



EDITAL PPGT Nº 02/2023 - SELEÇÃO DE CANDIDATOS ÀS VAGAS DO PROGRAMA DE PÓS-GRADUAÇÃO EM TRANSPORTES PARA O CURSO DE MESTRADO ACADÊMICO COM INGRESSO NO SEGUNDO PERÍODO LETIVO DE 2023

## PROVA DE MÚLTIPLA ESCOLHA

### Leia com atenção as instruções abaixo:

1. A prova terá duração de **2 (duas) horas**, já incluído o tempo de preenchimento da folha de resposta.
2. Será eliminado o candidato que, durante a realização das provas, for surpreendido portando: aparelhos eletrônicos, tais como *wearable tech*, máquinas calculadoras, agendas eletrônicas e(ou) similares, telefones celulares, *smartphones*, *tablets*, *ipods*®, gravadores, *pen drive*, mp3 *player* e(ou) similar, relógio de qualquer espécie, alarmes, chaves com alarme ou com qualquer outro componente eletrônico, fones de ouvido e(ou) qualquer transmissor, gravador e(ou) receptor de dados, imagens, vídeos e mensagens etc.; óculos escuros, protetor auricular, lápis, lapiseira/grafite, marca-texto e(ou) borracha; quaisquer acessórios de chapelaria, tais como chapéu, boné, gorro etc.; qualquer recipiente ou embalagem que não seja fabricado com material transparente, tais como garrafa de água, suco, refrigerante e embalagem de alimentos (biscoitos, barras de cereais, chocolate, balas etc.); livros, dicionário, notas ou impressos que não forem expressamente permitidos.
3. Não será permitida a interferência e/ou a participação de outras pessoas, salvo em caso de candidato que tenha solicitado condição especial, em função de deficiência que impossibilite a realização da prova pelo próprio candidato.
4. Durante a realização da prova, o candidato não deverá se comunicar com outros candidatos nem se levantar sem a autorização do responsável pela aplicação da prova.
5. A folha de resposta deve ser preenchida com caneta em tinta azul ou preta.
6. O candidato somente poderá deixar a sala de prova após **30 (trinta) minutos** do início da avaliação.
7. O candidato somente poderá levar o caderno de questões no decurso dos últimos **15 (quinze) minutos** anteriores ao horário determinado para o término da prova. Caso o candidato opte por deixar a sala de prova antes deste horário, o caderno de questões deverá ser entregue juntamente com a folha de resposta.
8. A desobediência de qualquer uma das determinações constantes nas instruções acima e no edital implicará na eliminação do candidato.

### Identificação do Candidato

Inscrição:

Nome completo:

Assinatura:

**QUESTION 1**

The Table 3 from the manuscript “Factors influencing subjective walkability: Results from built environment audit data” gives the Statistical Models Predicting Subjective Scores from micro-scale street characteristics.

**Table 3.** Statistical Models Predicting Subjective Scores from micro-scale street characteristic

Predictors	Subjective Score for Travel			Subjective Score for Leisure		
	Estimates	CI	p	Estimates	CI	p
(Intercept)	4.75	3.54 – 5.96	<0.001	6.48	5.33 – 7.55	<0.001
<b>Land Use</b>						
Main land use (Reference: Residential)						
Vacant / Industrial				-1.31	-1.88 – -0.74	<0.001
Commercial				-0.81	-1.20 – -0.43	<0.001
Mixed				-0.47	-0.84 – -0.10	0.012
Parks				0.83	0.47 – 1.19	<0.001
Parking lots				-0.65	-0.98 – -0.32	<0.001
Transit stops				-0.64	-0.95 – -0.32	<0.001
<b>Accessibility</b>						
Walkscore	0.16	0.10 – 0.21	<0.001			
<b>Street connectivity</b>						
Cul-de-sac	-0.99	-1.47 – -0.50	<0.001			
<b>Safety and security</b>						
Pedestrian light signal (Reference: None)						
One Intersection	-0.37	-0.66 – -0.07	0.014			
Two Intersections	-0.01	-0.41 – 0.39	0.971			
Speed limit	-0.33	-0.49 – -0.18	<0.001	-0.56	-0.74 – -0.38	<0.001
Street lighting (Reference: None)						
Some	0.47	0.07 – 0.87	0.020	0.57	0.12 – 1.02	0.014
Ample	0.85	0.35 – 1.35	0.001	1.23	0.67 – 1.79	<0.001
<b>Pedestrian facility and comfort</b>						
Benches	0.47	0.22 – 0.73	<0.001	0.61	0.29 – 0.94	<0.001
Sidewalk buffer (Reference: None)						
One side	0.65	0.28 – 1.03	0.001	0.57	0.14 – 1.00	0.009
Two sides	0.89	0.54 – 1.24	<0.001	0.81	0.42 – 1.20	<0.001
Sidewalk maintenance	0.72	0.48 – 0.96	<0.001	0.53	0.27 – 0.80	<0.001
Sidewalk tree cover (Reference: 0-25%)						
26 - 75%	0.58	0.34 – 0.81	<0.001	0.94	0.66 – 1.22	<0.001
76 - 100%	0.76	0.29 – 1.23	0.002	1.29	0.75 – 1.83	<0.001
<b>Streetscape design</b>						

Related do Accessibility variable, in the paper context, it is correct to state that:

- Walkscore was the only variable that had a significant effect on subjective walking for travel scores with an increase in 0.16 points for every increase of 10 in Walkscore.
- The lack of effect on leisure walking scores was expected as per definition leisure walking is discursive meaning that pedestrians are not walking to a specific destination and as such having access to destinations is likely not important.
- Walkscore is not accurate to measure perceived walkability, especially for leisure walking.
- Walkscore is a micro-scale variable.
- All statements are correct.

**QUESTION 2**

The text below is extracted from the paper “Demand risk and contractual abandonment: a real options



analysis of the BR-381/262/MG/ES highways concession" (Costa & Rocha, 2021).

"Early termination of a concession is almost always associated to the materialization of one or more of the risks that in one way or another frustrate the initial expectations of one or both the parties to the contract and lead them to abandon the project. Of all the risks associated to a highway concession project, the demand risk is considered to have the most financially corrosive effect (Flyvbjerg et al., 2005; Lara Galera and Soliño, 2010; Song et al., 2018)."

Considering the text, which alternative best represents how the traffic was modeled for the dynamic analysis of the project's cash flows:

- a) The deviation between the effective and expected traffic in the project's first year follows a normal distribution. The mean and the standard deviation were based on the index recommended by the Brazilian Highways Concessionaires Association. In the following years, the traffic obeys a Geometric Brownian Motion. Its growth was assumed to be linear (2.29% per annum), derived from the feasibility studies. Given the unavailability of a historical series of traffic data, volatility (2.93%) was estimated based on a database constructed with data gathered from 41 Brazilian federal and state highway concessions.
- b) The deviation between the effective and expected traffic in the project's first year follows a triangular distribution. The mean and the standard deviation were based on a database constructed with data gathered from 41 Brazilian federal and state highway concessions. In the following years, the traffic obeys a Mean Reversing Motion. Its growth was assumed to be linear (2.29% per annum), obtained from a proxy of GDP growth expectation. Given the unavailability of a historical series of traffic data, volatility (2.93%) was estimated based on the index recommended by the Brazilian Highways Concessionaires Association.
- c) The deviation between the effective and expected traffic in the project's first year follows a triangular distribution. The mean and the standard deviation were based on a database constructed with data gathered from 41 Brazilian federal and state highway concessions. In the following years, the traffic obeys a Mean Reversing Motion. Its growth was assumed to be linear (2.29% per annum), derived from the feasibility studies. Given the unavailability of a historical series of traffic data, volatility (2.93%) was estimated based on the index recommended by the Brazilian Highways Concessionaires Association.
- d) The deviation between the effective and expected traffic in the project's first year follows a normal distribution. The mean and the standard deviation were based on a database constructed with data gathered from 41 Brazilian federal and state highway concessions. In the following years, the traffic obeys a Geometric Brownian Motion. Its growth was assumed to be linear (2.29% per annum), derived from the feasibility studies. Given the unavailability of a historical series of traffic data, volatility (2.93%) was estimated based on the index recommended by the Brazilian Highways Concessionaires Association.
- e) The deviation between the effective and expected traffic in the project's first year follows a normal distribution. The mean and the standard deviation were based on the index recommended by the Brazilian Highways Concessionaires Association. In the following years, the traffic obeys a Geometric Brownian Motion. Its growth was assumed to be linear (2.29% per annum), obtained from a proxy of GDP growth expectation. Given the unavailability of a historical series of traffic data, volatility (2.93%) was estimated based on a database constructed with data gathered from 41 Brazilian federal and state highway concessions.

