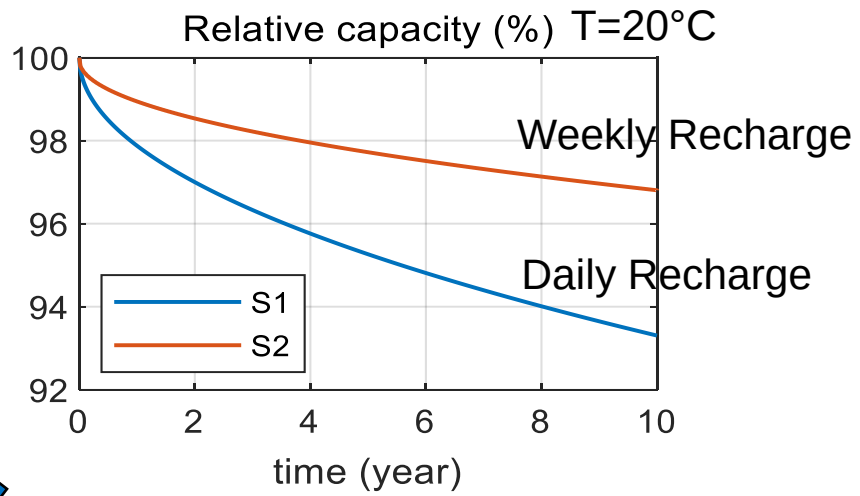
User convenience

PhD overview



L2EP
Laboratoire d'électrotechnique et d'électronique de puissance de Lille

(Prior Work)



Dr. David RAMSEY (2018-2021)
EV consumption in extreme conditions

Université de Lille — UQTR Université du Québec à Trois-Rivières

Alla NDIAYE (2020-2024?)
EV charging & aging strategy

Lyon 1 — Université de Lille — MEGEVH French network on HEV's

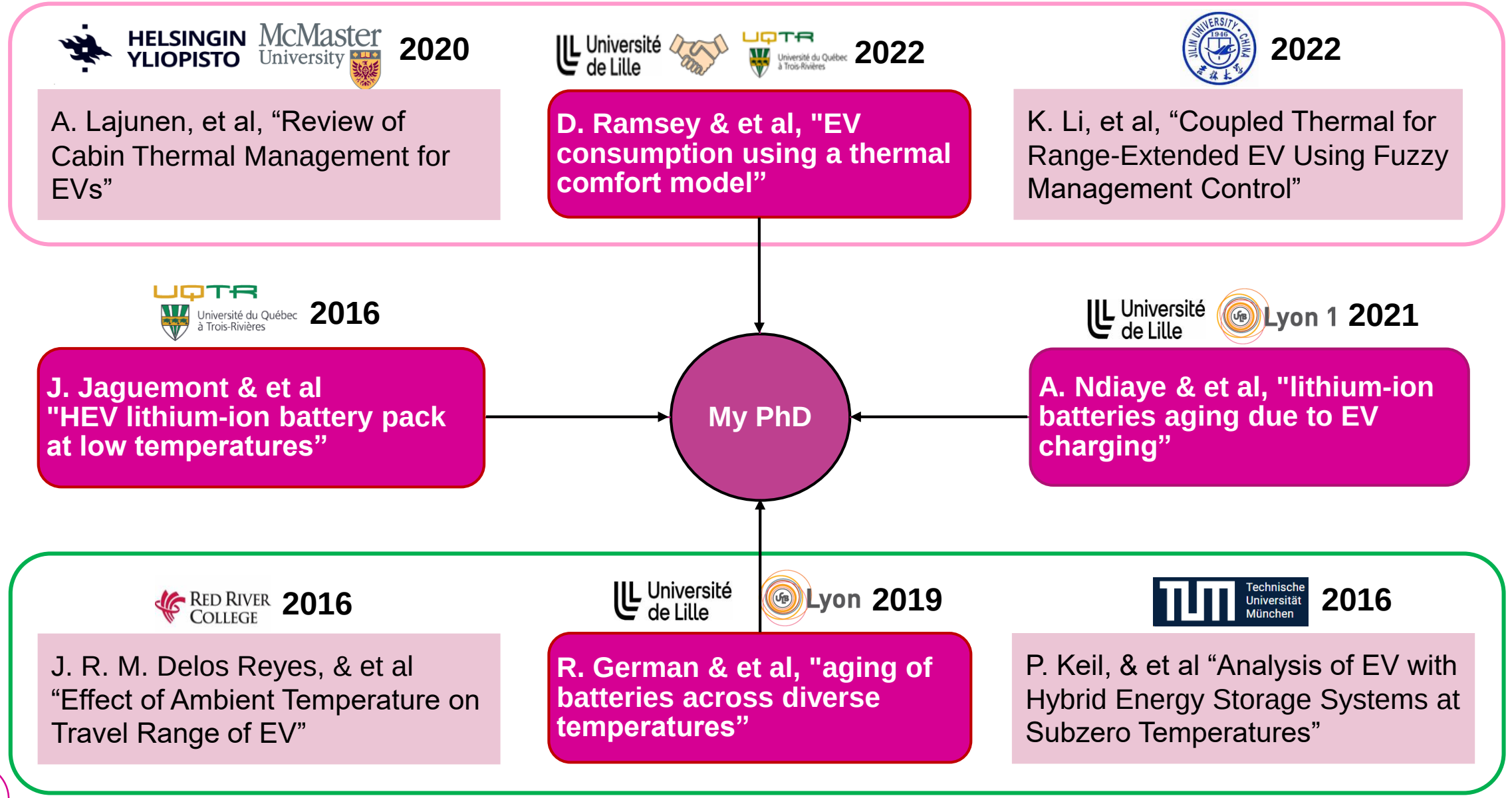
Charging Strategies for Electric Vehicle in Various Climatic Conditions