### QUESTION 3

From the paper "4D Trajectory Conflict Detection and Resolution Using Decision Tree Pruning Method", what is AIDL?



Thus, based on this paper, it can be concluded:

- AIDL is the Android Interface Definition Language.
- AIDL file using the Java programming language for Android users.
- AIDL is an Aircraft Intent Description Language computation language to support ATM.
- AIDL is an IDL language used to generate code that enables two processes on an Android-powered device.
- Letters 'a' and 'b' are correct.

#### QUESTION 4 (ANULADA)

Consider the fragment from the paper by Zehui Guo et al (2023), "Impact of new Energy Vehicle Development on China's Crude Oil Imports: an empirical analysis":

*"Breaking the highly oil-dependent energy use structure in the transportation sector will be crucial for China to reduce its dependence on crude oil imports and ensure its energy security, and the development of new energy vehicles is helping to break this dilemma. A time series analysis summarizes the possible relationships between new energy vehicles and crude oil imports, i.e., new energy vehicles, as alternatives to fuel vehicles, will reduce the demand for oil in the transportation sector, which will in turn reduce crude oil imports, and crude oil prices and crude oil production will inhibit crude oil imports. In this empirical study, monthly data from 2015 to 2021 on crude oil imports, the market share of new energy vehicles, crude oil prices, and crude oil production are selected, time-series multiple regression modelling is adopted, and endogeneity is treated using a generalized method of moments (GMM). The regression results show that crude oil imports decrease by one unit for every 16.32% increase in crude oil prices, indicating that price factor is the most influential factor in China's crude oil imports, while crude oil imports decrease by one unit for every 133.99% increase in crude oil production, indicating that an increase in crude oil production contributes less to the reduction of crude oil imports. One unit of crude oil imports is added for every 15.53% increase in the share of new energy vehicles, indicating that the effect of new energy vehicles on limiting crude oil imports has not yet emerged. Probably due to the fact that new energy vehicles have not yet had a significant impact on fuel vehicles, oil consumption will continue to increase in the short and medium term, with oil for the petrochemical industry becoming the primary driver of this increase. Finally, policy implications are provided from the perspective of crude oil demand, supply, and China's oil price mechanism."*

The text above indicates that:

- The price of crude oil has no significant effect on new energy vehicles' market share.
- The price of crude oil is correlated with crude oil imports.
- There is no relationship between crude oil imports and crude oil production.
- Crude oil imports depend positively on new energy vehicles' market share.
- None of the above.

**JUSTIFICATIVA:** Ao reavaliar as opções indicadas para a questão 4 referente ao artigo Zehui Guo et al (2023), "Impact of new Energy Vehicle Development on China's Crude Oil Imports: an empirical analysis" é possível notar que a opção "b" que indica a existência de correlação entre as duas variáveis pode ser interpretado como correlação positiva ou negativa. Sendo assim, é correto afirmar que as duas respostas ("b" e "d") são válidas.

#### QUESTION 5

The text below is from the paper "Transitioning to manual driving requires additional time after automation deactivation."



*“Additional factors seem to influence the time to transition back to manual driving. Three factors have emerged in several studies as likely causes for delayed reactions in a take-over situation: The quality of automation monitoring through the driver, the characteristics of the NDRT (non-driving related tasks) and the complexity of the situation to which the driver has to react.”*

Thus, based on the text above, it can be concluded:

- a) The degree to which automation is monitored can affect the transition from automated to manual driving.
- b) Characteristics of the tasks performed during automated driving can influence the ability to take back manual control and the speed of the transition to manual driving.
- c) The complexity of the situation in which a TOR (take-over request) is triggered has been identified to affect the takeover time.
- d) *“The quality of automation monitoring through the driver, the characteristics of the NDRT (non-driving related tasks) and the complexity of the situation to which the driver has to react”* cannot be considered as factors that influence the TOR.
- e) Letters ‘a’, ‘b’ and ‘c’ are correct.

#### QUESTION 6

The paper *“Brazilian railways separability infrastructure/operations: investigation by production indicators”* by Da Silva (2022) aims to investigate the performance of rail freight transportation concessions in Brazil regarding production scale, scope and density in the last 10 years and whether verticalization measures would be more advantageous than separating infrastructure and operation, or not. Answer the question about the paper: The measurement of efficiency and productivity can be parametric and non-parametric. What was the choice by the author?

- a) Data Envelopment Analysis.
- b) Least Square.
- c) Frontier Analysis.
- d) GMM.
- e) Entropy.

#### QUESTION 7

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- a) He uses a regression analysis.
- b) He uses a qualitative analysis.
- c) He uses a causality analysis.
- d) He uses a contrafactual analysis.
- e) He uses a graph analysis.

#### QUESTION 8

From the paper *“4D Trajectory Conflict Detection and Resolution Using Decision Tree Pruning Method”*, the

critical problem is high computation complexity for Conflict Detection, for proximity  $O(n^2)$ , where "n" is:

- a) The number of passengers.
- b) The number of controllers.
- c) The number of airports.
- d) **The number of aircraft.**
- e) The number of airlines.

**QUESTION 9**

The Table 3 from the manuscript “Factors influencing subjective walkability: Results from built environment audit data” gives the Statistical Models Predicting Subjective Scores from micro-scale street characteristics.

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Benches	0.47	0.22 – 0.73	<0.001	0.61	0.29 – 0.94	<0.001
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Sidewalk tree cover (Reference: 0-25%)						
26 - 75%	0.58	0.34 – 0.81	<0.001	0.94	0.66 – 1.22	<0.001
76 - 100%	0.76	0.29 – 1.23	0.002	1.29	0.75 – 1.83	<0.001
<b>Streetscape design</b>						

Considering the results to Safety and Security and Pedestrian facility and comfort, it is incorrect to state:

- a) Speed limit had a statistically significant effect (negative) on the subject score model.
- b) Street lighting only had a significant impact on both models when in ample presence compared to none with an increase of 0.85 and 1.23 points for travel and leisure scores respectively.

- c) Benches on a street segment had a significant effect in both models.
- d) Sidewalk maintenance had a higher effect on leisure scores.
- e) All statements are correct.

**QUESTION 10**

As shown in Figure 9 below from the manuscript of Lee et al. (2023) “Advancing investigation of automated vehicle crashes using text analytics of crash narratives and Bayesian analysis”, this study generated a summary diagram highlighting the critical interrelationships among pre-crash conditions, AV driving modes, crash types, and crash outcomes. They are summarized according to the marginal effects of explanatory variables in Models 1, 2A, 3A, 4A, and 5A from the frequentist approach.

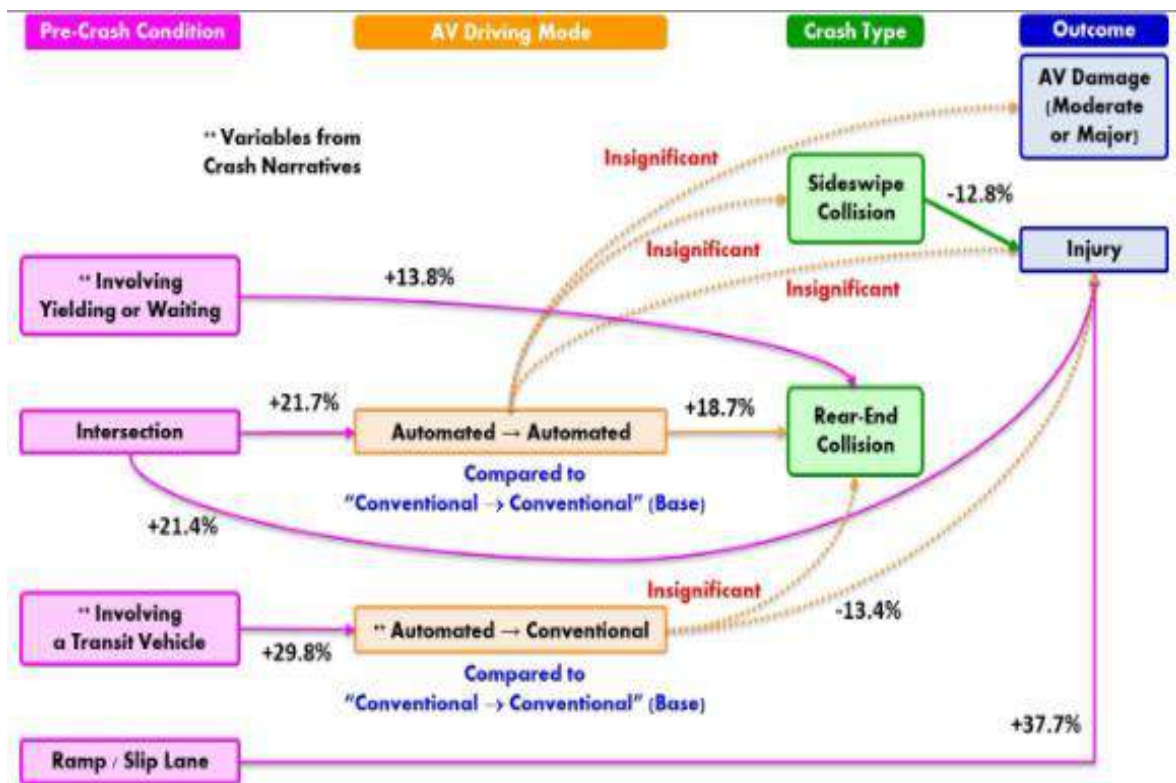


Figure 9. Summary of key interrelationships

- I. “Intersection” is associated with a higher chance that an AV is in the automated driving mode by 21.7 %, given a crash. “Ramps or slip lanes are” correlated with a higher chance of injury by 37.7 %, given a crash.
- II. The automated driving mode is correlated with a higher chance of a rear-end collision by 18.7 %, compared to the conventional mode.
- III. “Involving a transit vehicle” is associated with a higher chance of manual disengagement by 29.8 %, given a crash.
- IV. “Sideswipe collision” is associated with a lower chance of injury by 12.8 %, given a crash.

Based on these above affirmatives, check the correct option:

- a) All statements are correct.
- b) Only statements I and II are correct.
- c) Only statements I and III are correct.
- d) Only statements I and IV are correct.
- e) Only statements III and IV are correct.

**QUESTION 11**

Considering Figure 7 extracted from Pellizzon et al. (2022), “Method for Setting Weight Tolerance Limits in High-Speed Weigh-in-Motion Systems: A Case Study in Brazil” it is true to say:

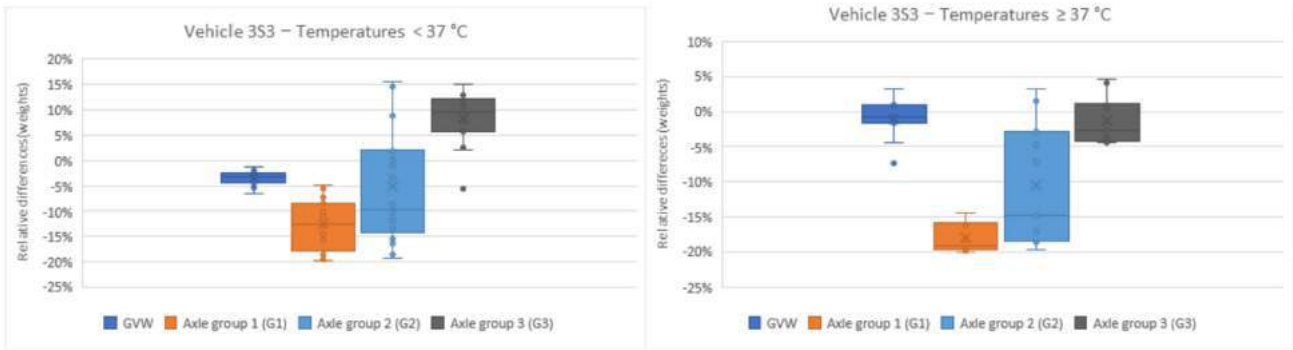


Figure 7. Box-plots of the relative differences of weight measurements by GVW and axles groups—articulated truck (3S3), six axles and three groups of axles—Section A02.

- There is no effect of the temperature on the weight measurements by GVW and axles groups for 3S3 trucks.
- The variation in the weight measurements for GVW is higher when temperatures are below 37°C.
- On average, the weight measurements for Axle group 3 (last box plot of each subfigure) are independent of the temperature.
- The weight measurements of GVW have the same variation as the axles when temperatures are above 37°C.
- None of the above.

**QUESTION 12**

Considering Figure 4 extracted from Pellizzon et al. (2022), “Method for Setting Weight Tolerance Limits in High-Speed Weigh-in-Motion Systems: A Case Study in Brazil” the order of trucks with higher Gross Vehicle Weight (GVW) capacity is:



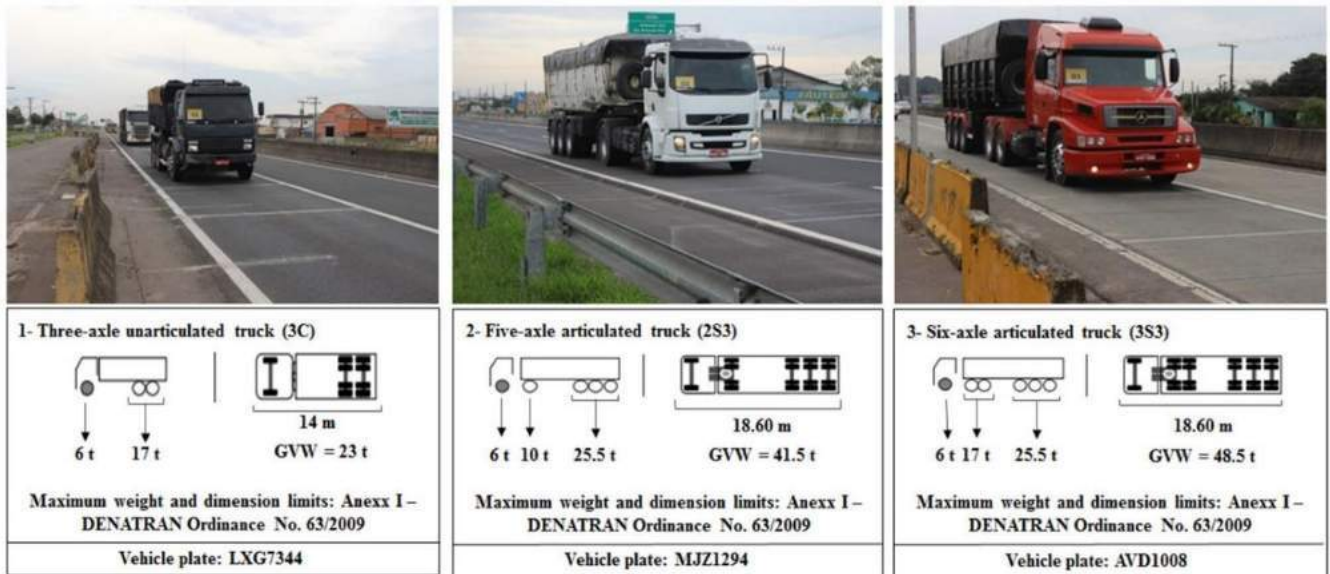


Figure 4. Vehicles used in the case study.