Low temp. calendar aging
Low temp. cycle ageing

Impact of preheating
Impact frequent charging

User Analysis
"Best Practice Guide"

Position of PhD



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Reference vehicle & charger

Reference vehicle & charger

Nissan Leaf

GEN 2 Model 2018

5 seater mid-size hatchback

Top speed 144 km/h

Range of ~270 km, WLTC3

40 kWh NMC battery

L2EP
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Charging Options

DC charging

46 kW

AC Charging

3.6 kW

Charge Connector Types

CHAdeMO

Type 2

Conclusion

- Diverse climatic conditions (down to -30°C)
- Impact of charging on battery aging
- User guide based on driving pattern, climatic conditions etc.

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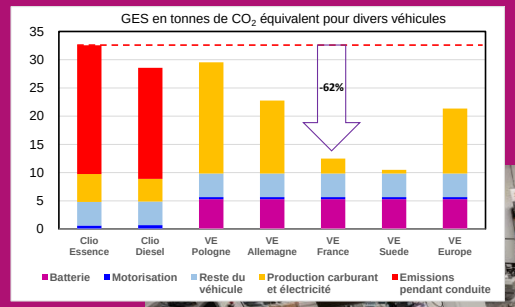

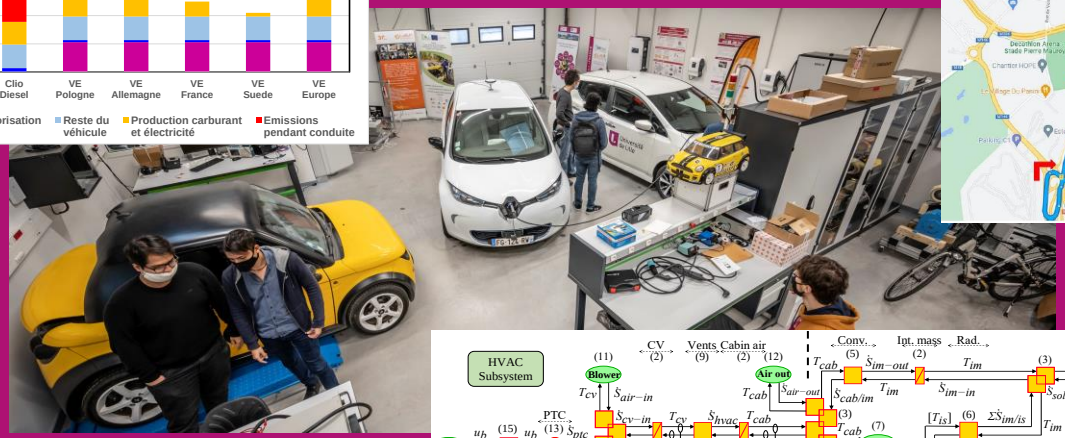

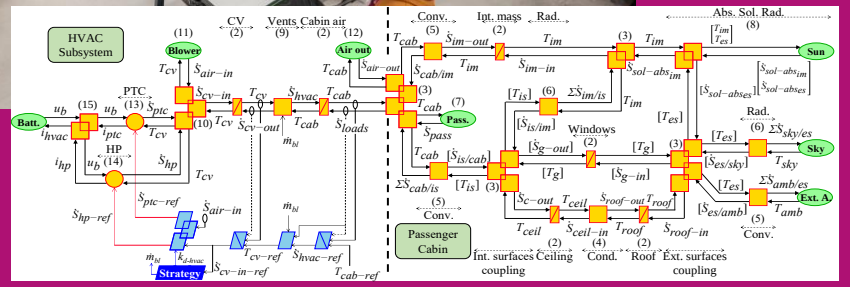

Our university as an exciting living lab towards eco-cities through an innovative transdisciplinary framework !