- a) 3C>2S3>3S3.
- b) 3C<2S3<3S3.
- c) 3S3<2S3<3C.
- d) 3S3=2S3=3C.
- e) None of the above.

**QUESTION 13**

In "Opinion of Residents about the Freight Transport and Its Influence on the Quality of Life: An Analysis for Brasília (Brazil)" the following figure shows the 5-Point Likert scale responses measured the respondents' level of agreement with the influence of these factors on the quality of life. Check the alternative that contains the highest number of totally disagree and totally agree answers.

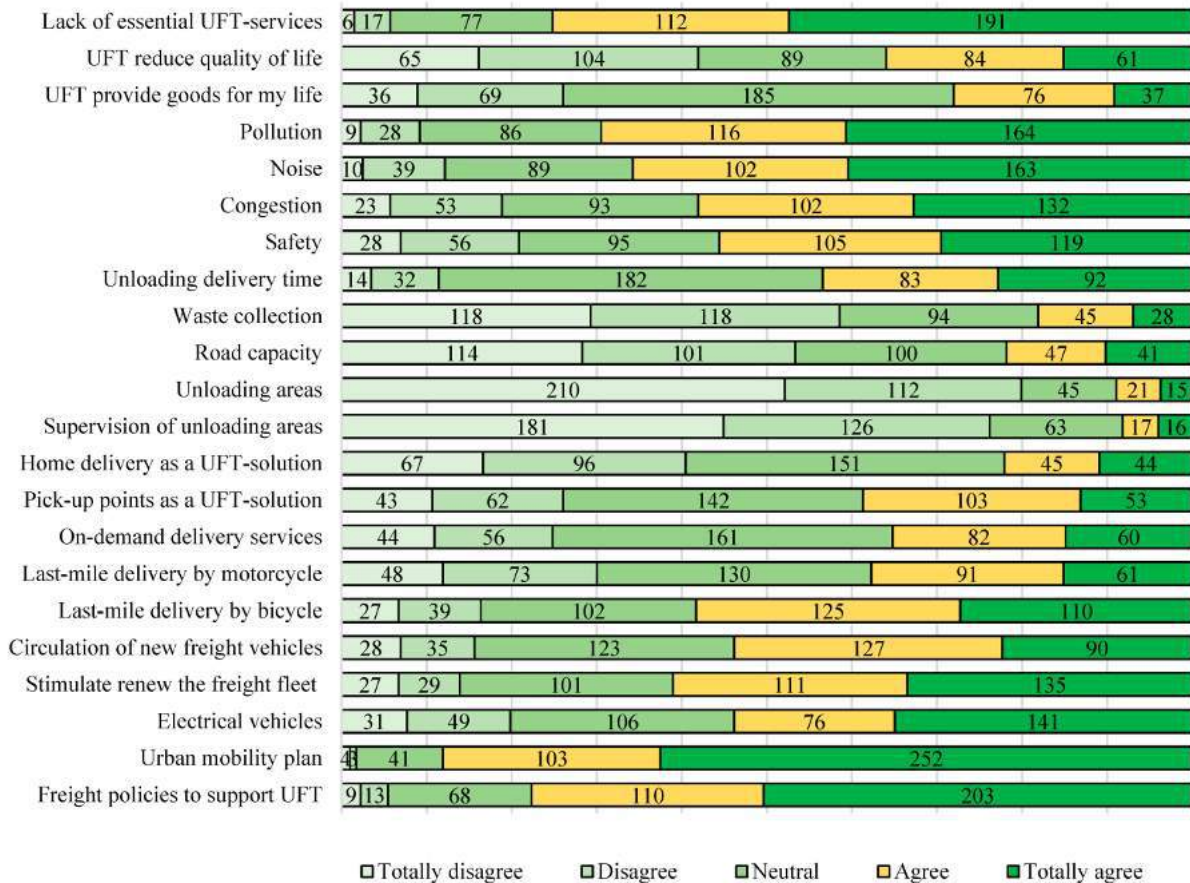


Figure 4. Level of agreement of the variable concerning the importance to the quality of life

- a) Waste collection and Pollution.
- b) Unloading areas and Urban mobility plan.
- c) Urban mobility plan and Electrical vehicles.
- d) Congestion and safety.
- e) UFT reduces quality of life and Urban mobility plan.

**QUESTION 14**

From the manuscript “Transitioning to manual driving requires additional time after automation deactivation.” M01 to M05 represent the take-over scenarios defined in their study. TOR is defined as the take-over request. Vertical line marks onset of event. According to the Figure 1 below, we can affirm:

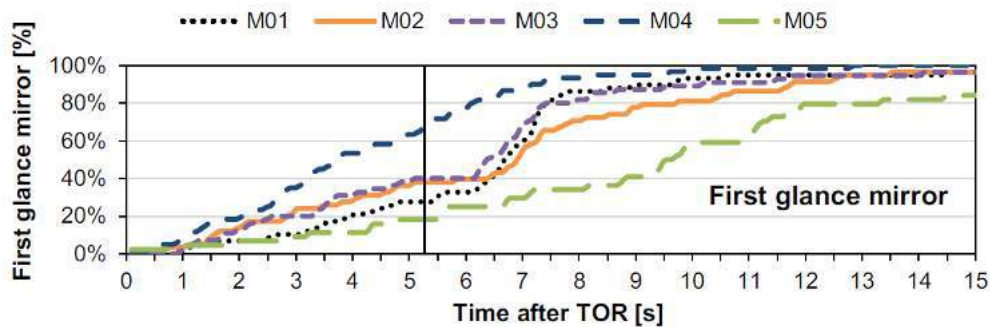


Figure 1. Cumulative percentage of first glance at the mirror after the TOR collapsed across all NDRT conditions. Vertical line marks onset of event (5.4 s)

- At TOR equal to 7s, considering M02, more than 80% of the participants did the first glance at the mirror.
- For M01, less than 20% of the participants did the first glance at the mirror at 5.5 s.
- Considering M04, more than 40% of the participants did the first glance in the mirror at 5.5 s.
- Considering a cumulative percentage graph, it is expected that curves tend to 100%, as seen in M01 to M04.
- None of the above.

### QUESTION 15

The paper "Active Road User Interactions with Autonomous Vehicles: Proactive Safety Assessment, Alozi, A. R. and Hussein A. M., Transportation Research Record, TRB 2023" shows the Figure 9 next of the Relative collision risk by movement type (based on through conflicts). It must be said that HIGHER values for Relative Collision Risk mean more dangerous conflicts.

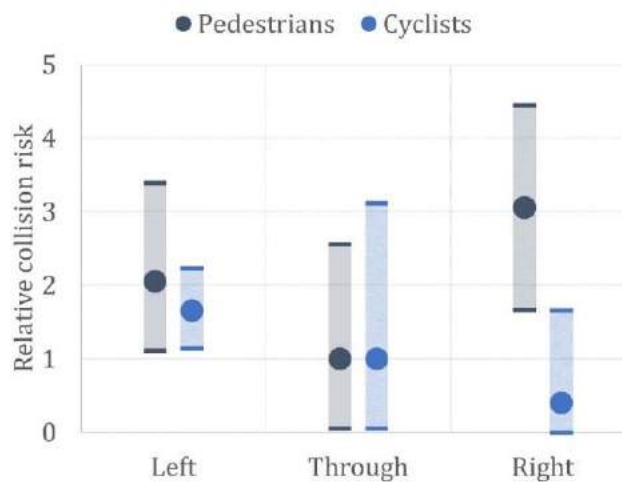


Figure 9. Relative collision risk by movement type (based on through conflicts).

Therefore, according to the Fig. 9 above which of the following sentences is the correct one:

- The left-turning conflicts are the most alarming ones for the pedestrians.
- The left-turning conflicts are the most alarming ones for the cyclists.
- The through-turning conflicts are the most alarming ones for the pedestrians.
- The through-turning conflicts are the most alarming ones for the pedestrians.
- The right-turning conflicts are the most alarming ones for the pedestrians.

### QUESTION 16 (ANULADA)

Consider Figure 3 from the manuscript of Lee et al. (2023) "Advancing investigation of automated vehicle crashes using text analytics of crash narratives and Bayesian analysis".

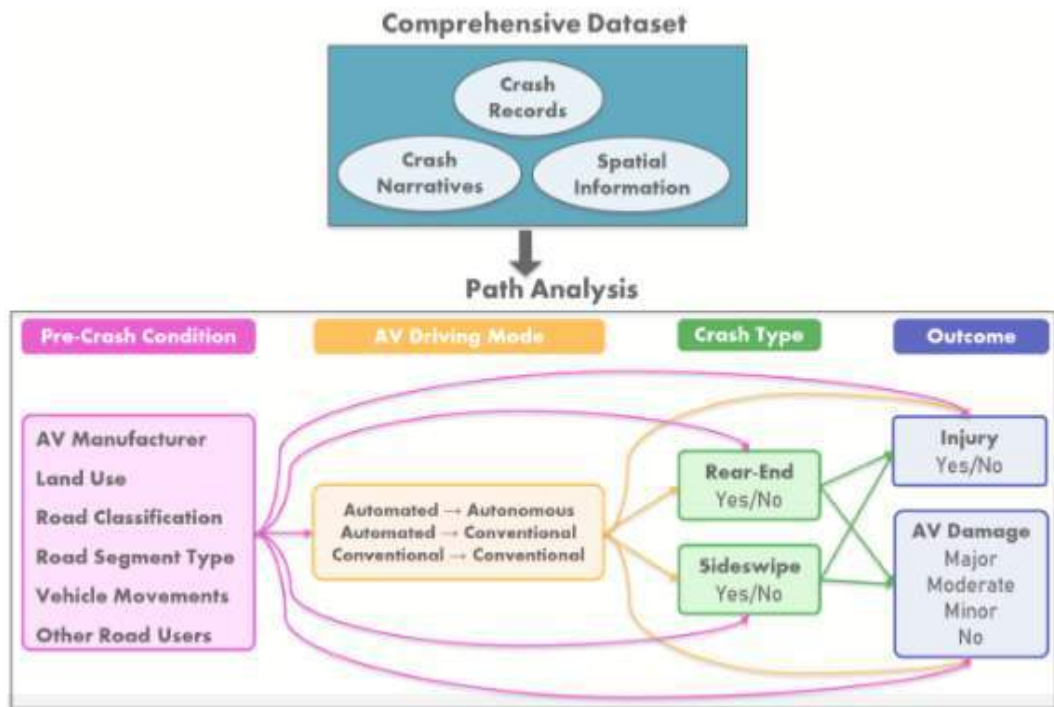


Fig. 3. Conceptual Framework.

- I. This study consists of two main tasks: (i) Organization of a comprehensive dataset of AV-involved crashes and (ii) Statistical analysis with a path analytic framework.
- II. The method uses surveys of those involved in the accidents.
- III. The method includes the investigation of the places where each AV-involved crash occurred to extract the variables concerning land use, road classification, and road segment types.

Based on these above affirmatives:

- a) Options I and II are correct.
- b) Options I and III are correct.
- c) Options II and III are correct.
- d) Options I, II and III are correct.
- e) All statements are incorrect.

**JUSTIFICATIVA:** O artigo de Lee et al. (2023) “Advancing investigation of automated vehicle crashes using text analytics of crash narratives and Bayesian analysis” deixa claro no resumo, no método (descrito na Figura 3 disposta na questão em análise) e no procedimento de obtenção dos dados que o estudo foi baseado em relatórios de colisão envolvendo veículos autônomos, não tendo sido mencionado em qualquer parte do texto a realização de pesquisas com usuários ou envolvidos nos acidentes. Ressalta-se que as informações denominadas “narrativas de acidentes” foram obtidas junto aos fabricantes dos Veículos Autônomos. Ver trecho específico da sessão de coleta dos dados:

“The crash narratives in AV collision reports are provided by AV manufacturers and can help identify the valuable information that the standardized form has failed to capture. This study shows how such data can be leveraged to improve knowledge of AV safety in mixed traffic. Specifically, this study collected additional variables by conducting a text analysis of crash narratives. The variable extraction from crash narratives has been performed according to the following procedure.

- Performing a text analysis of all the crash narratives to check word or phrase frequency.
- Comparing the frequently mentioned words or phrases to the items recorded in crash reports.

- Finding out the frequently mentioned words or phrases missing in crash reports.
- Setting a variable corresponding to specific words or phrases.
- Extracting the variable's value for each case by reviewing each crash narrative.
- Testing the variable in statistical modeling to check if it has a statistically significant impact."

Assim, apesar de a figura apresentada na questão (Fig 3. Conceptual Framework) indicar "Crash Narratives" e não "Survey", a comissão indica a anulação da questão por entender com o termo "narrative" poderia contribuir para a interpretação de participação de envolvidos nos sinistros nesses relatos.

### QUESTION 17

The following text is extracted from the paper of Costa & Rocha (2021), "Demand risk and contractual abandonment: a real options analysis of the BR-381/262/MG/ES highways concession":

"The possibility of abandoning a highway concession contract introduces flexibility in the investment project. Investment projects that present managerial flexibility can be analyzed in the light of real options theory. Unlike the traditional Net Present Value (NPV), the NPV of a flexible investment project is expressed by the relationship  $NPV_{RO} = NPV_T + V_{RO}$ , where  $NPV_{RO}$  is the net present value of the flexible investment project,  $NPV_T$  is the traditional NPV and  $V_{RO}$  is the value of the real option. The last term enters in the equation because the private partner was given the right to abandon the concession."

Considering the text above and the modelling of the contractual abandonment option, read the following statements and choose the correct answer:

- The binomial tree method proposed by Cox, Ross and Rubinstein (1979) was used to model the uncertainty of the Future Project Value as a function of the stochastic demand process.
  - The authors modelled contractual abandonment as a sales option (put option). The exercise of the option was taken to be from year 9 to year 29 of the concession. According to them, this assumption avoided the abandonment possibility during the initial investment phase, which could result in very high indemnity values to be paid by the public authority.
  - The project volatility was defined as the standard deviation in the percentage variations in the project value from one period to the following one, according to the formula  $z = \ln(PV_1/PV_0)$ . That value was calculated using Monte Carlo simulation of the cash flow subject to risk.
  - The price of abandonment (strike price) was equal to the value of the indemnity as foreseen in ANTT Resolution nº 5.860/2019. The indemnity values for reversible assets should be based on the historical costs, less taxes recovered, financial costs, depreciation and amortization. A discount of 10% was applied to that amount to cover expenses with the retendering process, eventual contract fines or sanctions and the period.
- Statements I and II are correct.
  - Statements I and III are correct.
  - Statements II, III and IV are correct.
  - Statements I, III and IV are correct.
  - Statements I, II, III and IV are correct.

### QUESTION 18

From the manuscript "4D Trajectory Conflict Detection and Resolution Using Decision Tree Pruning Method", what are the uncertainty factors in CD&R:

- Human.



- b) Aircraft.
- c) Weather.
- d) Temperature.
- e) All of the above.

### QUESTION 19

The text below was extracted from Pellizzon et al. (2022), "Method for Setting Weight Tolerance Limits in High-Speed Weigh-in-Motion Systems: A Case Study in Brazil":

"In general, considering the p-values for the section A02, given the comparative tests performed and the accuracy situation of the HS-WIM system, and also from the tests of multiple comparisons, it was possible to verify that all of them seemed to be influenced by vehicle configurations, including the respective characteristics of traffic (load and its distribution, dimensions, types of axles, wheel spacing, type of wheel, tire filling pressure and their distribution on the pavement, etc.), by the variations in speed and also by the association or relationship between the types of vehicles and the speeds, when interacting with the pavement and their respective geometric characteristics and responses to the applied loads. This result is consistent with the considerations pointed out by ref. [27] regarding vehicle–road interaction and also about dynamic load."

It is possible to conclude from weight measurements that:

- a) The weight measurements show variation only when the vehicle configurations is considered.
- b) The weight measurements show variation only when the vehicle configurations and speed are considered.
- c) The weight measurements show variation when the vehicle configurations and speed are considered.
- d) The weight measurements show variation when the vehicle configurations and geographical location are considered.
- e) None of the above.

### QUESTION 20

According to Costa & Rocha (2021) in the paper "Demand risk and contractual abandonment: a real options analysis of the BR-381/262/MG/ES highways concession", the abandonment option adds a considerable sum to the project's original value (without the existence of flexibilities). The authors highlighted the importance to have prior knowledge of the value that a possible retendering process aggregates to projects so that future concession contracts can be modelled more efficiently, taking into account three aspects: 1) the concession must be attractive for private investment; 2) the attractiveness of eventual contractual default must be limited; and 3) the government must minimize its budget commitments. To analyze the behavior of the abandonment option value, a sensitivity analysis was conducted for major variables. Which of the following alternatives represents the tested variables?

- a) Project volatility, risk-free rate and investment schedule.
- b) Fine on indemnity, project volatility and underlying asset value.
- c) Fine on indemnity, project volatility and risk-free rate.
- d) Project volatility, investment schedule and underlying asset value.
- e) Fine on indemnity, traffic volatility and underlying asset value.

### QUESTION 21

"Take-over time equal to take-over quality?" it is a question presented in the manuscript "Transitioning to

manual driving requires additional time after automation deactivation". The author explains that:

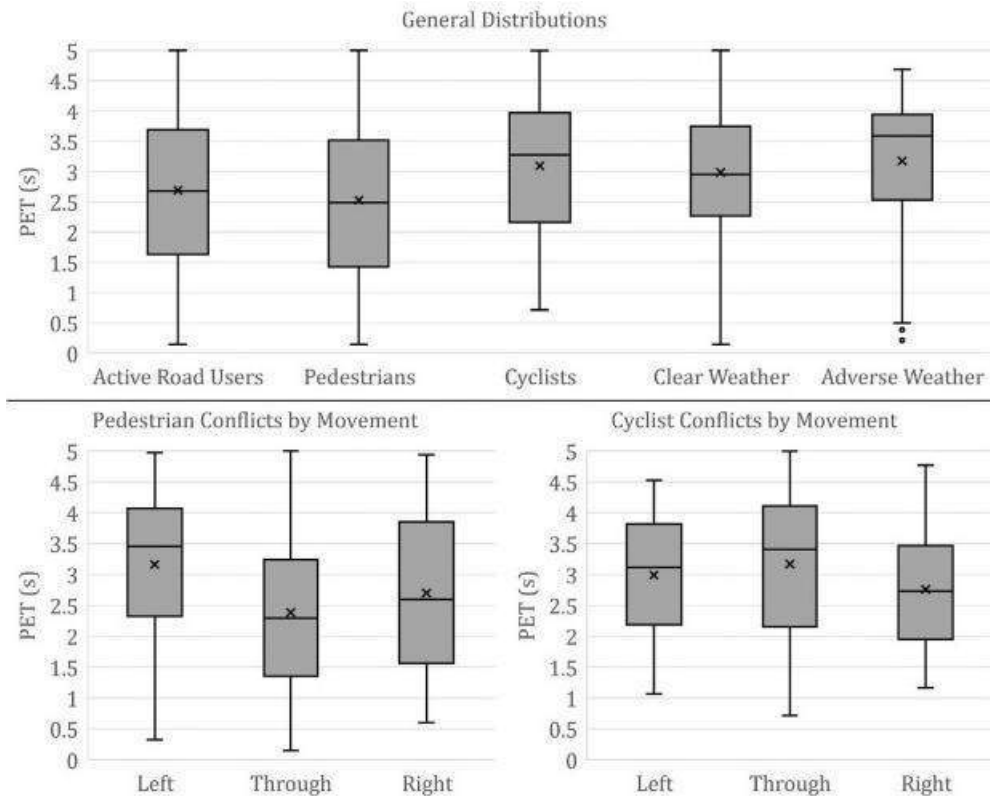
"...It becomes apparent, that the take-over time can only reflect one aspect of a drivers' readiness to retake control, especially in complex driving situations. To supplement and validate the take-over times it is therefore crucial to define additional measures of take-over quality. To define a sufficient time period for a safe transition of control, different measures for the readiness to react after a TOR need to be analyzed."

It means that:

- a) The take-over times measured in some studies do not represent drivers' capacity to take over control of the car when they did safely.
- b) The take-over quality is not affected by drivers' readiness to retake control, especially in complex driving situations.
- c) To supplement and validate the take-over times it is therefore crucial to define additional measures of take-over quality.
- d) Longer take-over times are not relevant when analyzing the quality of the driver's driving.
- e) The manuscript's author considers that treating different measures for the readiness to react after a take-over request is not relevant. Therefore, it is not necessary to analyze it.

**QUESTION 22**

The paper "Active Road User Interactions with Autonomous Vehicles: Proactive Safety Assessment, Alozi, A. R. and Hussein A. M., Transportation Research Record, TRB 2023" shows the Figure 6 below of the Statistical distribution breakdown of the Autonomous Vehicle (AV) conflicts for the road users. Observe that LOWER values of PET (post-Encroachment time) in the y-axis, mean RISKIER movements.



**Figure 6.** Statistical distribution breakdown of the considered conflicts.  
Note: PET = post-encroachment time.

Therefore, according to the Fig. 6 above which of the following sentences is the correct one:

- a) For the Pedestrian Conflicts by Movement, the left-turn conflicts are the riskiest ones.
- b) For the Cyclist Conflicts by Movement, the through-turn conflicts are the riskiest ones.
- c) For the Pedestrian Conflicts by Movement, the through-turn conflicts are the riskiest ones.
- d) Analyzing the General Distribution graph, it can be said that the cyclist conflicts are riskier than the pedestrian conflicts.
- e) For the Cyclist Conflicts by Movement, the left-turn conflicts are the riskiest ones and, for the Pedestrian Conflicts by Movement the left-turn conflicts are the riskiest ones.

**QUESTION 23**

According to the text reproduced below from the paper by Zehui Guo et al (2023) we can assert that

“As suggested by Schwert (1989) [23], the ADF test was further performed (Table 1) on the logarithmic values of each variable with lag order  $P_{max} = [12 - (T/100)1/4] = 11.49$ , taking  $P_{max} = 11$  and sequentially making  $p = 10, 9, \dots$  until the lag order is 5, the last order lag term (L2D.) is significantly non-zero and the ADF statistic  $Z(t) = -3.610 < -3.469$ , and the null hypothesis is at 5% level of significance, i.e., the logarithm of the new energy vehicle market share is considered to contain no unit root and to be a smooth time series. The ADFs of crude oil imports, crude oil prices, and crude oil production are similarly smooth time series and meet the prerequisites for time series multiple regression analyses.”

- a) ADF tests on the data preclude the use of multiple regression analysis.
- b) Some of the (data) time series have unit roots.
- c) Although the dependent variable is smooth, the explanatory variables exhibit unit roots.
- d) None of the variables, dependent and explanatory, exhibit unit roots.
- e) None of the above

**QUESTION 24**

In “Opinion of Residents about the Freight Transport and Its Influence on the Quality of Life: An Analysis for Brasília (Brazil)” the following Figure 2 shows that 18.4% of the quality of life is explained by:

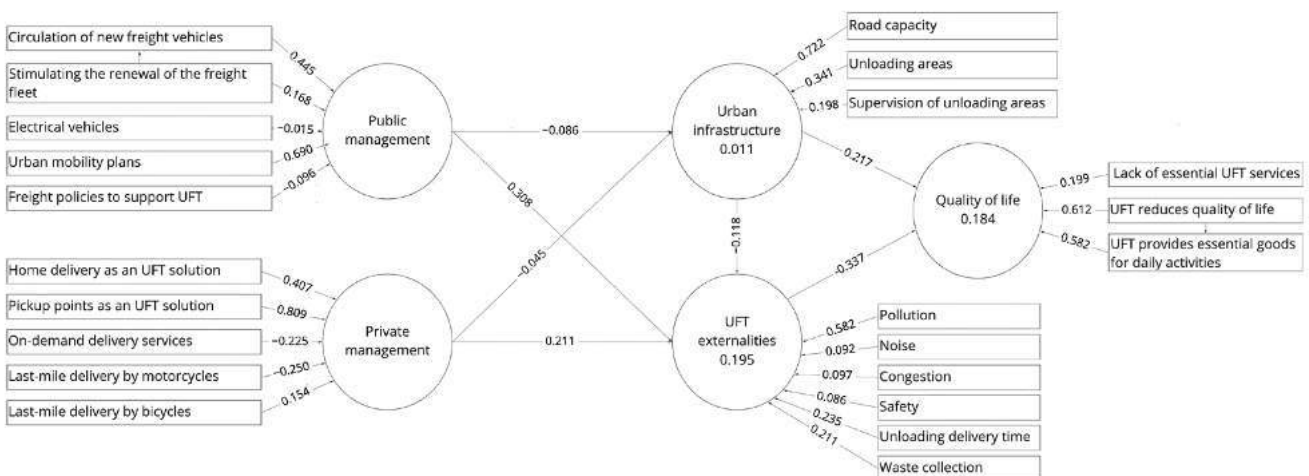


Figure 2. Path model.

- a) Urban infrastructure.
- b) Public management.
- c) Urban infrastructure e UFT externalities.





- d) UFT externalities.
- e) Public management e UFT externalities.

### QUESTION 25

Consider the text reproduced from the paper *"Impact of new Energy Vehicle Development on China's Crude Oil Imports: an empirical analysis"*:

Based on the analysis in the introductory section, the paper makes the following hypotheses.

- Hypothesis 1. The higher the market share of new energy vehicles, the lower the crude oil imports.
- Hypothesis 2. The higher the crude oil production, the lower the crude oil imports.
- Hypothesis 3. The higher the price of crude oil, the lower the volume of crude oil imports.

The text from the paper by Zehui Guo et al (2023), allows to state that:

- a) All hypotheses are proved valid.
- b) None of the hypotheses hold.
- c) Only hypothesis H1 holds.
- d) The results are inconsistent with hypothesis H2.
- e) **The results are inconsistent with hypothesis H1.**

### QUESTION 26

The paper *"Brazilian railways separability infrastructure/operations: investigation by production indicators"* by Da Silva (2022) aims to investigate the performance of rail freight transportation concessions in Brazil regarding production scale, scope and density in the last 10 years and whether verticalization measures would be more advantageous than separating infrastructure and operation, or not. Answer the question about the paper: By the conclusion, the verticalization in the Brazilian railway can or can't be a model in concessions contracts, because:

- a) Verticalization cannot be a model because there are no scope gains.
- b) The results are sufficient to indicate verticalization as a model because there are scope gains.
- c) The results are sufficient to indicate verticalization as a model because there are scale gains.
- d) **The results are not sufficiently robust to categorically state which structure is better.**
- e) Verticalization can be a model because there are scope or scale gains.

### QUESTION 27

The paper *"Active Road User Interactions with Autonomous Vehicles: Proactive Safety Assessment, Alozi, A. R. and Hussein A. M., Transportation Research Record, TRB 2023"* shows the Figure 10 next of the Distribution comparison of through conflicts involving pedestrian violations. Observe that LOWER values of PET (post-Encroachment time) in the y-axis, mean RISKIER movements. It is also said in the paper that *"the high number of conflicts involving pedestrian violations can be attributed to the nature of the streets where the data was collected, most of which were minor urban streets where the subject AV was travelling at low speeds"*. As a result, many pedestrians would cross in groups, giving them a higher sense of safety.

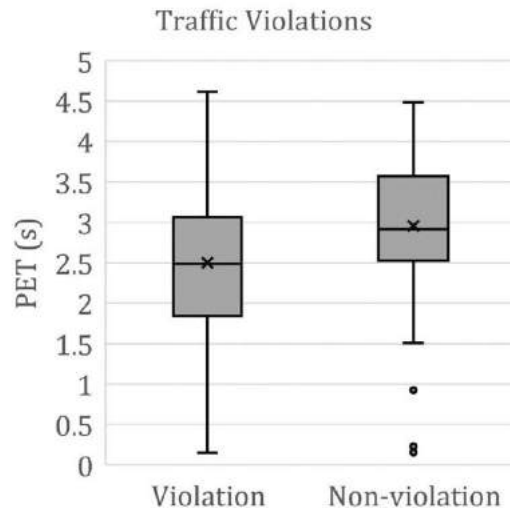


Figure 10. Distribution comparison of through conflicts involving pedestrian violations.  
Note: PET = post-encroachment time.

Therefore, according to the Figure 10 above which of the following sentences is the correct one:

- a) There is a lower number of conflicts involving pedestrian Violations when compared with pedestrian non-Violations.
- b) The low number of Conflicts involving pedestrian Violations is because the data was collected mainly in freeways and not in minor urban streets.
- c) There is a higher number of conflicts involving pedestrian non-Violations when compared with pedestrian Violations.
- d) There is a higher number of conflicts involving pedestrian Violations when compared with pedestrian non-Violations.
- e) The high number of Conflicts involving pedestrian non-Violations is because the data was collected mainly in freeways and not in minor urban streets.

### QUESTION 28

The Table 1 from the manuscript of Lee et al. (2023) "Advancing investigation of automated vehicle crashes using text analytics of crash narratives and Bayesian analysis" gives the descriptive statistics of key variables of this study.

**Table 1**  
Key Statistics (Sample Size = 260).

Variable	Frequency	Percentage (%)
<b>Vehicle manufacturer</b>		
Cruise LLC	105	40.4
Waymo LLC	98	37.7
Other	57	21.9
<b>AV driving mode</b>		
Automated → Automated	104	40.0
Automated → Conventional (Manual Disengagement)	62	23.9
Conventional → Conventional	94	36.2
<b>Land use</b>		
Residential	102	39.2
Commercial	103	39.6
Recreational	11	4.2
Other	44	16.9
<b>Road classification</b>		
Freeway / Expressway / Highway	11	4.2
Street	222	85.4
Other	27	10.4
<b>Road segment type</b>		
Intersection	215	82.7
Ramp / Slip Lane	6	2.3
Other	39	15.0
<b>Vehicle movements (AV, Second Vehicle)</b>		
(Stopped, Straight)	61	23.5
(Slowing/Stopping, Straight)	11	4.2
(Straight, Straight)	24	9.2
(Straight, Changing Lanes)	16	6.2
(Left, Straight)	10	3.9
Other	138	53.1
<b>Involving an AV's yielding or waiting</b>	60	23.1
<b>Other road users</b>		
Involving a transit vehicle	6	2.3
Involving a pedestrian or bicyclist	16	6.2
<b>Crash type</b>		
Rear-End	135	51.9
* 129 AVs (95.6 %) were rear-ended by another vehicle.		
Sideswipe	52	20.0
* 36 AVs (69.2 %) were sideswiped by another vehicle.		
Other	73	28.1
<b>Involving injury to at least one person</b>	50	19.2
<b>AV damage level</b>		
None	21	8.1
Minor	198	76.2
Moderate	38	14.6
Major	3	1.2

Statistics offer information on vehicle movements and AVs' interaction with other road users before a crash. Considering the statements below, check the correct option:

- Notably, 23.5 percent of the crashes occurred when an AV was stopped while the second vehicle was proceeding straight.
- Notably, 6.2 percent of the crashes occurred when an AV and the second vehicle was proceeding straight.
- Notably, 60% of crashes occurred while an AV was yielding to or waiting for other road users.
- Furthermore, it is revealed that 6 percent of the crashes occurred while an AV was interacting with a transit vehicle.
- Meanwhile, 2.3% of the crashes happened while an AV was interacting with pedestrians or bicyclists.

**QUESTION 29**

The question refers to Table 3 - Statistical Models Predicting Subjective Scores from micro-scale street characteristics (paper “Factors influencing subjective walkability: Results from built environment audit data”).

**Table 3.** Statistical Models Predicting Subjective Scores from micro-scale street characteristic

Predictors	Subjective Score for Travel			Subjective Score for Leisure		
	Estimates	CI	p	Estimates	CI	p
(Intercept)	4.75	3.54 – 5.96	<0.001	6.48	5.33 – 7.55	<0.001
<b>Land Use</b>						
Main land use (Reference: Residential)						
Vacant / Industrial				-1.31	-1.88 – -0.74	<0.001
Commercial				-0.81	-1.20 – -0.43	<0.001
Mixed				-0.47	-0.84 – -0.10	0.012
Parks				0.83	0.47 – 1.19	<0.001
Parking lots				-0.65	-0.98 – -0.32	<0.001
Transit stops				-0.64	-0.95 – -0.32	<0.001
<b>Accessibility</b>						
Walkscore	0.16	0.10 – 0.21	<0.001			
<b>Street connectivity</b>						
Cul-de-sac	-0.99	-1.47 – -0.50	<0.001			
<b>Safety and security</b>						
Pedestrian light signal (Reference: None)						
One Intersection	-0.37	-0.66 – -0.07	0.014			
Two Intersections	-0.01	-0.41 – 0.39	0.971			
Speed limit	-0.33	-0.49 – -0.18	<0.001	-0.56	-0.74 – -0.38	<0.001
Street lighting (Reference: None)						
Some	0.47	0.07 – 0.87	0.020	0.57	0.12 – 1.02	0.014
Ample	0.85	0.35 – 1.35	0.001	1.23	0.67 – 1.79	<0.001
<b>Pedestrian facility and comfort</b>						
Benches	0.47	0.22 – 0.73	<0.001	0.61	0.29 – 0.94	<0.001
Sidewalk buffer (Reference: None)						
One side	0.65	0.28 – 1.03	0.001	0.57	0.14 – 1.00	0.009
Two sides	0.89	0.54 – 1.24	<0.001	0.81	0.42 – 1.20	<0.001
Sidewalk maintenance	0.72	0.48 – 0.96	<0.001	0.53	0.27 – 0.80	<0.001
Sidewalk tree cover (Reference: 0-25%)						
26 - 75%	0.58	0.34 – 0.81	<0.001	0.94	0.66 – 1.22	<0.001
76 - 100%	0.76	0.29 – 1.23	0.002	1.29	0.75 – 1.83	<0.001
<b>Streetscape design</b>						

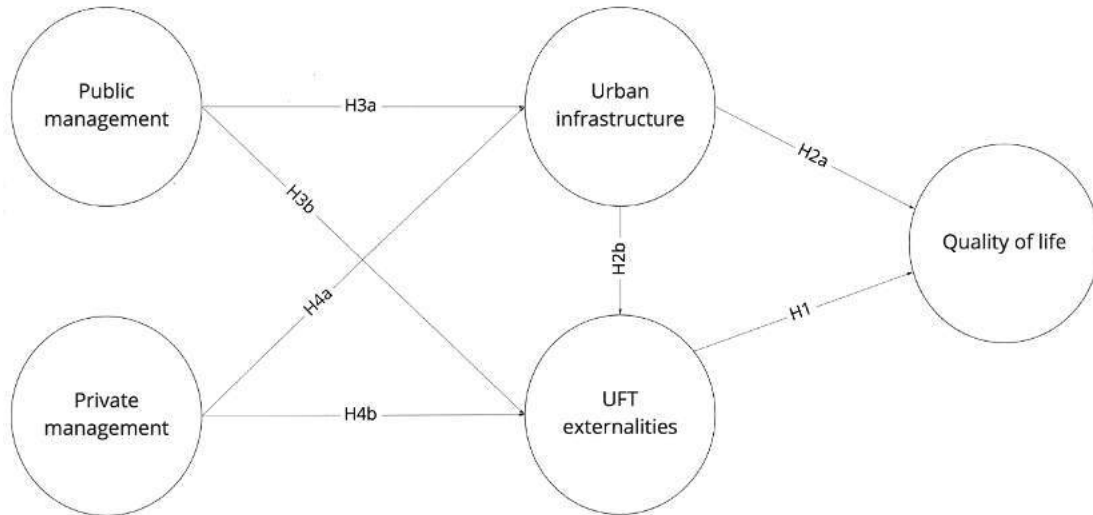
Related to Land Use variables, it is incorrect to state that:

- Vacant or industrial land use led to a significant decrease in leisure scores of 1.31 points compared to residential ones.
- The list of land use variables is part of the meso-scale characteristics.
- The negative effect of vacant or industrial was expected as segments with such land use are generally characterized by heavy truck traffic, poor aesthetics as well as noise and air pollution.
- Commercial street segments can be categorized by heavy traffic across modes which has been shown in previous research to discourage leisure walking.
- All statements are correct.

**QUESTION 30**

The paper “Opinion of Residents about the Freight Transport and Its Influence on the Quality of Life: An Analysis for Brasília (Brazil)” analyzes how Urban freight transport (UFT) externalities influence residents’ quality of life.

The conceptual model used to verify how UFT externalities influence residents' quality of life is presented in the following Figure 1.



**Figure 1.** Conceptual model.

Which of the listed variables in the model is not an intervening latent variable?

- a) Public management.
- b) Private management.
- c) Urban infrastructure.
- d) Quality of life.
- e) UFT externalities